4th International
Landscape Archaeology Conference
22nd-25th August 2016

Dept. of Archaeology and Ancient History
Uppsala University

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landscape
archaeology
conference
LAC 2016

Valsgärde

Valsgärde is the best preserved and most extensively excavated boat burial site in the region. Objects from nearly a 100 burials can be seen at the Museum Gustavianum in Uppsala and the Gamla Uppsala museum. These graves play a key role in the ongoing Viking phenomenon project.

3D model by Daniel Löwenborg, Uppsala University

	MONDAY 22nd AUGUST						
	IHOPE DAY						
10.00-12.00	IHOPE session A (Hörsal 4)		Distributed Observing Network of the Past			Chair: Tom McGovern	
12.00-13.00	Lunch						
13.00-15.00	IHOPE session B (Hörsal 4)		Water Management and Food Security			Chair: Paul Sinclair	
15.00-15.30	Coffee						
15.00-18.00	LAC 2016 REGISTRATION DESK OPEN						
15.30-17.30	IHOPE/LAC roundtable (Hörsal 4)		If the Past Teaches, what does the Future Learn?			Chair: Carole Crumley	
18.00-20.00	IHOPE/ LAC Opening Reception (sponsored by IHOPE)						
	TUESDAY 23rd AUGUST						
8.00-	**LAC2016 REGISTRATION**						
	OPENING						
9.00-10.50	Plenary 1						
	Hörsal 3						
	1. Opening	2. Gaffney	3. Neubauer	4. Bewley			
10.50-11.10	Coffee						
11.10-13.00	Session E1	Session F1	Session B1		Session C3	Session F4	
	Hörsal 2	H425	A114	A138	A144	B115	B153
	Ortega et al.	Schumacher et al.	Gouw-Bouman et al		Braemer & Geyer	St. John-Brooks	
	Heitz	Coughlan et al.	Kolár et al		Bruins & van der Plicht	Meier	
	Glais et al.	Palet et al.	Jacomet		Avni	van Lanen	
	Avramidis et al.	Orengo et al.	Tallavaara et al			Knappett et al.	
	Wright		Eser		Discussion	Pethen	
13.00-14.00	Lunch						
14.00-16.00	Session E1 cont'd	Session F1 cont'd	Session B1 cont'd	Session A2	Session C3 cont'd	Session F4 cont'd	Session E3
	Hörsal 2	H425	A114	A138	A144	B115	B153
	Given	Stagno et al.	Kay et al	Diachenko & Zubrow	Al Karaimeh & Lucke	Efkleidou	Meister et al.
	Chelazzi	Cruz Cardete	Richer et al	Allison	Al Qudah et al	Banaszek	Avni et al.
	Kennedy	Chapinal	Widgren	Tseng	Wilson	Pihokker	Ben-Dor et al.
	Lucke & Schörner	van Leusen et al.	Manyanga	Hladík & Tamaškovic	van Rensburg	Erskine	Davidovich
	Lawrence	Polonio et al.	Mtetwa	Nakoinz & Faupel	Discussion	Groenhuijzen & Verhagen	Discussion
	Discussion	Discussion	Discussion	Rajala		Pálsson	
16.00-16.30	Coffee						
16.30-18.30	Session C1	Session F1 cont'd	Session B3	Session B2	Session E4	Session G4	Session E3
	Hörsal 2	H425	A114	A138	A144	B115	B153
	Muhonen	Colominas et al.	Lindholm	Meyer et al.	Namirski	Frenzel	Gadot
	Klingborg	Knockaert et al.	Costello	Harris et al.	Sulas & French	Yokoyama	Cocoual
	Staub	Jiménez-Manchón et al.	Ekblom & Gillson	Rowland & Hamdan	Serreli	Stephan et al.	Kvapil
	Veropoulidou	Discussion	Tigrino et al.	Muianga	M. Serra	van Beek et al.	Mosca
	Pasquinucci		O'Donnel	Manyanga	L. Serra	May et al.	Koukouni
	Sunejaa & Kamble		Stagno et al.	Discussion	Panetta et al.	Escobar et al.	Discussion
	WEDNESDAY 24th AUGUST						
08.30-10.30	Session A1	Session D3	Session G3	Session B2 cont'd	Session D1	Session C6	Session A3
	Hörsal 2	H425	A114	A138	A144	B159	B153
	Ertsen	Collins	Trinks & De Smedt	Shoemaker	Meier	Fredengren	Seppä et al.
	Monks & Dortch	Pau et al.	Heske & Posselt	Rassoul & Dahli	Brysbaert	Oestigaard	Coffman & Rasic
	Puy et al	Frejman	Christiansen	Adamu Isa	Díaz-Andreu & Mattioli	Schwadron	Lanoë et al.
	Schmidt	Hopper et al.	Dabas & Forlivesi	Sinclair	Gassner	Gheorghiu	Rogers
	De Bie et al.	Diarte Blasco	Hulin et al.	Discussion	Aguilar Sánchez	Rundkvist	Schmuck
	Moore	Discussion	Verhegge et al.		Discussion	Discussion	Reuther et al.
	Discussion						
10.30-10.50	Coffee						
10.50-12.30	Session A1 cont'd	Session D3 cont'd	Session B4	Session D4	Session D1 cont'd	Session C6 cont'd	Session G2
	Hörsal 2	H425	A114	A138	A144	B159	B153
	McGovern et al.	Ruiz et al.	Hoaen	Hellqvist & Roth	Herrera Malatesta	Pintar	Christie
	Menchelli & Iacopini	Gleeson	Gearey & Richer	Lindkvist	Veldi	Halkon	Kinahan
	Bebermeier et al.	Heide & Andersen	Sciuto & Hallqvist	Pettersson Jensen	Kolen	Eklund et al.	Murray
	Kluiving	Leonard	Besson	Magnusson	Rodéhn	Micle	Egberts
	Discussion	Discussion	Henselowsky et al.	Discussion	Discussion	Discussion	Jaufar
12.30-13.30	IALA founding meeting 13.00-13.30 (Hörsal 2) - Lunch						
13.30-14.50		Session D3 cont'd	Session B4 cont'd	Session D4 cont'd	Session G1		Session G2 cont'd
	Hörsal 2	H425	A114	A138	A144	B159	B153
		Smith	Pierik et al.	Berg Nilsson	Orengo et al.		Benlloch et al.
		Carrer & Cavulli	Martinsson-Wallin & Wallin	Karlsson	Petrova & Laska		Graham et al.
		Newman	Wickham-Jones et al	Hjärthner-Holdar	Van Eetvelde et al.		Barker et al.
		Discussion	Discussion	Discussion	Discussion		Discussion
15.20-15.45	Buses to Gamla Uppsala						
15.45-17.45	Site tours Gamla Uppsala						
17.45-18.30	Reception at Gamla Uppsala						
18.30-22.00	Conference Dinner						
	THURSDAY 25th AUGUST						
08.30-10.30	Session C5	Session A4	Session F3		Session D2	Session F2	
	Hörsal 2	H425	A114		A144	B115	
	Jacobsson	Ruiz & López	Wright et al.		Hennius & Gustavsson	Morabito et al.	
	Petersen et al.	Wright et al.	Meister et al.		Åstrand	Huigens	
	Kosian & Weerts	Ventrelli & Chery	Knabb & Rosen		Rui et al.	Nominoë	
	Pierik & van Lanen	Gutiérrez Soler et al.	Josephson Hesse		Kiimann	Pereira Magalhães	
	Kluiving et al.	Baltzer Heide	Wachtel		Discussion	Discussion	
	Discussion	Discussion					
10.30-11.00	Coffee						
11.00-12.40	Panel C5 cont'd	Panel A4 cont'd	Panel F3 cont'd		Panel D2 cont'd	Panel F2 cont'd	
	Hörsal 2	H425	A114		A144	B115	
	Garcia et al.	Sánchez-Palencia et al.	Rambukwella		Theune	Rosenberg	
	Schiestl et al.	Triboi	Williams		Sciuto et al.	Brusgaard	
	Bunbury et al.	Rodéhn	Davidovich		Chernysheva et al.		
	Pennington et al.	Discussion	Shelach-Lavi		Jönsson	Dickinson	
	Discussion		Discussion		Discussion	Discussion	
12.40-13.30	Lunch						
13.30-16.00	Poster session						
16.00-18.00	Plenary 2						
	Hörsal 3						
	1. Somadeva	2. Kinahan	3. Radimilahy	*4. Closing Ceremonies*			

4th International

Landscape Archaeology Conference

22nd-25th August 2016

Dept. of Archaeology and Ancient History
Uppsala University

Venue: Ekonomikum
Kyrkogårdsgatan 10, 753 13 Uppsala, Sweden

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LAC 2016
and IHOPE
meeting
Uppsala
22-25 August

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WELCOME TO LAC2016
UPPSALA, 22nd – 25th AUGUST 2016

Dear Colleagues,

Welcome to the Fourth Landscape Archaeology Conference (LAC2016)! We hope that you will find the conference both intellectually stimulating and socially and professionally rewarding.

LAC was launched in 2010 to promote interdisciplinary research across all aspects of landscape archaeology. Previous LAC conferences have been held in Amsterdam (Free University, 2010), Berlin (Free University, 2012) and Rome (Royal Netherlands Institute in Rome & Swedish Institute in Rome, 2014). The Department of Archaeology and Ancient History at Uppsala University is honoured to have been invited to organise the fourth biennial meeting, and we hope the conference lives up to all your expectations. This is the largest LAC meeting yet, and we are thankful for your level of interest and support.

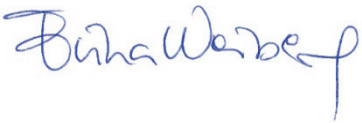
For those presenting oral papers and conference posters, we sincerely hope everything goes smoothly and without mishap. And for all participants, members of the Local Organising Committee and our student volunteers – easily recognisable by their LAC2016 T-shirts – are here to help, so please ask if in doubt about anything or just wanting information.

We also hope you enjoy your stay in Uppsala – especially the excursion to Gamla Uppsala, and the reception and dinner that follow, and of course, for those taking part, the post-conference excursions on Gotland and around Uppland. One memory we hope that you will all take away is how central ideas about rural, urban and maritime landscapes, their study and their documentation are to the work of our department. As various posters on display throughout the conference will indicate, the Department has a long tradition of landscape research from diverse perspectives and in many different parts of the globe, from Scandinavia to southern Africa, Anatolia to Latin America. Examples of ongoing projects include Landscape Transformations and Socio-Ecological Management in Limpopo National Park, Mozambique; Collecting Sápmi: Early Modern Globalization of Sámi Material Culture and Contemporary Sámi Cultural Heritage; Domesticated Landscapes of the Peloponnese: Social-Environmental Dynamics from the Neolithic to the Roman era; The Samoa Project – Origins and Development of Monumental Structures in West Polynesia; War of the Worlds: the Present Past on the Island Battlefields of the Pacific, 1941-45; and the Resilience in East African Landscapes Marie Curie Skłodowska Innovative Training Network. Several current PhD projects also have a strong landscape focus, many of which make use of sophisticated GIS approaches for data analysis and interpretation helping to build the department's strengths in archaeological GIS and the use of digital technologies in heritage interpretation.

In wishing you an enjoyable and productive conference and stay in Uppsala, we would like to thank our sponsors for making this meeting possible: The Department of Archaeology and Ancient History, Uppsala University, The Faculty of Arts, Uppsala University, the Riksbankens Jubileumsfond, the Swedish Secretariat for Environmental Earth System Sciences (SSEESS), IHOPE, Kungl. Humanistiska Vetenskaps-Samfundet i Uppsala, The Rydberg Fund, Uppsala University, the Forum for Africa Studies, Uppsala University, and the British Institute in Eastern Africa, Nairobi.

We would also like to thank IHOPE – and especially Professor Paul Sinclair, Professor Carole Crumley and Dr Karl-Johan Lindholm – for coordinating their one-day event with LAC and generously supporting our opening reception and shared roundtable event; all our plenary speakers for finding time to attend the conference given their busy schedules; Akademikonferens Uppsala, for handling registration and payment; Ekonomikum for our meeting venue; Gamla Uppsala Museum, Disagården Open-Air Museum and Svenska Kyrkan for their help with our afternoon event and generous hospitality; our caterer's Cajsa's Kök and Högskolerestauranger AB; Marija Petek for typesetting the book of abstracts; our performers Erika Lindgren Liljenstolpe and Cecilia Österholm and the Norrland Nation Singers; LAC's founding committee: Dr. Sjoerd Kluiving, chair (Free University, Amsterdam), Dr. Wiebke Bebermeier (Free University, Berlin) and Prof. Dr. Gert-Jan Burgers (CLUE+, Free University, Amsterdam) for their invitation and inspiration; Professor Lars Karlsson, Head of Department, Department of Archaeology and Ancient History for his unswerving support; the Department's hard-working administrative staff: Elisabet Green for her work on the conference webpages and on other IT issues; Carina Ehn for handling the finances and financial reporting; Jill Wennermark and Camilla Berström for handling room and hotel bookings and lots of other logistical issues; our colleagues at the Department and in the Faculty of Arts for their moral support; our colleagues John Ljunkvist, Daniel Löwenborg and Joakim Kjellberg for arranging the Gamla Uppsala excursion, Axel Frejman for designing the conference bags and T-shirts, and Nik Petek for his brilliant work on the book of abstracts; our colleagues Andreas Hennius, Helene Martinsson-Wallin, Gustaf Svedjemo and Annika Larsson for offering to lead post-conference excursions; all the members of the Local Organizing Committee for their hard work, and our student volunteers for acting as such excellent ambassadors.

Paul Lane
Professor of Global Archaeology



Erika Weiberg
Post-Doctoral research Fellow
Classical Archaeology & Ancient History

Uppsala, August 2016

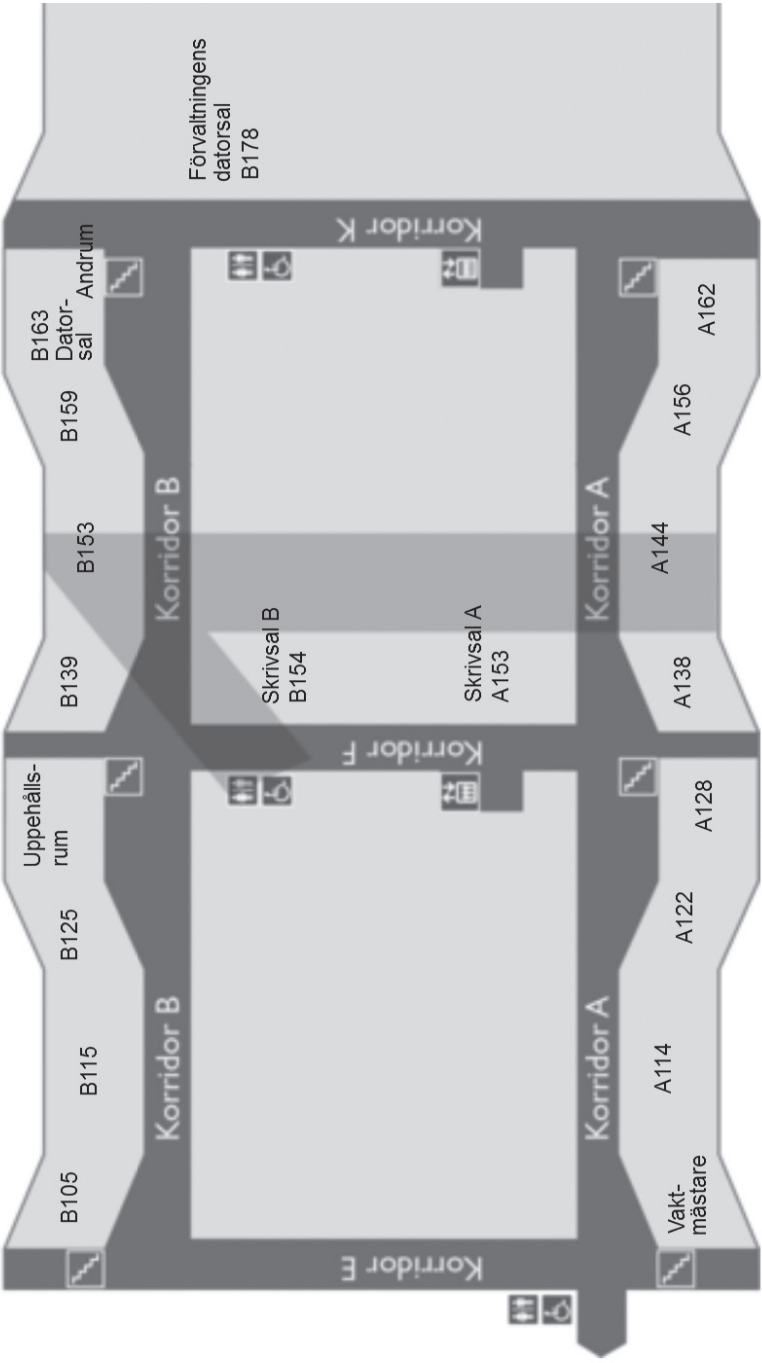
LAC2016 Local Organising Committee

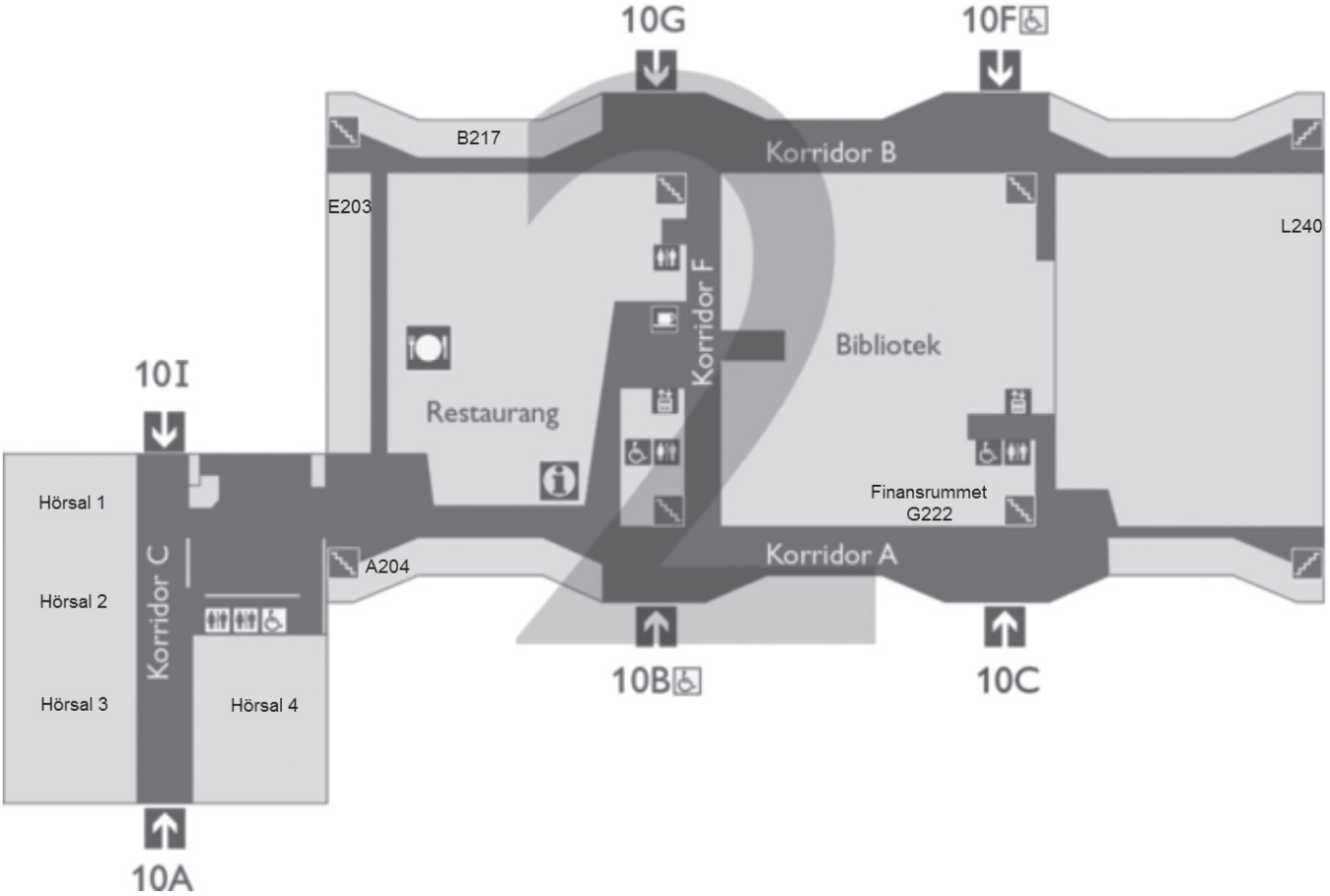
Paul Lane (Chair), Erika Weiberg (Co-Organiser), Joakim Kjellberg, Nik Petek, John Ljunkvist, Kristina Josephson Hesse, Angus Graham, Martin Finné, Andreas Hennius, Axel Frejman, Karl-Johan Lindholm, Daniel Löwenborg, Anna Shoemaker, Anneli Ekblom, Helene Martinsson-Wallin, Gustaf Svedjemo and Anton Bonnier

LAC2016 Student Volunteers

Kristine Gierow, Fredrik Gahm, Ronja Samuelsson, Amanda Jeppson, Sabrina Enqvist, Sofia Gran, Anna Lindström, Linus Mattsson, Beatrice Widell, Joakim Hallberg, Sebastian Bostrom, Ghaza Alyasin, Jon Lundin and Linus Eriksson

Venue: Ekonomikum – Floor plan

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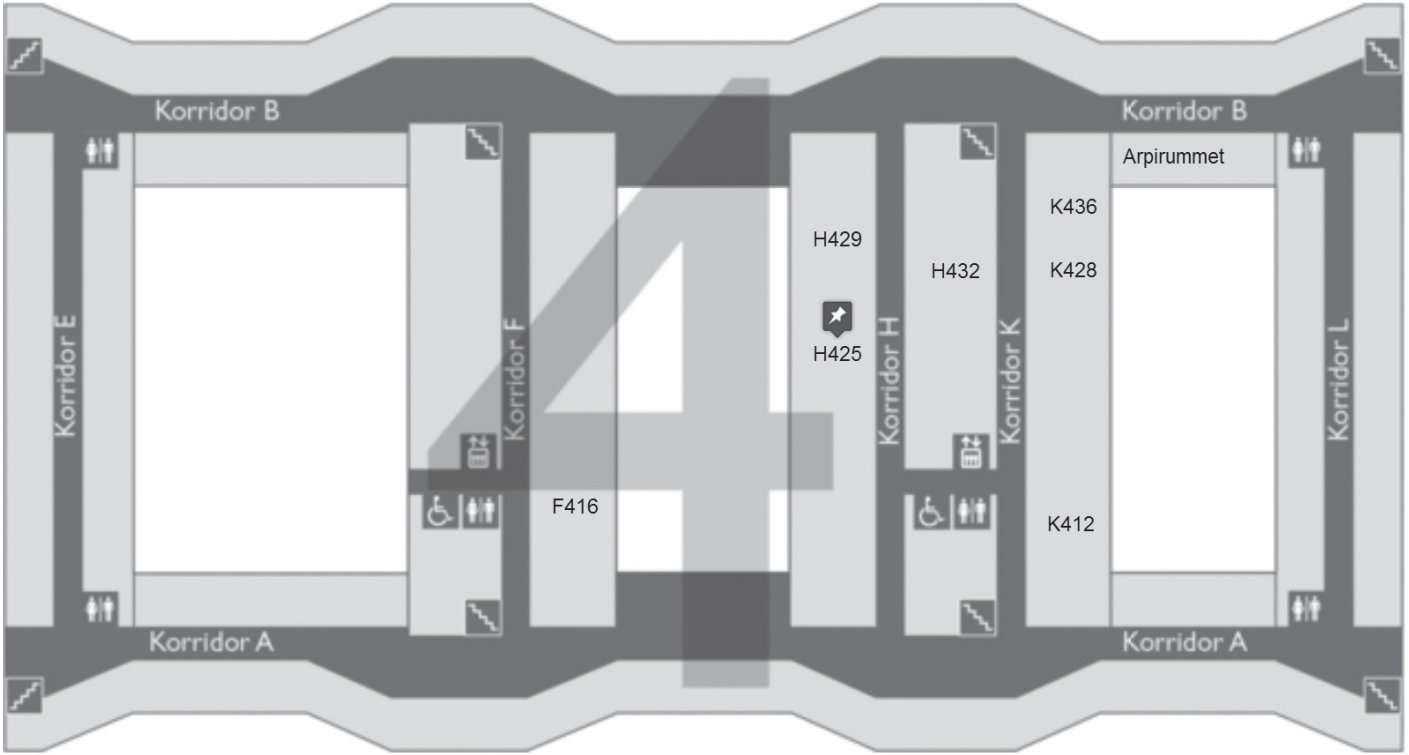
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Korridor A
Korridor A

International Association of Landscape Archaeology

Founding meeting

WEDNESDAY 24th AUGUST 13.00-13.30

VENUE: Hörsal 2

The International Association of Landscape Archaeology (IALA) is an association *under formation* aiming at promoting interdisciplinary research in the field of landscape archaeology. IALA will provide a platform for archaeologists, cultural and earth scientists and researchers from neighbouring disciplines to present and discuss results from this broad field of landscape research between the sciences and humanities. The activities of the Association are directed toward mutual collaboration of all scientific institutions, professors, teachers, assistants and young scientists in the European Union area and beyond.

The association will hold its *founding meeting* during the 4th Landscape Archaeology Conference (LAC2016) to bring together people interested in shaping the aims, financial concept, and statutes of IALA. The goal is to provide a platform for future research and collaboration among young and established researchers from various disciplines and to bridge the divide between sciences and humanities.

Web details: http://www.clue.vu.nl/en/projects/current-projects/IALA/index.aspx

PLENARY 1

Landscape Archaeology in Global Perspective

Part 1: Loss, Discovery, Recording and Protection

TUESDAY 23rd AUGUST 09.00-10.50

VENUE: Hörsal 3

Lost Frontiers: An Archaeological BREXIT in the Southern North Sea

Professor Vince Gaffney

Affiliation: Anniversary Chair in Landscape Archaeology, School of Archaeological Sciences, University of Bradford

In June this year, the United Kingdom chose to leave the European Union. Brexit is, of course, not the first time that Britain has separated from the mainland of Europe. Global warming at the end of the last Ice Age led to the inundation of vast areas that had once been home to thousands of people and resulted in the last physical separation of the area of the British Isles from mainland Europe. The product of a global phenomenon these lost lands hold individual, unique and largely unexplored records of settlement and colonisation linked to climate change over millennia. Such landscapes cannot be explored nor analysed conventionally, however recent UK research, using seismic reflection data, has led to the creation of maps showing rivers, lakes, hills and coastlines relating to inundated European landscapes of the Early Holocene. Using these base data a new ERC-funded project aims to transform our understanding of the colonisation and development during this critical period of history through a suite of innovative methods and research approaches. This paper will outline the "Lost Frontiers" research programme and consider how we may need to adapt our archaeological approaches in order to understand these key landscapes.

Prospecting Archaeological Landscapes

Professor Wolfgang Neubauer

Affiliation: Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology, Vienna & Vienna Institute for Archaeological Science, Vienna University

The massive threat of destruction of buried cultural heritage demands for fast, efficient and reliable methods for its identification, documentation and interpretation. The Valletta-Convention states that non-destructive investigation methods should be applied wherever possible. Therefore, large-scale applications of non-invasive archaeological prospection methods offer great potential. They provide both landscape archaeologists and planning authorities with the necessary spatial information at multiple scales, ranging from the archaeological site to a complete archaeological landscape. However, scientific archaeological prospection requires implementation to the highest technical standards

with regard to instrumentation, spatial sampling intervals, positioning accuracy, data processing and visualization, as well as appropriate novel methodological concepts for the archaeological interpretation of individual sites and archaeological landscapes. All of this also demands coordinated fundamental research aimed at the development and improvement of new ways to acquire the basic data sets, and to extract their archaeologically relevant information by means of well-thought, integrative interpretation tools.

Landscape Approaches to Endangered Archaeology in the Middle East and North Africa (EAMENA)

Dr Robert Bewley

Affiliation: School of Archaeology, Oxford University.

This paper presents the approach, initial results and future strategies for the EAMENA project, which began in January 2015. An open-access web-based information system has been designed, using Arches open-source software. This database allows for basic information about each site to be easily accessible for anyone interested in understanding, at a landscape-scale, archaeological sites in the region, with a view to their better preservation. Building on the work done by Aerial Photographic Archive for Archaeology in the Middle East (APAAME) and the Aerial Archaeology in Jordan project (see www.apaaame.org) the EAMENA project has initially chosen a number of key areas in Saudi Arabia, Syria, Iraq, Iran, Jordan, Libya, Yemen and Egypt for its work. The archaeological heritage of the Middle East and North Africa is of huge global significance. It includes very large, and often unrecorded landscapes, with significant prehistoric and historic sites, dating from all periods, up to and including twentieth century sites. The biggest threats to these archaeological sites are agricultural activities, conflict zones, looting and the huge increase in urban expansion, as a result of the quickly rising populations. Where significant sites are threatened by modern development (road building, town and village expansion, agriculture and looting) the team has worked with the local authorities in managing the threats and risk to archaeological sites. The project has been funded by the Arcadia Fund (www.arcdiafund.org.uk) based at Oxford University in collaboration with Leicester and Durham Universities, UK.

PLENARY 2

Landscape Archaeology in Global Perspective

Part 2: Beyond Europe

THURSDAY 25th AUGUST 16.00-18.00

VENUE: Hörsal 3

Landscape Dynamics of Late Holocene Hunter-Gatherer/Foragers in Sri Lanka

Raj Somadeva

Affiliation: Postgraduate Institute of Archaeology, Colombo, Sri Lanka

Landscape archaeology is a fresh initiative in prehistoric research in Sri Lanka. For more than 100 years, the main concern of archaeology in Sri Lanka was to establish the time depths of different archaeological 'industries' and 'cultures', and to make linear explanations of the changes in material culture with reference to corresponding ecological contexts. Departing from these traditions, this paper presents an argument that the landscape is an active and forcible determinant providing an impetus to bolster 'cultural individuality' among foraging communities, with a focus on the Holocene adaptations of hunter-gatherers who occupied the foothills of the central mountains of the island. Here, changes in foraging practice are substantially reflected in the recent archaeological findings from regional scale surveys that have been securely dated to the fifth millennium BCE. One of the most decisive characteristics of this was the creation of new forager landscapes. Three cave sites occupied by foraging communities were excavated in 2015 and early 2016. These results, coupled with information collected from a series of site surveys and ethnographic surveys provide supplementary evidence to understand the interactions between the landscape and the foraging communities. These results are presented in this paper and the impact caused by the physical landscape to make their lives more meaningful within an 'imaginary landscape' will be analysed. Various factors that persuaded the foragers to make their choice of landscape selections and the impact of the properties of the natural landscape in order to differentiate foraging groups across the space will also be discussed. The degree to which the physical landscape was a source of inspiration that moulded technology, rituals and symbolism will be assessed.

The Dancing Kudu: Women's Work and the Domestication of the Namib Desert Landscape

John Kinahan

Affiliation: School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, and Namib Desert Archaeological Survey, Windhoek

An unusual combination of evidence from the second millennium AD reveals a closely integrated pattern of land-use and ritual practice in the Namib Desert. This is an extremely arid environment which imposed a regime of high mobility and short-term occupation on hunter-gatherer and nomadic pastoralist communities. Women's harvesting of wild grass seed formed an essential contribution to subsistence, ensuring improved survival of episodic famine and some stability of population. Seed-harvesting and grinding were carried out by groups of women roaming over wide expanses of the desert landscape and leaving a clear, repetitive and detailed archaeological signature. This evidence includes rock shelters, communal grinding sites, seed storage structures, pottery and rock art. Women's communality and the importance of grass seed as a resource are also apparent in structural and figurative evidence of girl's initiation at one major rock art site. Initiation centred on the symbolic and instructional value of the female kudu which represents the exemplar of ideal qualities in women, through their gentle, passive nature and habitual sociality. The fact that women's seed-harvesting groups shared the desert landscape – as well as some specific sites – with wandering groups of female kudu, shows a remarkable integration that dissolves the boundaries of human and natural landscapes.

Landscapes and Sacred Rice in Highland Madagascar

Chantal Radimilahy

Affiliation: Institut des Civilisations/Musée d'Art et d'Archéologie de l'Université d'Antananarivo, Madagascar

The existing landscape across the world expresses aspects of the long relationship between people and their natural environment. One such landscape in Highland Madagascar comprises a complex of sophisticated rice cultivation terraces and irrigation systems. These are the focus of this presentation, in which I will talk about a research programme on ancient rice culture and how knowledge about it may be investigated archaeologically. In Madagascar, the earliest date known so far from archaeological results for rice consumption and possibly rice cultivation is the tenth century AD and comes from the coastal region. In the interior, even though substantial consumption of rice is sometimes amazing, knowledge about its cultural development in the past has not been well studied. The Sacred Rice project aimed to change this, starting initially by looking at kin-based irrigation practices around rice fields associated with ancient sites. The project aims to understand the changing landscape, the role of irrigated rice in the emergence of the Malagasy Highlands' major kingdom of the nineteenth century. From the later second millennium AD, irrigated rice became culturally and politically important, and remains so to this day. The landscape shows the range of vision about people, their history and their country and, today's population often refers to a sovereign's words: "the ocean is the limit of my rice field." In fact, rice is highly valued as an important dietary staple and as sacred as it is compared to "God". How has the modern landscape with intensive cultivated landscape emerged? The research used archaeological survey, excavations and other anthropological approaches coupled with oral enquiries on the traditional rice cropping systems and the different local or "traditional" varieties.

A. Integrated Approaches in Landscape Archaeology

A1 Living In A Landscape – How to Incorporate the Short-Term in Landscape Archaeology

WEDNESDAY 24th AUGUST 08.30-12.30

VENUE: Hörsal 2

Session Organisers: *Maurits W. Ertsen[1] and Dan E. Lawrence[2]*

Affiliations: (1) Water Resources, Delft University of Technology; (2) Department of Archaeology, Durham University

Session Abstract

Just as the actions of ants building a nest affect their environment, actions of humans have co-shaped their environment in relation to that same environment. Humans change almost everything in the landscapes surrounding them, through processes analysed as (Human) Niche Construction, Evolutionary History, Socio-Ecological Systems, et cetera. The environment changed by organisms changes those same organisms; selective pressures from an environment have an influence on survival strategies of those living within that environment. What these approaches have in common is their focus on (the results of) human-environment interactions emerging over long periods of time. Longer term trends, however, are created by series of short-term, small-scale interactions between people, institutions, technologies and the environment. Here we see commonalities with a Latourian perspective on environmental change and management, especially aspects of Actor-Network-Theory which argue that the human-nature divide is theoretically flawed. This session aims to bring together case studies, theoretical principles, methodological implications, and consequences for research agendas in landscape archaeology related to the realization that the short term creates the long term instead of the other way around. Emphasis will be placed on the inseparability of the natural and human worlds and its consequences for landscape archaeology. The session hopes to assess the new insights, as well as the pitfalls, such an approach can bring to our understanding of how networks of people and material conditions shape their landscapes.

Paper Abstracts

Nothing but shapes and variations. The material in actor network theory

Maurits W. Ertsen

Affiliation: Water Resources, Delft University of Technology

Just as the actions of ants building a nest affect their environment, actions of humans have co-shaped their environment in relation to that same environment. Humans change almost everything in the landscapes surrounding them, through processes analysed as (Human) Niche Construction, Evolutionary History, Socio-Ecological Systems, et cetera. What these approaches have in common is their focus on (the results of) human-environment interactions emerging over long periods of time – as in archaeology in general. Longer term trends, however, are created by series of short-term, small-scale interactions between people, institutions, technologies and the environment. Based on the realization that the short term creates the long term instead of the other way around and framing the paper around three case studies I will highlight theoretical principles and methodological implications for studies of the past. Case 1 deals with ancient Mesopotamia, case 2 with the Hohokam in the USA, and case 3 with the Gezira system in Sudan. Allowing the material as much agency as humans would have, the paper explores a Latourian perspective on landscape and environmental change within archaeology. Every actor – modern, historical or archaeological – is dealing with the progressive construction of reality through translations transforming agents. In these transformations, the material does not translate wishes faithfully. Power and domination are heavily expressed in the material, but have to be maintained. The paper will assess insights as well as pitfalls such an approach can bring to our understanding of landscapes as actor-networks.

Archaeological evidence for management of landscapes in hunter-gatherer societies

Carly Monks and Joe Dortch

Affiliation: University of Western Australia, Perth

Ethnographic and historical evidence indicates that Australian Aboriginal people employed (and employ) a complex and effective range of resource management practices. Accounts of these practices are documented in the letters and journals of 18th and 19th century European explorers and colonists, describing people burning vegetation to benefit plants and animals, as well as horticultural practices often described as "gardening" or "farming". Some traditional resource management practices – such as burning – continue in parts of Australia today, often in conjunction with biodiversity conservation programs. Yet despite this ethnographic and documentary evidence, and despite an increasing awareness of the ways in which Aboriginal Australians and other hunter-gatherer societies created and influenced landscapes, identifying archaeological evidence for such practices remains difficult. One of the biggest challenges lies in the issue of attempting to identify short-term (e.g. seasonal, annual, or generational) evidence for resource management in the archaeological record. In this paper we review a range of ways in which Aboriginal people in south-western Australia engaged in niche constructing behaviours, and explore how we can identify such practices in the archaeological and palaeontological record. We argue that using cultural niche construction as an explanatory framework in archaeological and palaeoecological investigation provides a different perspective with which to explore the reflexive, short-term nature of human-environmental relationships.

Increasing the resolution of Scandinavian anthropic deposits: The potential of XRF core scanning and geoarchaeology

Arnald Puy, Andrea L. Balbo, Camilla Zinsli and Morten Ramstad

Affiliation: Maritime Civilizations Department, University of Haifa, Israel

Anthropic deposits in W Scandinavian hunter-gatherer-fisher archaeological sites are

usually massive, highly enriched in organic matter, with almost no biogenic carbonate remains such as shells or bones. Although they might have formed as a consequence of several cycles of settlement and abandonment, the precise identification of these sequences and their environmental impact is problematic as these deposits appear homogeneous to the naked eye. Here we show how the combination of XRF core scanning with traditional geoarchaeological techniques may help overcome this limitation. We use the case study of Hakonshella, a Mesolithic hunter-gatherer-fisher settlement located in western Norway. Fluctuations in geochemical proxies (mainly P, Ga, Ti and the Si/Al ratio) and redoximorphic features highlight four cycles of site occupation, deforestation and site abandonment in an otherwise massive, homogeneous deposit. The approach deployed at Hakonshella has potential to increase our understanding of the short-term events that led to the formation of anthropic deposits, as well as to identify their impact in the surrounding landscape, in Scandinavia and other similar climatic regions.

Building human landscapes: Daily activities and environmental transformations in ancient Amazonian settlements

Morgan J. Schmidt

Affiliation: Museu Paraense Emilio Goeldi

Short-term, small-scale interactions between humans and the environment may result in profound transformations of that environment over time. Recent research in Amazonia has revealed the extent that everyday actions, such as the discard of refuse or walking on a path, have modified the geomorphology and soil fertility in the vicinity of ancient settlements. Over time, these activities change the conditions for plants and animals both during and after human occupation of the sites by altering such things as soil moisture and nutrient availability. The fertile anthropic soil known as terra preta, formed mainly through the discard of refuse around habitation areas, is a perfect example of how quotidian actions by humans and other organisms together created these human landscapes. Another example is the numerous incised roadways that have been documented at many sites. These depressions were formed over time by simply walking on a cleared path in tandem with the action of rainwater erosion. Repeated everyday actions have resulted in a widespread pattern where similar features are found in ancient settlements across the broad Amazon region. These landscapes have been documented in several widely spaced areas and in differing contexts, including large sites along major rivers as well smaller sites in interfluvial areas. The processes of niche construction resulted in patterns of modified soils and geomorphology that reflect the organization and use of space in a settlement. Once these anthropic features are formed, they may serve as landesque capital, spaces that are repeatedly used by succeeding generations or occupations.

When and how did prehistoric daily practice start to affect landscapes? Case study from a sandscape in Flanders, Belgium

Marc De Bie,[1,2] Erwin Meylemans[1] and Jan Bastiaens[1]

Affiliations: (1) Flanders Heritage Agency, Belgium; (2) Vrije Universiteit, Brussels

In general, the sandy landscapes of the Low Countries suffered less from (water) erosion than the loamy areas. They are thus suitable regions to study long-term effects of early human activities. Recent large-scale surveys revealed how Late Glacial and Early Holocene hunter-gatherers intensely used the Campine area in Flanders in a surprisingly systematic

way. Established land use patterns by small mobile groups over millennia created vast and rich site complexes at particular places. Whether this repetitive mobile practice was due to stable socio-cultural traditions or to specific subsistence needs, it seems that transformations in the landscape were still limited to the ecological context and may have resulted from burning practices or targeted hazelnut exploitation, for instance. With the construction of Neolithic and Bronze Age barrows and tumuli, early agrarian societies for the first time deliberately aimed to impact the morphology of the landscape and to leave permanent monuments. Soils preserved underneath these barrows reveal already a quite significant impact on the natural environment. Gradual progress in agricultural practices eventually led to large scale transformations of the sandscape and the establishment of Celtic fields. In this paper we examine the effects of these increasing modifications on the ecological and physical environments (e.g. dune formations) and of possible feedback loops on prehistoric human behaviour. We also consider how (more) traces of these early land transformation practices can now be observed with modern Lidar technology and how such landscapes challenge conventional conservation management procedures.

Alternating Tempi and Varied Valences in the Creation of Cultural Landscape in Far Northern Peru

Jerry D. Moore

Affiliation: California State University Dominguez Hills

Over five millennia of prehistory, a series of relatively short-term human modifications resulted in an extraordinarily complex cultural landscape at the site of Santa Rosa, Department of Tumbes, in far northern Peru. Archaeological excavations and geophysical survey have documented extensive, spatially dense, and thematically diverse acts over prehistory, interventions that transformed a relatively small and topographically undistinguished place. These modifications include a) initial occupation at circa 4000 BCE, b) the establishment of large elliptical dwellings and creation of large, circular ritual hearths between 3500 and 2700 BCE, c) the abandonment of the area until ca. CE 1300 when rectangular dwellings were created followed by d) the creation of secondary burial cairns, and e) the creation of bi-chromatic mounds into which provincial Inka shaft tombs were placed at circa CE 1450 – 1500, and f) finally the current recognition of the area as being a wak'a or sacred place by modern residents of the community of Santa Rosa. Not only were these actions distinct, but they were associated with different sets of cultural values. This paper summarizes the archaeological evidence of how relatively short-term interventions have resulted in an enduring cultural landscape.

Sex slaves and troll wives: An interdisciplinary study

Ragnhildur Sigurdardottir,[1] Astrid Ogilvie,[2] Vidar Hreinsson,[1] Arni Daniel Juliusson,[1] Megan Hicks,[1,3] Andrew Dugmore,[3] Anthony Newton,[3] Ian Simpson,[4] Arni Einarsson,[5] Orri Vesteinsson,[5,10] Steven Hartman,[6] Richard Streeter,[7] Mike Church,[8] Ian Lawson,[9] Adolf Fridriksson,[10] George Hambrecht,[11] Carole Crumley[12] and Thomas McGovern[13]

Affiliations: (1) Reykjavik Academy, Reykjavik, Iceland; (2) Institute of Arctic and Alpine Research, Boulder, CO, USA (3) University of Edinburgh, UK; (4) University of Stirling, UK; (5) University of Iceland, Reykjavik, Iceland; (6) Mid Sweden University, Sweden; (7) University of St Andrews, UK; (8) Durham University, UK; (9) University of St Andrews, UK; (10) Institute of Archaeology, Reykjavík, Iceland; (11) University of Maryland, College Park, MD, USA; (12) Uppsala University, Uppsala, Sweden; (13) City University of New York, NY, USA.

Floodplains have been the cradle of some of the earliest and richest civilizations in history. While most floodplain management systems tend to be near sea level, there is a unique system in the mountainous Lake Mývatn region in Iceland, the only community that has persisted in that elevation in Iceland since settlement c. 1100 years ago. These floodplain wetlands have provided essential outfield hay for livestock feeding and abundant grazing. The farmers of Lake Mývatn have used adaptive short-term management strategies to maintain and preserve the long-term characteristics of the landscape on which their lives depended. These strategies have changed though time, but the main objectives were to protect the wetlands from degradation and to manage their productivity. This continuous struggle is reflected in historical accounts, geoarchaeology aided by dating of volcanic ash layers, traditional ecological knowledge, and even in fairy tales and myths. Of particular interest is the myth of the troll woman Kráka. Her purpose in creating the river was to wreak revenge on the human population for resisting her romantic advances and culinary tastes in young men. Her ultimate goal was to destroy all human habitation in the Mývatn area, which she expected to happen when the people finally lost the battle with the river. Challenges in managing the river were thus related both to the people´s struggle to survive in this landscape– a challenge of farming in marginal environments with natural processes, and also the challenge of not being eaten by the curse of the troll.

Living in a landscape which is being Romanized

Simonetta Menchelli and Eleonora Iacopini

Affiliation: Dipartimento di Civiltà e Forme del Sapere, University of Pisa

Our remarks refer to the Pisa South Picenum Survey Project concerning the Tenna and Aso River Valleys (the Marches, Italy), which in Roman times mostly belonged to the Firmum and Asculum colonies. We will deal with this topic by trying to reconstruct the daily life of the native people (the Picens) who lived in the surveyed areas during the Romanization process. Our aim will be to define how this short term event (c. 3rd-2nd century BC) took place forming various landscapes according to different geographical and geomorphological characteristics (inland/coastal areas; mountainous/hilly/plain districts). Moreover, by means of integrated research, including archaeological, literary, epigraphic and archive sources, in a short/long term perspective, we will try to identify the natural and anthropic dynamics by which these Romanized landscapes have survived, in a more or less evident way, up to the present time.

Coupling on-site and off-site landscape archaeological approaches in tracing the short-term in landscape archaeology – A case study on early iron smelting in Silesia, Poland

Wiebke Bebermeier,[1] Michael Thelemann,[1] Philipp Hoelzmann,[1] Enrico Lehnhardt,[2] Michael Meyer[2] and Brigitta Schütt[1]

Affiliations: (1) Institute of Geographical Sciences, Freie Universität Berlin, Germany; (2) Institute for Prehistoric Archaeology, Freie Universität Berlin, Germany

Spreading from the Near East from the 2nd millennium BCE onwards, the technique of iron smelting reached Eastern Silesia (Poland) in the 1st century CE (Roman period). At this time the region of the Widawa drainage basin was inhabited by the Przeworsk culture. While the older moraine landscape of the study area lacks ores from geological rock formations, bog iron ores were relatively widespread and commonly exploited for early iron production. A cluster of iron slag sites, situated in the Widawa catchment area in southwestern Poland, was investigated integrating a coupled on-site and off-site approach, including surveys and excavations as well as sedimentological and geochemical analysis of iron slags, bog iron ore deposits and archaeological findings. This approach allows combining results of long-term and short-term developments. The reconstruction of the landscape history since the Saalian glaciation, shows climatically induced incision and aggradation phases of the Widawa River drainage system. The onset of human impact on the landscape dates to the 2nd millennium BCE, while the pre-Roman Iron Age is characterized by alluvial fan activities in the vicinity of prehistoric slag sites. Based on the on-site investigations, information on the suitability of local bog iron ore for early iron smelting, technical information on the smelting process, and the work organization at the smelting sites are derived. Coupling the reconstruction of long-term landscape history with high resolution short-term information on resource demands, and technological and organizational aspects of iron smelting permits better understanding of the impacts of iron smelting on socio-economic and natural aspects in Silesia, Poland.

Is the tipping point from inceptive to counteractive changes in niche construction theory to be defined by archaeological data and will it contribute to the Anthropocene discussion?

Sjoerd Kluiving

Affiliations: VU University Amsterdam, Dept. of Archaeology; CLUE+ Research Institute for Culture, History and Heritage, The Netherlands

Recent insights propose the new epoch Anthropocene to emerge as a "tipping point from inceptive to counteractive changes" which corresponds to the concept of runaway sociocultural niche construction, which expresses the need to adapt to the created change (Ellis, 2015). Although this process can also be seen in hunter-gatherer societies, e.g. niche broadening, it is the capacity to sustain this runaway process, not just one phase or the other, that enables societies to gain the capacity to act on the Earth system at global scales, and therefore to 'cause' the Anthropocene. To test the hypothesis we use data from Northwest Europe and the eastern Mediterranean regions. Besides that we also observe a difference in scale of impact: raising the surface by reed bushes affects a micro-region (10 x 10 metres) while dikes and other water management structures affect meso- to macro-regions (10 x 10 to 100 x100 km). Counteractive changes will be discussed if they are coeval with runaway sociocultural niche construction, whether they are coeval with the capacity to sustain the change or runaway process. Potentially, a scaled human nice construction model will result from this analysis as well as contributing to an improved understanding of humans' interaction with nature and to discussion of the emergence of a new chronological epoch in an interdisciplinary research arena.

A2 Interactions in Archaeology

TUESDAY 23rd AUGUST 14.00-16.00

VENUE: A138

Session organisers: *Oliver Nakoinz,[1] James Allison,[2] Aleksandr Diachenko,[3] Franziska Faupel,[1] Daniel Knitter[4] and Ezra B. Zubrow[5]*

Affiliations: (1) University of Kiel; (2) Brigham Young University; (3) Institute of Archaeology of the NAS of Ukraine; (4) Institute of Geographical Sciences, Freie Universität Berlin; (5) SUNY at Buffalo

Session Abstract

Interaction is one of the main drivers of social, cultural and economic processes. Interaction models address an influential aspect of human-human and human-environment relationships. Interaction structures the movement of people, objects, and ideas across landscapes, while understanding of archaeological landscapes requires knowledge regarding the interactions that influenced the nature and distribution of archaeological remains. The term 'interaction' is an abstract concept which covers different types of relationships, different modelling approaches and different theories. According to the wide range of interaction types, the related models are ranged from simple conceptual models to complex models. Examples are migration models, wave of advance models, fall-off curves, diffusion models, gravity models, network analysis and agent-based interaction models. Network analysis may be used for the production of optimal routing and vehicle loading plans; multi-modal transport problems; network partitioning and territory definition; facility location on a network; and travel demand analysis. This session aims to contribute to systematization and integration of theoretical and modelling approaches focused on interaction, including the important aspect of the relationship between empirical and theoretical models. The key questions are as follows. How can we measure interaction? What parameters influence interaction? What are the static and dynamic solutions to these issues? What types of simulation approaches are decent to model interaction? What theories are/may be involved and to support certain methodological approaches and explain the obtained results? How can we validate theoretical interaction models? What kind of integer models may be applied to studies of interactions?

Paper Abstracts

Demographic variables in simulations of interactions: methodological issues of estimations

Aleksandr Diachenko and Ezra B.W. Zubrow

Affiliations: (1) Institute of Archaeology of the NAS of Ukraine; (2) SUNY at Buffalo

Most models of interactions include population size and density at different spatial scales when comparing settlements to regions and supra regions. Interaction estimates usually are considered as values directly related to population and inversely related to distance

in variations of gravity models. Meanwhile, if the GIS-based approaches allow the high-quality simulation of landscape, pathways etc., precise estimation of the values related to demography remains a problem that extends well-known issues of demographic archaeology. This paper concerns the general methodological issues of demographic development implemented into spatio-demographic studies. These are as follows. In which cases should population estimates be considered *per s*e or require additional mathematical 'filtering'? What is the relation between spatio-demographic variables and relative chronology? Are there any cases of the so-called demographic constants in population density and how may they be explained?

Landscapes of interaction: understanding social landscapes through quantitative models of artefact distributions

James R. Allison

Affiliation: Brigham Young University

Exchange of material goods is one of the most basic forms of human interactions. By tracing the distribution of ceramics, stone tools, and other materials archaeologists are often able to make inferences about the nature of interactions, and about the economic and social relationships of the people involved. These artefact distributions are a fundamental feature of social landscapes, with the potential to reveal much about the structure of social life. But artefact distributions are often complex and difficult to describe, especially at large spatial scales, and they often require some form of abstraction to make them comprehensible. Archaeologists have therefore used a variety of quantitative models to describe and explain spatial distributions, but the relationships between specific abstract models and the underlying social relationships responsible for creating the artefact distributions are often unclear. This paper examines the relationship between models and data using databases from the North American Southwest. More specifically, I apply different abstract models, including fall-off curves, gravity models, and network models, to the distributions of several different Native American ceramic types manufactured between A.D. 1200 and 1500. Previous studies by the Southwest Social Networks Project, whose data I use, have led to well-founded (but still debatable) conclusions about the nature of social relations involved in the manufacture and exchange of these types. Applying different models to these distributions will allow comparison of the usefulness of the different methods in revealing different aspects of the social interactions responsible for the underlying artefact distributions as well as for the organization of settlements across the landscape of the North American Southwest.

The impacts on culture and landscape – conservation and development of stonework under the interaction between Kinmen and mainland China

Yi-Jen Tseng

Affiliation: Department of Architecture, National Quemoy University, Taiwan

Kinmen is a small island next to Xiamen and Quanzhou, Mainland China. The excellent stone used in traditional building mainly came from the mainland, while the others were quarried around the settlement. However, with the beginning of the Cold War across the Taiwan Strait in 1949, these traditional resources of stone were forbidden to be imported to Kinmen. Only minor repairs could be made to buildings due to lack of building resources,

and authentic landscapes of human settlement were preserved. Since 2002, however, it has been possible to import building stone from Mainland China with permission, while at the same time use of the local quarry was restricted. As a result, the landscape of Kinmen has changed rapidly: original stone has been replaced, hand carving techniques have begun to disappear, and road surfaces have largely changed with the availability of low-priced stone. Thus, the reconnection of a commercial link which was broken due to the Cold War may become a new factor influencing the traditional settlement landscape. The rapid interaction between Kinmen and Mainland China has been changing the architecture and landscape consciousness of people. It has had not only a great impact on traditional stone craftsmanship, but also the pace of change has made conservation of traditional culture and landscape far harder than before trade relations improved between Taiwan and China.

Structural equation modelling in the research of interactions of the great Moravian centres with their economic hinterland (Central Europe, Mikulcice, 9th – 10th century)

Marek Hladík and Jakub Tamaškovic

Affiliation: Institute of Archeology of the CAS, Brno, Čechyňská

This case study is focused on understanding the socio-economic interactions between the Mikulčice agglomeration (non-autarkic political, economic and religious supra-regional centre) and its economic hinterland, and on understanding the interactions of the settlement structure and the natural environment. The concept of the research is based on settlement areas theory and central place theory. Given the large number of exploratory analyses and GIS analyses (FA, APM, centrality analyses) the theories developed about interactions have become increasingly complex. Therefore, we need a tool to grasp this complexity and to answer the following questions: How stable is the exploratory model? How do cultural-historical models correspond with the data? Which environmental and socio-economic factors primarily determined the centre's interaction with its surroundings? Are reductions of a multidimensional space correct? Does the APM-defined causality correlate with the causality in the live culture environment? We used Structural Equation Modelling (SEM) (IBM AMOS) to answer these questions. We first performed a confirmatory factor analysis (CFA) and we used its bootstrapping algorithms to simulate missing data. The second step was to test a more comprehensive structural equation analysis model. The model combined the CFA with the Path Model. SEM confirmed many of the findings of the exploratory analyses and the validity of the structural equation analysis model. However, the CFA revealed problems with the reduction of multidimensional space. In multiple cases, the bootstrapping algorithms changed the nature of latent variables. The research has shown the potential of SEM when interpreting causal relationships in the past.

Modelling Early Iron Age interaction in South-West Germany Demographic variables in simulations of interactions

Oliver Nakoinz and Franziska Faupel

Affiliation: University of Kiel

There are many different approaches that allow interaction to be modelled. Each approach has certain strengths and shortcomings. In archaeology, empirical models tend to use a rather limited number of empirical observations while theoretical models apply complicated concepts and unrealistic assumptions. We try to circumvent the problems by applying the data to an extensive database and by using a very simple theoretical model. The usage

of cultural distances as inverse proxies of interaction enables us to include all data from an extensive database which produces a very detailed and significant result. We apply a generalized version of Renfrew's fall-off curves (distance diagrams) as empirical model to the data. Different variants of distance diagrams focus on different aspects of interaction. In contrast to Renfrew's rather sophisticated mathematical functions, we are using the simplest theoretical model, a monotonic increasing (because it is inverse) function. Many influencing factors are included in the empirical model. For example, the interaction can be measured in a reconstructed road system. Cost distances can be used instead of geometrical distances. The gravity law can be used in order to consider different densities of population. Together, using results from an ongoing project, the paper provides a multifaceted picture of the systems of interaction in SW Germany during the Early Iron Age.

Materiality and landscape: multicultural interaction and changing group identities in central Italy from the Orientalizing to the Late Republican period

Ulla Rajala

Affiliation: Department of Archaeology and Classical Studies, Stockholm University

In this paper I discuss the application of Social Identity Theory (SIT) in a specific historical and geographic situation during the last millennium BC in central Italy. Until recently, SIT has been neglected in archaeology, although the concepts of 1) social categorisation, 2) social identification and 3) social comparison allow description of the attachment of individuals to different identities and characterisation of expressed materiality within past landscapes. As a case study, I present the materiality as evidenced in the Faliscan area between the Etruscans, the Latins, the Sabines and the Umbrians that saw the foundation of the Latin colonies of Sutrium and Nepet after the collapse of Veii in 396 BC. I will present a multi-layered comparative model used to interpret and characterize this ultimately colonial landscape and the different identities that were expressed across local, regional and interregional boundaries with the potential and observed outcomes (through acculturation, hybridisation, integration and/or rejection). The resulting model will be ultimately used to assess how the underlying cultural distances between different communities may have affected the incorporation of new areas within Rome's boundaries.

A3 Late Glacial Northern Landscapes: an Integrative Approach to Paleolandscape and Human Land Use Reconstructions

WEDNESDAY 24th AUGUST 08.30-10.30

VENUE: B153

Session Organisers: *Joshua D. Reuther[1] and François Lanoë[2]*

Affiliations: (1) University of Alaska Museum of the North & Department of Anthropology, University of Alaska Fairbanks; (2) School of Anthropology, University of Arizona

Session Abstract

The Late Glacial (about 16,000 to 11,000 years ago) human colonization and population expansion across northern Eurasia and northern North America (Eastern Beringia) occurred during a time of vast climatic and environmental changes. Prior to the Late Glacial, northern landscapes were dominated by a relatively homogeneous biome, characterized by dry and cold conditions, and sparsely or not populated. As temperature rose and humidity increased, glaciers gradually receded, sea level rose, and vegetation and fauna adapted to changing biotopes following complex patterns. Landscapes previously inhabited by humans radically changed in their nature and structure; some land connections such as the Bering Land Bridge began to diminish, while other landscapes opened up to colonization. This session focuses on the reconstructions of north Eurasian and Beringian landscapes and environments, as well as changes in Late Glacial faunal communities and human land use and technological systems.

Paper Abstracts

Rapid climatic and biotic turnover rates during the Pleistocene-Holocene transition

Heikki Seppä, Normunds Stivrins, Oliver Heiri, Siim Veski and Janne Soininen

Affiliations: University of Helsinki

The Northern Hemisphere is currently warming at a rate which is unprecedented during the Holocene. Associated with this rapid warming are accelerated biotic turnover and extinction rates, and fundamental ecosystem reorganizations. The previous time in geological history with comparable warming rates was during the Pleistocene-Holocene transition (PHT) about 15,000 to 11,000 years ago. Here, we explore the biotic turnover rates during the PHT by focusing on the Baltic region in the south-eastern sector of the Scandinavian Ice Sheet, where an exceptionally dense network on microfossil and macrofossil data that reflect the biotic turnover history exist. We further use a composite chironomid—based summer temperature reconstruction compiled specifically for our study region to calculate the PHT rate of temperature change patterns. Our results show that the fastest biotic turnover in the terrestrial and lacustrine communities occurred during the Younger Dryas-Holocene shift at 11,700 years ago, when the rate of warming was 0.17°C/decade, thus slightly lower than the current Northern Hemisphere warming of 0.2°C/decade. This shift is also marked by regional extinctions, including disappearance of mammoth and reindeer and many arctic-alpine plant taxa, such as *Dryas octopetala* and *Salix polaris*, from the region. An even faster rate of temperature change occurred at the onset of the Younger Dryas, 12,800 years ago. However, the biotic turnover was relatively low during this period. In addition to the rate of temperature change, the potential of crossing critical threshold values may be an important factor explaining the differences in biotic turnover responses.

Landscape use and temporal patterning of rhyolite toolstone in Eastern Beringia

Sam Coffman[1,2] and Jeffery T. Rasic[1,2]

Affiliations: (1) University of Alaska Museum of the North; (2) National Park Service

This paper better refines our understanding of rhyolite as a viable toolstone on the landscape in eastern Beringia. Rhyolite, a fine grained volcanic rock, geochemically similar to obsidian, is relatively common in lithic assemblages of central Alaska and amenable to geochemical characterization. PXRF technology was used to analyse over 1000 rhyolite artefacts from over 100 archaeological site assemblages. The assemblages, ranging in age from the late Pleistocene to late prehistoric (last 500 years) demonstrate a long and continued use of the material. What is more, these results recognize distinct geochemical groups that appear to correlate with distinct geological sources. While geological origins of most of these groups remain unknown; two groups have been pinpointed (Groups G and H), with the two largest Groups (A and B) locations unknown, but thought to be located in the central Alaska Range. These two groups represent both, the highest quality and longest continued use in Alaska. Spatial and temporal use of the remaining groups have helped develop broader views of human toolstone selection and contributed to devising chronological patterns. For instance, some Groups only appear in the archaeological record during the middle to late Holocene. This provisional framework of geochemical variation among tool quality rhyolite sources in this region is an important first step toward a more robust understanding of prehistoric land use and offers another way of addressing movement of people and manufacture of certain artefacts (i.e. bifaces vs. microblades vs. flake tools) among prehistoric groups in eastern Beringia.

Resource and landscape use in late Pleistocene Beringia: a view from the Shaw Creek Flats

François Lanoë,[1] Joshua Reuther[2,3] and Charles Holmes[3]

Affiliations: (1) School of Anthropology, University of Arizona; (2) University of Alaska Museum of the North; (3) Department of Anthropology, University of Alaska Fairbanks

The colonization of Beringia during the Late Glacial period (about 14,500-11,700 cal. B.P.) represents the first permanent settlement of the subarctic and provided a pathway to the colonization of North America. The Shaw Creek Flats and nearby middle Tanana river, in central Alaska, constitute the densest area of identified Late Glacial sites; these are generally characterized by low-density occupations and diverse technological complexes. Recent research suggests some of these sites were specialized, short-lived locations dedicated to a single or few activities. Based on the spatial association of artefacts and faunal remains, the site of Swan Point CZ4b is interpreted as a workshop related to the production of composite tools, and the site of Keystone Dune is interpreted as a camp related to hunting activities. Specialized sites can be seen as logistical forays oriented towards the exploitation of specific resources within a larger economic landscape. Logistical sites, along with other, more residential sites, provide insight as to the strategies of landscape use employed by Beringian people in the Shaw Creek Flats.

Late Quaternary coastal landscapes in the Alaskan Arctic

Jason Rogers

Affiliation: Northern Land Use Research Alaska

Existing data on sea-level history and coastal landform evolution in the Alaskan Arctic are quite sparse. This paper reports on new materials and dates from recent geophysical and marine coring investigations in the Beaufort and Chukchi Seas. These results provide new data points for the Alaskan continental shelf relative sea-level curve, and help to refine our understanding of regional Holocene and Late Pleistocene environments and paleolandscapes.

Tracking coastal adaptation in southeast Alaska

Nick Schmuck

Affiliation: University of Alaska Fairbanks

Both the ethnographic record and late Holocene archaeological sites describe a coastal life-way on the Northwest Coast of North America. This paper reports on the use of an archaeological sensitivity model developed within ArcGIS to track this coastal settlement pattern deeper in time in southeast Alaska. The model has performed extremely well when tested against late Holocene sites (96.8% of the sites falling within the top 10% of the modelled landscape). Here the model incorporates changes in sea-level to track evidence of this settlement pattern in the early Holocene, using newly discovered early Holocene sites reported in 2015 by Forest Service Archaeologist Risa Carlson and Forest Service Geologist Jim Baichtal. This method shows promise for targeting research of late Pleistocene/early Holocene southeast Alaska, as better resolution data marking sea-level change become available.

Landscape evolution and human occupation of the Middle Tanana basin: a high-resolution record of Late Glacial and early Holocene environmental change and hunter-gatherer land use in Eastern Beringia

Joshua D. Reuther,[1,2] Ben A. Potter,[2] Nancy Bigelow,[3] Charles E. Holmes,[2] Julie A. Esdale,[4] Francois Lanoë[5] and Matthew J. Wooller[6]

Affiliations: (1) University of Alaska Museum of the North; (2) Department of Anthropology, University of Alaska Fairbanks; (3) Alaska Quaternary Center, University of Alaska Fairbanks; (4) Center for the Environmental Management of Military Lands, Colorado State University; (5) School of Anthropology, University of Arizona; (6) Water and Environmental Research Center, Institute of Northern Engineering, University of Alaska Fairbanks

The middle Tanana Valley basin of interior Alaska, an unglaciated region of Eastern Beringia, holds a high-resolution record of human-environment interaction that extends over 14,000 years, one of the longest such records in North America. The Late Glacial and early Holocene landscapes of this region were dynamic with several areas displaying considerable ecological restructuring. Aeolian silt and sand accumulated in lowland areas and adjacent foothills at relatively high rates, river down-cutting was prevalent across the valley, and natural forest fires were present. These disturbance regimes and periods of landscape instability fostered a wide expanse of early- to mid-successional mixed vegetation communities that included herbaceous tundra, shrubs and deciduous trees, and provided key habitats for large grazers and browsers, which were significant resources for early hunter-gatherer populations. Several major environmental transitions occurred in the region as the Holocene climate warmed and effective moisture increased, including the spread of deciduous and coniferous forests and peat lands, a broader expanse of lake development, and intensified landscape stability. These transitions introduced changes to the extent of habitat and seasonal availability of mammal and aquatic food resources. We present a reconstruction of middle Tanana Valley landscapes over the last 20,000 years to discuss how environmental factors may have affected human colonization and fostered hunter-gatherer economic change as humans responded to shifts in local landscape instability and stability.

A4 "Cultural Landscapes: What For?" - Demonstrating the Social Impact of Our Work

THURSDAY 25th AUGUST 08.30-12.40

VENUE: H425

Session Organisers: *Guillermo Reher[1] and Graham Fairclough[2]*

Affiliations: (1) Centro de Ciencias Humanas y Sociales (CSIC), Madrid; (2) School of History, Classics and Archaeology, Newcastle University

Session Abstract

In recent years, there has been an increasing expectation among policy makers and society more widely for investment in science and in heritage to be justified in social terms, not least in the light of the Faro Convention on the Value of Cultural Heritage to Society, and of the European Landscape Convention's emphasis on democratic participation in constructing and managing landscape. This should have compelled landscape archaeologists to become doubly aware of the need to show the value generated by their activities, whether these are social or economic. But has it? More often than not landscape archaeologists are greatly involved in the post-excavation valorisation, planning and management of these areas, but in what is often an unrecognized role for landscape and heritage, hard evidence of the benefits of cultural landscape research are rarely presented. In this session, organised by members of the JPI-Cultural Heritage network 'CHeriScape' (www.cheriscape.eu), we will consider how landscape archaeologists are responding to this socio-political requirement for greater accountability. We invite the presentation of examples of archaeologically-informed research and practice in cultural landscapes where there has been a concurrent or subsequent effort to evaluate the positive impact on society. In particular we invite discussion on how monitoring and evaluation was carried out, what resulted, and whether this was duly pitched to the policy makers, to positively reflect on the discipline. This session aims to include both landscape archaeology practitioners and specialists with experience in evaluating and quantifying the impact of cultural landscapes, so that the inter- and trans-disciplinary dialogue can help enrich the practice of researchers, scientists, cultural resource managers, spatial planners and consultants.

Paper Abstracts

Learning from Las Cuencas

Nacho Ruiz and Sara López

Affiliation: Arkitektskolen Aarhus, Denmark

The 'Learning from Las Cuencas' research project, awarded the EU Prize for Cultural Heritage / Europa Nostra Awards 2015, provides a new perspective of industrial cultural landscapes. Despite being focused on a local environment, the coal mining area of the Cuencas Mineras Centrales of Asturias, among its interests is the creation a universal architectural story. The mining areas, after undergoing an intense process of industrialisation, have

changed considerably over a brief period of time. In just a few decades, what were once natural valleys with basically rural economic and social structures came to host busy urban agglomerations of unexpected density in their very heart. This heretical urban configuration is equally the result of the impact of economic interests in a specific space and in a relatively short lapse of time. Consequently, the co-existence of natural, rural, industrial and urban landscapes came about in a totally uncontrolled and unplanned fashion. The fuzzy limits between the different landscapes foreclose the possibility of identifying their areas of influence. The Cuencas are perceived as a mesh of opposing yet interconnected identities. This has given rise to incredibly heterodox building patterns that contain the conflict on which they are erected embedded in their genetic code. These are hybrid architectures, mutating artefacts which, despite the invisibility of their inevitable marginality, can offer really interesting lessons in architecture today.

Integrated cultural landscape planning at Ancient Corinth, Greece

James C. Wright,[1] Konstantinos Kissas,[2] Guy Sanders[1] and Thymio Papayannis[3]

Affiliations: (1) American School of Classical Studies at Athens; (2) Ephoreia of Antiquities at Ancient Corinth, Greek Ministry of Culture; (3) Med-Institute for Nature and Anthropos

Since 2014 ,the Inspectorate of Antiquities of Corinth, the American School of Classical Studies at Athens, and the consultant Thymio Papayannis have been developing an integrated master plan to protect, preserve and present the 6 km2 area that encompasses all the natural and cultural components of the landscape of Ancient Corinth: the ancient harbour at Lechaion, the ancient city, and the citadel of Acrocorinth. These are mixed nature and heritage zones including wetlands, ancient harbour facilities, mixed industrial and agricultural regions, villages, the sprawling remains of a famous ancient city, and the agricultural and uncultivated nature zone of the great fortified citadel. They span 8,000 years with some 270 monuments from the 6th c. BC through the 19th c. AD. Our goal is to preserve a magnificent nature zone and its cultural heritage by providing a sustainable infrastructure and administration. We will facilitate a variety of uses, such as bird watching, wild and cultivated plant appreciation, and guided walking paths through the historic monuments and the museum that display the multi-layered history of the famous city. Essential is involvement of the local population (citizens, civic groups, civic officials, regional officials). We are producing proposals to improve infrastructure and rationalize access, add proper signage and displays, and to consolidate and conserve standing remains. This is a long-term strategic plan that will seek public and private funding. As a part of this endeavour the committee intends to submit proposals for Ancient Corinth to be listed as a UNESCO World Heritage Site.

Rubi Antiqua: A social instrument for historical and archaeological re-discovery

Daniela Ventrelli and Aurore Chery

Affiliation: CNRS- ANHIMA UMR 8210- Paris

This paper aims at demonstrating the social impact of the Rubi Antiqua project. Laureate in 2013 of the Emergence competition organised by the City of Paris, this research project deals with the archeological history of Ruvo di Puglia, a former Peucetian site famous in

the first half of the 19th century for its numerous antique graves containing rich funerary furniture. The governing principle of our work consists in rediscovering the cultural matrix of the history of this important site. Between 1810 and 1850, it was considered by collectors and art merchants all over Europe as the main source for clay artefacts. Nowadays, many collections of Italic and Italiot art, kept in the high ranking museums around the world, comprise pieces from Ruvo. One other aspect of our work, that we would like to stress here, is our sociological study of the local elite in relation to the excavations in the 19th century. They were driven by a heritage consciousness, as well as by local patriotism, two concepts that are still active nowadays. As a consequence, through tangible examples and archives, we would like to highlight the continuity between the activity of some 19th century collectors in order to save Ruvo's antiques and our action now, when we endeavour to recount this history. This paper will then insist on a double social impact at two different moments: in the 19th century and today, with the local institutions taking advantage of the Rubi Antiqua project in order to promote culture and history in Apulia.

The Giribaile transfer experience

Luis Gutiérrez Soler, María Alejo Armijo, Antonio Ortiz Villarejo and José Alejo Sáez

Affiliation: Instituto Universitario de Investigación en Arqueología Ibérica, Universidad de Jaén

Giribaile is an archaeological area in southern Spain, close to the Guadalquivir valley. It has remains belonging to different historic times from recent prehistory. We have developed a programme of research here from start of the 1990s. We have carried out intensive survey campaigns trying to improve archaeological and historical knowledge of the cultural landscape, and have had the opportunity to excavate the proto-historic city of the Giribaile plateau. The project is part of a strategic collaboration with the Local Development Association. The Giribaile archaeological project tries to generate cultural opportunities in the landscape with our participation in the "territory museum", built by the cultural managers of the Local Development Association. We have made a cultural program of activities showing the best achievements of the recent archaeological excavation campaign. This program consisted of several conferences and a low cost, mobile, public exhibition. We have opened a facebook and instagram link to the project to improve personal contact with people. We have a consistent group of local volunteers who help us in different tasks and the history of Giribaile is now reaching schools thanks to guided visits led by primary and secondary teachers. We have made a serious effort to transfer our scientific experience to the cultural agents of the territory. On the other hand, we have help from citizens to continue with the project, beating financial, administrative and legal problems. These are focused on the private property of the archaeological area.

LandscapeMuseumLandscape – Turning a community on to the landscape

Poul Baltzer Heide

Affiliation: The Archipelago Museum of Southern Denmark (Øhavsmuseet Faaborg)

Landscape archaeology can be a direct catalyst for growth in marginal areas! With this paper I would like to demonstrate and discuss some of the experiences we have collected during the process of transforming The Archipelago Museum of Southern Denmark in

Faaborg, Denmark, from a very traditional local museum to a modern, specialized landscape museum, doing research, outreach and public heritage management. In doing so, we collaborate with other authorities, special interest groups, private land owners, tourist organizations and funding bodies, and we have public and social impact as a core value. Our primary and most important objective is to re-forge a connection between modern humans and the cultural landscape that they are part of in order to turn indifference into pride and give value to an otherwise increasingly marginalized area. We believe that this forging can only take place when the individual guest meets and connects to a place in the landscape. In the paper I will show some of the techniques we have used in order to connect particularly phenomenological research and new interpretation techniques. Unmanned outreach in the landscape and public domain can prove a challenge, but I will present some of the techniques we have applied (e.g. geocaches and apps), and invite colleagues to discuss the benefits and pitfalls in these approaches in relation to generate a high impact.

Measuring heritage policy impact in Las Médulas cultural landscape

Javier Sánchez-Palencia, Almudena Orejas, Guillermo Reher, and Brais Currás

Affiliation: Centro de Ciencias Humanas y Sociales (CSIC), Madrid

In 1997, Las Médulas, the largest Roman gold mine, was incorporated into the UNESCO World Heritage List. This was a milestone in a process whereby, since the 1980s, archaeological interest turned into a heritage protection and valorisation strategy. The socioeconomic landscape could not be direr, with abandoned and ageing villages, little occupation and limited, and often times damaging, industry. Twenty-eight years after this began, and almost 20 since the listing, the lives of the local communities have changed much. This landscape has not been without significant management changes and administrative competition which has hampered the elaboration of a coherent strategy. In this way it reflects the contentious nature of heritage landscapes in Southern European countries. This paper aims not to criticize or recommend, but rather to, despite problems, understand the impact that heritage policy has had on the local community. We draw on socio-economic data to provide a discussion framework that may allow such an understanding. It will also present a reflection on the problem with measuring qualitative information, and the difficulty in doing this while being an archaeologist.

Spontaneous large scale practice, urban pastoralism as an environmental tool for sustainable urban planning

Roxana Maria Triboi

Affiliation: "Ion Mincu" University of Architecture and Urbanism

Pastoralism represents an important cultural legacy of our geographical area, a defining feature of Romanian identity. The importance of this practice, marginalized all over the world due to harsh conditions and constrains, is to be found in all forms of artistic expression and others like a testimony of our past. The evolution of urbanization has actually created a favourable context for this practice in the last decade. Factors like chaotic fragmentation of the periphery, development of urban gaps or waste land, the abandonment of agricultural exploitation of arable land, the demand for dairy and meat products, and European Union subventions have all increased the activity of urban pastoralism (inside but especially

outside cities). The phenomenon can be observed also in neighbouring countries in the Balkans. Urban pastoralism entails an ecosystem, and develops social and economic services that are multiple but are not given enough recognition by residents and authorities due to the general negative perception of these practices next to the urban residential areas. There are also other factors that put pressure on this fragile phenomenon. The proper recognition and management of this socio-economic practice could transform it into an important tool for sustainable urbanism.

Gamla Uppsala: Landscape formation and heritage practices

Cecilia Rodéhn

Affiliation: Center for Gender Studies/Department of Archival, Library, Information & Museum Studies, Uppsala University

The aim of this paper is to discuss landscape formation and the uses of, and interaction with, the landscape at Gamla Uppsala heritage site. Furthermore, the paper also discusses how the landscape is an active agent in these interactions. In center of this research are the museum educators working at Gamla Uppsala Museum. The material is based on participant observation of guided tours investigating how the museum educators moved and used the landscape while being in the landscape. Qualitative interviews were carried out asking questions about the landscape and the museum educators' movement. The formation of Gamla Uppsala is also considered – a landscape is not simply something that is, but is shaped by, e.g., thinking and discoursing about it. At Gamla Uppsala the landscape is to a large extent formed by archeological activities and archaeological discourses and this formation also affects the museum educators' movement and mediation. Consequently, the dominant narrative of Gamla Uppsala is investigated and a particular focus is on the exhibition and its relation to some archeological discourses. From this knowledge I discuss how archaeological discourses have shaped the landscape and how the museum educators' movements are shaped by the shaping of the landscape. I conclude by discussing what consequences this has for the mediation, and maintenance, of Gamla Uppsala as a heritage site.

B. Landscape Historical Ecology and Climate Change

B1 Land-use and Anthropogenic Land-cover Change over the Holocene - Information of Value for Climate and Environmental Research

TUESDAY 23rd AUGUST 11.10-16.00

VENUE: A114

Session organisers: *Marie-José Gaillard,[1] Andrea Kay[2] and Leanne Phelps[2]*

Affiliation: (1) Linnaeu University, (2) University of Lausanne'

Session Abstract

The goal of PAGES' new LandCover6k working group (http://www.pages-igbp.org/ini/wg/landcover6k/intro) is to achieve Holocene land-cover and land-use reconstructions that can be used to evaluate and improve the scenarios of anthropogenic land-cover change (ALCC) by Klein Goldewijk et al. (2011; HYDE) and Kaplan et al. (2009; KK) for the purpose of climate modelling studies. Climate modellers need information on past anthropogenic land cover and land use change to a) validate climate models, b) investigate land use as a type of the climate forcing (i.e. the effects of anthropogenic land use and associated land cover changes on climate) for the past, present and future. The diet, technology, culture, and economy (land use) of a society has varying physical manifestations on the surrounding landscape (land cover). Therefore this session will welcome interdisciplinary papers covering a broad range of topics, including but not limited to, archaeology, historical ecology, botany and modelling, in order to facilitate an interdisciplinary exchange of ideas and promote discussion. Data to be considered include land cover changes (e.g. cropland and pasture) and quantification of different land use practices (e.g. wood harvest, use of fire, irrigation, fertilization, tillage, and grazing intensity). LandCover6k focuses on the last 6000 calendar years (i.e. the period in the Holocene when anthropogenic deforestation occurred on most continents), but it will also cover older periods in regions where significant human impact on vegetation occurred earlier. LandCover6k has links to other research programs, in particular IHOPE (Intergrated History and Future of People on Earth), GLP (Global Land Project), PMIP (Palaeoclimate Modelling Intercomparison Project), and PAGES-GPWG (Global Paleofire Working Group). We welcome all contributions within palaeoecology, archaeology and history, dealing with these aspects of landscape history and ecology over short to long time sequences, and at any of the local to regional and continental spatial scales, and from any region of the world.

Paper Abstracts

The complete picture: combining palynological, cultural and landscape data to reconstruct palaeovegetation patterns

Marjolein T.I.J. Gouw-Bouman,[1] Hanneke A.A. Bos,[2] Harm Jan Pierik,[1] Roy van Beek[3] and Wim Z. Hoek[1]

Affiliations: (1) Department of Physical Geography, Utrecht University, Utrecht, The Netherlands; (2) ADC Archeoprojecten, Amersfoort, The Netherlands; (3) Centre de Recherches Historique de l'Ouest (CERHIO), University of Rennes, Rennes, France

Present day vegetation patterns in Northwestern Europe are the result of the interaction between the abiotic landscape, human interference, climate and vegetation. Often, palaeovegetation reconstructions are only based on palynological data. When reconstructing past vegetation patterns, the abiotic landscape and archaeological data can provide additional and very useful information. Especially, in geomorphological dynamic and heterogeneous areas these data can be used to reconstruct vegetation patterns in between palynological data points. In the Netherlands numerous detailed palaeogeographical maps and a rich archaeological record are available. To use these data for regional vegetation reconstruction a new interpretative method was developed which reconstructs the distribution of past vegetation communities on the basis of the reconstructed geomorphology. The method is applicable in all regions where there is sufficient information about the abiotic landscape and its development, archaeology, and a good coverage of palynological data. The method was applied in a heterogenous Weichselian coversand region, Twente, in the eastern part of the Netherlands and in the dynamic Holocene Rhine-Meuse delta in the central part of the Netherlands. The method is applicable for visualising both long-term vegetation dynamics and short term shifts.

Past human activities, woodland and climate during the Holocene in Central Europe: large-scale quantitative approach

Jan Kolář,[1,2] Peter Tkáč,[1] Petr Kuneš,[1,3] Martin Macek,[3,4] Mária Hajnalová[5] and Péter Szabó[1]

Affiliations: (1) Department of Vegetation Ecology, Institute of Botany of the Czech Academy of Sciences, Brno, Czech Republic; (2) Institute of Archaeology and Museology, Masaryk University, Brno, Czech Republic; (3) Department of Botany, Faculty of Science, Charles University in Prague, Czech Republic; (4) Department of GIS and Remote Sensing, Institute of Botany of the Czech Academy of Sciences, Průhonice, Czech Republic; (5) Department of Archaeology, Constantine the Philosopher University in Nitra, Slovakia

Archaeological records indicating past human activities on a landscape level are only sparsely used in a quantitative way in current scientific practice. Demanding data collection with equal coverage is not the only reason. Significant problems also lie in depositional and post-depositional processes. Thus, the record of past human activities does not cover time and space equally for a diverse range of both cultural and natural reasons. During our research we collected archaeological data from a large area (27000 km2) of the eastern part of the Czech Republic. The paper will present some of our quantitative approaches including

modelling of past human activities, pollen-based quantitative vegetation model (REVEALS) and local macrophysical climate models. We will discuss the character of the archaeological record from different ecological zones within the area of interest and its significance for revealing past economies, population dynamics and socio-environmental relationships.

Tracing Late Neolithic economy by archaeobiological on-site data

Stefanie Jacomet

Affiliation: Basel University, DUW, IPNA, Switzerland

Besides off-site microscopic data, various on-site palaeoenvironmental data provide an invaluable tool for landscape and land use reconstruction. For getting an idea on land-use, botanical macro- and micro-remains, hand-collected animal bones, remains of microfauna, and data on woodland management (dendrotypology) are necessary. In addition, well preserved archaeological layers are needed as known from the area of the Central European lake dwellings (a UNESCO World Cultural Heritage Site since 2011). Such dwellings existed during the Late Neolithic (c. 4300–2400 cal. BC). For this period, especially for its earlier phases, discussions of land-use patterns are contradictory. Based on off-site data, slash-and-burn – as known from tropical regions – is thought to be the only way land was cultivated. On-site data, however, show a completely different picture: all indications point to permanent cultivation of different cultivars. Cycles of landscape use are traceable, including coppicing and moving around the landscape with animal herds. Archaeobiological on-site-studies further indicate also that hunting and gathering were an important component and that the landscape was manipulated accordingly ("niche-construction"). Late Neolithic land-use systems also included the use of fire as a tool for opening up the landscape. It is of crucial importance to bring together all the types of palaeoenvironmental proxies in an integrative way. Only this allows us to draw a more comprehensive and reliable picture of the land-use systems in the Late Neolithic than had been reconstructed previously largely on the basis of off-site data.

Changing human population size and its influence on Mid-Holocene land-cover in Finland and Sweden

Miikka Tallavaara,[1] Kevan Edinborough,[2] Petro Pesonen,[3] Niina Kuosmanen,[1] Laurent Marquer[4] and Heikki Seppä[1]

Affiliations: (1) Dept of Geosciences and Geography, University of Helsinki, Finland; (2) Institute of Archaeology, University College London, UK; (3) National Board of Antiquities, Helsinki, Finland; (4) Dept of Physical Geography and Ecosystems Science, Lund University, Sweden

Recent archaeological studies have shown that prehistoric human population dynamics can be reliably reconstructed using temporal distributions of archaeological radiocarbon dates as a proxy of relative population size changes. These studies indicate remarkable fluctuations in Mid-Holocene human population size that peaks between 6000 and 5000 cal. BP over large areas in northern and north-western Europe. Recently, the use of pollen data has also been advanced with the REVEALS (Regional Estimates of VEgetation Abundance from Large Sites) method that now allows quantitative vegetation reconstructions. These two research programs can be integrated to assess the role of changing human population size on land-cover. The aim of this presentation is to explore the impact of human population dynamics on land-cover in southern Finland and Sweden 8000–3000 cal. BP. Owing to the availability

of various suitable sedimentary deposits and a long research history in archaeology and palaeoecology, these areas in northern Europe provide large archaeological datasets and numerous high-resolution biological proxy records of the long-term dynamics of terrestrial environments. Therefore, they form an excellent case for studying the early human impacts on environment. Human population dynamics are reconstructed using the temporal distribution of regional sets of archaeological radiocarbon dates. These reconstructions of human population dynamics are statistically compared to long-term records of past land-cover inferred from pollen data using the REVEALS-method.

An interdisciplinary approach on ancient iron mining and smelting on Elba Island

Raphael A. Eser

Affiliations: Topoi Berlin; Humboldt University Berlin, Winckelmann-Institut

This paper (part of my doctoral project) deals with the chronology and the impact of iron smelting sites on the landscape balance of Elba Island in antiquity. While the ancient mining of iron ore and its further processing on Elba is an undeniable fact, the onset of iron production and its impact on the landscape balance of the island is still not clear. Today's research tendencies assume different age determinations for iron production on Elba that are often linked to a documentary-attested but not archaeologically dated shift of iron smelting sites on the island. Reasons for the shift are manifold and founded on political conditions like imminent danger from external powers as well as an hypothesized overexploitation of Elba's forest resources for fuel production that forced dislocation of smelting furnaces because of wood shortage. Further, it is presumed that in antiquity, deforestation, subsequent soil erosion and the (air) pollution from furnaces must have caused an ecological change on Elba. The paper's main objectives are therefore the creation of a fixed chronology for the era of Elban iron mining and smelting with a start, shifting and end date as well as reconstruction of the historical ambiance with the environmental changes in relation to iron reduction processes. The data sources are prospections, mapping, sediment analysis as well as slag surveys that were conducted and evaluated by a closely operating team of physical geographers and classical archaeologists.

Mapping livelihoods in sub-Saharan Africa from 1800 BC to AD 1500

Andrea U. Kay, Leanne N. Phelps, and Jed O. Kaplan

Affiliations: Institute of Earth Surface Dynamics, University of Lausanne

The changing land uses associated with the Iron Age transition in sub-Saharan Africa, such as increases in food-production and fuel consumption for metallurgy, may have had widespread consequences for regional climate, hydrology, biodiversity and ecosystem services that persist to the present. Quantification of these impacts and potential feedbacks is difficult however, because the archaeological and historical record is highly fragmented in time and space. We are approaching this problem from a modelling perspective by developing a classification system of subsistence and lifestyles based on a broad synthesis of archaeological, archaeobotanical, and ethnographic observations. A subset of this classification has now been mapped in time-slices across West and Central Africa where we focused primarily on several categories of agricultural land use which occurred heterogeneously in space and time. The main differences between these categories is the relative reliance on and variety of domestic species, and in turn the energy invested in them. While the particular crop or animal species utilized was partially dependent on

environmental variables, diversification and intensification led to more stable agricultural results and an increase in the prevalence of farming societies. This paper presents the progress of this data synthesis and mapping process, using examples from the completed work on West and Central Africa, as well as the early stages of our work on East Africa.

Land use and land cover change in East Africa – initial findings from LandCover6k East Africa

Suzi Richer,[1,2] Rob Marchant[1] and Daryl Stump[2]

Affiliations: (1) Environment Department, University of York; (2) Department of Archaeology, University of York

Understanding how people affected the environment in the past is complex and requires not only different datasets, but also an understanding of how these data may, or may not, relate to one another. This paper presents the initial findings of LandCover6k East Africa. LandCover6k is a global network/working group examining land cover change over the Holocene, however, a substantial part of this also aims at understanding land use change within this period. As such, and with the collaboration of a large number of archaeologists and palaeoecologists, we have been bringing together existing archaeological and palaeoenvironmental data for the region. By combining these datasets we have the potential to elicit past nuances of land cover and land use change. However, while this is the ultimate aim, there are also gaps and problems with combining datasets. As we explore here, these are not necessarily barriers to our understanding of land cover and land use change in the past, but they can take us down unexplored avenues, give us a deeper understanding of our data (ways in which it can/can not be employed) and these gaps can also be used to identify opportunities for future research.

Agricultural systems in sub-Saharan Africa 1000 to 1800 AD

Mats Widgren

Affiliation: Department of Human Geography, University of Stockholm

Recent global historical cropland data sets used in climate modelling grossly underestimate the pre-colonial development of agriculture in the Americas and many parts of sub-Saharan Africa. Such data sets are usually based on back-casting and environmentally deterministic algorithms. Historical geographers have been slow in responding to this new demand for a global synthesis. No attempt has yet been made to express the present knowledge of global agrarian history in maps. Only for the Americas has such a synthesis been achieved. A small international project has been set up to answer to these challenges on a global scale. It aims at global reconstructions of agricultural systems for AD 1000, AD 1500 and AD 1800. In this paper I present maps of African agricultural systems by 1000 AD, 1500 AD and 1800 AD. It is based on the existing historical and economic historical literature, archaeology and archaeobotany and observations by early travellers.

Past land use and land cover in the Shashi-Limpopo Basin: Making the most from 19th century travelogues

Munyaradzi Manyanga

Affiliations: Archaeology Unit, University of Zimbabwe

This paper makes inferences on land use changes from information from 19th century narratives of hunters, traders and missionaries and compares it with archaeological data and modern realities in the Limpopo valley. The travelogues of such people as St. Vincent Erskine (1868-1869), Fredrick Elton (1870) and Carl Mauch (1870) among others provide a vivid account of land use and land cover in the Shashi-Limpopo Basin during the later part of the 19th century. When contrasted with contemporary and archaeological reconstructions of the distant past, these travelogues allow for the reconstruction of long term land use changes when sifted of the obvious biases.

The historical and urban Ecology of ancient Great Zimbabwe urbanism: an archaeometallurgical view

Ezekia Mtetwa

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Mounting landscape evidence underpinning metal extraction and processing activities at and around Great Zimbabwe suggests that the ancient city's industrial past might have been more complex and ambiguous than previously appreciated. In the traditional archaeology of Great Zimbabwe, its pyrometallurgical materials such as tuyeres, slags and ores have recurrently been rendered as related to ceremonial iron smelting and brought from outside the urban settlement. An effect of this concept is that it essentially obscures the archaeological manifestations of long-term social engagements and modification of the state and condition of vegetation in the cultural and physical landscape of Great Zimbabwe. Margaret Conkey's remarkable idea of humans being simultaneously materialists and symbolists is enfolded in this paper with the aim of making industrial activities in the Great Zimbabwe landscape archaeologically meaningful and visible. The paper argues that only then is it possible to reach and discuss the ancient city's experiences of securing iron provisioning systems and the corresponding history of ecological change. New evidence of iron smelting technologies with rectangular furnace designs, multiple fused tuyeres, and flow and furnace slags is discussed in this paper as materializing the metallurgists' constant experimentations towards meeting Great Zimbabwe's ever-growing demands of iron within its dynamic ecological processes and systems.

B2 Landscape archaeology in Africa: new approaches, methods and substantive results

TUESDAY 23rd AUGUST 16.30-18.30 AND
WEDNESDAY 24th AUGUST 8.30-10.30

VENUE: A138

Session organiser: *Paul Lane*

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Session Abstract

This session will focus on the ways in which past societies in Africa have influenced their environments, and the new methods being used to study these landscape dynamics. Because of the interdisciplinary nature of the topic, this session will welcome papers from a variety of disciplines including, but not limited to, archaeology, botany, historical ecology, and modelling, in order to facilitate an interdisciplinary exchange of ideas and promote discussion. Papers on any geographical region of the continent (not just sub-Saharan Africa) are welcome, and so as to encourage comparison and reflection on what is landscape archaeology in Africa, how is it practiced, and what are the emerging trends in terms of new theoretical perspectives, methods and/or research directions. Papers on any period from the Early Stone Age to the recent past are welcome.

Paper Abstracts

Understanding actual and ancient morphodynamics within the Southwest Ethiopian Highlands and their effects on archaeological preservation in river landscapes

Svenja Meyer,[1] Oliver Bödeker,[2] Bahru Zinaye,[3] Ralf Vogelsang,[4] Steven A. Brandt[5] and Olaf Bubenzer[1]

Affiliations: (1) Institute of Geography, University of Cologne; (2) Department of Geosciences, University of Cologne; (3) Addis Abeba University; (4) Institute of Prehistoric Archaeology, University of Cologne; (5) Department of Anthropology, University of Florida

Ethiopia constitutes diverse environments that were created by interacting tectonic and climate regimes that formed montane forests, grasslands, savannahs, and deserts. Here, we present the results of varied geoarchaeological research on caves, rockshelters, and landscapes aimed at understanding human-environmental interactions in the Late Quaternary. Influenced by natural conditions and anthropogenic impacts, periodical runoff and actively eroding river valleys lead to gully erosion within the southwest Ethiopian Highlands. Widespread degraded areas within the northern Lake Abaya area have exposed obsidian raw material outcrops and archaeological assemblages of Middle and Later Stone Age (M/LSA) date. Deposits including areifacts are interlaced with volcanic deposits which suggest that humans were affected by volcanic activity and changing environments during the past. Drainage system and geomorphological analyses were conducted to understand actual and ancient fluvial dynamics and archaeological preservation within the catchment of the Bisare River and Mount Damota. The latter contains the Mochena Borago prehistoric site, which is under study for Late Pleistocene to Holocene occupation of anatomically modern humans and builds the chronological framework for integration of LSA and MSA assemblages. This study was conducted under the aegis of the Collaborative Research Centre (CRC 806) "Our Way to Europe", project "Out of Africa – Late Pleistocene Rock Shelter Stratigraphies and Palaeoenvironments in Northeastern Africa". This research centre, focusing on the culture-environment interaction and the human mobility in the Late Quaternary, is generously funded by the Deutsche Forschungsgemeinschaft (DFG).

Nomadic spatiality: Case studies through time from sedimentary deposits, east of Lake Turkana, northern Kenya

Jack Harris,[1] Emmanuel Ndiema,[1] Purity Kiura,[1] Carolyn Dillian,[2] Rahab Kinyanjui,[1] David Braun,[3] Susana Calvalho,[4] Rene Bobe[3] and Lori Dibble[5]

Affiliations: (1) National Museums of Kenya, Nairobi; (2) Coastal Carolina University, USA; (3) George Washington University, USA; (4) Oxford University; (5) University of Nairobi, Kenya

Some of the earliest pioneering efforts on spatial studies of the Early Stone Age in Africa were conducted by Glynn Isaac and one of us, JWKH, in the 1970s. By taking the ancient landscape as the frame of reference rather than 'site specific' studies, which were the norm at the time, we utilised stone artefacts and associated remains as markers for the movements of early Pleistocene people across the ancient landscape at Koobi Fora, Northern Kenya. The distribution of material remains across the ancient landscape provided insights into past hominin land use, foraging patterns and diet. In those early studies we focused on a narrow time frame c. 1.6 million years ago. In this paper we expand the time interval to include deposits reaching back to four million years of age with the emergence of *Australopithecus anemensis* (defined in part by the deposits east of Lake Turkana) through to the modern human condition and the emergence of pastoralism as an economic practice. We discuss the challenging methodological issues in dividing up such a long time interval into time segments and such extensive deposits covering 3000 square kilometers with the aim of comparing and contrasting changing paleo-landscapes and hominin and archaeological records from the early Pliocene through the Holocene. A particular focus of this paper is spatial studies in the Holocene. Not surprisingly, perhaps, a feature of the Holocene archaeological record is the lower density of material remains, which would imply highly mobile communities of pastoralists. In addition, the more diversified nature of the archaeological materials and their landscape distribution at Koobi Fora, such as pottery, obsidian artefacts, ostrich eggshell and other beads, and clay figurines indicate more complex life ways

Changing interactions between human groups and the landscape in prehistory: the view from the western Nile Delta

Joanne Rowland[1] and Mohamed Hamdan[2]

Affiliations: (1) TOPOI Excellence Cluster, Freie Universitaet Berlin / University of Edinburgh; (2) Faculty of Geology, Cairo University

This presentation explores the wider use of the landscape by human groups (mobile and settled) in the western Nile Delta at Merimde Beni Salama (MBS). The first farming village in North Africa was located in 1928 (Junker 1928) at MBS and which today is along the western fringes of the Delta and was founded on the fan of the Wadi el-Gamal. Recent investigations in the area have focussed on exploring the extent to which the landscape surrounding the site was exploited during the 6th millennium BC in the Neolithic, as well as encompassing a broader reconstruction of the landscape at the time through sedimentary coring. Excavations (2014-16) have provided new evidence for the use of the Wadi also in the Middle Palaeolithic (see also Schmidt 1980), and the local environment is becoming much clearer, with many geological sections having been exposed during recent construction work in the area, and recorded during our rescue mission to the area. One key question is that of whether the landscape around Merimde Beni Salama was utilised more intensively at certain periods of time, and if so why, and by whom. Was it exploited more during particular seasons, or was it dependent upon broader changes in the environment over decades, or longer? These new results suggest a much more extensive use of space than previously considered, which has repercussions for thinking about the population size and amount of land utilised by the early settlers, as well as mobile groups.

Hunter gatherer cultural and symbolic frontier in central Mozambique landscape

Décio Muianga

Affiliation: Eduardo Mondlane University/Kaleidoscopio

The Later Stone Age (LSA) in Mozambique remains poorly explored and its archaeological heritage is still largely explained in terms of well-known sequences elsewhere in Southern Africa. Central Mozambique is rich in sites with archaeological evidence related to hunter-gatherers. The lithic assemblages and rock paintings from Manica and Tete provinces are among the sources of evidence that help to explain the use of the rock shelters in the area. Lithic analyses and radiocarbon dating show that diverse formal tools were produced or used in different sites as part of the hunting and gathering way of life. In order to understand the use of the landscape resources throughout time by different hunter gatherers in south central Africa, this paper uses typological features recognized from the lithics analysis and rock art research to understand the fragmentary sequence of occupation in Manica and Tete. I show that diagnostic cultural materials strongly suggest the engagement by hunter gatherers with the surrounding environment and maintenance of an LSA way of life through the first millennium AD. On the other hand, the research results also illustrate the existence of a frontier used by forager communities in the exploration of this vast landscape that extends from the Zambezi Plateau to the Eastern Zimbabwe Escarpment of Central Mozambique.

Rethinking the Mapungubwe cultural landscape: Reflections from beyond Greefswald

Munyaradzi Manyanga

Affiliation: Archaeology Unit, University of Zimbabwe

This paper presents a changing view of the Mapungubwe cultural landscape that builds on research in the nearby Mapela, Jahunda and Mateke Hills, Zimbabwe. Since the turn of the 20th century, treasure hunters and researchers have collected a large volume of material from archaeological sites on the Greefswald farm, near the Shashe and Limpopo River confluence in South Africa. This is where the sites of K2 and Mapungubwe are located. Archaeological evidence from the sites has to a large extent been used to define and characterize the origins and development of socio-political complexity in southern Africa. Archaeological research in recent times has ventured in areas beyond the confluence area. The results from the sites in the Mateke Hills (south-eastern Zimbabwe), Mapela and Jahunda (south western Zimbabwe) suggest that Mapungubwe and K2 were just two among many sites in the broader Mapungubwe Cultural Landscape. Preliminary indications suggest that a similar pattern maybe the case in western Mozambique and eastern Botswana. Of interest is how a state centre based at the edge of such an extensive state was able to control an entire region which straddles the modern nation states of Botswana, Mozambique, South Africa and Zimbabwe.

Pottery in a pastoral place: understanding the Amboseli landscape through ceramic analysis

Anna Shoemaker

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Pastoralist landscapes from the perspective of an archaeologist studying material remains represent palimpsests of overlapping encounters. To an archaeologist in East Africa, pots are an important material component of mobile pastoralism. Pots are formed from clay, a geographically dispersed resource available in varying qualities across a physical landscape. Pots are more than clay however, they come into being through the interaction of fire, water, temper, and human labour. Interpreting the fragmented remains of pots most often recoverable by archaeologists presents challenges, though analysis of composition, form, decoration, and use-wear can illuminate on the multiple temporal, spatial, functional, and symbolic significances of these objects. Furthermore, the deposition and recovery of ceramic remains are processes that take place in physical and cultural landscapes. It is recognized that repeated use of the same spaces allows for the accumulation of ceramics and other archaeological signifiers of occupation and settlement. Conversely, pots are also transportable items, and the appearance of ceramic sherds in the landscape can too be evocative of pathways, movement, and connectivity. In this sense, pots are born from the soil, objects realized and embodied by people, and to the archaeologist they are imperfect material representations of human networks embedded in the landscape. This paper discusses preliminary results of ceramic analysis from surface survey and test-excavation collections from the Amboseli basin, southern Kenya. This research asks, what can pottery reveal about pastoral dwelling in the Amboseli landscape?

L'architecture funéraire protohistorique en Algérie: entre survivance Saharienne et interactions Méditerranéennes

Hocine Rassoul and Mohamed Dahli

Affiliation: Mouloud Mammeri University of Tizi Ouzou

L'intérêt porté aux morts en Algérie, et ce, en raison du nombre exceptionnel de sépultures protohistoriques connues, à nos jours, ainsi que la pluralité des expressions architecturales recensées, nous renseigne sur cette pratique spatiale séculaire, et sur le dynamisme et les mouvements qu'a connu cette rive de la Méditerranée. Sachant que le Sahara fut une région humide, les hommes ayant occupé ces vastes contrées nous ont laissé des traces impérissables, l'art rupestre qui immortalise sur la pierre leurs croyances et pratiques du quotidien, ajouté à cela les monuments érigés en mémoire des défunts. L'aridité du climat qui caractérisa le Sahara à partir de l'Holocène, poussa les populations locales à d'importantes migrations vers les territoires plus humides. L'interaction avec d'autres peuplements et/ou civilisations donnât alors naissance à de nouvelles conceptions architecturales pour les monuments dédiés aux morts. Les Mausolées dits « royaux », Madracen aux Aurès et tombeau de la chrétienne à Tipaza, présentent des permanences architecturales avec les monuments préhistoriques et protohistoriques du Sahara. L'architecture funéraire du Nord algérien résultante des survivances sahariennes et des interactions méditerranéennes. La volonté d'aller à la reconquête de ce patrimoine méconnu, à travers l'inventaire de ses différentes typologies architecturales recensées en vu de comprendre son processus d'évolution et/ou transformation et son influence sur le paysage d'antan sont nos principaux objectifs.

Post-Medieval economic interaction in the Central Sudan: Kiawa since the fifteenth century

Aliyu Adamu Isa

Affiliations: Department of Archaeology, Ahmadu Bello University

West Africa seems quite an ideal region where commerce prospered due to differences in climate and soil distribution, and the wide gap in the levels of cultural and material development of its people. This must have linked several neighbouring peoples in pre-colonial times, but research on these internal commercial networks appears to have been neglected. For over four decades, the prestige-good economic model has played a prominent role in most theories of secondary state development. This has prevented us from understanding the role of subsistence goods, the material culture of trading communities, and commodity movement in the local economy, despite their significance for understanding the economic and political organization of complex societies. With a focus on the later phase of economy and material culture of Kiawa, this paper aims to contribute to an archaeological assessment of this area, seen as crucial to the better understanding of mobility and intermingling of people and ideas that characterizes the recent archaeology of West Africa. From a theoretical perspective a Network Analysis framework seems the most appropriate way to analyze, define and interpret the resilience and economic interaction among polities in the Central Sudan and particularly Hausaland between c. 1400-1817 AD. Results from excavation and careful observation of the morphology, wear, chronology and context of different materials are expected to expose cultural differences between traders and locals. Network analysis of interactions between people and places/sites together with graph-theoretic concepts will be used to explore the effect of the exchange network on Kiawa.

Eating volcanoes: Landscape dynamics on Ngazidja, Comores

Paul Sinclair

Affiliation: Department of Archaeology & Ancient History, Uppsala University

This presentation reports on work carried out on the Comores under the Urban Origins in Eastern Africa programme. Following on from the excavations carried out by H.T. Wright at Mbashile, Ngazidja, Comores in the 1980s, micro-stratigraphical investigations of the site were carried out in 1992 using motorized augers, test pits and geochemical analysis. The combined results contribute to deriving a model of insular urban land-use in volcanic environments which will be discussed in relation to current initiatives in the western Indian Ocean.

B3 Landscapes, Archaeology, and the History of the Commons

TUESDAY 23rd AUGUST 16.30-18.30

VENUE: A114

Session organisers: *Karl-Johan Lindholm,[1] Anna Maria Stagno[2] and Vittorio Tigrino[3]*

Affiliation: (1) Uppsala University; (2) University of the Basque Country; (3) Università del Piemonte Orientale

Session Abstract

During the early modern and modern periods, forms of common management of natural resources had a crucial role in the history of rural landscapes. Commons indicate a category of "traditional" goods (meadows, pastures, woods, etc.) used by communities and maintained by principles of cooperative management or joint ownership. From the perspective of the social sciences, commons are multi-functional dynamic resources with strong adaptive and innovative capacities, and, from an historical point of view, they were important in rural and agricultural settings until the modern period. Strongly criticized, starting from the end of 18th century, and considered as obstacles for economic and modern development, they conserved their importance, in some cases, until the 20th century. Starting from the consideration that the exercise of common rights on lands were crucial in shaping rural landscapes, and that the evidence of such management is still visible, the aim of this session is to discuss, in a multidisciplinary perspective, how is it possible to analyse the material (environmental and archaeological) effects of that management? The study of the material and jurisdictional dimension which characterizes the topic could be one of the main subjects for the landscape archaeology of rural and mountain areas, and could permit archaeology to have a crucial role in this important debate in the social sciences. The panel offers a forum for discussion and comparison of historical and archaeological perspectives (also case studies are welcome), and to discuss how it is possible to archaeologically identify and investigate commons and their dynamism in a long-term perspective.

Paper Abstracts

Living on the Rural Edge (LoRE): The biocultural heritage of commons and communal livelihoods

Karl-Johan Lindholm

Affiliation: Department of Archaeology and Ancient History, Uppsala University

'Commons' can refer to many different types of institutions for collective action, identity making, resource utilisation and management, in the past and in the present. Commons can be characterised as multifunctional dynamic resources shaping social relations and identity, constituted via self-governing forms of decision making, with strong adaptive and innovative capacities. Most significantly for this presentation, commons and communal livelihoods have also shaped rich biocultural heritages consisting of biological and tangible and intangible cultural legacies, for example various archaeological sites, memories, landscapes, place names, biodiversity and ecosystem dynamics. The objective of this paper is to present the LoRE network, a joint initiative for landscape research on commons. The paper will provide examples of how the concept of commons can be related to a variable archaeological record, mainly associated with the landscapes of rural areas. The main question to be discussed is to what extent it is possible to identify commons by an archaeological landscape approach and how long-term perspectives on commons can contribute to current discussions concerned with heritage management.

Summer pastures in post-medieval Ireland: access, control and co-operation

Eugene Costello

Affiliation: Department of Archaeology, National University of Ireland

In Ireland, historical documentation of commons is relatively poor compared to some other countries in Europe. This is especially the case with regard to hills and mountains. Although clearly suitable for summer grazing by cattle or sheep, they are usually depicted on historical maps simply as blank spaces, with detailed descriptions as to their use and regulation occurring either infrequently or not at all. Legal documentation of disputes relating to upland grazing is also very rare. The questions of access, control and co-operative effort on Irish summer commons are therefore somewhat vexed when relying on historical evidence alone. In this context, the archaeological record has a key role to play. Based on my own recent research into the practice of booleying, a type of small-scale transhumance practiced in Ireland up to the 20th century, I ask what can be inferred about Ireland's upland commons from the archaeological and ethnographic records. People involved in booleying maintained seasonal settlements in the summer pastures, the remains of which are now known as booley huts or houses. What does the distribution and morphology of these settlements tell us about commons as social constructions? Did people relate differently to one another while at summer pasture? Were herders' perceptions of social space influenced by the social make-up of their home settlements in the lowlands (which are better documented)? Furthermore, how did existing local institutions and systems of transhumance cope with encroachment onto commons as a result of population growth in the 18th and 19th centuries?

Biodiversity management and commons in Africa

Anneli Ekblom[1] and Lindsay Gillson[2]

Affiliations: (1) Department of Archaeology and Ancient History, Uppsala University; (2) Plant Conservation Unit, Dept. of Botany, Cape Town University

The target for protected terrestrial area set by the millennium goals is 17% of the earth's surface and nature conservation areas are now expanding, particularly in Africa that has a low coverage of formalised protected areas. However, when it comes to cultural landscapes, establishment of protected areas may not be the best solution; strict protection risks hampering locally based landscape management initiatives. In fact the highest proportion of biodiversity resides outside of protected areas and therefore conservation efforts need to extend into land that is used for food production. Incentives for biodiversity protection therefore must be built and fostered amongst local practitioners and land managers. New management strategies are needed that are able to integrate historical and locally situated knowledges and local organisations of management. Customary management to a great extent is based on cooperative forms of land management or commons. The African continent offers many examples of successful sustainable natural resource use based on commons, and wildlife friendly food production systems that have proved resilient to environmental and social change. However, strict nature conservation and also development policies are risks hampering continued practices of management and innovation of the commons; there is therefore a need to review organisational forms of commons and cultural landscapes in Africa, and to revive and reinforce the adaptive management techniques that are embodied in customary and emerging commons looking both at organizational diversity but also at the landscape mosaics that these organisations produce.

Common resources, settlements and "locality patterns": Archival and archaeological sources for the history of solitical Spaces (XVIIth-XXth c.)

Vittorio Tigrino,[1] Maria Rocca[2] and Alessandro Panetta[3]

Affiliations: (1) Università del Piemonte Orientale; (2) Scuola Normale Superiore di Pisa; (3) Università di Genova

The case study we present is focused on Brevenna valley, in the Ligurian Apennines (NW Italy), an area which hasnot been much investigated in a traditional archaeological way, but which has recently seen an increasing number of archaeological studies focused on common lands. The paper aims to explore, the potentialities of a dialogue between social and political history and archaeology in the investigation of management of common resources in the past. Focusing on the last centuries from the *Ancien regime's* end onwards, this research analyses the role of common properties in the processes of exploitation of environmental resources, using documentary (archival, cartographical,...) and archaeological sources as complementary "traces" to reconstruct these dynamics: the first to highlight the relationship between the different "stakeholders" (feudal lords and state, private owners, kinship and communities), often involved in conflicts about the rights of access to the resources; the second as an archaeological record by which in a regressive way we can access and decipher the physical boundaries of specific forms of common resource management. In this way, we try to demonstrate that the analysis of this processes at a local scale (that of landscape archaeology and of microhistory) could give us important information about the dynamics of the "locality", explaining the creation and the transformation of settlement patterns in relationship to claiming collective rights in the resources by (dynamic) local social groups.

Almost a common but not quite: Questioning how archaeology should approach commons

Ronan O'Donnel

Affiliation: Department of Archaeology, Durham University

This paper will use data from four case-studies situated in Northumberland, UK in order to examine the margins of our definition of commons. It is argued that the instances presented here demonstrate that a common as defined by lawyers, a definition usually accepted by geographers and historians, is essentially archaeologically invisible, though they often share certain material features. The case-study data raise two specific problems:

1. there is often a time-lag (sometimes as much as a century) between the enclosure of a common and any material change;
2. there are many instances in which pieces of enclosed land are used in ways which are very similar to the ways in which true commons are used.

As archaeology is concerned with the material, and usually the local, these are problems that we will be forced to confront if we choose to study commons. However, our unique disciplinary identity could allow us to be confident in choosing the boundaries our own study of commons, while being aware of the definitions used in other disciplines. The importance of this choice is highlighted by the fact that some of the instances discussed were clearly grey areas for people in the past, who in their day to day life would be little concerned by legal specifics, and so by including these cases in an archaeological study of commons we may address some of the complexity of the subject which is often overlooked.

Reconstructing the historical dimension of commons: a multidisciplinary approach for the study of historical forms of land appropriation. First results of a project in southern Europe mountains

Anna Maria Stagno,[1,2] Alessandro Panetta,[2] Valentina Pescini,[2] Christine Rendu[3] and Carlos Tejerizo García[1]

Affiliations: (1) Research Group on Cultural Heritage and Landscape, University of the Basque Country; (2) Laboratory of Environmental Archaeology and History, University of Genoa; (3) Lab. Framespa-Terrae, Université Toulouse - Jean Jaurès

This paper aims to discuss the results of a multidisciplinary research project devoted to the historical investigation of common-lands, comparing case studies from the Basque mountains, the Ligurian Apennines and the French Pyrenees. The objective is to analyse the dynamic nature and the historical dimension of common-lands, starting from the reconstruction of their present organization and ecology, and going back in time. The central focus is on the material evidence of the construction and negotiation of access rights, where the different forms of appropriation of common-lands played a crucial role. These are often related, during medieval and post-medieval periods, to conflicts between local actors and communities. Investigation combines archival research with field work (archaeological surveys and excavations, observations from historical ecology) and lab analysis (archaeobotanical and geo-chemical analysis). The discussion will show how to distinguish different practices of environmental resource management and to associate their identification with different forms of (temporary or permanent) land appropriation, which can be interpreted as archaeological markers of conflicts over common-lands. Case studies will demonstrate that the analytical characterization of the environmental resource management practices through the combination of surveys, excavation, and lab analysis, constitutes a successful strategy to relate changes in the management of common-lands to transformations in common access rights, and more generally to the problems of rural history.

B4 Environmental Humanities: A Rethinking of Landscape Archaeology?

WEDNESDAY 24th AUGUST 10:50-14:50

VENUE: A114

Session organisers: *Sjoerd Kluiving,[1] Kerstin Líden,[2] Christina Fredengren,[2] Christof Mauch[3] and Kristine Steenbergh[1]*

Affiliation: (1) Vrije Universiteit Amsterdam; (2) Stockholm University; (3) Ludwig-Maximilians University

Session Abstract

There has been an increasing archaeological interest in human-animal-nature relations, and the material turn within archaeology has shifted focus from symbols and social construction to an acknowledgement of how things, places or even the agencies of land and water contribute to the shaping of relations. Parallel to this, the field of environmental

humanities poses the question of how to work with the intermeshing of humans and their surroundings. *Environmental Humanities* aims to invigorate current interdisciplinary research on the environment, in response to a growing interest around the world in the many questions that arise in this era of rapid environmental and social change. In this session we narrow the focus to environmental humanities and landscape. The Environmental Humanities are an emerging interdisciplinary area of international research and teaching that addresses contemporary environmental challenges in a way that is historically, philosophically and culturally informed. Environmental Humanities explores questions such as: What are the historical relations between humans and landscapes? How do fiction and film shape our thinking about climate change? How did people react to floods in the seventeenth century? How do we compare different time scales in different disciplines? These questions and many more are at the heart of the Environmental Humanities (EH) as well as Landscape Archaeology (LA). To take stock of the ways in which we interpret the term EH we propose in this session a rethinking of LA. Is the broad interdisciplinary arena of EH an acceleration of the process of integration that is central in LA? Can we envision that future developments, such as the discussion of the Anthropocene concept, are in fact demanding interdisciplinary collaborations such as EH and LA? In this session we encourage researchers and scientists to submit their abstract in landscape archaeology which, in LAC, is a tradition of interdisciplinary research in geology and archaeology related to different perspectives of landscapes. This session calls for papers that reflect on how the landscape concept can be re-vitalised by taking a critical look at nature/culture relationships and benefit from moving beyond a social constructivist backing for landscape theory. We especially encourage young scientists to submit an abstract in this emerging new interdisciplinary research area. We intend to produce a special volume as the outcome of this session.

Paper Abstracts

Engaging the senses in the wilder world: Archaeology of the Wild

Andrew Hoaen

Affiliation: Institute of Science and the Environment, University of Worcester

Landscape Archaeology engages with the world inhabited by humans across a wide range of time scales, from the present and recent past back to the landscapes of the earliest hominids. These investigations largely concern inhabited landscapes either farmed or in which hunting and gathering take place. I am interested in how we can use approaches derived from the humanities to help interpret the Wild in its original sense of the uncultivated and untamed. In this paper I will examine how concepts of the wild have been constructed within the arts and poetry by investigating its origins in the picturesque, especially Wordsworth and the later transcendental movement in America, e.g. Thoreau. Most branches of Archaeology have paid little attention to how the Wild may have been constituted in the past. This paper aims to explore how the humanities can help us bridge this apparent gap between what we think of as the cultivated lands of farms and fields, or the home territory of a hunter gatherer group, and the lands beyond the bounds. How might this approach be developed alongside the new field of sensory archaeology *sensu* Hamilakis? Does the concept of the Wild develop with the invention of agriculture or did a separation always exist between the known and the unknown? Looking forward, what of the wild in a world dominated by Humans; how will we conceptualise the wild in the Anthropocene?

Into the woods: A rhizomic approach to understanding past and present woodland

Benjamin Gearey[1] and Suzi Richer[2,3]

Affiliations:(1) Department of Archaeology, University College Cork; (2) Department of Archaeology, University of York; (3) Environment Department, University of York

Recent years have seen an increased interest in inter and intra disciplinary research, breaking down the long held view of the arts/science divide. Simultaneously within archaeology, and the social sciences more generally, new theoretical thoughts and works have been drawing on posthuman discourses, with a move towards 'flatter' structure in terms of the processes of knowledge creation, sometimes expressed in terms of being 'rhizomic'. In this paper, we question what these movements and alignments amount to for palaeoecology, and especially its relationship to, and interface with, archaeological thought. Drawing on the case study of Shrawley Woods, UK, we follow the diverse lines of enquiry (palaeoecology, archival research, oral history, archaeology, personal reflection and ecology). We do not intend to 'prioritise' one perspective over the others, but use them as starting points, 'lines of flight', to see how they intersect and intermesh. We explore how such a reflexive and more 'flattened' approach can yield a deeper understanding of past and present woodland landscapes and how it allows engagement outside and across 'conventional' academic/scientific modes of enquiry.

What are men to rocks and mountains?" (Austen 1853:135) A new materialist framework for provenance studies on stones

Claudia Sciuto and Johan Hallqvist

Affiliation: MAL- Environmental Archaeology Laboratory, University of Umeå

Traditionally in archaeological research a difference is made between artefacts and ecofacts: culture/man-made and nature/nature-made. We want to question this categorization especially when referred to geological resources and stone tools/stonework. We aim to build a theoretical framework for studying raw materials exploitation focusing on non-human agencies and human-nature entanglements. Physical and mechanical properties of geologic matters are related to the organization of production sequences and trades. The material qualities of material culture are essential, therefore a new approach integrating theory and archaeological sciences is needed. Case studies concerning stone tool making and quarrying, are discussed using a trans-disciplinary approach engaging ethnology and geoarchaeology, suggesting practical applications of new materialist and posthuman theories.

Travel books as landscape archaeology reports

Françoise Besson

Affiliation: Université Toulouse 2-Jean Jaurès

British and American travellers in the Pyrenees reporting their observations about the link between landscapes and mountain life might be seen as landscape archaeologists. The observation of the changes in agricultural landscapes, the traces of war particularly in the Basque country, the transformation of villages, the observation of inscriptions and archaeological vestiges, the interpretation of ruins, the analysis of place-names and their link with the various languages spoken in the area are as many examples of the interest of those

travellers in the history of the Pyrenees as discovered through natural or humanly-shaped landscapes. The aim of the paper is to ask the question whether travel literature may be seen as a form of landscape archaeology. Can we speak about landscape historical ecology in that form of writing based on observation? Texts and pictures by 19th- to 21st-century British and American travellers and mountaineers (Violet Alford, Mrs Boddington, Thomas Clifton-Paris, Louisa-Stuart-Costello, Sarah Ellis, Amy and Thornton Oakley, Kev Reynolds Henry Russell, Charles-Richard Weld among others) will be used to try to answer these questions.

Multi-scale dimensions of relief in geoarchaeology: A base for reconstructing Late Pleistocene environments of the Eastern Desert of Egypt

Felix Henselowsky, Jonas Handke, Andreas Bolten, Karin Kindermann and Olaf Bubenzer

Affiliation: University of Cologne

Scale, spatial and temporal, is one of the most important issues to deal with, when reconstructing former environments and landscapes in geoarchaeology. Interdisciplinary research such as geoarchaeology is dealing with different disciplines, descriptions and interpretations and therefore often work with varying meanings of specific scales. Nevertheless, these problems can be avoided by the explicit definition of scale and resolution, when discussing data availability, research questions and level of interpretation. We present remote sensing investigations of different scales, in order to answer crucial questions about the late Pleistocene terrain environment as one important aspect for the migration of anatomically modern humans in Northeast Africa, with specific focus on the Eastern Desert of Egypt and the important archaeological site of Sodmein Cave. Based on the classification between the dimension of a landform and their persistence, we identify three different levels of observations concerning the identification of landforms: The Microrelief (object dimension between 10-3- 10-1km), Mesorelief (10-1 - 101km) and Macrorelief (101- 103km). Each scale has significant relief forms, e.g. starting from single wadi terraces, specific catchments, and drainage network up to full mountain ranges, all of them with informative values for a specific spatial and temporal scale. The paper discusses problems and challenges of this approach for the Eastern Desert as an example of a today´s hyper arid environment.

Aeolian drift-sand dynamics, vegetation changes, and population pressure: spatial analysis of inland drift sands and Roman and Early-Medieval occupation patterns in the Netherlands

Harm Jan Pierik,[1] Rowin J. van Lanen,[1,2] Marjolein T.I.J. Gouw-Bouman,[1] Bert J. Groenewoudt[2] and W.Z. Hoek[1]

Affiliations: (1) Department of Physical Geograph, Utrecht University; (2) Cultural Heritage Agency, Ministry of Education, Culture and Science, Netherlands

Holocene drift-sand activity is commonly linked directly to population pressure and agricultural activity. The first occurrence of small-scale Holocene aeolian activity took place during the Neolithic, whereas large scale drift-sand activity started during the Middle Ages (especially after AD 1100) due to intensification of farming and demographic pressure.

Although demographic pressure is widely accepted to be the main cause behind drift-sand activity, this is currently not supported by studies that link spatial and temporal patterns in landscape management and drift sand occurrence on a supra-regional scale. Population size gradually increased from the Neolithic period onwards but was interrupted during the late-Roman period and the beginning of the Early Middle Ages (roughly 4th - 5th century). This resulted in a regional reforestation phase, probably coinciding with decreased drift-sand dynamics. In this contribution, we compare events of drift-sand activity with locations characterised by intensified demographic pressure on the landscape for three periods: the Roman period, the Early Middle Ages and the Late Middle Ages characteristic Pleistocene sand regions in the Netherlands. For this, we compiled a new supra-regional overview of drift-sand activity dates (14C, OSL, archaeological and historical), that we compared with existing national soil maps, historical-route networks and vegetation reconstructions. Here we present the first results of this spatial comparison and asses the relative importance of environmental factors (e.g. landscape setting) and demographic pressure on the formation of drift sands for these periods.

Digital re-construction of a Bronze Age stone wall enclosure and its surrounding landscape at Lina Mire on Gotland, Sweden

Helene Martinsson-Wallin and Paul Wallin

Affiliation: Department of Archaeology and Ancient History, Uppsala University

The aim of the project presented here was to digitally reconstruct the stone wall enclosure at Gothemshammar and to understand its location in the surrounding landscape. Excavations of the feature uncovered its internal construction details, as well as, dateable materials from domestic animals and charcoal. Fifteen AMS dates gave a clear and somewhat unsuspected age of the structure to the mid Bronze Age ca. 900-700 BC. The northern end of the wall is to be found at the end of a steep cliff, and since the southern end of the wall ended in an open slightly slanting terrain it suggested that it might have ended at the sea level when built, to demarcate a point in the landscape. We therefore reconstructed the water level using LIDAR data indicating that the former sea level in the mid Bronze Age could be set at about 10 m above the current sea level in this area. To place the wall enclosure in its Bronze Age context we also plotted other features tied to the same time, such as stone ship settings, cairns, other wall enclosures, and known hoards into the reconstructed landscape. It then became quite evident that points, small islands, and coastal locations were of great importance for the location of these monuments and that Lina Mire must have been an important "port" for Bronze Age communications, and Gothemshammar was strategically located at the entrance of this water system. With this study as a starting point, we aim to analyse of other prehistoric remains from various time frames in combination with analyses of geological sediments from the nearby Lina mire. In general, the Island of Gotland comprises a well-defined research area including a limited variety of discrete landscapes and an array of prehistoric remains ranging over the past 8000 years. Thus, the human lifestyles on Gotland embrace forager to urban strategies. Many of the island's past remains have been surveyed, and excavated data are relatively abundant, but the full potential of this material for comprehensive and multidisciplinary studies on socio-environmental dynamics have not been realized before. To go beyond this initial project and reconstruction of Gothemshammar and surrounding area, we have formed a multidisciplinary research group comprising of archaeologists and geologists. Our research idea is that dated archaeological remains on the landscape be co-analysed with the palaeoclimatic records to establish a detailed climate model and shore-line displacement. A high-resolution multi-proxy approach targeting material from mires, and lake areas will be used to understand large scale climate dynamics. The intention is that this metadata be used to create detailed digital reconstructions of past human and natural

environments to understand the human-environment interactions over time. Our aim is also to present the results to the general public and local communities as web applications at selected archaeological visitor's sites especially in the area around Gothemshammar and Lina mire.

People, Land and Water at the Heart of Neolithic Orkney

Caroline Wickham-Jones,[1] Martin Bates,[2] Richard Bates[3] and Sue Dawson[4]

Affiliations: (1) University of Aberdeen; (2) University of Wales Trinity St David; (3) University of St Andrews; (4) University of Dundee

This paper considers changes to the watery landscape around the monuments at the heart of Neolithic Orkney, notably the possible implications of the transition from freshwater to marine conditions in the lochs that surround the sites. Research demonstrates considerable transformation in the Neolithic landscape of Orkney driven partly by rising relative sea-levels around the archipelago. This change was particularly apparent in the area around the ceremonial sites at the Heart of Neolithic Orkney, where the isthmus on which the monuments were built diminished in size due to rising water levels around it and where transgression from fresh water to saline and tidal conditions took place just before building activity started. Ongoing excavation has highlighted considerable Neolithic activity here, at the site of the Ness of Brodgar, in addition to the standing stones at the Ring of Brodgar and Standing Stones of Stenness, as well as the sites of Maeshowe and Barnhouse. In order to understand these sites fully, it is necessary to consider the changing landscape within which they were set. This landscape change took place throughout the life of the monuments. It would have been apparent to those whose activities incorporated the monuments and is thus likely to have been integral to the meaning of the area in prehistory. The discussion will explore the possibility that the encroachment of the sea into the heart of Neolithic Orkney was a significant factor for the subsistence farmers who lived among the islands.

C. Landscapes and Water

C1 Perceptions, use and engineering of water

TUESDAY 23rd AUGUST 16.30-18.30

VENUE: Hörsal 2

Session Organisers: *Patrik Klingborg and Angus Graham*

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Session Abstract

Water has always been a key part of any landscape throughout the world. It exists in many shapes and forms, ranging from ice and steam to calm lakes and violent floods. The natures of water and these states has allowed it to transform the environment and determine the conditions by which humans move and live, while also prompting humans to perceive waters in many different ways. Water sources may be considered active or passive, pure or unpure, living or dead, everlasting or ephemeral. Not only does its visual fluidity, solidity, stillness, expanse and reflectiveness provide meanings, but its sound, smell, taste, touch and immersion in it provide essential experiential significances. The combination these meanings and the physical agency of water is of prime interest as it affects the way in which both the landscape around humans and the water systems in the landscape have been shaped, understood and used. This session therefore intends to discuss the ways in which the transformation of the waters in landscapes affects the way in which landscapes are viewed and used by its inhabitants while also exploring how these ways of understanding and giving meaning to waters affect the way humans use, think and interact with waters in the landscape. In essence, how are sacred and secular landscapes and waterscapes constructed and used through the manipulation and perceptions of water?

Paper Abstracts

Springs of cure: Finnish-Karelian spring tradition and the perception of water

Timo Muhonen

Affiliation: Department of Archaeology, University of Turku, Finland

This paper discusses springs in the context of traditional Finnish-Karelian healing practices. The subject has been studied relatively little and especially archaeological research is mostly lacking. However, archaeological studies can greatly benefit from folklore records from the 19th and early 20th centuries as they illustrate – even in considerable detail – the main ideas according to which springs were perceived and suitable springs selected and used. The records also tell us how the objects deposited in springs functioned, how water taken from them was used and where it was then delivered and why. Folklore convincingly shows that the key elements of springs were carefully considered with respect to the central

concepts of the folk world view of the time. This information can help archaeologists for example in locating "lost" springs and in interpreting the material found in them. Furthermore and perhaps more importantly, folklore records add to our knowledge of how water and different key places and spaces in the landscape were perceived and how they functioned in relation to each other. These include – in addition to springs – saunas, cemeteries and the forest. They and the related practices had an integral – also spatial – link to the afterworld and the different supernatural beings inhabiting them, hence placing springs seamlessly in the cosmos of humans and the supranormal. As the spring tradition carried ideas that reflect age-old world views, some of its observed elements can provide a guide to interpretations regarding times before the 19th century.

Waters, gods and social consequences

Patrik Klingborg

Affiliation: Department of Archaeology & Ancient History, Uppsala University

This paper has two aims. First, it will show how fresh waters in the ancient Greek world were given divine associations, based on the concept of activity and passivity. Secondly, it will discuss how these given meanings had a major effect on the construction of the water supply system. The paper begins with a discussion of the water sources available to the population of the Greek world (rain, water courses, springs, fountains, lakes, wells and cisterns) and the divinities these were associated with, as well as the forms these associations took in literature, art and everyday objects. It will continue by showing how these associations were based on the degree to which the waters were the active part in a conceptual water-human relationship. The second part will briefly exemplify how these ways to view water sources as active and passive in the water-human relationship largely determined which waters were used at different times in the Greek world, stressing the importance of such water-human relationships for our interpretation of the past.

The transformation of urban and private landscapes in Pompeii through the use of engineered water

Thomas Staub

Affiliation: Department of Archaeology & Ancient History, Lund University

This paper aims at presenting different aspects of the urban landscape of the city of Pompeii and the changes provoked by the use of engineered waters. The townscape itself must have undergone perceptible transformations, both directly through the installation of public fountains but also through the steadily flowing waters on the streets. The presentation will also discuss the use of artificially created waterscapes as an important element in the realm of small-scale landscapes represented by private gardens. The layout of these smallest forms of landscape was highly affected by the introduction of pressurized water into the town in the Augustan period. Many different ways of using water as adornment can be observed, from simple water-outlets, where the glittering water itself constituted the embellishment to complex systems of ornate fountains and elaborate pools that created artificial waterscapes. But these elements were not only used to change and embellish the landscape of the gardens but also entire viewing axes throughout at least the more lavish dwellings. Finally, two other aspects of these elements of water engineering will be considered: the sought for effect (according to ancient sources) on the soundscape for inhabitants and guests as well as the perceived, refreshing effect on hot summer days and evenings, so typical for the southern Italian region of Campania.

Eating cockles, wearing cockles in Neolithic and Bronze Age Northern Greece

Rena Veropoulidou

Affiliation: Hellenic Ministry of Culture & Sports, Museum of Byzantine Culture, Athens

Shells from prehistoric Aegean contexts offer great research potential as they represent evidence of various human acts in different fields of lived experience. Until recently, however, their analysis has been directed towards functional interpretations, leading to a scarcity of contextual approaches. Thus, our appreciation of how molluscan species, relevant seascapes and products made from these shells were perceived is skewed. This paper investigates the evidence from the study of large archaeomalacological assemblages from 16 sites in Northern Greece with the aim to sketch the history of interactions between people and waterscapes from the Early Neolithic up to the Late Bronze Age (6700/6500 - 1100 BCE), with an emphasis on the production and use of perforated cockle shells. Following a biographical approach, the results shed light on the methods of cockle exploitation and consumption, drawing attention on the different stages of their life-time and related human experiences. The archaeomalacological assemblages are evaluated in light of recent chrono-stratigraphical and environmental evidence at the micro-scale and according to the cultural profile of each site. This integrated approach allows consideration of how molluscs and shells were implicated in social acts, while also exploring the ways in which cockle shells were associated with waterscapes, identity and tradition synchronically and diachronically. Finally, it argues that cockle artefacts may have acted as references to particular waterscapes, and through these mediums identities were created and expressed in different ways over the course of five and half millennia.

'The Rivers Promised Not to Deluge the Country' (Strabo 5.2.5): waterscapes and water engineering in north western Tuscany (5th century BC – 18th century AD)

Marinella Pasquinucci

Affiliation: University of Pisa, Italy

Multidisciplinary diachronic research in the Pisa and Lucca districts (North-Western Tuscany, Italy) provide evidence of water landscapes and management practices during Etruscan, Roman, Medieval and post-medieval times. Three case studies are presented: 1. The complex hydrogeological evolution of the Pisa-Lucca territory and the long- term human actions aimed at optimizing river regimes were clearly perceived by the ancients, as documented by Strabo 5.2.5. Evidence of water engineering is provided by ancient, medieval and post-medieval ditches and channels and by river straightening. 2. The humid-cold phase dated mid-5th – late-8th century caused catastrophic floods. At the time (late Antiquity – early Middle Ages) bishops frequently exercised both religious and civil functions. According to medieval hagiography, Saint Frediano, bishop of Lucca in the late 6th century, prevented river floods by diverting the course of the Serchio. His action was perceived and recorded as a miracle. 3. From the 15th century, several plans to reclaim a large swampland in the coastal district (south of Lake Massaciuccoli) were made. In 1653, the Dutch "engineer" van der Strecht became owner of two swamplands. He built a few windmills in order to raise the marshy water and direct it through minor ditches into a main channel. The project failed, but its relevance was long perceived and der Strecht's name survived at least until the 18th century in maps.

Sacred water: shaping the Tirtha at Ramtek, Maharashtra, India

Manavvi Sunejaa[1] and Milind Kamble[2]

Affiliations: (1) Department of Architecture & Planning, Indian Institute of Technology, Roorkee, Uttarakhand; (2) School of Planning & Architecture, Vijayawada, Andhra Pradesh

Water has been a quintessential part of human existence. While providing for sustenance of life and structuring many a settlement along its edge; water has been a prime object of veneration across religions and cultures. As an integral element of the landscape water in all its forms – ranging from a mere droplet to the meandering river, and ultimately the mighty ocean – has been associated with the Sacred from times immemorial. The Indian context is a noteworthy case in point. For, from being the sin atoning river Ganga, to playing host to the largest congregation of humanity in the world – the Kumbh, water is inextricably woven into the Indian ethos. The numerous water structures, tanks, kunds (resevoirs), ornate baolis (place of ritual bathing), wells and so forth dotting the Indian subcontinent tell an interesting story of how people interact in diverse ways with water while bringing to light the intriguing human-water relationship. In keeping with the above, this paper shall discusses the case of Ambala Tank, Ramtek, Maharashtra, India. Located forty five kilometers off Nagpur, Ramtek is a "Tirtha" in the Vidarbha region encircled by the Ramgiri and Kaikai hills. The paper traces its chronological evolution, its role in shaping the Tirtha and summarises the myths, beliefs associated with the diverse ways in which pilgrims, tourists, and varied sects of people in a class, caste driven society relate to water. Focusing on its social construction the study will discuss how human – water relationships are gradually being transformed in the context of Ambala tank, Ramtek, Maharashtra, India.

Invited Discussant:

Professor Veronica Strang

Director of the Institute of Advanced Study, Durham University.

THERE IS NO C2 SESSION

C3 Water Harvesting Systems as Key for Understanding Human Management of Arid Environments

TUESDAY 23rd AUGUST 11.10-16.00

VENUE: A144

Session Organisers: *Anna-Katharina Rieger[1] and Thomas Vetter[2]*

Affiliations: (1) Max Weber Center for Advanced Cultural and Social Studies, Universität Erfurt; (2) Institut für Geographie und Geologie, Universität Greifswald

Session Abstract

Two billion people worldwide live in arid environments. Water and productive soils have been and are scarce resources in these regions, but they still provide a certain – albeit limited – carrying capacity. Under landscape archaeological aspects, arid environments are often studied in terms of oases and other groundwater resources, where artifacts cluster. However, societies from prehistoric to pre-industrial times developed resource management and land use systems, particularly elaborated water-harvesting schemes that were precisely adapted to the arid conditions. These decentralized small-scale systems were scattered over wide areas and reflect the long-term experience with the hydrological regime. The perception of these marginal regions in the ancient centers and empires and their political significance was limited. Consequently, textual and archaeological records are rare. The analysis of adapted resource management systems with a combination of archaeological, sedimentological, hydrological, pedological, climatological, and bio-scientific approaches contributes significantly to an integrated reconstruction of landscapes, embracing the elements of their physical setting, their interrelations with human management and the organizational implications for former societies. The session aims at bringing together scholars working in arid environments of various world regions. Specialists from geo- and life-sciences, hydrology, archaeology, agricultural and geospatial sciences are invited to present and discuss the transdisciplinary investigations methods to understand arid landscape management from the Late Neolithic to Early modern times. The exchange of ideas intends to raise the awareness for the land use potentials and the socio-cultural organization in arid environments, as well as the synergies arising from innovative interlinking of methodologies.

Paper Abstracts

Geo-archaeological approach for the study of hydro-agricultural systems in arid areas: examples from Western Syria

Frank Braemer[1] and Bernard Geyer[2]

Affiliations: (1) CNRS - CEPAM-Université de Nice; (2) Archéorient, Université Lyon

Archaeological survey helps highlight water supply systems, date and characterize them, and delimit their area of influence. It allows deducing forms of development that adapt to the milieu's potential. In arid areas, cultivation and livestock farming are complementary. They both depend on the constraints of the components of the natural environment, but also they depend on the creation of water developments which improve the land operative potential. They sometimes allow extending agricultural territories in repulsive areas that do not allow sustainable implementation. A first step of our project in Syria was the study of small regions where environmental components can be finely analyzed through knowledge gained on the field: basaltic area in the South and arid margins in the North. Maps of land use potential have thus been proposed; they take into account the environmental components (topography, geology, soils, hydrology, etc.), and also the changes brought by the introduction of hydraulic techniques. They allow highlighting changes in the attractiveness for both cultivation and breeding, and thus they highlight land use conditions over the long term. We then propose a generalization to the whole of Western Syria that requires a different approach. It integrates the small scale mapping

of different constraints that shape the potential and water development techniques. It is based on data available at the Country level: morpho-soil maps, satellite imagery.

Landscape archaeology of ancient agricultural terraces and water harvesting in the Negev Desert

Hendrik J. Bruins[1] and Johannes van der Plicht[2]

Affiliations: (1) Bona Terra Department of Man in the Desert, Ben-Gurion University of the Negev; (2) Faculty of Mathematics and Natural Sciences, University of Groningen

Landscape archaeology has great potential in rural desert regions. Tens of thousands of ancient agricultural stone terrace walls were built in ephemeral streams (wadis) and valleys in the central Negev desert. Water harvesting led to extraordinary archaeological site formation. Sediment/soil accumulation though time in terraced fields captured human history in the region in a more comprehensive manner than recorded by architectural remains. The average annual rainfall ranges from 100 mm in the arid central Negev, where most ancient agricultural wadi terraces exist, to only 25 mm in the hyper-arid southern Negev. Agriculture was enabled through the construction of stone terrace walls in valleys, which captured runoff and floodwater. Each runoff flow also transports some sediment from the hilly catchment unto the terraced fields. Landscape archaeology of terraced fields, coupled with radiocarbon dating, surprisingly showed that water harvesting dates back to the Late Neolithic, about 7000 years ago. Also the 2nd millennium BCE, which was understood to be missing in the region, showed up in a terraced field through a consistent series of 32 radiocarbon dates from 1602 to 922 BCE. Soil micromorphological research revealed ferric nodules (iron mobility) and carbonate nodules (calcium mobility), usually absent in a desert climate. These features can only be explained by the effect of water harvesting, which changed the "soil climate" to considerably wetter conditions. Charcoal particles and bone fragments occur in certain soil layers, indicating past manuring based on kitchen refuse. Soil fertility management also included animal dung, found together with many carbonate spherulites.

The rise and fall of runoff harvesting agriculture in the southern Levant - climatic fluctuations or political shifts?

Yoav Avni

Affiliation: Geological Survey of Israel

The rise and fall of the desert agriculture in the southern Levant are often described as the consequences of climatic shifts which severely influenced the ancient civilizations. However, new OSL dates of runoff harvesting installations from the Negev Highlands, southern Israel, indicates that most of the desert agriculture activities were established during the 3rd-4th centuries AD and were continuously maintained for 200-300 years after the collapse of the Byzantine Empire. In a large scale research focusing on the natural and anthropogenic factors that influenced the desert agriculture, we found that the continuous usage of the agricultural plots between the 3rd and 10th centuries was accompanied by an on-going accumulation of re-deposited loess soils within the runoff harvesting installations. In some cases the overflow breached the stone dams and caused rapid soil erosion in the agricultural fields. This process enforced the farmers to intensify their maintaining efforts under the harsh desert environment. As the political shift was

imposed on the southern Levant, a gradual decrease in the economic value of the desert agriculture is evident. The political shift of the 7th century ceased support from the central government and weakened the ability of the farmers to stand firm against the harsh desert conditions. This triggered a gradual decline of the desert agriculture in the Levant, leading to its final collapse after the 9th century. The climate fluctuations were found to be irrelevant, as evident from continues usage of the runoff harvesting installations by the Bedouin population to the present.

Irrigated agriculture along a precipitation transect in northern Jordan

Sufyan Al Karaimeh[1] and Bernhard Lucke[2]

Affiliations: (1) German Jordanian University; (2) FAU University Nürnberg Erlangen, Institute of Geography

In this paper, we compare agricultural systems in the hinterland of three ancient sites in northern Jordan: Gadara/Umm Qeis, Abila/Queilbeh, and Umm el-Jimal. These are located along a precipitation gradient: rainfall decreases from about 500 mm in the west to approximately 150 mm in the east. In the arid east around Umm e-Jimal, the ancient city relied on water systems diverting sporadic runoff from two valleys to numerous water basins and reservoirs, and also to terrace systems. However, the remaining terraces are limited in scale and host a limited amount of sediments, suggesting that irrigated agriculture near Umm el-Jimal was conducted only to a limited extent. In contrast, the site of Gadara/Umm Qeis to the west does not only enjoy higher precipitation, but was also connected to the 'Qanat Firaun', the longest known aqueduct of antiquity. Numerous rock-cut channels were found in caliche crusts of rocky hills in the vicinity, and could be traced over long distances. The channels divided into branches, junctions and outlets to supply water to the slopes, probably for irrigation purposes. Although bare rocks prevail in the largest part of the today forested limestone hills, few remains of ancient terrace systems were preserved in some areas. They suggest that intensive irrigated agriculture had been carried out in the hinterland of Gadara during classical antiquity, using wastewater from the aqueducts, and taking advantage of caliche crusts for water harvesting and channel construction.

Taming the torrents: the terrace engineering of Petra

Khaldoon Al Qudah,[1] Qasem Abdelal,[2] Catreena Hamarneh[3] and Nizar Abu-Jaber[2]

Affiliations: (1) Department of Earth & Environmental Sciences, Yarmouk University Jordan; (2) School of Natural Resources Engineering and Management, Amman, Jordan; (3) German Protestant Institute of Archaeology, Amman, Jordan

As in many arid areas, Petra suffers a perverse dilemma of limited water resources and periodic flash floods. The average annual rainfall in the area is about 180 mm, much of which falls in short bursts. Until today engineers still puzzle over how to deal with such conditions. Much has been made about the Nabatean water harvesting and distribution systems in Petra, but these rely greatly on spring , dams and cisterns, which no matter how large and limited in the amounts of water that they can store and distribute. Recent single flood events within the drainage basin have been measured to be up to 5 million cubic meters. On the other hand, the storage capacity of the hydraulic management system in the area is at most an order or two of magnitude lower. Certainly, these systems served domestic and small garden needs, but they were insufficient to collect enough water to

mitigate floods or to irrigate the large farms that were needed to feed the population. The Petra region is characterized by extensive terrace systems that cover the slopes to the north, south and east of the drainage basin. These vary in age, design and function, working together to preserve the soil, collect water within that soil, create agricultural field and to alleviate flooding. Research at selected sites has revealed pottery dating back to the Bronze Age, with well-developed soils collected behind these structures, indicative of their long-term existence. Rain-runoff testing has shown significant effectiveness of these terraces and the accumulated sediments behind them in capturing water and slowing and stopping surface runoff. Preliminary evidence shows that the spacing and alignment of the terraces were such as to optimize their function. Runoff and gullying can be seen only where terraces have been neglected and have collapsed. Work on this project is ongoing, and it is hoped that it will increase our insight into ancient technologies and how they may be implemented in the modern world.

Waterway management in Late Roman northern Egypt

Penelope Wilson

Affiliation: Department of Archaeology, Durham University

The northern Nile Delta affords a good example of the development of settlement and economic potential in a landscape of marshes, lagoons and unstable river channels. During the Roman and Late Roman period (30BC-AD641), the northern Nile Delta was extensively remodelled in terms of population density, settlement distribution and management structure in order to harness waterscapes and the additional agricultural lands of Egypt to feed Rome and Constantinople. Recent survey and archaeological work has begun to investigate how an area of previously low population was turned into an area with the agricultural potential to feed Rome for a third of the year and transformed the dynamics of ancient Egypt for ever. The sites of Sais, Buto and Tell Mutubis are discussed in order to understand the way in which new land was organised using the waterway network of Nile branches and distributaries to exploit Egypt to the maximum. The resilience of the system collapsed after the Arab Invasion but the later colonial powers in the nineteenth century were able to restore the Late Antique situation through new irrigation projects to re-establish Egypt as an East Mediterranean power house under an imperial power. These trajectories provide an insight into the archaeology of water landscapes and the decision-making processes which affect their development.

Water management systems on the island of Socotra, Yemen

Julian Jansen van Rensburg

Affiliation: Research School, Freie Universitat Berlin

Situated off the tip of the Horn of Africa, the island of Socotra has featured prominently in historical texts as an important source for aloes, dragon's blood and incense. It has been suggested that the increased demand for these products, particularly during the 1st centuries BCE/CE, led to a large scale agricultural intensification process on the island. The evidence for which is seen as an extensive set of walls and enclosures that are found across the island. However, little has been done in terms of understanding how these potential agricultural systems would have functioned within their local landscape. As in many arid environments, such as Socotra, the management and control of water resources is key to any type of intensive production. Ethnographic accounts stress the reliance of

the island's population on seasonal rains for agriculture. However, the presence of ancient water control systems such as cisterns, wells, dams and terraces found throughout the island, suggests that there was a need for additional irrigation and water conservation systems. How these systems and the walls interrelate with the intensification of agricultural production on Socotra in antiquity has yet to be adequately explained, or examined. In this paper I demonstrate how remote sensing of satellite imagery together with the evidence from archaeological survey and excavation, paleo-climatic and environmental studies, and historical accounts has now made it possible for us to begin to understand how these systems may have worked.

THERE IS NO C4 SESSION

C5 The ever-changing environment: Landscape-archaeology in river landscapes

THURSDAY 25th AUGUST 08.30-12.40

VENUE: Hörsal 2

Session Organisers: *Hans Middelkoop,[1] Frieda Zuidhoff,[2] Hanneke Bos[2] and Nelleke van Asch[1]*

Affiliations: (1) Department of Geosciences, Utrecht University; (2) ADC Archeoprojecten, The Netherlands

Session Abstract

River landscapes are and were one of the most densely populated areas in the world. These landscapes are gradient rich and often show large variations in elevation, nutrient availability, vegetation, and soil conditions within small distances. The diverse nature of river landscapes with its high biodiversity and numerous resources provide humans with many favourable opportunities (e.g. food, trade, transport). The positive aspects of river environments were often disturbed by river dynamics: flooding, bank erosion, silting up of channels and avulsions occurred on annual to decadal time scales. These often required human adaptation, like shifting production areas, changing land use practices and methods of subsistence. Dynamics even may have resulted in abandonment of settlements and/or cultural practices. Although increasing human impact has affected many rivers across the globe, river landscapes have remained dynamic areas prone to flooding. The long relationship between humans and the fluvial landscape is intriguing, and raises some fundamental questions on the interrelation between the dynamics of both: Why have river landscapes, in contrast to other regions, been populated nearly continuously in spite of the highly dynamic environment? How have past societies adapted to different types of fluvial dynamics? Why did some fluvial dynamics result in settlement abandonment and

others not? Did such conditions arise due to an accumulation of processes, or catastrophic events? Can we find tipping points in the adaptive capacity of past societies to fluvial dynamics? In this session we welcome papers dealing with topics regarding this complex interaction between river dynamics and subsequent cultural adaptations.

Paper Abstracts

Flooding and land use: Premodern environmental adaptation in southern Sweden

Oscar Jacobsson

Affiliation: Kulturlandskapet, Sweden

There is a certain tendency in current debates to view river flooding as a threat to human settlement and agriculture. Yet flooding is a natural – and necessary – riverine process which contributes to the establishment of valuable biodiversity reserves. Viewed from a historical perspective, the contemporary debate is strangely unaware of how people have coexisted with and used flooding in the past. This paper presents the results from a research project investigating the relationship between land use and flooding zones in the pre-modern rural landscape of three waterways in Southern Sweden from 500 BC to 1800 AD. Through a retrogressive study of historical maps, records and physical remains in combination with modern GIS data it is possible to analyse this dynamic relationship in a manner which contributes to holistic understanding of riverine historical landscapes. Signs can be seen in the material of a considerable knowledge concerning the extent of flooding zones, not least in the layout of arable and meadow. Arable areas are often found in locations protected from river flooding during the studied period, while the flooded zones were mostly actively used as meadowlands. Using the results from this project, the actual effectiveness of naturally flooded meadows can be discussed as well as their history and contribution to river valley settlement formation.

When Trondheim was born: An interdisciplinary approach to the emergence of an urban centre in a fluvial landscape

Anna Petersen,[1] Axel Christophersen,[2] Johannes de Beer,[3] Louise Hansen[3] and Paula U. Sandvik[4]

Affiliations: (1) Norwegian Institute for Cultural Heritage Research (NIKU); (2) University Museum/Department of Archaeology and Cultural History, Norwegian University of Science and Technology (NTNU); (3) Geological Survey of Norway (NGU); (4) Museum of Archaeology, University of Stavanger (UiS)

Trondheim is located in central Norway. Its historic nucleus occupies a central part of the river plain where the River Nid (Nidelva) enters Trondheimsfjorden. The present-day landscape is a result of a continuous emergence of land and shoreline regression due to glacioisostatic uplift since the last Ice Age, in combination with fluvial processes and human occupation during the Holocene. The first evidence of human settlement dates back to c. 2,500 BP. In the late Viking-Age and the early medieval period c. AD 900 – 1100, a non-agrarian settlement expanded in the eastern part of the river plain, near two inlets in the main watercourse's western bank. The inlets, now long since filled in, may have been formed due to channel abandonment during uplift, perhaps aided by landslide activity.

The inlets were sheltered from harsh weather conditions, providing good harbour facilities, which was a key factor in the rise of the early medieval settlement. Recent archaeological finds of an early-medieval stave church and a cemetery contemporary with the hitherto earliest-known non-rural settlement on the southern inlet's north-eastern side provides solid grounds for a comprehensive spatial analysis in order to identify the criteria for the choice of the original settlement site and the practical challenges involved in establishing a non-rural settlement. This paper aims to discuss the relationship between geology, hydrology, paleoecology and human impacts in terms of and in relation to complex landscape-formation processes and land use. The goal is to establish a broad empirical basis for an ever-more detailed understanding of the establishment of the late Iron Age/ early-medieval urban settlement and the natural preconditions.

Mapping the archaeological river landscapes of the Netherlands

M.C. Kosian and H.J.T. Weerts

Affiliation: Cultural Heritage Agency, Ministry of Education, Culture and Science, The Netherlands

In the past two years the Cultural Heritage Agency of the Netherlands has developed a nationwide landscape GIS. For this new conceptual approach we put together several multi-scale landscape classifications into one GIS. At the local scale a nationwide geomorphological GIS is available in the Netherlands. We have combined the local scale with the national scale and even the wider European scale. To do so, we first defined national physical geographical regions based on the national geological map. We also made sure there was a reference with the European LANMAP2 classification. Furthermore, we used a GIS that contained the position of dikes and a GIS with geological faults. We came up with 26 landscape units, based on genesis, large-scale geomorphology, lithology of the shallow sub-surface and age. All together, they define the natural boundary conditions for anthropogenic use. At the local scale, the boundaries of the national units can be defined and precisely mapped by linking them to the geomorphological map polygons. Each national unit consists of a typical assemblage of local geomorphological units. With this new map local councils as well as provincial, or even national governments can address zones of human activities through time and space and therefore manage their heritage policies, or the assignment specifications given to archaeological companies. Likewise, archaeologists can use this new map for better, more detailed predictive modelling. In this paper we address both the realization of this map as well as it's uses in archaeology and spatial planning (policies) for Holocene Netherlands.

Roman and Early-Medieval occupation of a delta: Settlement dynamics in the Rhine-Meuse Delta (The Netherlands)

Harm Jan Pierik and Rowin J. van Lanen

Affiliations: (1) Department of Physical Geography, Utrecht University; (2) Cultural Heritage Agency, Ministry of Education, Culture and Science, The Netherlands

River landscapes are among the most densely populated areas in the world. In the Rhine-Meuse delta, The Netherlands, the late-Roman and early-medieval periods (AD 270 - 1050) were characterized by both cultural changes (e.g. in demography, settlement location) and environmental changes (river avulsions, changes in flooding frequency). In the delta plain, the relatively high and dry natural levees were most favourable for habitation. The

extension and relative elevation of these important landscape units has recently been mapped in high detail, exploring the distribution of settlements on these landscape units and the changing patterns of settlements through time is the next step. We have applied a multidisciplinary approach by integrating new high-resolution palaeoenvironmental reconstructions with archaeological datasets. Our aims were to: 1) determine the spatial distribution of settlements on geomorphological landscape units, and 2) explore changes in human-environment interactions from the late Roman period to the Early Middle Ages. In this contribution, we present the first results of these analyses. Integrating these datasets is an important step towards further understanding of the relative contribution of (and the interaction between) environmental and cultural factors in determining settlement distribution in the Rhine-Meuse delta.

Rivers and the city: Dynamic processes interacting with Medieval habitation in Vlaardingen, western Netherlands

Sjoerd Kluiving,[1,2] Tim de Ridder[3] and Marcel Dasselaar[4]

Affiliations: (1) Department of Archaeology, VU University Amsterdam; (2) CLUE+ Research Institute for Culture, History and Heritage, Amsterdam; (3) VLAK (Archaeology department), City of Vlaardingen, The Netherlands; (4) Arnicon, Archeomedia, Capelle aan den Ijssel, The Netherlands

In Medieval times, the city of Vlaardingen (the Netherlands) was strategically located on the confluence of three (sub-)rivers, the Meuse, the Merwede and the Vlaarding. A church of early 8th century was already located here. In a short period of time Vlaardingen developed into an international trading place, the most important place in the former county of Holland. Starting from the 11th century the river Meuse threatened to flood the settlement. The flood dynamics have been registered in the archives of the Fluvisols and were recognised in a multidisciplinary sedimentary analysis of these archives. In this paper, the results from extensive interdisciplinary research (76 mechanical drill holes, grain size analysis (GSA), thermo-gravimetric analysis (TGA), archaeological remains, soil analysis, dating methods, micromorphology, and microfauna) will be compared with new archaeological and micromorphological data. Pedogenic features are recorded with soil description, micromorphological and geochemical (XRF) analysis. Given the many archaeological remnants and features present in the lower units, in geological terms it is assumed that the medieval landscape was drowned while it was inhabited in the 12th century AD. After a final drowning phase in the 13th century, as a reaction to it, inhabitants started to raise the surface. Within archaeological terms the boundary between natural and anthropogenic layers is stratigraphically higher, so that in their interpretation the living ground was dry during the 13th century. In this paper this contradiction will be highlighted and it will be discussed how the geological interpretation compares to alternative archaeological visions.

Farming (and fearing) the riverbed. Agriculture and herding, socioeconomic structures and natural disasters in a Mediterranean riverscape during the Holocene.

Arnau Garcia,[1] Tania Polonio,[1] Santiago Giralt,[2] Jaume Oliver,[3] Santiago Riera[4] and Josep M. Palet[1]

Affiliations: (1) Landscape Archaeology Research Group, Catalan Institute of Classical Archaeology (GIAP-ICAC); (2) Institute of Earth Sciences Jaume Almera, Spanish Scientific Research Council (ICTJA-CSIC); (3) Research Group "Arqueologia Agrària de l'Edat Mitjana", Autonomous University of Barcelona (ARAEM-UAB); (4) Seminar of Researches and Studies on Prehistory, University of Barcelona (SERP-UB)

Most Mediterranean hydrological networks are characterized by irregular torrential regimes highly sensitive to precipitation variability. In such environments, human activities are forced to adapt to a wide range of situations, from periodical water scarcity to punctuated abrupt and violent floods. Research carried out in the middle course of Congost river -a small water-course in the North-East of the Iberian Peninsula- showed different long-term socio-environmental dynamics involved in the configuration of the landscape. The analysis of those dynamics allowed us to identify different models of river-scape management by human communities and their resilience to some climatic events. A diachronic and interdisciplinary perspective has been adopted to examine the long-term transformations of the Congost landscape. Geomorphology, archaeology, historical geography and the study of documentary collections were used during the course of the research. Preliminary results revealed that one or more torrential floods, associated with the last phase of the Little Ice Age (18th C. AD), had a strong impact on the study area. On the one hand, the territorial reorganization that followed those events was characterized by transformations on the political and socioeconomic spheres of the rural community. On the other hand, most of the documented elements (small lagoons, irrigation systems and mills) of the late medieval and modern landscapes (13th-18th C. AD) disappeared or were substantially modified. These Medieval uses masked evidence of other historical management models linked to both Early Medieval (9th - 12th C. AD) and Antiquity/Late Antiquity (2nd C. BC - 7th C. AD) periods.

Settling amongst shifting branches: Fluvial and settlement dynamics in the north-western Nile delta of Egypt

Robert Schiestl,[1] Andreas Ginau[2] and Jürgen Wunderlich[3]

Affiliations: (1) Department of Ancient History, LMU Munich; (2) Goethe Univ. Frankfurt a.M.; (3) German Archaeological Institute Cairo

Settlement activity in the Nile delta is characterised by its profound connection to the branches of the river Nile. All major ancient settlements were founded on waterways. The constant shifting of these Nile branches – coming either too close or moving too far away – was a fundamental challenge for settlements. The region around Buto (Tell el-Fara'in) in the northern western delta, investigated since 2010 by the German Archaeological Institute Cairo, in cooperation with the Goethe University Frankfurt am Main, illustrates different adaptive practices. The central city Buto, founded in the 4th millennium BC, seems to have been abandoned for almost 1500 years, most likely due to flooding of parts of the settlement. The massive increase in settlements in the Roman and Late Roman periods (1st c BC – 7th c AD) can be tentatively linked to a new minor branch of the Nile, which opened this area for large scale economic and settlement activity. The current investigation combines archaeological and geographic research. A significant linear distribution of ancient settlements located during survey suggests the course of an ancient branch of the Nile. This defunct branch is, however, not marked by alluvial levees detectable on the modern surface relief. The verification of this course is currently ongoing by means of auger core drilling. This verification also makes use of geochemical analyses, in which we identified distinctive element properties in settlement material and material of their surrounding as a key to unlock the shared history of settlements and waterways.

Corpses and connectivity: Near-Nile proxies for human adaptation to landscape change

Judith Bunbury,[1] Piers Litherland[2] and Salima Ikram[3]

Affiliations: (1) Department of Earth Sciences, Cambridge University; (2) Division of Archaeology, Cambridge University; (3) American University in Cairo

Rapid climate fluctuation in the Holocene generated new habitats in Egypt while destroying others. Sediments, tombs, monuments, tracks and documents form a disparate group of evidence for these changes but the floodplain record itself is often obscured by subsequent developments; reworking, deposition and erosion. We explore whether carbon-dated sediments and climate records can be integrated with documentary, architectural and archaeological evidence that is dated by regnal year of the King in the Nile valley and near-Nile deserts. Our first case study is from the Early Holocene Kharga basin where the Nile reached highstands and overflowed into the wadis surrounding the valley while the second is from the second millennium BC when rainfall expanded the floodplain and refreshed parts of the desert activating cross-desert routes. In the first case, the study of an ancient lake basin that formed as the Nile overflowed during periods of high temperature reveals biases in the archaeological data which is nonetheless consistent with floodplain records from the Nile Valley. In the second case we examine rapid climate changes during the New Kingdom (1550–1077 BC) when rainfall increased and the ancient sediments and aquifers were refreshed in the Khargan and Theban areas. Did these rains and the associated wadi activations change the Theban building strategy for the tombs in the Valley of the Kings and surrounding areas?

Landscape evolution of the Nile delta and the emergence of Ancient Egypt

Benjamin Pennington,[1] Tony Brown[1] and Fraser Sturt[2]

Affiliations: (1) Geography and Environment Department, University of Southampton; (2) Department of Archaeology, University of Southampton

A geoarchaeological model linking the evolving fluvial landscape of the Nile Delta to changing settlement patterns, subsistence strategies, and social developments culminating in the emergence of the Ancient Egyptian State is devised for the period c. 6000–2500 BC. The changing paleo-landscapes of the delta are established through the 4D modelling of data from over 1500 extant geological borehole records, radiocarbon, OSL and pottery dates; data which reveal major shifts in the character and extent of different environments across the delta plain during this period. These changing landscapes necessarily need to be considered in any discussion of contemporary social developments. Links between the changing environments and settlement patterns are established through GIS-based models, while shifts in the availability of nutritional resources specifically predicted by the landscape model are verified using zooarchaeological and archaeobotanical data. Social and political developments culminating in the formation of the State are reinterpreted based on the environmental model. Geoarchaeological evidence further suggests that a similar model may be applicable in considering the contemporary evolution of other archaeologically important lower alluvial systems in the mid-Holocene: the Huang He, the Indus Valley and Lower Mesopotamia.

C6 Archaeology of Water Landscapes

WEDNESDAY 24th AUGUST 08.30-12.30

VENUE: B159

Session Organisers: *Christina Fredengren,[1] Andreas Hennius[2] and Susanna Eklund[3]*

Affiliations: (1) Department of Archaeology & Classical Studies, Stockholm University; (2) Department of Archaeology & Ancient History, Uppsala University; (3) Societas Archaeologica Upsaliensis (SAU), Uppsala

Session Abstract

This session deals with the materialization processes that link up water and archaeological landscapes and call for papers concerned with depositions of artefacts, sacrifices and folklore associated with wetlands, lakes, and rivers in a large geographical area and in a long time perspective. In recent archaeological debates water has been approached either through relational or object oriented ontologies as an alternative route for "Thinking with Water". Water is looked upon as socially, politically and ritually constituted and challenges earlier approaches. Provoked by the findings of materials like artefacts, bones from animals and humans, worked wood and pottery that showed up during ditching lakes and extracting peat in the early 1800´s – wetland archaeology was established. However, access to specialists are not evenly spread through-out Europe. Unfortunately proper archaeological excavations are few and heritage authorities need more knowledge of how to handle these types of sites Rituals and depositions connected to water has had a recent revival with a lot of new material and recent archaeological research in Sweden and abroad. This session calls for papers that deals with archaeology of waters in abroad perspective concerned not only with the ritual practices and research potential but also questions addressing the antiquarian perspective. How can we locate these types of small scale remains, where do the depositions occur in the landscape and how to excavate them in a good manner? A major question is how Thinking with Water alters or meets earlier understandings of "Water-Thinking" in archaeology.

Paper Abstracts

Has water ethics?

Christina Fredengren

Affiliation: Department of Archaeology & Classical Studies, Stockholm University

A major question in this session is how Thinking with Water alters or meets earlier understandings of "Water-Thinking" in archaeology. Some writings in archaeology have a slight tendency to work anthropocentrically and to define landscape as perceived by the human being. This is also evident in the definition of landscape in the European Landscape Convention, where landscape is captured within the representational sphere of the human mind. Normark (2015) has suggested to work with archaeology and water from a hydrocentric perspective. Barad (2008) writes, "language has been granted too much power" and that materiality also bears with it its own ethics. This paper will explore these

approaches and through the archaeological material of depositions of human/animal remains and artefacts in water, drawing on the author's two research projects, the Swedish project "Tidens Vatten" and the Irish project "Islands of the Dead" which particularly deals with Irish water mythology. It will address the question has water ethics?

Floods, fields and Pharaohs – inundated landscapes in Ancient Egypt

Terje Oestigaard

Affiliation: Nordic Africa Institute, Uppsala

The pyramids were built because of an ideology or religion emphasizing the sun-cult and worship of Ra. But why worship the sun and not the Nile in a desert environment when the temperatures during the summer approach 50°C? Were the ancient Egyptians water-blind living in a desert where all life and well-being was dependent upon water and the arrival of the annual flood? Is it possible to explain this sun-cult as a truly unique African cosmology or did the Egyptian civilisation also develop a water cosmology as most other early civilizations did? By focusing on the actual fluctuations and the characteristics of the Nile floods, it will be argued that Osiris' embodiment of the Nile was believed to be real and intimately connected to death, and in fact, the waters were the divine blood and life-juices from which everything and all life arose. There were three main characteristics of the inundation: the Green, the Red and the White Nile – different colours of the flood due to changing sediments flows. These visual changes seem to have been incorporated into the mythology and hence uniting ecology and cosmology. Although hidden in symbolism and metaphors, the Egyptian civilization was deeply imbued with the life-giving waters. Thus, the aim is to approach the sun cult and the pyramids from a perspective emphasising the role of the Nile in the Egyptian cosmology.

Water worlds: ritualized wetlands and watery landscapes in Florida

Margo Schwadron

Affiliation: U.S.National Park Service

Wetlands and watery landscapes in Florida persisted for millennia. Interestingly, the discovery and investigation of a few sites such as the famous Key Marco, Windover and Belle Glade sites, which yielded pond burials, incredibly rare preserved organic artifacts and remains, and the oldest dated human brain DNA, have been viewed as anomalies. Many more sites are linked however as larger and related communities of hunter-fisher-gatherer taskscapes, shell midden „shellscapes" and ceremonial landscapes, and provide evidence of large-scale human terraforming, engineering and the ritualization of these watery landscapes. It is critical to view these wetland sites as large, interconnected waterscapes which linked people through the vast cosmological wetland through time, leaving a persistence of memory marked on the landscape. Massive ritualized shell works, canals, burial mounds and transformed wetland landscapes reflect this important watery tradition, which require specialized methodological and theoretical considerations for site modeling, identification, investigation, and data preservation.

A representation of wetland in the Pre-Pottery Neolithic: metonymic landscapes at Gobekli Tepe

Dragos Gheorghiu

Affiliation: National University of Arts in Bucharest

Iconic representations of the landscape in prehistory are very rare, to cite only the fresco from Çatalhöyük. The wetland seems to be entirely absent from the iconography of that period, emerging only in historical times. In Antiquity the landscape was occasionally presented in an indexical manner, through the means of iconic representations of plants and animals; a famous example is the Madaba mosaic, in which the Jordan wetland and arid areas around it are evoked with the help of aquatic and terrestrial animal images. Such a metonymic way of evoking a landscape by means of the image of an animal which indicates the natural habitat (and consequently a definite part of the landscape) is utilized in the present paper to interpret the iconography of the Gobekli Tepe Pre Pottery Neolithic (PPN) site. The T-shaped stone pillars at Gobekli Tepe are carved with images of invertebrates and vertebrates whose habitat is well defined in the wetland and which allow the reconstruction of the landscapes imagined by the PPN people.

Bronze Age deposition sites around Lakes Mälaren and Hjälmaren in Sweden: Seeking landscape rules

Martin Rundkvist

Affiliation: Umeå University

Bronze Age settlements and burials in the Swedish provinces around Lakes Mälaren and Hjälmaren yield few bronze objects and fewer of the era's fine stone battle axes. Instead, these things were found by people working on wetland reclamation and stream dredging for about a century up to the Second World War. Then the finds stopped because of changed agricultural practices. The objects themselves have received much study. Not so with the sites where they were deposited. This presentation reports on a wide-ranging landscape-archaeological survey of Bronze Age deposition sites, with the aim to seek general rules in the placement of sites. How did a person choose the appropriate site to deposit a socketed axe in 800 BC? Over 140 sites have been identified closely enough to allow characterisation of their Bronze Age landscape contexts. Numerous recurring traits emerge, forming a basic predictive or heuristic model. Bronze Age deposition sites are a site category that could profitably be placed on contract archaeology's agenda during infrastructure projects. Archaeologists should seek these sites, not wait for others to report on finding them.

Rivers Keep Many Secrets: Bronze and Iron Age Deposition of Human Remains in River and Settlement Contexts

Andrea Pintar

Affiliation: UVA/VU Amsterdam

The subject of watery areas as archaeological hotspots is under debate. Many archaeologists believe artefacts recovered from rivers have been eroded and have lost their context, particularly when recovery is a result of dredging activities, which destroy the stratigraphic layers required for dating. The goal of this research is to highlight the relevance of "out of context" riverbed material (human and animal remains, pottery, metal objects) in the discussion of prehistoric mortuary practices, and the importance of excavating, preserving and studying these archaeological remains, which are at risk of being lost forever. In my Master's Thesis, I discuss deposition of human remains in a variety of wetland and watery areas such as rivers, estuaries, fenlands, and caves, in addition to dry land sites from: Scotland and England, Germany, The Netherlands, and the Czech Republic. I also bring to light a critical heritage case involving Neolithic and

Bronze Age Alpine lakeshore settlements. This work is attempting to weave together an interdisciplinary tapestry consisting of: anthropological interpretations on conceptions of the use of water in prehistoric cosmographies of life and death, forensic taphonomy in riverine and land contexts, and palaeoenvironmental understanding of the physical role of fluvial environments in Bronze and Iron Age local and supralocal communities. Connecting the role of fluvial environments to deposition practices can illustrate the valuable place riverine archaeology occupies within discourse on prehistoric society.

Wold and wetland - An integrated approach to exploring an ancient East Yorkshire landscape

Peter Halkon

Affiliation: Department of History, University of Hull

This paper will provide an account of the long term exploration of the contrasting landscapes of the rolling hills of the western escarpment of the Yorkshire Wolds and the lowlands to the north of the River Humber, particularly the catchment zone of the River Foulness (www.ironmasters.hull.ac.uk) which has yielded remarkable remains from Palaeolithic handaxes and faunal remains to Roman roadside settlements, perhaps the most well known find being the Iron Age Hasholme logboat. All this has been achieved through a combination of aerial photography, geophysics, fieldwalking and excavation, supported by palaeo-environmental study, undertaken by community volunteers and students of all ages from a number of universities. In the short time available, the main focus of this presentation will be on an Iron Age hilltop settlement at Nunburnholme (http://www.nunburnholmewithkilnwickpercypc.co.uk/) and a contrasting multiperiod site close to the Humber itself.

Lake Bokaren – forgotten no more

Christina Fredengren,[1] Susanna Eklund[2] and Andreas Hennius[3]

Affiliations: (1) Department of Archaeology & Classical Studies, Stockholm University; (2) SAU, Uppsala; (3) Department of Archaeology & Ancient History, Uppsala University

In 1939 while digging a ditch through the late Lake Bokaren some 15 kilometres northeast of Uppsala the workers discovered remains of humans and animals as well as artefacts of organic materials on a wooden platform. The site was excavated by archaeologists in the followings years. Even though an interesting find, no report was written and except for some short notices in different publications the site was forgotten and the find material and documentation scattered. For the last years we have been running a project to gather the find material, documentation and put a report together also including 14C analyses. In 2015 we also conducted a small excavation at the site. Despite a small excavated area remains of three humans whereof at least two show clear traces of violent death and parts of at least six horses has come to light. The work has resulted in a reinterpretation of the site, showing it was a place for sacrificing humans and animals during almost 1000 years from 100 -1100 AD. During this period society changes in several fundamental aspect including the rise of the powerful kings in Gamla Uppsala and the conversion to Christianity. In this paper we would like to present our work and the site from a larger landscape perspective connected to local and regional centres of power but also address questions of potential and possibilities of archaeology of water.

Landscape and economics: An analysis of the distribution of water mills at the end of the Middle Ages in the Banat Province (Romania)

Dorel Micle

Affiliation: West University of Timisoara

The historical province Banat is in southwestern Romania and it has the shape of an amphitheatre descending from east to west. Several rivers have been exploited economically through water mills, useful for the agricultural communities in the area. Starting from the analysis of historical and land survey maps, satellite images and aerial photographs, we aimed to identify the exact location of water mills (most of them have disappeared) and carry out geomorphographic and geomorphometric analyses of their area. We have thus tried to understand the hydrotechnical solutions used in the Middle Ages as well as the dynamics of their building in relation to the local socio-economic context. We could also note that in some areas that seem to meet all hydrographic and pedological conditions, there was no water mill along the watercourses despite the evidence of cereal crops in the area of the villages. Diachronic analysis of the landscape shows that there have been massive anthropogenic interventions in some areas of Banat (in the 18th, 19th, and 20th centuries) that have changed the course of the rivers, their flow and the depths of the water beds. Because of drainage, channelling, deforestation and ploughing, many of the ex-watercourses that were marshy during the Middle Ages were turned into agricultural land. This indicates that the economics of medieval villages were completely different from the economics of modern times, and that the water mills along certain rivers were exploited by human communities far away. This observation opens new insights on mobility, inter-community relationships, merchandise circulation, craft specialisation (such as milling), etc. We try to demonstrate that the presence of water mills along certain rivers alone points to an adaptation to the landscape and to efficient exploitation of water resources in the area: medieval communities practiced different economic activities that can be explained by the geomorphologic and historical context.

D. Frontier Landscapes, Landscape Frontiers

D1 Crossing Boundaries: Exploring the Limits of "Landscape"

WEDNESAY 24th AUGUST 8.30-12.30

VENUE: A144

Session organisers: *Jan Kolen,[1] Martti Veldi,[2] Eduardo Herrera Malatesta[1] and Ann Brysbaert[1]*

Affiliations: (1) Faculty of Archaeology, Leiden University; (2) Estonian National Heritage Board

Session Abstract

The classical notion of landscape is strongly tied to the West - and more particularly to North-Western Europe, were it developed during the Middle Ages within a specific context of people's relationship to the land. It is furthermore closely related to the history of visual representation (including the invention of perspective and cartography), enlightenment science and western convictions about human-nature relationships. In this specific context, the landscape came to refer to a sense of territoriality, visual perception and domination over nature (and others). However, we can safely assume that these values did not characterize human living space in the same way or to the same degree in deep history and other regions of the world. Archaeologists are therefore exploring critical reformulations of the landscape concept (e.g., "soundscape", "taskscape", "maritime landscape", etc.) as well as alternative notions (such as connectivity, heterotopia, etc.) that may better fit the spatial and cultural realities of distant societies, both in time and space. The classical landscape concept has its limits, both from a cultural and historical point of view, and it is an explicit aim of this session to explore these limits and cross boundaries.

Paper Abstracts

Diviscapes

Thomas Meier

Affiliation: Institute for Pre- and Protohistory and Near Eastern Archaeology, University of Heidelberg

Frequently, and throughout times and cultures, the shaping and (re-)interpretation of landscapes is considered as a mirror of society's world view, and landscapes have been interpreted in relation to known or assumed cosmological beliefs or have even been "read" as clues to reconstruct such beliefs. Such studies regard landscape as a kind of material picture of a past ideational world. Such an approach follows the original meaning of the

term "landscape" being a material and interpreted depiction of a reality as much as of an idea. Additionally, this notion is based on the categorical division between ideational worlds (world view, cosmology) and material worlds (landscape); it ascribes to the material world the capacity to be a trace of or even a proof for something, which is long gone. This is not only a Western, but even an early modern concept with (presumably) little relevance to other times and cultures. Instead I want to explore opportunities and consequences of an approach which considers landscape not as a material representation of a cosmological else, and not even as intertwined with another "divine" sphere, but as being its substantial aspect beyond a material-ideational-divide and beyond a representational concept. At the time of writing this proposal I do not have the slightest idea where this exploration might lead to ...

Inverted Landscapes

Ann Brysbaert

Affiliation: Faculty of Archaeology, Leiden University

Modern western understanding of both human and environmental resources dominate how we believe that these were also employed in the past. Ethnographic studies, however, have often indicated that non-western communities, and possibly also past societies, ascribed symbolic, cosmological and mythical powers and meanings to their surroundings, whether the entire landscape or specific parts of it. Let there be no doubt that stones were exploitable building materials, but their closer inspection leads to a much richer interpretation, especially when not all materials seem to conform to rational economic choices. The best known example may be the 'bluestone' trilithons at Stonehenge, which came from 250 km away. This paper presents the results of a recent study about the choices of stones employed at the Late Bronze Age citadel at Tiryns (Greece) which suggested not only economic considerations, but also a creative interplay, likely initiated by the builders themselves, in which they moved and placed stones in specific locations which, in turn, resulted in decorative embellishment and socio-political statements. Such human – material interplay with(in) the surroundings is a clear taskscape or a meshwork of activities and materials in which boundaries between the different actors blur, and in which the surrounding landscape seems inverted. The resulting constructions seem to form the material expressions of deep memories and markers of social practices played out by the inhabitants of Tiryns in and with their socio-political landscape. Additional Greek examples illustrate that such practices were not unique to the Late Bronze Age period.

Decorating acoustics. Soundscapes of post-Palaeolithic rock art in the Western Mediterranean

Margarita Díaz-Andreu and Tommaso Mattioli

Affiliation: Universitat de Barcelona

Research on soundscapes is a breakthrough field of research in rock art studies. It looks at aspects other than the materiality and aesthetic of sites and places by recovering less evident and intangible cultural signs such as those related to the individual and collective acoustic perceptions felt at rock art spaces. The study of soundscapes aims to quantify and qualify the sonoric experience that rock art creators experienced by being in the rock art landscape. This paper presents the experimental tests of the project "SONART - The sound of rock art" by which a sample of post-Paleolithic rock art in Spain (Arroyo de San Serván in Extremadura and Muntanyes de Prades in Catalunya), France (Vaucluse in Provence-Alpes-Côte d'Azur) and Italy (Gargano mountain in Puglia and Majella mountain in Abruzzo), dating from the

Neolithic to the Bronze Age, have been analysed. Borrowing methods and technologies from disciplines other than archaeology, the project has investigated landscapes in terms of soundscape and acoustics. Results so far indicate the relevance of acoustics as a factor for the production, location and active use of rock art landscapes in the Western Mediterranean.

Beyond the walls- Locating the 'common denominator' in Herod's landscape palaces

Evie Gassner

Affiliation: Hebrew University of Jerusalem

The purpose of this paper is to discuss the location of a 'common denominator' in the structure of Herod's "Landscape" palaces, through the study of the relationship each palace has with its surroundings. These palaces- the Promontory Palace in Caesarea, the Third Palace in Jericho, the Northern Palace in Masada and the Palace of Great Herodium- were chosen as case studies for their scale, architectural complexity and the unique connection they share with the landscape. The first part will summarise my Thesis, which dealt with the meaning of the inner structure of the "Landscape" palaces and their function. The purpose was to find the 'common denominator' between the palaces through comparison of their structural units and the discussion of their function. The conclusion was that, notwithstanding several repetitive elements, no such denominator can be found within the palaces and so it must be sought for outside the boundaries of their walls. The second part of this presentation will deal with the "relationship" of the palaces with the landscape and their surroundings and will try to locate the elusive denominator outside the palaces' walls via comparison of the scenery around them and its different elements. This section will also try to demonstrate how Herod's 'larger than life' style of building seeped through the structures themselves and into the shaping of the landscape and its boundaries.

The sacred landscape of Santo Tomás Ocotepeque

Omar Aguilar Sánchez

Affiliation: Leiden University

Until now, the ancient Mixtec/Ñuu Savi landscape has been described in Western terms. These studies consider that the landscape was delimited as a territory in pre-Colonial times – an idea that is strengthened by the presence of colonial maps which indicate the historical territory with specific markers. Today, however, the Mixtec People have strong religious, symbolic and ethical connections to their landscape which they share with Divine Beings and where they perform rituals and commemorate historical events. This view contrasts with the dominant Western perspective. Unfortunately, the current sacred landscape is not taken into consideration in studies towards the ancient landscape because the cultural continuity is not fully recognized. This is caused by (1) the destruction, expropriation and discrimination from the colonial period, which has resulted in the fragmentation of the cultural-historical heritage of the Mesoamerican Peoples as a whole; and (2) the limited access of Mixtec People to higher education that would allow them to self-study their history. The aim of this paper is to discuss the key role of living heritage in understanding the ancient Mixtec landscape as a sacred landscape, which in turn will lead to a better understanding of the landscape depicted in the pictorial manuscripts and the function of archaeological sites. I will focus on Santo Tomas Ocotepec (a Mixtec community) and its sacred landscape from the sixteenth century to the present. This will be done by analysing the Mixtec cultural heritage from the indigenous perspective.

Contested taskscapes: On perceptions of the environment in the Age of Colonial Encounter

Eduardo Herrera Malatesta

Affiliation: Leiden University

This paper provides a theoretical and methodological framework based on Ingold's concept of taskscape and Descola's notion of nature and society, to study the different relations and perceptions Amerindians and Spaniards had of their natural/cultural environment. When the Spaniards first arrived in the Caribbean in 1492, and throughout the later process of colonization, their relations with Amerindian population were strongly affected by cultural misunderstandings. As in the well-known case of Atahualpa & Pizarro in the Andes, many of the initial Spanish-Amerindian conflicts were the result of cultural differences. Moreover, there is general agreement in anthropology that every conceptualization of nature is a cultural construct. This is the focus of this research, to study the different Amerindian and Spaniard perceptions of the environment as a prominent aspect among the conflicting relations and representations after 1492 in the Caribbean. In this paper I explore this clash of worldviews from a case study in northwestern Hispaniola, the area of the first Spanish settlement in the American continent. Early colonial cartography and other colonial documents relating to this area show conflicting representations with Amerindian settlement patterns; which resulted in an invisibilization of Amerindian presence in documentary history. I propose that this initial invisibilization was a result of three main issues: 1) the Spaniards' agenda to exploit resources, 2) their specific needs to move over land and sea, and 3) their implicit definition of landscape and territory.

Landscape as a medium of religious syncretism. Natural sacred sites in Estonia

Martti Veldi

Affiliation: Estonian National Heritage Board

Natural sacred sites are various landscape features (such as hills, valleys, rivers, lakes, springs, forests, stones) which have been historically used as places of worship, healing, prayer, contemplation, and other spiritual practice. According to different estimates there can be up to 5000 such natural sacred sites in Estonia. These sites have been important places for local communities, and have been considered "special" or "anomalous" locations in the landscape throughout time. They are rich sources of diverse folkloristic, ethnographic and archaeological data, combining religious syncretism and different, often conflicting, worldviews. Natural sacred sites are multi-layered places in the landscape, which represent different meanings, ideas, and values in the depth of time. The paper tackles questions and topics such as: Why some places are more important than the others? What creates myths and legends around landscape features? Whom do they serve and why? Which implications and influences of pagan, Catholic, Lutheran, and neo-pagan ideas can be traced in the living landscape? How are these sites approached and managed by conflicting interest groups? The paper is illustrated by various case studies from Estonia.

Terrorscapes as heterotopias

Jan Kolen

Affiliation: Faculty of Archaeology, Leiden University

Over the past two decades archaeologists have discovered the 20th-century sites of trauma and terror in Europe as a new field of archaeological interest and public dialogue. Although research initially concentrated on the hotspots of conflict, trauma and terror, such as the concentration camps from the Second World War, the perspective has now shifted towards their wider spatial and social contexts. Notable examples are the archaeological projects and surveys at Treblinka, Auschwitz and Westerbork and on the Channel Islands, where the research focuses on the archaeology of whole "terrorscapes" and their post-war transformation into highly valued landscapes of memory. Through the archaeological focus on the relationships between the spatial, material and ideological, these projects significantly contribute to the realization that terrorscapes were designed and used as spatial technologies for exercising terrorism in active ways, not only practically and physically but also symbolically. Yet, although the new terminology explicitly links the former spatial organization of terror to the notion of landscape, spaces of terror are not easily understood from a conventional landscape perspective. Alternatively, this paper explores sites of terror and their archaeological dimensions as "heterotopias", the geographical concept elaborated by Foucault for non-hegemonic spaces that cannot be classified easily in terms of here and there, public and private, self and other. Viewed from this perspective the former concentration camps were part of large-scale spatial structures that were characterized by ambiguity, liminality and inversion – dimensions in which arrangements of material culture played a significant role.

The Landscape and Boundary Making in Archaeology

Cecilia Rodéhn

Affiliations: Centre for Gender Research & Department of ALM, Uppsala University

This paper investigates the landscape as an active agent, in the Baradian sense, with the ability to shape the scientific pursuit of archaeology. In doing so, I explore the landscape as a way of thinking about archaeology and archaeological practices as present in archaeological discourse. I unpack this by focusing on places and spaces in the landscape and the materiality associated to these places and spaces. Moreover I investigate different interactions with the landscape and how this is considered. From this knowledge I explore the landscape as a materiality fundamental in determining boundaries in archaeology. In other words as materiality that demines, and is appropriated in determining, what is included and excluded into the science of archaeology and into archaeological practices.

D2 Exploring the rural edge – Outland landscape exploitation and resource colonization

THURSDAY 25th AUGUST 8.30-12.40

VENUE: A144

Session organisers: *Andreas Hennius,[1] Ingunn Holm,[2] Kathrine Stene[3] and Eva Svensson[4]*

Affiliations: (1) Uppsala University; (2) University of Bergen; (3) University Museums of Bergen; (4) Karlstad University

Session Abstract

This session seeks to explore the rural edge (in Scandinavia called Utmark – Outlands) such as forests, moorland, mountains or coastal areas and economic, social and cultural aspects of these landscapes. The intention is to focus on the landscapes beyond the settlements, as arenas for multiple activities, like husbandry, agriculture and exploitation of diverse resources and raw materials. The rural edges have been vital both for the subsistence of local communities and as commodity producers for mercantile interregional networks in Europe. We call for papers concerned with aspects of resource utilization and exploitation of the landscapes of the rural edges and the relation to central agrarian and urban centres mainly during the European Middle Ages and Early Modern Times (c. 500 AD – 1700 AD). Examples of topics we would like to address include:

- Production and exploitation of outlying areas
- The role of products from the rural edges in the interregional trading networks
- Intensification and altered use of the rural edges due to the search for new resources and raw materials

Paper Abstracts

Whalebone as an outland resource – Whalebone gaming pieces from the 6th century in central eastern Sweden and beyond

Andreas Hennius[1] and Rudolf Gustavsson[2]

Affiliations: (1) Department of Archaeology and Ancient History, Uppsala University; (2) Societas Archaeologica Upsaliensis

Recent studies suggest that a majority of gaming pieces found in central Swedish graves are made of whalebone and not unspecified bone or antler as previously thought, already from the middle of the 6th century and onwards. Whaling and whalebone handicrafts is usually not discussed this early and the results imply considerable consequences for our understanding of the use of resources and the importance of coastal landscapes during the period. It is most probable that the whalebone gaming pieces were traded from the north Norwegian coast to large parts of central Sweden and beyond. The large geographical distribution of whalebone artefacts bears witness to developed interregional trading networks in Northern Europe, already during early medieval times. The raw material used in gaming pieces can be seen in the light of a colonization of new landscapes in the search for new and exotic raw materials. The study of the whale bone gaming pieces is one among several others showing an expansion into areas that previously only demonstrate marginal activities suggesting a change in need for outland resources and products already in the 6th century. During the following centuries the exploitation of the outland landscapes and its products becomes fundamental for Scandinavian economy.

Iron, waterpower and outland technology - An example from Stäket, Småland the South Swedish woodlands

Johan Åstrand

Affiliation: Museiarkeologi sydost

The old borderland between Sweden and Denmark was an area in which outland resources were of great importance. Production of tar, iron and other forest products were, together with cattle breeding, the base of the local society during the Medieval and Early Modern period. The iron production was based on a bloomery technology with a strong regional tradition. Slagheaps found close to brooks and waterfalls indicate that waterpower was frequently used in iron production. Results from an excavation of a Late Medieval iron production site at Stäket, southwest Småland, shows that traditional bloomery at this site was combined with water power. Metallurgical analysis shows that this made the iron production more effective. The introduction of waterpower has often been seen in the context of a feudal society. In the border region local farmers had a strong and independent position and the influence of the feudal institutions was very limited. The introduction of waterpower and the modernization of the old bloomery technique seems to have been made by the local farmers themselves. The example from Stäket shows that the ability of introducing and adapting new technologies was of great importance for people living on outland resources. Maybe too much attention has been put on actors like Cistercians and feudal lords in the discussion about medieval innovation. The local ability of introducing new techniques was probably of great importance for a successful use of outland resources.

From forest and common grazing to urban agriculture in Kongsberg, Norway: Landscape impacts of the 17th century silver rush

Liv Marit Rui,[1] Bengt Windelhed[2] and Mats Widgren[3]

Affiliations: (1) Kulturminneconsult; (2) Landskapsarkeologerna; (3) Stockholms universitet

Following the opening of silver mines in Bolivia in the mid-16th century the global exchange value of silver decreased dramatically. However, silver remained the main currency for global trade and the late 16th and early 17th century can be characterized as a silver rush. When silver was found in Sandsvær, Norway in 1623, this therefore led to rapid establishment of a silver mine. The foundation of the mining town Kongsberg included a large area of land, for the mines, but also for the agricultural provisioning of the town. Land around the town was cleared by miners and resulted in a large number of stone enclosures, walled cattle paths and fields. Miners and their families grazed their livestock, collected hay and cultivated crops. When the town was at its peak in the late 18th century it was surrounded by 32 km^2 of such enclosures. Urban agricultural land is known from many towns in the Nordic countries from historical records, but Kongsberg is unique because of the well preserved remains and the possibilities for historical archaeology to reconstruct farming and daily life of the miners and their families. Large areas of enclosures still surround the present town, but are rapidly lost to residential and industrial land use. During the last ten years, a series of documentations of the enclosure landscape around Kongsberg have been carried out. During the last few years, new areas have been documented, together with C-14 analysis and pollen analysis. This presentation summarizes the main results from this work.

Living on a coastal farm in Northwest Estonia: A study of land-use and population changes in Einbi and Kudani villages on the Noarootsi Peninsula from 1590 to 1860

Hele Kiimann

Affiliation: Department of Social and Economic Geography, Uppsala University

The aim of the current paper is to explore how the local livelihoods and farming systems

of coastal inhabitants in NW of Estonia changed from the late 1500s to 1860. Two villages on the largely Swedish populated Noarootsi Peninsula, Einbi (Enby) and Kudani (Gutanäs), are examined in detail. The paper demonstrates how resources from both land and sea affected individual households (farms), or the entire village as a production unit in relation to socio-political restrictions. Also, how landscape patterns have evolved over time, including the analysis of a constructed land-uplift model. To comprehend the conditions for cultivation and its practice back in 1600s, the hypothetical humus content in soil profiles from several historical fields have been constructed. The study showed how the development of two villages in fairly similar geographic settings differed largely due to socio-political restrictions. During feudal times, the main changes were related to the fact that local nobility could maintain their land ownership rights and regulations for manorial deliveries and corvée duties. Changes to natural conditions, such as soil quality and land uplift, had substantial effect on land productivity as well.

Gold mining in marginal Alpine landscapes

Claudia Theune

Affiliations: Department of Prehistory and Historical Archaeology, University of Vienna

The use and exploitation of pastures and ore, especially salt, in several regions of the Alps is widely known from prehistoric times on. It is also known that the Alps were never a barrier for trade and communication routes from Central Europe to the Italian peninsula and *vice versa*. Especially during the Roman Period infrastructural expansion contribute to the exploitation and development of many regions. In early Medieval times many of these structures fell out of use, and it was not until the high and late Medieval period that targeted measures were taken to intensify the use of these regions again, beside the construction and extension of roads, pasture and mining activities were also involved. Many of these sites are situated in an Alpine landscape (altitudes above 2000 m), so the miners and farmers couldn't feed themselves but had to be provided with food, tools etc. from the settlements in the valleys. In this paper I present a case study of gold mining in the Tauern region (Salzburg). Surveys and excavations show the detailed process of gold mining at different sites in a marginal region. I aim to discuss the time of exploitation in the late Medieval period and the decline in the Early Modern period. Of interest are the reasons and causes for this development.

Crags, caves and cows. Stone materials exploitation in the Puy-de-Dome (France) during the Middle Ages and modern times

Sciuto Claudia,[1] Allios Dominique,[2] Cocoual Antoine[2] and Guermeur Nominoe[2]

Affiliations: (1) MAL- Environmental Archaeology Laboratory, University of Umeå, Sweden; (2) LAHM – University of Rennes 2, France

The Puy-de-Dome (Auvergne, France) is a department characterized by the volcanic range of the Chaine-des-Puys. The attestation of human settlement in this mid-mountain region covers a wide chronology, from the Neolithic to the present day, in association with a local economy, principally based on pastoralism and agriculture. Our research concerns the districts of Murol and Saint Nectaire, and the human-environment interaction read through the dynamics of the exploitation of geological resources. In this area, different outcrops and various types of stones are available and easy to collect. A diverse range of

exploitation strategies can be observed from systematic open air quarries to selection of materials from moraine deposits and landslides. By mapping the different resources in the landscape and the use of those materials we can draw the outlines of a complex regional network. We focus on the transition from the early Middle Ages (7th-8th century) to modern times (17th-18th century), when population growth caused the establishment of new villages, castles, rupestrian settlements and stimulated a massive need of new building materials. Systematic survey and mapping of outcrops and quarries has been carried out using close range remote sensing techniques (such as Near Infrared Spectroscopy and Hyperspectral Imaging) and organized in a GIS database. The datasets were processed through multivariate data analysis as data mining tools. The project involves international collaboration between the University of Umea, Sweden, the University of Rennes 2, France, and the geologist-volcanologist Pierre Lavina.

Stone corrals in the North Caucasus – GIS and soil studies of the traces of prehistoric and medieval animal husbandry

D.S. Korobov,[1] Elena V. Chernysheva,[2] A.N. Babenko[3] and A.V. Borisov[2]

Affiliations: (1) Institute of Archaeology RAS, Moscow; (2) Institute of Physicochemical and Biological problems in Soil Science RAS, Pushchino; (3) A.N. Severtsov Institute of Ecology and Evolution RAS, Moscow

This paper presents results from a multidisciplinary research project on the stone corrals situated in the Kislovodsk basin and its southern vicinities (North Caucasus, Russia), supported by RFBR (projects No 15-06-02561; 16-36-00381). The first stage included the analysis of aerial photo archives and the application of GIS for mapping and investigation of the spatial distribution of the ruins of places used for livestock keeping in the Alpine zone. As a result, more than 1000 stone corrals were recognized and included into the GIS, around half of which could be preliminary dated to the modern period because of their rectangular shape and internal intensive dark vegetation colour. The remaining 500 corrals situated at the absolute heights of 1000 up to 2500 m seem to be the structures potentially associated with prehistoric and medieval animal husbandry. According to ceramic finds and 14C data from small scale excavations, the creation of these corrals could be dated to the first millennium AD, whereas they were reused up to 17th – 18th centuries. The study of soils from corrals showed a significant increasing of phosphate content and urease activity. The main peculiarities of soil in corrals are the abundance of thermophilic microorganisms, resulted from heating of dung under composting. A large number of thermophilic microorganisms and high level of urease activity in soil inside the corrals allows identification of places of animal keeping on a wide range of archaeological sites.

Graves in a landscape of living – Iron Age burials as indicators of resource extraction and trade in the central Scandinavian inland region

Amanda Jönsson

Affiliation: Department of Archaeology and Ancient History, Uppsala University

The idea of the serene, untouched forest has had a big impact on the research history of the inland region of Central Scandinavia, an area often regarded as wilderness rather than a cultural landscape. Prior to expansion of permanent settlements in the early Middle Ages, the forests and mountains have been considered inhabited by a hunter-gatherer population, albeit with intense contacts with farmers in the coastal areas. This perception has begun to shift in recent years, along with increasing indications of large-scale resource

extraction in the area during the Iron Age, as well as forest clearing, burning and grazing. My MA-study, focuses on the Iron Age burials of the inland region, traditionally divided into two separate categories that relate to the ever present forest-farmland dichotomy. The burials' topographical locations in the landscape has been the key factor in determining some of them, called 'hunting-ground burials', as belonging to a hunter-gatherer population. In my study, I use GIS-analysis to question the validity of this categorization. I also present an alternative way of understanding the hunting-ground burials, suggesting that they are elements of patterned domesticated landscapes in areas with intensified resource extraction, and relate to important communication and trade routes. This way, I wish to bring the discussion on these burials up to date with a new perception of the Scandinavian inland region, as an arena for resource extraction and trade.

D3 Rethinking "Critical Frontier Studies": Disentangling Transitional Landscape Narratives

WEDNESDAY 24th AUGUST 8.30-14.50

VENUE: H425

Session organisers: *Francesco Carrer, Rob Collins and Caron Newman*

Affiliation: Department of Archaeology, Newcastle University

Session Abstract

The concept of frontier is surprisingly uncontested among historic environment professionals. 'Frontiers' are often associated with ideas of political, social, economic and cultural marginality, conflating it with concepts of borders and barriers, liminality, transition and threshold. Distorted perceptions rely upon the subjective perspective of the observer, but it is essential that these concepts are disentangled. By definition, a frontier is marginal or liminal, but this need not include a defined border; marginality and liminality are characterised from centres, be it economic, socio-political and/or cultural. Even so, a number of studies have underscored that frontier populations and landscapes have their own cultural identity, regardless of their affiliation and relation to the core. Frontier landscapes have their own coherence and meaning, but the interplay of core and periphery is essential to understanding the narrative of frontiers and borderlands. Landscape archaeological techniques can provide a significant contribution to the identification and analysis of frontiers distinct from borders and transitional space. The session organisers are looking for papers that contribute to new methods and narratives in border and frontier landscape studies using an archaeological approach. Papers may wish to address the following questions: How do we define and identify frontiers in the landscape? What is the difference between frontiers and borders? Do frontiers and borders create distinctive local landscapes? What is the relationship between state actors and frontiers, and are these relations legible in the landscape? Both case-studies and theoretical papers are welcome.

Paper Abstracts

The use and abuse of 'frontier': Cross-cultural characterisation of the concept of frontier

Rob Collins

Affiliation: Newcastle University

Frontier and border studies have benefitted from a resurgence in popularity in recent years, and 'frontiers' are more frequently encountered in literature than they were 20 years ago. Yet while the premise of a frontier is generally understood, there remains a surprisingly inconsistent use of the term, and in some literatures, 'frontier' can be used interchangeably with 'border' or 'boundary', 'transitional' or 'liminal' landscapes. While a frontier may encompass all of these features, the terms should not be conflated. This paper provides an overview of well-known historic frontiers from around the world that serve as case studies, identifying the features common to each. A definition of 'frontier' is offered, arguing that frontiers can only exist in a situation of extreme geo-political asymmetry. This definition is then examined relative to the concepts of a border, boundary, liminality, and periphery.

Archaeological cultures and cultural borders between Veneto and Friuli in the Late Bronze Age. Methodological approach and historical implications

Elisa Dalla Longa,[1] Valentina Donadel,[1] Giovanni Tasca,[2] Laura Pau,[1] David Vicenzutto,[1] Michele Cupitò[1] and Giovanni Leonardi[1]

Affiliations: (1) Dipartimento dei Beni Culturali, Università di Padova; (2) Museo Civico "Federico De Rocco", S. Vito al Tagliamento (Pordenone)

The aim of this contribution is to investigate, both from a methodological and a historical point of view, the problems concerning the archaeological identification of possible borders between different cultural entities in North-Eastern Italy in the Late Bronze Age. Particularly, this research focuses on the territory between the western Venetian and Friuli plains; the analysis will also include a short overview of the cultural features of this territory in the previous Bronze Age phases. Methodologically, our approach is to analyse a wide sampling of ceramic indicators – chosen on the basis of their cultural significance, their distribution pattern and the relationship between the cultural entities and landscape features. This territory represents a significant case-study thanks to the existence of two clearly defined cultural aspects in the western- and eastern-most areas (the palafitticolo-terramaricolo cultural aspect in the West and the Castellieri one in the East), while the areas in-between do not present conspicuous gaps, but a gradual transition with almost imperceptible local changes. In later phases the cultural pattern needs to be further investigated, especially in the bordering area between the Protovillanovan aspects one in the West and the Urnfield Culture one in the East. From a territorial point of view, we will analyse the relationship between the identified cultural borders and the main geographical features of the landscape, with a particular regard to the hydrographical aspects; this analysis is also meant as an insight on our understanding of the value of geographical limits as borders in the past.

Borders and frontiers in ancient Greece, the case of frontier sanctuaries

Axel Frejman

Affiliation: Department of Archaeology and Ancient History, Uppsala University

The concept of 'frontier sanctuaries' has been used to explain remote sanctuaries. Since it was first noted that some sanctuaries were fortified and could serve a military or political function, scholars have applied and found the concept useful. It is however not unproblematic. Sanctuaries are not always situated at borders, for example the main Corinthian sanctuaries are both situated well inside Corinthian territory. Nor is it obvious that sanctuaries should be interpreted from a city-centred perspective. Sanctuaries could exist in and for themselves, as the earlier Heraion in Argolis, first interpreted as a frontier sanctuary but later an interstate meeting place. Apart from the political, there is also another frontier, towards the eschatia, the wilderness, where sanctuaries of Artemis are common; she seems especially suited for veneration at borders. Clearly using the frontier sanctuary concept is a complex matter. This paper aims to critically review our understanding of space, borders, and frontiers in the ancient Greek world, using outland sanctuaries. Questions are – among others – how borders and frontiers were understood in antiquity? Could sanctuaries manifest borders and frontiers, if so, how? The paper aims to diversify our sometimes arbitrary use of the frontier sanctuary concept, and hopefully add to the session at large.

The northern and western Borderlands of the Sasanian Empire

Kristen Hopper, Dan Lawrence and Nadia Khalaf

Affiliation: Department of Archaeology, University of Durham

Recent research has suggested that investment in security, water management, and urban foundations on a grand scale are common elements of the northern and western frontier landscapes of the Sasanian Empire (AD 224 – 650). A key element of these frontiers was the construction of physical barriers (from nearly 200km long defensive walls to fortified mountain passes) that do not always reflect cultural, social or economic frontiers, particularly when these landscapes are viewed in long-term local perspective. Reframing our narrative of imperial frontiers by approaching their study from the bottom up as well as the top down can help us to better understand the impact of transformations to the landscape brought about in the Sasanian period, and their legacy. Case studies involving satellite remote sensing, ground based survey, and excavations undertaken by the *Persia and its Neighbours* project on the northern and western frontiers of the Sasanian Empire will be drawn upon. These methods demonstrate that the frontiers of the Sasanian Empire were as varied as the environments they existed in and were reflective of diverse and local social, political and economic histories as much as they were of imperial strategies.

Cultural frontiers in Late Antiquity? Urban and rural landscapes and the settlement of "Barbarians" in the Iberian Peninsula

Pilar Diarte Blasco

Affiliation: School of Archaeology and Ancient History, University of Leicester

The Iberian Peninsula in Late Antiquity provides a strong case study of the process of the arrival of "barbarians" between the 5th-8th centuries AD and their resultant interaction with the local population in both town and country. The end of 6th century marked the

dominance of one of the people settled in the peninsula, the Visigoths, who had previously shared power in a fragmented peninsula with both Suebi and Vandals. The new elites appear, in this complex period, as a mixture of the old Roman aristocrats and the new Germanic nobility. This paper questions the landscape of Iberia in order to try to trace both its political and cultural frontiers. The theoretical questions concern the link between these incomers and the Roman substrate; new forms of authority; and changed patterns of social organization in the landscape. These are fundamental for assessing cultural, physical and settlement adaptations and impositions. How we understand these changes and the relationships between these and the social complexity of this period are key to this study. Furthermore, this phase of transition between the Roman period and the Middle Ages coincides with the loss of some urban centres, a deep crisis in the Roman rural system, and the so-called Early Medieval Cold Episode (AD 450-950), characterized by lower temperatures and greater aridity. The approach is interdisciplinary, analysing various types of data (archaeological, environmental, geographical and textual) in interrogating the late antique landscapes of Hispania and its potential frontiers.

Rethinking central Medieval frontiers in Iberia from a landscape archaeology perspective

Guillermo García-Contreras Ruiz, Rowena Y. Banerjea, Alexander D. Brown and Aleksander G. Pluskowski

Affiliations: Department of Archaeology, University of Reading

The study of Medieval borders in the centre of the Iberian Peninsula is changing rapidly. The boundaries between the Muslim territories of al-Andalus and the Christian territories of the northern kingdoms –mainly Castile– had been interpreted either as highly militarized areas or as very unpopulated spaces. Both views came from studies that only used written sources but these have had influence in other historical and archaeological studies. This image is changing with the rapid growth of commercial archaeology as a result of the rise in public works, and especially due to increased use of paleoenvironmental analysis techniques in a few projects. Thanks to this landscape archaeology, we are starting to learn that there was a dense network of villages, peasant towers, watchtowers, small castles and large fortified villages that caused important changes in their environments and shaped some aspects of the current landscape. Using the province of Guadalajara as an example, we will show the current state of art on the medieval frontier landscape as well as the first results and methodologies used in a project that is in its early development phase. This study takes advantage of the previous experience from a project focused on the environmental changes that occurred during the Teutonic Order crusade in the Baltic region.

Frontiers in the Early Medieval Irish Sea region: Landscapes, seascapes and communities

Patrick Gleeson

Affiliations: School of History, Classics and Archaeology, Newcastle University

The Early Medieval Irish Sea region was characterized by a myriad of polities, all bound into shifting networks of alliance and allegiance. This network constituted a series of fluid and transient kingdoms, and this paper examines the relationship between these kingdoms from the perspective of landscape. It explores how the nexus of landscape and identity was implicated in shaping different scales of polity and community as well as the physical,

conceptual, cultural and ideological frontiers between them. It examines how territory, landscape and seascape were bound up with dynamic conceptions of sovereignty, and how such ideas in turn were defined and perceived. How these concerns shaped cultural, political and symbolic frontiers as spaces of negotiation and transition is also examined.

Dynamic island frontiers – settlement discontinuity in Danish marginal islands AD 700-1900

Poul Baltzer Heide and Peter T. Andersen

Affiliations: The Archipelago Museum of Southern Denmark (Øhavsmuseet Faaborg)

With this paper we address how islandscapes and their role as a national frontier can transition back and forth between national marginality and centrality, even in relatively small areas like the Western Baltic. In order to do so we will present the results of several projects from the archipelago south of Fyn, Denmark, that comprise 50 small and very small islands. These projects all aimed at exploring the unique characteristics and historical development of this particular islandscape, and cover the period from the formation of the islands between 7,000 and 3,500 B.C. up to the present. The projects include contributions from both archaeology, history and ethnology and we will present the results of the entire project team. We will, however, use this opportunity to focus on the results from the late Iron Age and onwards, where a combination of archaeological and historical sources enable us to demonstrate how islands were looked upon in their own time, and how they appear to represent a high level of discontinuity, lasting until today. In this period the islands are influenced by e.g. raging Vikings, partial abandonment, integration into the largest medieval royal deer park in Denmark, forced resettling in the Renaissance, culminating in 1223 A.D. when Danish kings Valdemar and Valdemar were abducted on Lyø. Through all this, the archipelago remained a frontier zone between Denmark and both Slavonic, German and Frankish regents.

The 'Fenland frontier' in Viking-Age England and the East Anglian 'core'

Alison Leonard

Affiliations: Faculty of History, University of Cambridge

H.C. Darby's 1934 article, 'The Fenland Frontier in Anglo-Saxon England', argued that the Fens defined Anglo-Saxon political geography as a natural and psychological frontier. Based on Domesday Book statistics and early medieval histories such as Felix's Life of St Guthlac, the Fens were seen as a sparsely populated and liminal landscape of little agricultural value. This characterisation has since been revised: the Fens were integral to early medieval regional economies, providing a wide range of resources; where habitable, they were in fact densely populated. The liminality of the Fens can therefore no longer be taken for granted, and Fenland 'borders' must be viewed differently based on perspective — whether environmental, economic, or socio-cultural. Perhaps, therefore, the concept of 'frontier' remains the best means of conceptualising such a nuanced landscape, but not without (re)defining. This paper contributes a new narrative to 'Fenland frontier' studies, set in the Viking Age. Concepts of frontier and core are queried through the interplay between material culture and natural and constructed landscapes. It is argued that the frontier status of the Fens can be fruitfully explored in light of an East Anglian 'core'. In turn, the emergence of a northern East Anglian identity, as distinct from the south, is best understood in the wider context of East Anglian and Fenland geography. The 'Fenland

frontier' was not merely a physical buffer: the evolving regional psyche of the East Anglian 'core' was contingent upon the Fens.

Change without loss: The effects of new "frontiers" on mobile communities in the Syrian Steppe, 3100-2300 BC

Stefan L. Smith

Affiliation: Department of Archaeology, University of Durham

While transition areas between two sedentary politically, socially, or economically-defined groups are generally considered "borders", those between a single such group and one or more mobile groups are often labelled "frontiers". However, this is mostly seen from the sedentarists' perspective – often as a "barrier" against the unknown – while little research has examined such regions from the viewpoint of the nomads, and what effects "frontiers" may have had on them. This paper looks at the Early Bronze Age semi-arid steppe of northeastern Syria, where the encroachment of large permanent settlements from likely external origins doubtless had a great effect on the region's existing nomadic groups. As the extent and power of these settlements grew into networked polities, many mobile communities would have found themselves in a newly-created "frontier" between the world of sedentism and that of nomadism. This likely resulted in the sedentarisation of some from a desire to reap the economic benefits of the newcomers, who, in turn, came to rely on the nomads for support during dry seasons. Thus potential co-evolutionary interactions took place across a "frontier" area, defined not primarily by geography, but by the types of economic subsistence practiced. However, as argued by Anne Porter, far from constituting a departure from a mobile lifestyle, such small-scale sedentarisation could have been considered part of nomadic culture, and indeed a mechanism that enabled it to flourish. Thus the gaining of a "frontier culture" by such groups may not necessarily have meant the loss of their previous, frontier-less, society. This hypothetical model will be critically evaluated with reference to extensive remote sensing and existing ground data uncovered by my PhD thesis.

Contested borders in marginal landscapes: The archaeology of Giau Pass (2236 m asl) in the eastern Italian Alps

Francesco Carrer[1] and Fabio Cavulli[2]

Affiliations: (1) McCord Centre for Landscape, Newcastle University; (2) "B. Bagolini" Laboratory, University of Trento

The concepts of border and frontier are often confused. But while 'frontier' is associated with marginality and liminality, 'border' is an institutional and political feature. This implies that frontier and border landscapes should not be considered equivalent. This general definition, though, does not apply to any case-studies addressed by landscape archaeology. Some landscapes can be described as both border and frontier landscapes, since they share the characteristics of both. In this paper the case of Giau Pass will be presented. This is an upland plateau (above 2000 m of elevation) in the Cadore Dolomites (eastern Italian Alps). From 1511 to 1918 it was a national border between the Austrian Empire and Venice. Being a quite rich seasonal meadow landscape, this border was contested by neighbouring communities up to the mid-18th century (when a wall fossilised the boundary). Archaeological survey has been undertaken here over the last five years and several prehistoric and historic archaeological find-spots were recorded. Historic documents have enhanced our understanding of the socio-economic and political

processes in this territory. The spatial organisation of landscape features was investigated using GIS, in order to assess their relationship with the contested border. The research outcomes suggest that the historic character of this marginal upland landscape is deeply affected by the existence of the boundary. Thus, frontier and border cannot be disentangled. Instead of contradicting the border/frontier discrimination, the Giau Pass case helps to define more accurately their distinctive features.

A reiving landscape? The Anglo-Scottish border in the Late Medieval and Early Modern periods

Caron Newman

Affiliation: McCord Centre for Landscape, Newcastle University

The Anglo-Scottish border was of political importance in the relationship between Scotland and England, but the area was a long way from political and socio-economic cores. Consequently, as well as being perceived as liminal, the border was seen as being culturally peripheral. It is an area in which society experienced an unusually large number of disjunctive events and processes between the 15th and end of the 18th centuries. These events are often misremembered or have been entirely forgotten in the popular consciousness. Yet the area retains a distinctive identity and outlook, and the landscape has a clear local character. The sense of peripherality was and is emphasised by the challenging nature of the environment, which is characterised by a wet climate and relatively infertile moorlands and large areas of modern forestry plantation. The processes of landscape development and change which underlie the modern landscape are not well understood. Building on the author's doctoral research, this paper examines alternative interpretations of the historic landscape of the Anglo-Scottish border, focusing on the modern county of Cumbria. It also looks at the results of recent fieldwork, using aerial photography, Lidar and field survey, which recorded previously unknown relict landscape features. From this new research, the paper will show how we can start to develop an understanding of the evolution of the character of the landscape and how that reflects processes of upheaval and change for the people of the border.

D4 The Landscape of The Mining District of Bergslagen - In the Borderland Between the Agricultural Areas and the Large Wooded Areas

WEDNESDAY 24th AUGUST 10.50-14.50

VENUE: A138

Session organisers: *Catarina Karlsson*

Affiliation: Bergslagens Medeltidsmuseum, Sweden

Session Abstract

New technology and knowledge were key ingredients in the changing medieval landscape, such as the mining district of Bergslagen in mid-Sweden. The general context is the late Medieval economic expansion, with its increase of population, production, consumption and growing market for iron and steel. In Sweden, this crucial process was characteristic of the centuries between 1200 and 1400 AD. The basis of the session will be historical and archaeological research and the results of the "Atlas of the Swedish mining districts" where all 23 mining districts with medieval origin in Sweden has been mapped and analysed. The frontier landscape of the vast, ore-rich outland changed rapidly during this process and was shaped by new technology. The ore-rich woodland of Bergslagen was swiftly formed to a different landscape where production of metal formed the conditions for a new type of society based on specialised production. In this landscape the dominating features were mining, charring, blast furnace production, smithing, transport and distribution. The base of this change can be compared to the urbanisation that at the same time were changing the landscape in other regions. The dominating agrarian base for work and household economy was challenged by specialisation, growing consumers' market and introduction of wage work. The change presupposed new laws both in towns and mining districts since the previous laws focused on legislation of the agrarian society. This frontier from agrarian to mining landscapes poses questions concerning both the actual physical landscape and the social landscape of Bergslagen.

Paper Abstracts

"What lies ahead of us?" Reconstructing the pre-mining ground conditions and environment in the landscape around Falun Mine, central Sweden

Magnus Hellqvist and Johan Roth

Affiliations: Department of Earth Sciences, Uppsala University

Mining is one of the most devastating human activities affecting the environment. Falun Mine, in Dalarna County (Bergslagen), Sweden, is a typical example of this extensive landscape alteration. The mine itself does not have the most obvious impact on the environment, but instead it is the activities connected to the mining that have a heavy impact. These include the management of ore, waste accumulation, along with the reorganization of the environment into an industrial landscape by, for example, material transfer, changing water courses and establishing settlements and infrastructure. The activity also has far-reaching spatial and temporal impacts seen in forest management and air pollution, for example. When trying to understand the development, as well as the attraction, of these frontier landscapes, one must first understand the former environmental and ground conditions. This is a complicated process in areas that have been significantly reorganised by human activity. In this project, a pre-mining landscape is reconstructed by combining map analysis, field mapping and investigations and previous publications. The site was originally dominated by a substantial mire that has now totally vanished and been replaced by a large depression that was created in 1687 and expanded as a mine into the 20th century. The reconstructed landscape has many similarities with the present surrounding natural environment, but has higher wetland and fine sediment coverage. The latter is a useful resource and interesting for agricultural purposes – which were key before the mineral resources were found – but are now long gone.

New laws for new communities

Thomas Lindkvist

Affiliations: Department of Historical Studies, University of Gothenburg

The purpose of the paper is to present how new forms of production and changed economic conditions promoted new types of social communities in the mediaeval society of Bergslagen in Sweden. As elsewhere in Europe, new communities were imagined and made coherent by customs and legal regulations. Customary laws changed when representatives of an emerging state and church organization imposed new legislation. There were different legal traditions. The provincial law codes promoted by King and Church from the late 13th century were focused upon regulating the relations within the agrarian society. When other forms of social relations emerged due to other forms of production there was a need to settle the new social and economic relations by complementary legislation, bye-laws or statutes. The influence from foreign mining legislation as well as the relations to the provincial law codes will be discussed.

The Medieval industrialization of the mining district of Norberg, Sweden - Continuity and change in mining and settlement 1000 – 1500

Ing-Marie Pettersson Jensen

Affiliation: Jernkontoret

Based on the dating of medieval blast furnaces, the mining and iron production that started in the 12th century and the 13th century seems to have been the main expansion phase for mining and settlement in the area around Norberg. In the early 14th century there may have been more than 120 blast furnaces around Norberg. In the second half of the 14th century, 30% of the blast furnaces were closed. Christian ideology broke down the former power of the local Viking Age magnates and dissolved their strong control over the route taken by the iron to the consumer, and their strong control over the craft and craftsmen was also reduced. Together, this contributed to the quantitative development of iron production, and permitted craftsmen and iron producers to strengthen their social positions by developing their operations. These actors became stronger during the Middle Ages and had much to win from an increasingly powerful monarchy. The development of the towns and trading created entirely new routes and institutions for the iron to be shipped down from the mining area. This created the right conditions for the peasant miners to free themselves entirely from the old structures that controlled the mining area and trade. After the Black Death it was increasingly important to be more self-sufficient and to reside on site, which is why the so-called peasant miner organization reinforced its position and became dominant. But at the same time, the first large scale industrialization of the mining area stopped.

Life and work at a Medieval blast furnace site

Gert Magnusson

Affiliation: Stockholm University

Before the age of mining the area of Bergslagen in Sweden was sparsely populated. There was farming in isolated places in fertile valleys. The introduction of industrialized mining has had a crucial bearing on our understanding of mediaeval Scandinavian

history, the urbanization of the Mälar valley and colonization of mining areas. Here we have 700 mediaeval blast furnace sites and some 10 000 mines, these ancient monuments provide possibilities to understand the earliest industrialization and its implication on woodlands. One site has been excavated and contributes to a better understanding of land use and daily work of a blast furnace site - Lapphyttan, 170 km NW of Stockholm. The investigations show a sophisticated industrial facility in the 13th century, with a blast furnace, eight fineries, a roasting pit, a dwelling house and an iron store. Various ores were used from mines 20 km away. Ponds for the water wheel changed large parts of the rivers. Products such as lump iron, osmund iron and iron bars, have been found. More than 9 400 artefacts demonstrating different stages of the work and the knowledge of the ironworkers have been recorded. The excavations reveal a complex industrial establishment with a water powered blast furnace. However, the fineries were still driven by muscle power thus creating a bottleneck in production. Archaeological artefacts and constructions will be used to reconstruct life, tacit knowledge of land and technology and how work at a mediaeval production site was dependent on large parts of the landscape.

The boundaries within - Medieval mines, mountains and mining districts

Lena Berg Nilsson

Affiliations: Landskapsarkeologerna/ArcMontana

The project "*Atlas of the Swedish mining districts*" has mapped and analysed the 23 mining districts of medieval origin in Sweden. At the start of the 16th century the mining districts had developed into administrative units with their own courts and governing bodies, although their geographical boundaries changed through time. However, the earliest written records mentions another concept: the (Ore-) Mountains (sw. berg), such as the great Copper Mountain, Silvberg, Norberg or Garpenberg. In my ongoing thesis work I analyse more than 50 medieval ore-mining sites in Sweden. Of these approx. 30 (ore-) mountains were situated within the boundaries of the medieval mining districts – the number in each district differs from just one to several – and a handful of the (ore-) mountains were situated without geographical connection to a mining district. In addition to these (ore-) mountains, the medieval sources also mention around 15 contemporary mines in Sweden. This paper will examine the relationship and definition of these three intertwined concepts – mines, mountains and mining districts – in medieval Swedish ore mining. What constituted a medieval(ore-) mountain or a mine in contrast to a medieval mining district? The paper takes its start from the Swedish National Heritage Board's register of ancient monuments (FMIS), results from the project "*Atlas of the Swedish mining districts*" and comparisons with the "Protected mile" around the great Copper Mountain in the 17th and 18th century. What determined the boundaries of the mines and mountains within – or outside – the medieval mining districts?

The mining district of Bergslagen - A prerequisite for change in the Medieval landscape and society

Catarina Karlsson

Affiliations: Bergslagens Medeltidsmuseum

The agricultural areas and the large forest areas of Bergslagen are two landscapes closely interlinked. In Sweden, the rapid emergence of Bergslagen was vital. The blast

furnace developed, perhaps as early as the 11th century, and around it extensive technical systems took shape, which then grew exponentially during the 1100s-1200s. In Bergslagen, Sweden's economic base was built in a sparsely populated outland. This setting was characterized by diversity and flexibility. The technological changes shaped a new landscape in both Bergslagen and the agrarian dominated areas. That was partly due to improved iron implements that enabled the farmers to claim new land. Changes in consumption, production and economic practice were during this period dependent of innovative thinking. Thus it can be concluded that not only did the expansion of the agrarian sector and the opening of the landscape form the basis for mines and towns, but also the reverse applied. Bergslagen was essential for agrarian expansion and hence for the expanding population and increased modernization. Increase in iron production was a prerequisite for change in medieval society and rural development was closely interrelated with iron production and trade. The frontier between agrarian and mining areas is clear in several aspects, but at the same time their co-dependency is vital for all the landscape and for society's historic changes.

The transition from the bloomery to the blast furnace process: A question of ores and capacity

Eva Hjärthner-Holdar

Affiliation: Arkeologerna Statens historiska museer

The know-how and knowledge of the producers of bloomery iron made it possible to prospect for new iron ore resources. Some had already tried to use rock ore in bloomery furnaces. The capacity of the bloomery furnace and the increased demand for iron made iron producers look for and invent new techniques. This would totally change the landscape and the economy of the Bergslagen area, as outlined in this paper.

E. Mediterranean Landscape Archaeology

E1 Cross-disciplinary and integrative approaches to human-environment interactions in Mediterranean landscape archaeology

TUESDAY 23rd AUGUST 11.10-13.00

VENUE: Hörsal 2

Session organisers: *Anton Bonnier, Martin Finné and Erika Weiberg*

Affiliations: Department of Archaeology & Ancient History, Uppsala University

Session Abstract

One of the most fundamental developments within Mediterranean landscape archaeology since the mid-20th century has been the increasing application of field survey to Mediterranean (micro-) regions. The attempt to combine data from different regions to produce broader landscape, narratives brought scholars together at a workshop in 2002 that resulted in the publication *Side-by-Side Survey: Comparative Regional Surveys in the Mediterranean World* (S.E. Alcock and J.F. Cherry, eds., 2004). These discussions remain deeply embedded within the disciplinary discourse of Mediterranean landscape archaeology. Yet, the idea of broader landscape narratives involves today even wider and more cross-disciplinary datasets, including palaeoclimate and palaeoenvironmental archives. Combining a variety of records we are, more often than not, dealing with regional perspectives that are in fact inter-regional seen from a field archaeological perspective, which in turn places new emphasis on the questions explored in 2002. The session seeks to explore how comparative approaches within Mediterranean landscape archaeology can be applied within modern cross-disciplinary research on human-environment interaction. How do we bridge disciplinary and methodological gaps in order to produce mixed but coherent regional datasets and integrated narratives on human-environment interaction? We invite papers that consider the great variety of complex issues such projects are likely to explore: including the integration of multi-proxy datasets; up-scaling as well as down-scaling of data; visualization of temporal and geographical variation; as well as the application of any results in relation to the wider scholarly debate on societal resilience and sustainability.

Paper Abstracts

The origin and development of a Mediterranean landscape: the integration of field survey techniques with the long-term archaeomorphological analysis of Valencia Mediterranean alluvial plain

Maria Jesús Ortega,[1] Josep Maria Palet[1] and Hèctor A. Orengo[2]

Affiliations: (1) Catalan Institute of Classical Archaeology; (2) McDonald Institute for Archaeological Research, University of Cambridge

The complex evolution of Valencia's territory has made it one of the most complex historical landscapes in Europe. But this complexity can also be problematic for its study, since the intensive historical occupation and geomorphological dynamics in combination with modern changes have deeply transformed the territory. Therefore, for its meaningful analysis, a multidisciplinary research perspective is needed. The different techniques employed include geomorphology (University of Valencia), multi-proxy palaeoenvironmental analysis (University of Barcelona and GEOLAB-CNRS), remote sensing (University of Cambridge) and archaeomomorphology and archaeological survey (Catalan Institute of Classical Archaeology). Archaeological survey and the GIS-based archaeomorphological analysis revealed as particularly useful. Survey has included the revision of the location, chronology and type of several known archaeological sites allowing us to analyse the evolution of settlement patterns from the Iron Age to the Medieval Islamic period. Also, the relation between sites and archaeomorphology has permitted identification of changes in settlement dynamics between the Iron Age, the Roman Republican and the Imperial periods. Archaeomorphological survey has allowed us to review the main features of some structures documented by the GIS-based analysis such as roads or holloways, some of which were identified by the archaeomorphological analysis as part of a Roman centuriation. The integration of these micro-scale studies has helped establish an extra-regional scale comparison, aligning Valencia's historic landscape evolution to that of other well-studied Mediterranean sedimentary plains.

Silent rivers of grass – the detection of ancient drove-roads in southern Italy

Christian Heitz

Affiliation: Department of Classical Archaeology, University of Innsbruck

An important interaction between humans and landscape was the practice of transhumance (migrating pastoralism). This economy is historically well attested in the Mediterranean area. Between central and southern Italy the climatic circumstances strongly favoured this kind of economy which, for hundreds of years, shaped the human as well as the natural environment. The existence of the practice of migrating pastoralism is testified already in the times of the Roman Republic. Over following centuries, drove-roads (called calles in Latin, tratturi in Italian) taken by the shepherds and their flocks, although unpaved, became particularly visible in the countryside as well as in urban regions, either as wide, often slightly sunken strips with special vegetation or as the main streets within or along the settlements. The project/paper seeks to explore the possibilities of tracing the course of ancient drove-roads, employing GIS and microbiology.

Contributions and limits of a multiscalar, geomorphological and palynological combined approach to human-environment relationships reconstruction, nearby the multiperiod tell of Dikili Tash (Northern Greece)

Arthur Glais,[1] José-Antonio Lopez-Saez[2] and Laurent Lespez[3]

Affiliations: (1) Geophen-LETG UMR 6554 CNRS, University of Caen Normandy; France; (2) Consejo Superior de Investigaciones Científicas-Spanish National; (3) Université Paris-Est Créteil Val de Marne

Archaeological investigations carried out on Dikili Tash tell, one of the oldest Neolithic settlements site in the Balkan region of Greece, have improved our understanding of the cultural, social and material evolution of the settlement. While global climate reconstruction research based on the study of the Tenaghi-Philippon marsh, located 7 km from the tell, have focused on forces that drive the environment at continental scales, we attempt to use the local sediment archives to identify periods of changes in human-environment interactions. The reconstruction of environmental changes is based on field work and more than 15 cores located in the wetland areas near the archaeological site. Two sources of palaeoecological investigations have been conducted: geomorphological and palynological. Three relatively new palynological records located respectively 1.75 km (Dik4), 150 m (Dik12) and 100 m (Dik5) from the archaeological site were extracted and will be presented. The first results from Dik4 cover all the Holocene until Antiquity and provide a continuous overview of the vegetation cover evolution. Cerealia pollen recorded at the bottom of the archaeological site from the Early Neolithic sequence (Dik12), associated with other pollen and non-pollen indicators, confirms that the first forest clearings were around 6500 cal BC. The study reveals two phases of decline in land use, although indicators of anthropogenic disturbance of the vegetation never entirely disappear. In contrast, four periods are characterized by an increase in land use extension and intensification. Beyond the limits of interpretation linked to the difficulty identifying cultivated or harvested plant species from recovered pollen taxa, this case study highlights the value of combining off-site palynological evidence and on-site data at different scales. It points out the need to assess the effects of specific farming and herding practices on the dynamics of mosaic landscapes.

Reconstruction of Holocene coastal environmental changes the last 8500 years of Zakynthos Island, Ionian Sea: a history of a segregated Mediterranean Island

Pavlos Avramidis,[1] George Iliopoulos[1] and Gert Wijngaarden[2]

Affiliations: (1) University of Patras, Rio; (2) Universiteit van Amsterdam

Zakynthos is one of the most seismically active regions in the Mediterranean area. It is located very close to the convergent boundary between the African and Eurasian plates and its Holocene evolution has been influenced by tectonic activity, catastrophic events and relative sea level changes. The scope of the present paper is to examine the Holocene palaeoenvironmental changes of the coastal area of Zakynthos Island using a multidisciplinary approach, combining sedimentological, palaeontological, geochemical, 14C and OSL dating data from four coastal cores, up to a maximum depth of 30 m. The sedimentological, palaentological, and geochronological studies reveal that sea level changes and tectonic activity have initiated significant modifications to coastal geomorphic settings on the island over the last 8500 yrs BP. The depositional environments and the palaeontological biofacies show four main different geomorphological and evolutionary stages. We recognized marine, lagoonal deposits with marine influence, brackish depositional environments and limnic deposits. The interpretation of our data indicates that the island before the middle Neolithic period and around 7500 yrs BP was fragmented into two main parts, where Vasilikos peninsula was a separate island. The fact that the Vasilikos peninsula had been a separate island during most of prehistory constitutes an important factor for future landscape archaeological research on Zakynthos and the other Ionian Islands.

The longue durée: The piedmont of the Corinthia and cycles of regional occupation

James C. Wright

Affiliation: American School of Classical Studies at Athens

The valleys of the Xerias, Longopotamos, Nemea, and Asopos Rivers are properly a piedmont zone intermediate between the coastal plains of the Corinthian, Saronic and Argive Gulfs. Study of the long term patterns of human exploitation of these valleys reveals cycles of occupation that differentiate this piedmont from adjacent coastal and montane regions. Examination of settlement histories from the Early Bronze Age through the 20th c. CE discloses a dynamic population mobility in relation to natural resources and to external political economies. Although this mobility is characteristic of the Mediterranean piedmont *sensu* Horden and Purcell, it has specific trajectories at different times in the past and these are of great importance for understanding the prehistory and history of the Peloponnesos. Variation in form of settlement and in forms of agro-pastoral economies and study of the routes of interconnection illustrate the special character of this piedmont zone in the long-term history of the rise and fall of political economies in the Aegean basin. This paper will discuss evidence from pollen cores, geomorphological studies, intensive survey, archaeological excavation, historical sources, and ethnography to explore demography, the dynamics of settlement and occupation, and interconnectivity. Through this study this piedmont will be characterized for its special position within the evolving political economies of the wider world of the Aegean, the Mediterranean, Western Europe, and the World.

Interdependent, interdisciplinary, integrated: conviviality theory and the life of the landscape

Michael Given

Affiliation: Archaeology, School of Humanities, University of Glasgow

One of the main challenges to pursuing an interdisciplinary analysis of human-environment interaction is the lack of an explicit body of theory that can embrace all sides of these tricky trans-boundary conversations. How can we bring artefact typologies, species lists, fuzzy chronology, interpretations of social identity, and survey data collected by a range of incompatible methods into the same narrative? How can we avoid dead ends such as environmental determinism in new guises, anthropocentrism, and the reduction of highly complex and nuanced datasets to simplistic models? This challenge is very clear when investigating the interaction between humans and the environment in Iron Age to contemporary Cyprus. We have some twelve intensive survey projects, at least twice that number of extensive survey projects, geomorphological mapping, botanical and faunal species lists from excavated sites, a range of climate proxies, and any number of social and cultural interpretations based on limited data sets and a bewildering variety of perspectives and theories. Is it possible to draw these into a coherent narrative? One tool for attempting this is what I term 'conviviality theory': life, in its broadest, more-than-physiological sense, consists of the intense, constantly developing interaction and interdependence between materials, things, living beings and environmental processes. As I hope to demonstrate for historical-period Cyprus, we can use this perspective to begin to talk across boundaries, listen to more perspectives, and include a dramatically expanded range of players in our understanding of the life of the landscape.

With great power, comes great responsibility'. Integrating heterogeneous legacies for the cross-disciplinary reconstruction of human-environment interactions in a Mediterranean landscape: Bronze Age Cyprus

Francesca Chelazzi

Affiliation: Archaeology, University of Glasgow

From the 2002 'Side-by-side survey' workshop, it is a matter of fact that the debate around working in a comparative format progressively gained some popularity in Mediterranean archaeology; today an increasing number of scholars is aware about the urgency of comparing regional datasets in order to produce wider landscape narratives. This is not only a theoretical perspective, but also a concrete necessity: it happens more and more often that some Mediterranean regions are faced with great urban and landscape changes due to mass tourism, deregulation of real estate, transformation of the agricultural economy, etc. Sometimes the only legacy at our disposal is a heterogeneous corpus of old reports, survey projects, casual discoveries and rescue excavations. Besides, during the last decade universities have been lashed by an incessant policy of cuts in several European countries, so that second-generation analysis is becoming a territory to explore especially by an increasing number of young archaeologists. Starting from the heterogeneous data-assemblage about Bronze Age Cyprus, my intention is to highlight the challenging purpose of comparing regional datasets in a wider and cross-disciplinary attempt. We are playing a game where several sneaky challenges are lying ahead: from the necessity to introduce a certain standardization for computational analysis, to the risk of reducing datasets to the lowest common attributes, thus losing the original complexity.

Redefining rural Petra: A landscape archaeological characterization of the Petraean hinterland in Nabataean-Roman times

Will M. Kennedy

Affiliation: Exzellenzcluster TOPOI, Humboldt-Universität zu Berlin

Numerous survey expeditions have already been carried out in the immediate environment of the Nabataean capital, Petra, documenting rural archaeological sites ranging from the Iron Age to the Byzantine and Early Islamic periods. Previous works have discussed rural settlements and land use strategies in the Petra region laying the focus outside Petra's city limits. However, the scope of Petra's immediate rural environment is based on a premature definition of a "Greater Petra", thus artificially labelling the area up to about 20 kilometres around the city as the Petra hinterland. Also, an overall and in-depth contextualization of the various archaeological sites in the Petra area is missing. This paper will therefore propose a revised definition of the Petraean hinterland re-evaluating the city's actual political, economic and social area of influence in Nabataean-Roman times based more on landscape archaeological methodologies and GIS-based analyses. Additionally, it will be necessary to discuss clear site typologies and characteristics in order to later set them into context with other rural structures and features such as road networks etc. Finally, other examples for Nabataean-Roman spatial strategies and settlement patterns from the wider region may be explored and tested against the archaeological evidence from the Petra region.

Reconstructing past land use in the context of soil properties along a precipitation transect in northern Jordan

Bernhard Lucke[1] and Günther Schörner[2]

Affiliations: (1) Institute of Geography, FAU Erlangen-Nürnberg; (2) Institute of Classical Archaeology, University of Vienna

Little is known about the spatial organization of past land use in the vicinity of ancient sites. We compared soils and off-site archaeological material in the hinterland of three ancient sites in northern Jordan: Gadara/Umm Qeis, Abila/Qweilbeh, and Umm el-Jimal. These are located along a precipitation gradient: rainfall decreases from about 500 mm in the west to approximately 150 mm in the east. Surveying the surroundings of these towns, it turned out that the distribution of pottery sherds varied considerably and significantly between the single sites. Based on former survey results suggesting that this surface material stems from human activities, these discrepancies have to be connected with differing agricultural regimes which in their turn are dependent on natural factors like soil properties and water supply. Not only the material culture, but also soil properties vary significantly in the surveyed areas. The most fertile soils bear the highest amounts of pottery. This suggests that the best soils of today were the preferred areas of the past, too. Numerous rock-cut irrigation channels suggest that rocky areas were used for water harvesting and transport, and channel outlets and few remains of terraces suggest that some rocky slopes hosted irrigated terraces. A major landscape change took place during or after the Byzantine-Umayyad period, possibly connected with earthquakes and heavy rains, which apparently led to erosion of terraces and the burial of channels. After that, the type and/or intensity of land use changed strongly, reflected by much reduced amounts of material culture on the fields.

Big data, long-term histories and survey datasets in northern Mesopotamia: Lessons from the Fragile Crescent Project

Dan Lawrence

Affiliation: Department of Archaeology, University of Durham

Since the pioneering studies of Robert McCormick Adams in Southern Mesopotamia (1965, 1981), archaeologists working across the Ancient Near East have developed a large corpus of settlement and landscape data. More recently this has been supplemented by the availability of high resolution satellite imagery, especially declassified spy photography such as CORONA, and greater access to cartographic information in the form of maps. However, as in the Mediterranean, there have been few attempts to integrate these disparate datasets in ways which allow for regional level comparison and interpretation. The Fragile Crescent Project, an interdisciplinary project based in the departments of Geography and Archaeology at the University of Durham, ran from 2008 to 2012 and attempted to fill this gap by bringing together data from over fifty regional surveys supplemented by satellite imagery and cartographic analysis. The afterlife of the project has been significant, and our current research involves relating the results to broader human-environment trends. The interpretation of different sources of information, as well as differences between the methodologies by which the original data were obtained, resulted in a high degree of complexity. Rather than sweeping this complexity under the carpet, we seek to embrace these discrepancies through concepts of certainty and uncertainty. This paper will give an overview of the approaches used in constructing the original dataset and discuss some of the results, relating long term trends in urbanism, irrigation and settlement to climate.

THERE IS NO E2 SESSION

E3 The Formation of Terraced Landscapes Around the Mediterranean: Timing and Motivation

TUESDAY 23rd AUGUST 14.00-18.30

VENUE: B153

Session organisers: *Uri Davidovich and Yuval Gadot*

Affiliations: Tel Aviv university

Session Abstract

Terraces constitute the most prominent agricultural installation around the Mediterranean, transforming valleys and slopes into series of quasi-flat plots while reducing soil erosion and increasing infiltration. Wide-scale terracing operations were not only a point of no return in human-environment interactions of highland regions, but also had far-reaching cultural implications with relation to the organisation of rural labour, economic decision-making and, possibly, carrying capacities and demographic trends. However, given that terraced landscapes are essentially palimpsests, identifying and dating initial terracing operations and later cycles of terrace construction and maintenance works are notoriously difficult. The importance of reliable dating of terraces cannot be underestimated, as it holds the key for accurate reconstructions of landscape formation processes and cultural trajectories. Current paradigms concerning the cultural transformation of Mediterranean landscapes assert that the phenomenon of wide-scale agricultural terracing commenced during different Bronze Age phases in various regions of the Mediterranean, and that there is a clear correlation between population growth and extensive terracing. The aim of the session is to test, and contest, these paradigms from the perspective of large-scale collaborative projects conducted in terraced Mediterranean landscapes during the last decades, which specifically targeted terrace dating as part of their research. Other than accurate timing of terracing operations, we wish to seek the specific motivations behind practicing terrace agriculture in different regions, motivations that may be rooted in social dynamics, economic mechanisms or cultural preferences other than those suggested in basic demographic models.

Paper Abstracts

Desert agricultural terrace systems at Early Bronze Age Jawa (Jordan) – Layout, construction age and efficiency

Julia Meister,[1] Jan Krause,[1] Bernd Müller-Neuhof,[2] Marta Portillo,[3] Tony Reimann,[4] Robert Rettig[1] and Brigitta Schütt[1]

Affiliations: (1) Institute of Geographical Sciences, Freie Universität Berlin; (2) TOPOI Excellence Cluster, Deutsches Archäologisches Institut; (3) University of Reading; (4) Wagenigen University

Located in the arid basalt desert of northeastern Jordan, the Early Bronze Age (EBA) settlement of Jawa is by far the largest and best preserved archaeological EBA site in the region. Recent surveys in the close vicinity revealed well-preserved remains of three abandoned agricultural terrace systems based on floodwater and runoff irrigation. In the presented study these archaeological features are documented by detailed mapping. Furthermore, sediment samples were taken within the terrace systems and analysed using a multi-proxy approach. The chronology of the terrace systems was obtained by optically stimulated luminescence (OSL) dating. In order to evaluate the efficiency of the water management techniques and its impact on harvest yields, a crop simulation model under today's climatic conditions is applied, simulating crop yields with and without runoff irrigation. Covering a total area of 38 ha, irrigated terrace agriculture was practiced on slopes, small plateaus, and valleys. Floodwater from nearby wadis or runoff from adjacent slopes was collected and diverted via surface canals. The terraced fields were arranged in cascades, allowing effective water exploitation through a system of risers, canals and spillways. Two OSL ages of terrace fills indicate that the construction of these terrace systems started as early as 5300±300 BP, which fits well to the beginning of the occupation phase of Jawa at about 5400 cal BP. The results of the crop model demonstrate that simulated grain yields increase considerably under supplementary runoff irrigation. Overall, these agricultural terrace systems seem to have been very efficient and their construction required a good adaptation to the local climatic-, hydrological-, geomorphological- and pedological conditions.

The natural sources of the agriculture soils in the Mediterranean terraced landscape – an example from the Judean hills, Israel

Yoav Avni,[1] Naomi Porat,[1] Yuval Gadot,[2] Uri Davidovich[2] and Gideon Avni[3]

Affiliations: (1) Geological Survey of Israel; (2) The Department of Archaeology and Ancient Near Eastern Cultures, Tel Aviv University; (3) Israel Antiquities Authority

Soils in the hilly terrains of the Eastern Mediterranean comprise two main natural sources: a contribution of insoluble residue from weathered carbonate rocks and a component of desert dust. As part of a large study on farming terraces in the Judean Hills, Israel, we dated by OSL natural pre-anthropogenic soils found on the slopes and in stream beds. Evaluation of the 17 available OSL ages of pre-farming soils shows that: 1. Environmental conditions that prevailed in the region since the Middle Pleistocene encouraged soils development and preservation, even on steep slopes. However, fluctuations in the balance between accumulation and erosion are observable. 2. While the larger and wider stream beds such as Nahal Refaim accumulated soils almost continuously since the Middle Pleistocene, smaller secondary valleys located in the steep hilly terrain preserve only 2-3 m of soil overlying bed rock. One of these sections was dated to 127-106 ka and its top is truncated. 3. The paucity of older ages indicates that the steep slopes are subject to severe soil erosion intervals. 4. When stone terraces were constructed for farming in historical times, the natural soil on the steep slopes of Early to Middle Holocene (8.7-3.7 ka) ages was used for terrace fill. Over the generations this natural component was constantly reused and recycled when terraces were repaired and rebuilt. 5. The increase in terrace construction in the past 700 years created a shortage of soil and it was diluted by comminuted limestone and chalk to increase its volume.

Are Terraces essential for Mediterranean dry farming? Jerusalem Highlands as a case-study

Eyal Ben-Dor, Yuval Gadot, and Rotem Elinson

Affiliations: Tel Aviv University

Recent archaeological studies have shown that in some parts of the highland regions of the Southern Levant significant terrace construction for dry farming began only during the Hellenistic period. Since it is clear that permanent human occupation began in this region during the Chalcolithic period (if not earlier), and that intensified agriculture-based settlement flourished as early as the Middle Bronze Age, new and intriguing questions arise: To begin with, how did human settlement thrive without terraces? Are there enough accessible flat plots of land available for cultivation? Was it possible to conduct agricultural activities on the slopes without terracing? What was the source of soils placed in terrace fills in later periods? To answer these and other questions we have focused on the area of the Jerusalem Highlands, a region typified by relatively steep topography and sedimentary rocks covered by thin terra rossa or rendzina soils. Using GIS for macro-analysis of the terrain and aerial LIDAR scanning for micro-analysis of soil volumes, we have mapped and quantified various types of available arable lands. In addition, soil types were characterized using an ASD spectrometer, and a spectral library was established in order to compare local natural soils and anthropogenic soils. In the paper we present preliminary results showing that human subsistence in this region was never dependent on terrace construction giving population estimates for the various periods of occupation of the Jerusalem Highlands.

Highland agriculture without terraces: reviewing Bronze and Iron Ages agricultural landscapes in the Jerusalem hinterland and their implications for terracing motivation

Uri Davidovich

Affiliation: Tel Aviv University

Large-scale terracing operations of highland regions around the Mediterranean are generally assumed to be correlated with settlement expansion and demographic growth. These assessments, however, are rarely corroborated by direct archaeological evidence. The development of the modern city of Jerusalem, located in the central highlands of southern Levant, during recent decades has led to an unprecedented volume of archaeological research into the city's rural hinterland, including the discovery and excavation of multiple agricultural settlements dated, among other periods, to the second and first millennia BCE (mainly Middle Bronze Age and Late Iron Age). Many of these sites are located on rocky slopes typical of the city's surroundings, and associated with agricultural installations such as stone piles, fences, and winepresses. Based on current evidence, agricultural practices in these areas did not include large-scale terracing, but was based on the exploitation of moderate topographic niches as well as soil pockets between lapies. This type of practice is also implied in several biblical sources, including the famous "song of the vineyard" (Is. 5: 1-6). Coupled with the results of "The Formation of Terraced Landscapes in the Judean Highlands" project presented by Gadot (this session), the accumulating evidence suggests that terracing was not applied extensively in the highland regions of the southern Levant during biblical times, even in periods witnessing population growth and greater economic activity. This suggestion contradicts common paradigms and calls for the question of motivation behind large-scale terracing and its introduction into the south Levantine Highlands to be re-addressed.

Dating the formation of terraced landscapes in the highlands of the Southern Levant: Field Methodology and Results

Yuval Gadot

Affiliation: Tel Aviv University

While terraces constitute the most recurrent humanly made feature in the hilly agricultural landscapes around the Mediterranean, they are notoriously difficult to date, and previous dating attempts often led to erroneous and misleading results. A new interdisciplinary research project entitled "The Formation of Terraced Landscapes in the Judean Highlands, Israel" addresses the problem of terrace dating using a large dataset of optically stimulated luminescence (OSL) dates obtained from terrace fills in combination with careful analyses of related geomorphological and archaeological records. The paper will present the main results of the project, demonstrating that intensive terrace construction began only during the second half of the first millennium BCE, while most terraced landscapes observable today were created during the last 700 years. Based on these results, the paper will also evaluate the socio-economic and historical contexts in which terraces were constructed in the rural periphery of Jerusalem, a thriving political, economic and religious centre for millennia.

Terracing landscape along the time in Auvergne (south-east France): the case of Murol

Cocoual Antoine

Affiliation: University of Rennes 2

Across centuries, the Auvergne landscape has been strongly marked by human action and it is hard to find a mountain that doesn't have terraces on its flanks. In this mountainous region of South-east France, terracing systems form a central element of fully anthropogenic landscapes. The territory of the town of Murol (Puy-de-Dôme) is a privileged witness of such facilities. Even if it seems that it was during the Middle Ages that a large part of the mountainsides were terraced, we could easily suppose an older origin for those structures, especially considering the numerous traces of previous occupation that have been found (such as proto-historic and Roma-era settlements) in the area of Murol. Study of these structures and their layouts has already shown the high complexity of their design which depended on their functions, the topography, the hydrographic network, and also their geographical positions. Analysis of terraces, their structuring, and conception brings new elements to understanding the expansion of occupation in Auvergne through the ages.

Labour and negotiation in a terraced landscape: The LBA terraces of Korphos-Kalamianos

Lynne A. Kvapil

Affiliation: Butler University

Agricultural terraces are a potentially rich source of archaeological data, but their treatment as such is problematic due to long-term use and reuse, localized architectural style, and difficulties connecting terrace use to securely datable material remains. This paper presents the results of the macroscopic investigation and systematic documentation of agricultural

terrace walls around the Late Bronze Age (LBA) harbour settlement of Korphos-Kalamianos in the eastern Korinthia region of southern Greece. Fieldwork exploring the heavily terraced landscape surrounding the settlement was conducted as part of the Saronic Harbors Archaeological Research Project (SHARP), and results suggest that there were up to three phases of superimposed terraces not only in the area surrounding the settlement but also within the settlement. Based on the periodic sequence of land use determined by SHARP, the earliest phase of agricultural terraces can be dated to the LBA, a time when the Mycenaean palace-states of the neighbouring Argolid flourished. Given the proximity of Kalamianos to the Argolid, it is not unreasonable to suggest that the large-scale terracing of the landscape in and around this harbour settlement was related in some way to the thriving palace-states nearby. Understanding the mechanisms behind this relationship, however, is more complicated. This paper situates the terraces of Korphos-Kalamianos within the context of changes in cultivation methods and labour allocation in a socio-political environment in which this hinterland settlement may have used the landscape (harbour and agricultural land) as a means of negotiating its position in the region in return for goods and technology.

Pantelleria: an ancient terraced landscape

Annapaola Mosca

Affiliation: Università di Roma La Sapienza

The Island of Pantelleria, in the heart of the Mediterranean, is characterized by the presence of terraces destined mainly for cultivation. The construction technique of dry stone walls has remained almost unchanged over the centuries. Surveys I conducted on the island have led to identification of the presence of ancient artefacts in sites where objects used for agricultural practices were found. In practice, all the stone walls had to take advantage of the special microclimate of Pantelleria to promote thermogenesis and allow the growth of vegetation.

Terraced Landscapes in the Medieval Aegean

Ioanna N. Koukouni

Affiliation: Independent researcher

This paper presents the terraced landscape of the Aegean islands, taking as case studies medieval Chios and Crete. Both islands were very important not only for their role in international maritime trade, but also for the renown of their fertile soil and cultivations. The insular agrarian economy developed in accordance with its natural restrictions: the natural relief breaks down into three different landscapes: the coastal, mountainous, and hilly zones with narrow coastal and fluvial plains. Settlements are built high up the hills overlooking the coasts. On a terrain of this nature, terraces for cultivation feature everywhere. This is a common characteristic on the stony soils of the Aegean islands. When visualised from a distance, these terraces give the effect of flights of stairs, therefore they are called “stairs” or skales in the local dialect. Each terrace was supported with retaining walls made of rubble. The greater part of the arable land, whether in the context of estate or village, had been cultivated within small peasant holdings by the family head with the help of the wife and children; therefore retaining walls mark also the boundaries of individual properties. This reality remained unchanged until the early twentieth century.

E4 Frontiers and Island Landscapes in Sardinia

TUESDAY 23rd AUGUST 16.30-18.30

VENUE: A144

Session organisers: *Federica Sulas and Giovanni Serreli*

Affiliations: Istituto di Storia dell'Europa Mediterranea CNR

Session Abstract

As Mediterranean frontiers change, the need for understanding long-term trajectories of Europe's environmental and cultural history deepens. Islands have offered both joins and barriers across the Mediterranean basin – where the divide between the worlds of Latin West and Arab-Muslim East first emerged. Amongst the less-explored, Sardinia, the second largest island of the Mediterranean, has provided both a strategic link and a shifting frontier between southern Europe and northern Africa. The home of peculiar prehistoric civilisations, Sardinia has embraced and rejected most of the cultures engaged in the making the pre-modern Mediterranean from Imperial Rome to the Crown of Aragon. Throughout changing climate, its well-watered pastures together with rough coasts and welcoming harbours, and fertile floodplains and river valleys for grains and orchards have fed external empires and indigenous polities. Yet, Sardinia's environment, and how it has changed, remain poorly understood and traditional agroecological practices are today perceived as conservative and improvident, even though rural landscapes and communities still hold firm against recurrent floods and fires. Environmental history is, thus, key in a region where biodiversity and economic development are focal points of current political and social agendas. Recently, new interdisciplinary research has begun advancing knowledge of different landscapes across the island by integrating methods from the humanities, social sciences and geoscience. Building on these, the proposed session takes an historical ecology approach to discuss islands as landscapes of frontiers, which are mobile in time and space but also constrained by physical boundaries.

Paper Abstracts

Settlement patterns and territoriality of the Nuragic east coast of Sardinia: new results

Cezary Namirski

Affiliation: University of Durham

Bronze Age and Iron Age Nuragic occupation in Sardinia includes a wide variety of different patterns, such as clustering of nuraghi in groups with buffer zones as territorial boundaries around them, occupation of the edges of highland plateaus, as well as small concentrations of the nuraghi in highland areas. The majority of these settlement patterns have been detected in the western and central part of the island, while the east coast of Sardinia (except the North-East) has received far less attention. Considering the diversity

of Nuragic settlement patterns in Sardinia, further research in landscape archaeology in different parts of the island offers the potential for recognition of new or additional patterns in specific areas of Sardinia. This paper presents results of landscape surveys undertaken between 2012 and 2015 in two sample areas of the east coast of Sardinia (Sarrabus and East Ogliastra), discussing their results (supported with GIS analysis) with reference to Nuragic settlement patterns and territoriality, emphasizing differences and similarities, as well as placing them within the wider context of the Bronze Age and Early Iron Age Nuragic settlement in Sardinia.

Pastures, orchards and ponds: towards an historical ecology of the Rio Posada landscape, eastern Sardinia

Federica Sulas[1] and Charles French[2]

Affiliations: (1) Istituto di Storia dell'Europa Mediterranea CNR, Italy; (2) University of Cambridge

For centuries, the Rio Posada has provided a link between Sardinia's agricultural coastal plains and the sheep farming societies of its rugged mountain inland. Already a focus of Bronze Age settlement, a main Roman port and, later, medieval religious and administrative centres were located in its delta. Despite such historical time-depth, the landscape and settlement history of the Rio Posada floodplain and hinterland remains poorly understood. Still a frontier landscape, the Rio Posada basin is today known as both a zone of hydrogeological hazard and a niche of cultural and natural diversity. This paper takes the Rio Posada as a laboratory to develop and test the application of an historical ecology approach to frontier landscapes in marginal zones. What was the landscape in the past? How were land, water and costal resources used? How did people cope with floods? By applying a context-specific and integrative approach, this paper elicits historical, environmental and ethnographic datasets to reconstruct the interplay between land and people at a rural level. While the river has provided both a resource and a threat to societal development in the region, there is now indication that hillsides, floodplain soils, and marshlands supported diversified agro-ecological practices. A legacy of such practices survives in land divisions and toponomastics still traceable in rural areas. In addition, the handful of archaeological sites known are located in those areas which remained untouched by recurring floods that swept part of the Rio Posada basin over the last centuries or so.

Frontier landscapes: Historical Marmilla and the Kingdom of Arborèa

Giovanni Serreli

Affiliation: Istituto di Storia dell'Europa Mediterranea CNR, Italy

In the Kingdom of Arborèa, magnificent castles were responsible for protecting the frontiers of the state and controlling its strategic territories. Some of these castles played a significant role in controlling economic resources such as was the case for two castles granted to the Republic of Genoa in 1168: Arcuentu and Marmilla. The Castle of Arcuentu controlled mineral resources in the Guspini area, and, the Castle of Marmilla the rich plains, which were historically known for agricultural productivity. These castles, built using significant economic resources and justified by their strategic importance, were soon contended by the main powers operating in the Medieval Mediterranean region: Genoa, Pisa, the Crown of Aragon. But these castles had also an impact on the landscape wherein

they were established. In particular, the Castle of Marmilla, the administrative seat of the homonymous district, exerted a significant influence and conditioned the surrounding landscape, which for centuries had been devoted to cereal agriculture and had sustained a balanced organisation in small villages, farmlands, and green areas along the rivers. This district, from classical times to the medieval period and modern era, was one of the main producers of grain and among the most important resources for the succeeding ruling powers. Today, the remains of this castle are still perfectly integrated in and characterise Marmilla's landscape. Recently, a new multimedia museum has been established to tell the history of the castle and the Kingdom of Arborea, illustrating its landscapes and the people who once lived there.

Medieval rural settlements in Trexenta: a case study

Maily Serra

Affiliations: Independent PhD Researcher

In medieval Sardinia, the curatoria (district) of Trexenta was situated on the north-western frontier that separated two of the main kingdoms ruling over the island: Calari and Arborea. The almost flat landscape of Trexenta is mainly composed by Miocene sands and limestone, which provide clays for local fertile soils. A networks of small watercourses feeds this landscape. Hills and rivers have provided natural boundaries over many centuries and the landscape is still today characterised by scattered small villages. The Middle Ages were the principal formative period for many of these in Trexenta, which was composed by 34 settlements: a large number of these had disappeared in 14th century, but a few of them still survive today. Using a landscape archaeology approach, new research in the area has combined field survey with the study of historical written and oral sources, cartography and aerial photography. Surviving settlements have been examined with an emphasis on recording their form, organization and boundaries, and what remains of their original nucleus. Two models of "urban" planning have been identified and an ancient road system has been reconstructed. The more ancient villages were located in places inhabited over centuries, thanks to the fertile soils. Borders, both external (between curatorie) and internal (between villages) have been identified. By applying an historical landscape approach, this study has illustrated both continuities and changes of settlements patterns and frontiers in Medieval Sardinia.

Coast view with Google and the Periplus of pre-modern Sardinia

Luigi Serra

Affiliation: Istituto di Storia dell'Europa Mediterranea CNR, Cagliari, Italy

The heritage of coastal towers, featuring the stunning coastal landscape of Sardinia and other coastal historical sites of the Mediterranean Sea, from the 16th century are evidence of the barrier the West had set against the Ottoman Empire with its increasingly frequent incursions. These "sea sentinels" confirm, with their motionless presence, that preserving the territory, its productive activities and its culture was a priority. Several studies and substantial research have been conducted on these towers, including interdisciplinary contributions. Building on these studies, new research has been exploring the history, heritage, and potential of these coastal towers. In the 1500s, Don Marco Antonio Camós circumnavigated the island to identify the best coastal sites in which the defence watchtowers could be built later. Camós' account provides unique, precise and direct

observation of the landscape and its features (including the towers) as seen from the sea. Revisiting in space and in time Sardinia's coastal landscape allows us to follow its transformation and cross the frontiers of the usual perspective we have of our lands, from the land itself. By looking at the coast from the sea, this paper argues that it is possible to break coastal borders and reach new observation points of our landscapes. Supported by multimedia, spherical shots and other available technologies, the design concept aims at replicating Camós' point of view, from the sea. This material static heritage could be dematerialized, and transformed into dynamic forms, for a multimedia experience through global "web browsing".

Concrete frontiers and invisible landscapes: the World War II landscape in north-western Sardinia (Italy)

Alessandro Panetta,[1] Matteo Pipia[2] and Paola Derudas[2]

Affiliations: (1) Universita degli studi di Genova; (2) Universita degli studi di Sassari

Starting from taking into account a database of nearly 200 surveyed and inventoried military buildings and pillboxes built in 1943 for the coastal defence of the north-western Sardinia (Province of Sassari), the goal of this paper is the study of the topographical organization of these buildings, their relationship with landscape and their internal spatial division according to their different tasks. The coastal defensive line designed to protect sensitive targets or possible landing areas, formed a concrete frontier, still visible in the landscape. But the elements it includes also have an important role in the landscape dynamics of the areas where they are placed, as active material culture that had efficacy in the past - as they still have in the present - on these areas and on the people who inhabit them. Pillboxes and other World War II archaeological features are an active part of the landscape, and the aim of this research is to apply an agency perspective and object biography approach to our case study. Moreover, assuming the environment as the place where relationships between human actors and "natural" ones happens, and assuming the landscape is the visible shape generated by these relationships, we tried to reconstruct landscape and vegetation dynamics all along the last century, before, during and after the war. To detect dynamics of change in vegetation, road systems, infrastructures and resource management systems, we used the combined methodology of traditional archaeological survey and historical map regression.

F. Mobility and Landscape

F1 Rethinking Mountain Cultural Landscapes: Integrated Analysis of Pastoralism and Transhumance

TUEDAY 23rd AUGUST 2016 11.10-18.30

VENUE: H425

Session organisers: *Josep M. Palet,[1] Lídia Colominas[1] and Hèctor A. Orengo[2]*

Affiliations: (1) Catalan Institute of Classical Archaeology (ICAC), Tarragona; (2) Department of Archaeology, University of Cambridge

Session Abstract

Recent studies show that mountainous regions are highly sensitive to human - environment interactions. However, they have traditionally been considered marginal and risky environments, constrained by climatic conditions and their topography. This idea has been used to consider mountains without real cultural values. Different international research projects have shown that their potential for historical knowledge is enormous and that they have a rich heritage. Recent research also shows that pastoralism has played a decisive role in the human shaping of mountain cultural landscapes since the Neolithic. Mountain anthropogenic deforestation episodes, related to the creation and maintenance of pastoral grasslands, have been documented from the Middle Neolithic onwards. One of the most important expressions of intensive pastoralism is the development of seasonal transhumance, involving movement of flocks and herders, which is known from the recent past and have contributed substantially to the shaping of mountain cultural landscapes. In this session, long and short-term multidisciplinary approaches that focus on the role of pastoralism in the shaping of mountain cultural landscapes will be welcomed. Archaeological, historical, zooarchaeological and ethnoarchaeological approaches integrated in interdisciplinary research will be especially encouraged. Mountain areas are also currently suffering major transformation processes resulting from the decline of traditional activities as a consequence of globalization and loss of identities. At the same time, social demand for landscape is growing as it is an important aspect of the quality of life. In that sense, the session also seeks to think about how mountain cultural landscapes have been lived and conceptualized by people and to what extent they are an element of identity construction, in order to develop a much needed social awareness of its cultural values.

Paper Abstracts

Pastoral landscapes of the Carpathians – A synthesis

Martin Schumacher, Christian Küchelmann, Anna Grabundzija, Wolfram Schier and Brigitta Schütt

Affiliations: Department of Earth Sciences, Freie Universität Berlin

The use of secondary animal products such as wool, milk and traction emerged during the Chalcolithic period. The spread of related innovations is complex and little is known about the impact of these innovations on the environment. The integration of data from different research fields is essential to tracing the propagation of the use of secondary animal products. Diversification of animal use implies increased animal husbandry and expansion of pastoral landscapes. The resilience of the landscape critically influences the pace and degree of how a given landscape responds to intensified grazing pressure. Furthermore, interferences between grazing impacts and climatic influences complicate the evidence of pastoral landscape modification. We integrated archaeozoological data from c. 250 sites, data on spindle whorls from c. 30 sites and published pollen, charcoal and geochemical data from 27 sites, all located in Southeastern Europe. Data refer to the period between 7000 – 3000 BP. Compilation and analysis of archaeozoological and archaeological data focus on sheep keeping and the use of wool. These data do not indicate proto-industrial wool production in Southeastern Europe during prehistoric times. Similarly, the meta-analysis of pollen and charcoal data reveals only slight herding-related vegetation changes between 7000 – 3000 BP, whereas after 3000 BP pastoral activities increase. The synthesis of environmental, archaeozoological and archaeological data from the Carpathian region allows us to present a diachronic view on the development of pastoral activities and their impacts on the landscape. Additionally, the integration of landscape sensitivity contributes to the validity of the resulting general view.

Reinterpreting high altitude forest to pasture conversion in the Holocene

Michael R. Coughlan, Ted L. Gragson and David S. Leigh

Affiliations: University of Georgia, Athens

Theories explaining the mid- to late-Holocene creation of high altitude pastures (HAPs) in Europe implicitly rely on analogues from European Colonial era agropastoral land conversion in the Americas. Pasture creation is presumed to be an intentional process of "forest clearance" associated with land use intensification. Yet, the transhumant grazing strategies that take advantage of HAPs are among the lowest intensity labour activities in agropastoral subsistence regimes. HAPs are also common pool resources that are costly to defend and, in the context of Neolithic to Iron Age population densities, the labour required to clear and maintain high quality pasture would have provided few if any net returns. We propose a socioecological model of forest to pasture conversion that couples an ethnoarchaeological interpretation of pastoral land use and an ecological theory of positive feedbacks between fire, vegetation, and soil. We support our model with multi-proxy evidence from a landscape-scale historical ecological investigation in a forest-pasture ecotone along a 12 km stretch of the Pyrenean divide. We rely on radiocarbon dating, charcoal concentrations, magnetic susceptibility, and geochemical signatures to derive the chronology of transitions in stratigraphic sediment sections from zero-order colluvial hollows. We use archaeological survey and radiocarbon dates from subsurface auger testing to assess the chronology and intensity of agropastoral occupation for the same landscape. Our results support a hypothesis that forests were gradually converted to pastures over a multi-century time scale through repeated use of pastoral fire and a sustained seasonal grazing regime combined with topographically mediated fire-vegetation-soil feedbacks.

Livestock activities in Eastern Pyrenees high mountains areas (Núria and Coma de Vaca valleys, Catalonia): the human shaping of a Cultural Landscape

Josep Maria Palet,[1] Arnau Garcia,[1] Hèctor A. Orengo,[2] Santiago Riera,[3] Tania Polonio,[1] Itxaso Euba[1] and Ramon Julià[4]

Affiliations: (1) GIAP, Catalan Institute of Classical Archaeology (ICAC); (2) McDonald Institute for Archaeological Research, University of Cambridge; (3) SERP, University of Barcelona; (4) Institute of Earth Science. CSIC. Barcelona

The main results from a six-year landscape multidisplinary research in the Eastern Pyrenees are presented with the aim to trace the long-term history of Vall de Núria and Coma de Vaca cultural landscapes (Catalonia). This research has been based on the integration of archaeological prospection and excavation, analysis of written sources and multiproxy palaeoenvironment analysis, including pollen, non-pollen palynomorphs, micromorphology, micro and macro charcoal and geochemistry. The study has been carried out starting from a landscape archaeology approach in order to treat archaeological, historical and palaeoenvironmental series as cultural proxies. The results show that livestock occupation of these high mountain valleys (2000 - 2600 m a.s.l.) dates from Neolithic to modern times. The first sign of grazing activities date from the late 4th millennium BC and this activity continues until the beginning of the Bronze Age. Antiquity is configured as an important period in livestock expansion especially from the 2nd – 3rd centuries and during Late Antiquity. Landscape dynamics show a new human impact in the 5th-6th centuries and a new grazing expansion from the high Middle Ages (9th – 10th c.). Archaeologically, this last period of land use is evidenced by the reuse of Roman structures and the construction of new ones which are more specialized, mainly in cheese production. This phase is also attested in the paleoenvironmental record when the alpine grasslands expand lower than 2000 m. Finally, archaeological data attests a new phase of pastoralism and metallurgy from the 14th–15th c. to modern and contemporary periods. The history of this landscape furnishes new data for the development of management tools for the sustainability of Mediterranean highlands.

Pastoral impact and landscape shaping in coastal Mediterranean mountains: rhythms, intensity and sociocultural factors.

Hector A. Orengo,[1,2] Arnau Garcia,[3] Magí Miret,[3] Paul Halstead,[2] Santiago Riera,[5] Sílvia Valenzuela,[2] Ana Ejarque,[6] Delphine Bosch,[7] Domingo Carlos Salazar García,[8] Judith Muñoz,[2] Dani López [9] and Rafel Jornet[9]

Affiliations: (1) McDonald Institute for Archaeological Research, University of Cambridge; (2) Department of Archaeology, University of Sheffield; (3) GIAP, Catalan Institute of Classical Archaeology; (4) Departament de Cultura, Generalitat de Catalunya; (5) SERP, University of Barcelona; (6) GEOLAB, Clermont-Ferrand University, CNRS UMR 6042; (7) Géosciences Montpellier, UMR-CNRS 5243 - Univ. Montpellier II; (8) Department of Archaeology, University of Cape Town; (9) Turó de la Font de la Canya.

Studies of pastoralism in mountains increasingly focus on multidisciplinarity, a long-term perspective, and high altitudes (over 1800 m.a.s.l.), reflecting both scholarly interest in apparently extreme environments and the availability of basins with anaerobic, continuous

sedimentary records. Low mountain ranges around the Mediterranean coasts, despite their proximity to areas of dense human population and thus likely intensive exploitation since later prehistory, are relatively neglected. The HumanScapes project has adapted methodological developments in high mountain archaeology to the low Garraf Massif of coastal northeast Spain, using a combination of LiDAR survey, archaeological excavation, stable isotope analyses of excavated animal bones, and extraction of microcharcoal, pollen and NPP records from continuous sedimentary sequences, coupled with ethnographic interviews. Human activity, particularly burning to promote grassland, played a major role in shaping the Garraf landscape at least during the Late Neolithic (LN) and pre-Roman and Roman Iron Age. Hill-top enclosures of LN, Early Iron Age (EIA) and Roman date are largely devoid of cultural material, suggesting use as animal pens rather than long-term human settlements. EIA enclosures are significantly larger than LN enclosures, suggesting use of the massif by increasing numbers of livestock over time. The location of the EIA enclosures at the intersections of later municipal boundaries, and away from natural longer-distance routes suggests their use by herds from local lowland communities. During the late Roman period, a yet larger enclosure, located near the only easy route across the Garraf (linking Barcino and Tarraco), may reflect longer-distance movements by larger numbers of livestock. This is compatible with palynological evidence for increased grazing of nearby coastal wetlands and with the opportunities afforded by urban markets, by safer overland passage resulting from Roman rule, and by villa-based estates perhaps offering large blocks of fallow (winter) and stubble (summer) pasture. Evidence is thus emerging for increasing large-scale and mobile pastoral use of the Garraf, but not yet of the long-distance seasonal transhumance over a wide altitudinal range of subsequent centuries.

Constructing cultural landscapes in rural areas: short and long distance transhumant movements in southern Europe. First results of a multidisciplinary research project

Anna Maria Stagno,[1,3] Amaya Echazarreta,[2] Begoña Hernández,[1] Arantzazu Pérez[2] and Marta Portillo[2]

Affiliations: (1) Research Group on Cultural Heritage and Landscape, University of the Basque Country, Spain; (2) Department of Prehistory, Geography and Archaeology, University of the Basque Country, Spain; (3) Laboratory of Environmental Archaeology and History, University of Genoa, Italy

This paper considers the problems of the archaeological evidence for changes in the husbandry practices and systems that can be detected both within (seasonal) settlements and in areas devoted to pastures. This research is grounded on the results of a multidisciplinary research project led by the Research Group on Cultural Heritage and Landscape at the University of the Basque Country (Spain), in collaboration with the Laboratory of Environmental Archaeology and History, University of Genoa (Italy). The discussion will debate the identification of markers of the transition from long distance transhumant to short distance transhumant husbandry, and vice versa. The presentation will include the results of archaeological surveys and excavations, observations of historical ecology, archaeobotanical and geo-chemical analyses and archival research. Through the discussion of two case studies from the Basque Mountains and the Ligurian Apennines, the different disciplinary perspectives will be compared. We will argue that a multi-proxy and micro-analytical approach can help better characterise divergent husbandry practices, which played different roles in the construction of the cultural landscapes of rural areas.

Long and Short-distance Transhumance in Ancient Greece: the Case of Arkadia

María Cruz Cardete

Affiliations: Complutense University of Madrid, Spain

The "traditional model" of Skydsgaard, based on the astu-chora opposition, has contributed greatly to an image of ancient Arkadia as a territory especially dedicated to pastoralism, with a strong presence of long-distance transhumance practices. However, historical, archaeological and environmental studies call into question the traditional models and point in other directions. First, transhumance is not a consequence of climatic and geological conditions, but a political-cultural and socio-economic decision. Secondly, a system based on long-distance transhumance would require sufficient specialization. Without it, long-distance transhumance is not an ecological, economic or political need. Beyond stereotypes, it is not clear whether the ancient Arkadians lacked other viable ways of getting the pasture that flocks require for their sustenance (ecological need). It is also unclear whether the demand for products related to livestock was strong enough to maintain a transhumance system (economic need). Finally, it is uncertain that livestock ownership was a basic element in the configuration of status beyond the 8th century (political need). Third, long-distance transhumance necessarily involves crossing political borders, which was really complicated in the world of Greek poleis. My proposal is to consider short-distance transhumance as a factor of livestock mobility in ancient Arkadia (and in many other parts of Greece). These practices overcome the technical and political problems (with their ecological and economic ramifications) of long-distance transhumance and provide a historical interpretation of ancient Greek economies through a household herding model, which helps us to integrate economy and identity in mountainous areas.

Transhumance and religion in Northern Greece: the sanctuary of Dodona

Diego Chapinal

Affiliations: Complutense University of Madrid, Spain

The economic activity in the Greek region of Epirus was mainly pastoralism during all Antiquity. This way of life was conditioned by its orography, due to the fact that this area was crossed by several mountain ranges and valleys. It entailed a particular social development in which shepherds played an important role as a means to spread the cultures and to encourage commerce. Taking this into consideration, this proposal is focused on the sanctuary of Dodona, in a wide chronological range, since the Bronze Age until the Hellenistic Period. Two aspects will be highlighted. First of all, some scholars sustain that the RHIII materials of this archaeological site do not show that it was a cult centre. However, it will be explained that there is enough evidence to defend that it was a seasonal sanctuary visited mainly by shepherds. Secondly, by using the methods of landscape archaeology, the way the sacred space of Dodona was transformed from the Archaic to the Hellenistic Periods will be analysed. This was a process in which transhumance was a decisive factor in the development of commercial and pilgrimage routes to the sanctuary.

Uncovering elements of prehistoric upland lifeways in Calabria: selected results from the Rural Life Project

Martijn van Leusen, W. de Neef, KL. Armstrong and J. Sevink

Affiliations: Institute of Archaeology, University of Groningen

Following intensive and systematic fieldwalking surveys in the mountains and uplands of the Raganello Basin (Calabria, Italy 2005-2008), from 2010 to 2014 a selection of small and undiagnostic late prehistoric pottery scatters as well as richer sites were studied in multidisciplinary detail by the authors' Rural Life Project, and these can now been placed in their landscape taphonomical context. Although it is still unclear whether permanent or seasonal, the absence of habitation structures in the geophysical surveys indicates the latter. In this paper we will focus on two landscape zones of particular interest: (1) debris slopes below limestone rock faces, and (2) upland undulating sloping land or UUSL. We will briefly discuss evidence from pollen data and plant/animal macro-remains to reconstruct late prehistoric land use, before focusing on the geoarchaeological studies conducted at three of our test sites. We will present different models for late prehistoric landscape exploitation and post-depositional history for each of the two zones: a pastoral/hunting model for zone 1, and an agricultural/pastoral model for zone 2.

Geoarchaeology of a high-mountain pastoral landscape: The potential role of soil and sediment analysis in the integration of multidisciplinary research. The Coma de Vaca valley study case, Eastern Pyrenees.

Tania Polonio,[1] Josep M. Palet,[1] Mercè Bergadà[2] and Santiago Riera[2]

Affiliations: (1) GIAP, Catalan Institute of Classical Archaeology (ICAC); (2) SERP, University of Barcelona

Recent landscape archaeology research on high mountain environments has been mainly characterised by the integration of palaeoenvironmental and archaeological data. However, some difficulties arise when attempting to integrate both datasets. Whereas palaeoenvironmental studies provide data characterised by high temporal resolution but low spatial resolution, archaeological studies provide important cultural data, which is restricted chronologically but very accurate in spatial terms. Hence, it is difficult to reach a proper correlation of cultural practices and their effects on the environment. The present work aims to provide a new approach to this problem in the framework of a multidisciplinary landscape archaeology project in a high-mountain area. Soil analyses are being conducted in the profiles excavated inside and outside archaeological structures, including topsoil, occupation levels, and layers below in order to thoroughly characterise taphonomical processes. The studied sediments correspond to huts and enclosures located at high-altitude (2000-2500 m.a.s.l) dated from the Neolithic to the Medieval period. Furthermore, horizons with archaeological evidence are being studied through micromorphological analysis to improve the microstratigraphic resolution of local sequences. Diachronical comparison of the results provided by these different contexts will allow production of a relative chronology of both human occupation and environmental processes. Additionally, high-resolution continuous sedimentary sequences obtained from local peatbogs have been extracted to conduct multi-proxy palaeoenvironmental studies. The pedological analysis of these histosoils will establish the relationship between environmental changes and stability and erosive episodes at a microregional scale. The integration of both local and regional sequences and cultural data will define the landscape dynamics in relation to the human occupation of the valley. This study illustrates the scope of a geoarchaeological approach in Mountain Landscape Archaeology as a potential tool for the integration of multidisciplinary data.

Grasslands, huts and sheep: Animal husbandry in the eastern Pyrenees during the Early Roman period. An interdisciplinary approach.

Lídia Colominas,[1] Arnau Garcia,[1] Hèctor A. Orengo[2] and Josep M. Palet[1]

Affiliations: (1) GIAP, Catalan Institute of Classical Archaeology (ICAC);(2) McDonald Institute for Archaeological Research, University of Cambridge

Several studies developed in the eastern Pyrenees have documented a phase of increasing human impact on the environment linked to animal husbandry during the Roman period. Multi-proxy palaeoenvironmental records comprising local and regional indicators suggest that a process of forest clearance affecting the upper areas and related to the creation and maintenance of pastoral grasslands took place then. There are, however, few data available to both characterize and evaluate animal husbandry. With this communication, we want to shed light on animal husbandry practiced in the eastern Pyrenees during the Early Roman period through an interdisciplinary approach combining zooarchaeology and landscape archaeology. This interdisciplinary approach will allow us to investigate one of the lesser studied land-uses developed in these sensitive environments but with the most impact on them. The analyses of faunal assemblages from Baltarga and Bolvir sites located in the Cerdanya valley show an animal husbandry focused on cattle during the late Iron Age. In contrast, caprine represents the most common species during the Early Roman period. It is also during that period when several shepherd huts and enclosures located in the surrounding high-mountain areas are documented, showing the practice of a more intensive and specialized animal husbandry during that period.

The question of the altitudinal mobility of caprine in Cerdanya (north-eastern Pyrenees, France) during Bronze Age based on oxygen and carbon isotope analysis from tooth enamel

Juliette Knockaert,[1] Delphine Bousquet,[2] Albane Burens,[3] Pierre Campmajo,[4] Laurent Carozza,[3] Christine Rendu,[4] Denis Fiorillo,[1] Jean-Denis Vigne[1] and Marie Balasse[1]

Affiliations: (1) Sorbonne Université, UMR 7209 CNRS/Muséum national d'Histoire naturelle; (2) UMR 5608 CNRS/ Université Toulouse Jean Jaurès; (3) UMR 5602 CNRS/ Laboratoire Géode, Université Toulouse Jean Jaurès; (4) UMR 5136 CNRS/Université Toulouse Jean Jaurès

Evidence of pastoral activities in the subalpine and alpine levels in Cerdanya raises the question of vertical mobility of the livestock: summer mobility to access to highland pasture for grazing and/or winter mobility to find resource in lowland area. Sequential stable carbon and oxygen isotope analysis were conducted on teeth of caprine from a mountain site (Llo, Pyrénées orientales, 1630 m) located between high plain (1300 m) and highland pasture (2200-2500 m) of Cerdanya. Results were compared with data from teeth of caprine from a coastal permanent site (Portal-Vielh, Hérault, 0 m asl) and confronted with a modern referential of Pyrenean transhumant and sedentary ewes. First, results permit us to distinguish a mountain signal though oxygen isotope values. Secondly, these results reveal a diversity of herding strategies used by herders in the mountain site. Moreover, co-variations of the $\delta^{18}O$ and $\delta^{13}C$ values of the domestic livestock from the mountain site are clearly different from the pattern usually observed in temperate Europe for this latitude. This specificity refers to a seasonal change in the carbon isotope signal recorded in the enamel. This could be caused by husbandry practices such as altitudinal seasonal movement and/or foddering. Finally, this paper provides a basis for apprehending the altitudinal mobility of the livestock during Bronze Age in European mountains though sequential stable carbon and oxygen isotopes analysis of teeth.

Study of the caprine diet through dental microwear: The Iron Age site of Turó Font de la Canya

Sergio Jiménez-Manchón,[1,2] Florent Rivals,[2,3] Sílvia Valenzuela-Lamas,[4,5] Isabel Cáceres,[1,2] Dani López[5] and Rafel Jornet[5]

Affiliations: (1)Universitat Rovira i Virgili; (2) IPHES, Institut Català de Paleoecologia Humana i Evolució Social; (3) ICREA, Spain; (4) Department of Archaeology, University of Sheffield; (5) GRACPE, University of Barcelona

Dental microwear is the study of microscopic tooth wear that show us which was the diet of animals during the last days before they died. Dental microwear, and diet, provide more information about economic and husbandry strategies and animal management. It is also a potential tool to know the development of seasonal pastoralism. This pilot study is focused on the study of twenty teeth of caprines (Ovis aries and Capra hircus) from the site of Turó Font de la Canya (Barcelona, Spain), dated from the 6th to 5th centuries BC. The results show a similarity in feeding patterns in the two species, however, a greater variability in Capra hircus was attested. We also identified a high quantity of pits in the teeth analysed. This can be a consequence of the presence of recent cut grass, the presence of grit, or also an over-exploitation of the pastures. Furthermore, the application of a new tool based on wild ungulates permitted the identification of two categories of accumulation of the remains: a short event for sheep (Ovis aries) –seasonal and quick slaughtering of sheep–, and a long event for goats (Capra hircus) –spread over the year. The interpretation of this difference will have to be developed in further investigations.

F2 Nomadic spatiality: the production of meaningful landscapes by mobile peoples

THURSDAY 25th AUGUST 8.30-12.40

VENUE: B115

Session organisers: *Harmen Huigens and Nathalie Brusgaard*

Affiliation: Leiden University

Session Abstract

In this session we explore the ways in which past nomadic peoples experienced and transformed the landscapes they moved through on their migrations and localized daily movements. For long, the relationship between nomads and the environment has been perceived from ecological and economic perspectives. From these perspectives landscapes are seen as more or less pristine natural environments nomads move through and exploit in order to sustain themselves. This view is in part the result of methodological issues in the field of nomadic archaeology, as for long it was thought that the material remains

of highly mobile communities were almost impossible to find. However, during the last decades many field projects have been successful in locating extensive landscapes of past nomadic societies, comprising campsites, funerary monuments, rock art, epigraphy, route markers, etc. We may now begin to explore new ways of studying and interpreting these remains. Rather than being 'wild' and natural, we may look at how nomadic landscapes were made culturally meaningful. For example, we may discuss the role of anticipated mobility and anticipated return in the spatial arrangements of nomadic landscapes. Also, we may explore how nomadic ideologies in relation to space are represented in rock art, or to what degree funerary monuments of nomads were important in the social arrangement of landscapes. Other topics that deal with the perception and transformation of nomadic landscapes are welcome. There are no restrictions on geographic regions or time-periods.

Paper Abstracts

From "tentscape" to landscape. Archaeological and cultural approaches in the identification of a meaningful nomadic landscape in the north-west of Qatar

Laura Morabito,[1] Jose C. Carvajal Lopez,[1] Gareth Rees,[1] Kirk Roberts,[1] Frank Stremke,[1] Robert Carter,[1] Richard Fletcher[1] and Faisal Abdullah al-Naimi[2]

Affiliations: (1) UCL Qatar; (2) Archaeology Department, Qatar Museums

Working on nomadic landscapes presents the researcher with complex methodological issues. The ephemeral nature of nomads' archaeological traces and the usual association of mobile groups with "marginal" and "unaltered" landscapes have often caused the de-culturalization of nomadic landscapes and their identification with pastoral taskscapes. The past of Qatar has been marked by nomadic pastoralism in a territory between the desert and the sea up to recent times. This makes it an ideal place to research the cultural dimension of nomadic landscapes in a long-term perspective. This contribution presents the case study of The Crowded Desert Project, an integrated programme of field survey and excavations in the north-western Qatari desert. The project started in winter 2015 and pursues a number of specific goals, such as mapping the presence of nomadic groups along time and integrating the available clusters of archaeological data in a culturally meaningful landscape in a diachronic perspective. A special focus is given to the social, economic, and cultural processes at work in the interplay between nomadic and urban life. The general methodology of the project is based on a multi-scale and multi-source approach, taking advantage of computer applications in archaeology. Archaeological surveys and excavations have been combined with geophysical surveys, aerial photography and satellite imagery analysis. The combination of these methods and their implementation on a specific GIS platform is turning out to be a powerful tool for integrating the previous knowledge of the area under study and for understanding the cultural dimension of its complex landscape.

Between Exploitation and Representation: Nomadic Spatiality in the Black Desert (Jordan) from ca. 200 BC to AD 800

Harmen Huigens

Affiliation: Faculty of Archaeology, Leiden University

During Classical Antiquity the Black Desert of Jordan was inhabited by pastoral nomadic

communities. These communities have been known mostly from historical sources, while their material remains and the landscapes these nomads inhabited have received hardly any attention. Until recently, very little was known about their natural and anthropogenic living space, how they used it, perceived it, and shaped it into economically, socially, and ideologically meaningful landscapes. For long, the explanatory framework of cultural ecology has been used by scholars studying these pastoral nomads. While much emphasis has been placed on cultural adaptations to environmental conditions, the degree to which the environment itself was transformed and possible motivations for such transformations have hardly been explored. In this paper, a study is presented on nomadic landscapes of the Jebel Qurma region, situated in the Black Desert. Archaeological surveys and excavations have thus far revealed a landscape that was extremely rich in all kinds of stone-built features left behind by pastoral nomads between ca. 200 BC and AD 800. These features form highly distinct and permanent places in the landscape that, at the same time, were erected and perceived by communities usually regarded as highly mobile. In this paper functional and symbolic aspects of these places will be explored as well as patterns of movement and other activities within the landscape. Interactions between place and mobility will thus be studied in order to better understand land use and spatial productions of pastoral nomads in the Black Desert.

Mountain land-use in Europe. Transhumance under the gaze of archaeology

Guermeur Nominoë

Affiliation: Laboratoire LAHM, Université Rennes 2

The municipality of Murol is located in basse-Auvergne, in the department of Puy-de-Dôme (France), in southwest of Clermont-Ferrand. This paper concerns a volcanic, mid-altitude, mountain zone to the west of the municipality of Saint Nectaire, and on the banks of Lake Chambon. Since at least the Neolithic until the present, the mountain was ceaselessly occupied, or at least crossed, fitted out and exploited. The latest data recently collected contradict, either totally or partially a large part of the previous publications concerning this area, and fresh research is needed on the numerous remains such as roads and temporary settlements showing craft and funeral activities, dating from Protohistory onwards. For the medieval period, the 'tras' (medieval shepherd settlements), provide an opportunity to to fill some of these gaps in knowledge regarding the modalities of occupation of the Auvergne mountains. The project outlined in this paper attempts to redraw the history of the occupation grounds in these mountains and put agropastoral practices into diachronic perspective. The focus is on the archaeological sources, especially surveys of these unique temporary settlements, but historic, ethnographical and environmental sources are also reviewed so as to better define the history of the mountains of the massif du Sancy (63 - Puy-de-Dôme) and to determine exactly the modalities that allowed various populations to stay there, in either sustainable or temporary ways.

Nomadic Hunter-gatherers and the formation of cultural landscapes in Amazonia

Marcos Pereira Magalhães

Affiliations: Museu Paraense Emilio Goeldi

Amazon archaeology has gone through profound conceptual and methodological transformations over the past two decades. This has changed both the scientific and popular images of this vast region. Today we know that the Amazon is not a "false paradise" whose

environment limited the development of large and complex indigenous societies. With many examples including the mounds and raised fields of the seasonally flooded savannas, the Amazonian "Stonehenge", the geoglyphs, and fertile *terra preta* soils, recent research is revealing a much more complex history of the region than was traditionally thought. In spite of the advances in our knowledge of the past in the South American lowlands, the debate continues over millennial-scale human impacts on landscapes and biodiversity. Some scientists still view the Amazon ecosystem as pristine with relatively insignificant impacts on ecological processes by indigenous societies. An historical ecology perspective, on the other hand, sees it as a vast anthropic landscape that has been modified over time, beginning with the first hunter-gatherers and continuing beyond the large farming societies present at the time of European colonization. The transformations resulted in a restructuring of biodiversity and the creation of domesticated landscapes. Recent research in the Serra dos Carajás in south-eastern Amazonia indicates a process of landscape domestication that began by the terminal Pleistocene with nomadic hunter-gatherer populations. Botanical inventories along with charred vegetable remains recovered from hearths and diverse stone tools indicate environmental management and continuity in the use of culturally selected plants throughout the Holocene.

A hunters landscape - Maglemosian hunting camps from the southeast of Fyn, Denmark

Anne Garhøj Rosenberg

Affiliation: The Archipelago Museum of Southern Denmark

With the onset of the warm pre-Boreal period at around 9000 BC the Danish landscape changed from tundra into a forested landscape, and with it a changed landscape for the early hunter-gathers. The new landscape, with limited visual capacities, must have changed their perception of the hunting grounds. The traditional sites from this period are situated close to water, primarily lakes or rivers, affording the hunter-gathers to use resources close by. But the hunters made use of the hinterland as well. These sites are relatively difficult to locate, but on the southeast of Funen seven sites have been located. Until recently these where only known from surface finds, but in the last couple of years excavations have been undertaken in this area due to a widening of a gravel pit. These excavations have changed our perception of the hunting camps; earlier these were thought to be relatively small and used only briefly. The recent finds shows us that the camps were much larger and used for long periods. The inventory is also very uniform, consisting almost entirely of microliths and the waste connected to their production. The questions are: Were all the hunting camps in reality quite large and used for a long time? Or do we have a combination of bigger and smaller camps? How did these camps relate to the new forested landscape? And, what is the relationship between location of the camps and the place of the hunt? This paper attempts to offer some answers to these.

Permanent pictures and moving peoples. Rock art in the Black Desert, Jordan

Nathalie Brusgaard

Affiliation: Leiden University

In the Black Desert of Jordan hundreds of archaeological sites and tens of thousands of textual and pictorial engravings can be found, left behind by nomadic groups approximately 2000 years ago. The inscriptions have fascinated epigraphists for over a century, but the

rock art and archaeology have received negligible attention. As a result, little known is about the images, their meaning, or the people who made them. Some epigraphists have proposed that the inscriptions and rock art are a form of graffiti, carved to pass the time during the long, idle hours of nomadic life. However, others have pointed out the spatial and possible ritual connection between the engravings and stone cairns, constructed in long lines on top of the basalt hills. Until now, neither suppositions could be challenged due to inadequate datasets. Recognising that the relationship between the landscape and these ancient nomad remains may be key to understanding the past societies, recent fieldwork in the Jebel Qurma area of the Jordanian Black Desert has systematically documented thousands of carvings, hundreds of archaeological features, and their context. As such, it is now for the first time possible to analyse the engravings in their micro and macro landscape contexts. This paper presents the preliminary results of the spatial analysis of the rock art and discusses what the spatial distribution of the carvings can tell us about the ancient nomadic societies and their use and transformation of the landscape.

Drawing nomadic lines? Exploring Neolithic landscapes of the sacred in montane Cumbria, UK

Steve Dickinson

Affiliations: The Prehistoric Society

In the Cumbrian mountains in the UK, it is currently widely acknowledged that Neolithic occupation was transient. Permanent settlement, and widespread cultivation is not considered to begin until the Bronze Age, with a multitude of remains from this period still extant on the lower slopes of the hills. Thus, the large-scale construction of stone circles in the region, and the working of thousands of stone axe-blades from its montane core, was supported by highly mobile populations. New survey work in the heart of this area is beginning to reveal rock art and monumental evidence for complex Neolithic responses, both to the extremely dramatic landscape; and to what it contained. As some archaeologists now argue, making distinctions for prehistory between 'nature' and 'culture' in such extreme landscapes does not aid a more nuanced understanding of how people in the past moved through them, how they responded to the other animals that occupied them, and how they left their ideas as part of these places. This paper explores new possibilities for articulating how Neolithic nomads explored the land, and left their beliefs in stone.

F3 Mobility, stability and human-landscape interaction in the archaeology of Asia

THURSDAY 25th AUGUST 8.30-12.40

VENUE: A114

Session organisers: *Gideon Shelach-Lavi,[1] Ido Watchtel[2] and Joshua Wright[3]*

Affiliations: (1) Hebrew University; (2) The Hebrew University of Jerusalem; (3) Aberdeen University

Session Abstract

The proposed panel brings together archaeological studies from different parts of the Asian continent, from Israel in the West, through Mongolia and Central Asia, to China in the East. The case studies all adopt a regional landscape approach to address the causes and consequences of changing human patterns of mobility and sedentism. We are interested in the ways by which human interaction with the regional environment shaped patterns of group mobility (such as in hunter-gatherers and pastoral societies) and movements of groups and individuals through the landscape (on roads and routes). We are also interested in how human modification of the landscape (in, for example, the construction of terraces, water-related installations, and roads) informed and shaped patterns of human fixation to location or to the region. The conveners of the panel are especially interested in novel methodological approaches that enable us to collect archaeological data relevant to the analysis of patterns of mobility and sedentism in a varied and challenging setting such as deserts, mountainous and forested areas. We are also interested in innovative ways of presenting our data and in novel analytical and theoretical approaches to address the observed patterns.

Paper Abstracts

Dornod Mongol Survey: Local practices, differentiated settings, and large regional survey

Joshua Wright,[1] William Honeychurch[2] and Chunag Amartuvshin[3]

Affiliations: (1) Aberdeen University; (2) Yale University; (3) Archaeology Section of the Mongolian Institute of History

The Dornod Mongol Survey is the largest research oriented archaeological survey in Northeast Asia. We are studying the emergence of states in the Mongolian steppe from their earliest beginnings in local political landscapes to their emergence as superpowers on the historical stage. Our survey aims to recover variations in local practices in different settings over a wide area in order to approach questions of regional variability and interaction. Central to our approaches are the ways in which mobility shapes and is shaped by landscape conditions and political forces. A wide range of possible past mobilities serve to sort and filter the archaeological record in different areas of the study region and shape the ways in which we can approach that record. This project is the most recent of more than 15 years of regional surveys in different regions of Mongolia. Pioneered by international scholars, further surveys are now rigorously carried forward by Mongolian archaeologists as well. We are developing methodologies that allow us to effectively study large regions of relatively homogenous desert-steppe and to systematically survey beyond 'islands' of ecologically and archaeologically rich terrain out into the previously unexamined grasslands and deserts between them. One such area is the southeastern Gobi region, a critical area for the long term history of Northeast Asia is positioned between the relatively densely inhabited core areas of the Khangai highlands in central Mongolia and the river basins beyond the Khingan mountains in China. Initial surveys have shown that far from being an unpeopled wasteland, this is a region highly sensitive to the dynamics of forces acting between these two relatively densely populated regions. We see this in local variations between regions and discontinuities between archaeological landscapes of different periods, a contrast to the Central Mongolian sequence.

A pastoral landscape for millennia: Investigating pastoral mobility in northeastern Jordan using quantitative spatial analyses

Julia Meister, Daniel Knitter, Jan Krause and Brigitta Schütt

Affiliations: Institute of Geographical Sciences, Physical Geography, Freie Universität Berlin

Northeastern Jordan is one of the few remaining regions in the Middle East where nomadism is still practiced. In this desert region, with low rainfall rates and great seasonal and annual variations, vegetation and water availability is heterogeneous, necessitating pastoral mobility. During winter, herders and their livestock move into the desert; during summer they move to the desert margins to places with permanent water supply. This system of pastoral mobility was introduced by the Late Neolithic. Within the basaltic region of the north-eastern panhandle of Jordan there is a dense distribution of pastoral remains. They were established due to the herders' practice of building animal enclosures using basalt boulders for corralling their flocks during the night. The resulting features provide an excellent and unique opportunity to investigate a pastoral landscape that has been frequently used during the last seven to eight millennia. In this study, we systematically recorded 9118 corrals based on satellite images. In order to investigate potential migration or communication routes as well as grazing lands of former pastoralists, we examine their first- and second-order characteristics using distance and density based approaches of point pattern analyses. This integrates remote sensing, and geomorphometric as well as graph based approaches. Overall, the results demonstrate that the observed distribution of corrals is influenced by natural characteristics as well as cultural practices.

Metallurgy and mobility: How nomads shaped trade and trade shaped the nomads

Kyle A. Knabb and Steven A. Rosen

Affiliations: Archaeology Division, Ben Gurion University

The Chalcolithic period of southern Israel is a milestone of human history, marked especially by the development of copper metallurgy. This new technological revolution, combined with the emergence of pastoral nomadism as a subsistence strategy, led to a matrix of opportunities for novel social interactions and human-environmental dynamics throughout the Protohistorical periods. The Timnian culture, a nomadic tribal society inhabiting the desert zones south of southern Israel, Jordan, and the Sinai Peninsula, became an integral part of the regional economic system as intermediaries between the sedentary Ghassulian-Beersheva culture and the raw materials they consumed. This is a particularly important relationship because the nearest copper ore source is located 90 km southeast of Beersheva, in Wadi Faynan, Jordan. Excavations at the site of Nahal Tsafit, a pastoral encampment located in the northern Negev desert and along the route from Faynan to Beersheva, provides crucial evidence for the trade connections between the Timnian and Beersheva cultures, and offers a glimpse of the changing patterns of mobility during the Chalcolithic. Based on the results of these excavations and petrographic analysis of ceramics collected from the site, we suggest that these new economic relationships informed patterns of territorial attachment to the landscape and shaped regional mobility patterns. In turn, this led to changes to human-environmental interactions in ways that have hitherto been only cursorily addressed.

Pastoral nomads' use of the semi-arid Syrian landscape c. 1810-1760 BCE

Kristina Josephson Hesse

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Hundreds of Akkadian clay tablets, derived from archaeological excavations at the palace of Mari by the Euphrates, clarify the strong integration between mobile tribes and city-states in Syria-Mesopotamia during the Old Babylonian period (c. 1810-1760 BCE). My project aims to illuminate the social and economic dynamics between pastoral nomads and settled people in this period, with the focus on the former and their ways of interacting with the surrounding landscape. The paper deals with the first step of methodological studies in this project, which is to map known sites into GIS together with trade routes, landscape features, suggested tribal territories, natural resources, and some remains (e.g. systems of cairns, corrals, kites) registered in the Syria-Norwegian Palmyrena project. The structured location of several hundred Bronze Age cairns, distributed on strategic hilltops and wadi outlets, in the mountain range outside the ancient trading centre of Palmyra in Syria, indicates that in addition to having been burial chambers these cairns were secondarily used as landmarks of territories and routes for trade and migration of pastoralists with their flocks. The landscape image will constitute the base for my further studies of networks and descriptive connections of relationships between people and tribes with places, trade routes, migration patterns etc.

Bronze and Iron Ages settlement patterns in the mountainous upper Galilee, Israel

Ido Wachtel

Affiliation: The Hebrew University of Jerusalem

The upper Galilee, located in northern Israel, was the hinterland of large Canaanite centres such as Hazor and Kabri, and was later on part of the Israelite kingdom. The cultural and social processes are reflected in the settlement patterns, and careful spatial examination can improve our understanding of trajectories of settlement history, human ecology and social change. This paper reports on the results of a new regional survey, which was designed as the first step in accumulating new pertinent data and addresses the geographic and ecological context of the socio-economic processes of this region. The purpose of this study is to re-evaluate the settlement patterns of the Bronze and Iron Ages in the Upper Galilee of Israel, using a new and updated survey methodology and spatial analysis. The aim of this method is to achieve better understanding of the size of each site and intensity of occupation during different periods in order to reconstruct the local trajectories and settlement dynamics during the 3rd and 2nd millennium BCE. Settlement location, size and intensity, together with accurate chronology are the basic variables needed in order to study and analyse changes in settlement patterns, ancient demography, and human interaction with the natural landscape and resources through time.

The evolution of early settlements in the Maha-Oya and Mahaweli River Valleys of Sri Lanka: A study of ecological zones and human adaptation to resource use and subsistence pattern

Chulani Rambukwella

Affiliation: Department of Archaeology, University of Peradeniya

The Maha-oya and Mahaweli rivers originate from the central montane region in Sri Lanka and flow to the western and eastern coasts, respectively, passing through diverse ecological zones. The central montane region, which lies between 1000' – 8000' above mean sea level, is considered to be an important historical and resource zone for natural products such as minerals, spices and other flora and fauna. It is an area yet to receive proper attention because the history of Sri Lanka is mainly studied in relation to the agrarian plains and the central montane region was given less priority. Our investigations here indicate that following the Mesolithic period, the Early Iron Age Culture (9th BC -3rd AD) prevailed in the upper reaches of the river systems that traverse the lower and middle montane region (1000' - 3000'). In the area there is seemingly a dearth of evidence between the 4th c. AD and the 8th c. AD. Evidence of human activities apparently intensifies again in the period after the 8th century AD. This paper presents the results of this new work and looks at the spatial distribution patterns of the archaeological sites to investigate what were the primary reasons behind the evolution of settlements in these regions in different time periods.

Multi-scalar communities in Bronze Age northern Asia: Local politics and transregional landscapes

James T. Williams

Affiliations: Renmin University of China

This paper uses the data collected from regional survey in Liaoning, China as a departure point to explore the concept of community affiliation. The paper will discuss the spatial characteristics of different communities during the Bronze Age. By unweaving the kin-defined, political, ideational, economic and religious community affiliations we can gain greater understanding of the intersection and congruence among these different types of communities, which societies may or may not be simultaneously affiliated. The material characteristics of these different types of communities can be understood spatially, but due to their nature it is essential that investigation takes place at a number of scales. The communities discussed in this paper range spatially from hundreds of thousands of square kilometres to less than one square kilometre. Since the landscapes differ so vastly in scale the approaches to understanding them must also differ.

Desert and sown relations in the Southern Levant: Comparing local deserts and the wide arid belt

Uri Davidovich

Affiliation: Tel Aviv University

One of the main prisms through which desert regions are studied, in archaeological as well as anthropological and historical research, is the relationship between autochthonous societies evolved in deserts, mostly pastoral nomads in various levels of mobility, and neighbouring sedentary agricultural societies. The interaction between the desert and the sown in the Near East is typically described either as a constant struggle, in which sedentists are continuously threatened by invasion of nomadic people into the settled land, which, if successful, carries destructive 'desertification' processes; or as a variation of core-periphery relations where pastoral nomads are described as dependent on agricultural and material products of the sedentary core. Archaeological research of the wide desert region, part of the northern hemisphere arid belt, located east and south of the Levant tended in recent decades to embrace the second paradigm, and interpreted the archaeological record relating to ancient desert societies accordingly. A somewhat neglected aspect of desert and

sown relations in the Levant, though, is the role played by local deserts located in proximity to the settled regions. An examination of human activity patterns in the Judean Desert, a small local desert east of the Judean Highlands, indicates direct exploitation of desert resources by sedentary societies rather than interaction with local nomadic populations. The observed patterns suggest that local deserts were part of what was perceived as the natural habitat of the sedentists living nearby, in contrast with the perception of the wider desert regions farther afield. In tandem, activity of mobile groups in the local deserts was limited, and took place primarily during periods of settlement decline.

From mobility to sedentism and back: The settlement patterns and human landscape in the Fuxin region, northeast China

Gideon Shelach-Lavi

Affiliation: Hebrew University

Since 2012 a joint Israeli-Chinese team have conducted a regional archaeological project in the Fuxin region, Liaoning province. The focus of our research is the transition to agriculture and sedentary ways of life. However, through our systematic regional survey and targeted excavations we were able to reconstruct the long-term trajectory that continued beyond the transition to agriculture in this region. The paper discusses methodological and analytic innovations that enabled us to detect processes of increased and decreased mobility of the regional population. It will also address our understanding of these processes, their causes and outcome, in the Fuxin region and, more generally, in Northeast China.

F4 Landscapes of Mobility: The Use of Computational Approaches in Modelling Ancient Patterns of Connectivity

TUESDAY 23rd AUGUST 11.10-16.00

VENUE: B115

Session organisers: *Francesca Chelazzi[1] and Simone Bonzano[2]*

Affiliations: (1) University of Glasgow; (2) Freie Universität Berlin

Session Abstract

Mobility concerns the logic and dynamics of movement of people, objects and ideas from place to place, on a daily basis and/or for extraordinary occasions, at local to global scales. The understanding of different dynamics of mobility, from hunter-gatherer communities to agricultural and industrial societies, largely depends on the ontological position of the observer and his/her research methodology. Especially in the last two decades, computer-aided landscape modelling has been improved with analytical approaches borrowed from other disciplines related to human connectivity (sociology, ecology, genetics, economics). This recalls the professional imperative to expand our research and to consider the occurrence of

diversified, overlapping and sometimes conflicting economies of mobility. That goes beyond the traditional dichotomies (daily/seasonal, sedentary/nomadic, institutionally managed/autonomous, local/regional) and new dynamics can be explored through the integration of computational analysis. The existence of woodlands or unfamiliar territories, for example, may introduce the assessment of the 'landscapes of risky mobility'; similarly remote and border regions may represent an interesting scenario for the 'landscapes of cultural interactions'. This session seeks to explore the different hermeneutic approaches underlying the investigation of movement and to provide an occasion of collective reflection on how we have come to shape our computer-aided analyses and how we can harmonize and contextualize quantitative approaches with their social and culture-based interpretations. We are looking for submissions addressing a broad range of topics and methodologies, at different spatial and temporal scales of analysis such as meshworks of identities, goods, ideas and knowledge as well as tracking of cultural interactions.

Paper Abstracts

Soil residue mapping at experimental archaeological sites: A fresh perspective on evidence of human mobility

Elspeth St. John-Brooks

Affiliations: University of Reading

In this paper, X-ray Florescence and magnetic susceptibility used to analyse contexts from 'Open Air Museums', including a longhouse floor at the Iron Age Village at Sagnlandet at Lejre, Denmark and a roundhouse floor at the Peat Moors Centre in Somerset, UK are presented. The floors of each building were systematically sampled and statistically compared to offsite samples. Detailed pattern analysis using ArcGIS provided 'hotspot' maps of elements and principle component analysis characterised the space. Emphasis was placed on the distinction between geochemical signatures of an activity, or how humans influenced movement of residues in and around buildings. In addition, insight into the role and effect of site lithology and activity intensity on elemental deposits was considered. These computer-based investigations of soil residue characteristics provided evidence of dynamic human movement. Trample zones and activity areas were identified using an adjustable methodological framework. The evidence provides fresh insight into human mobility at a local scale across multiple contexts. The future of this research lies with increasing the scale, from local to regional, using computer-based analysis and complementary scientific techniques. Archaeological contexts under investigation include the Neolithic building and routeways associated with Marden Henge, Wiltshire where the Reading University Field School takes place in partnership with English Heritage. The aim is to move away from traditional perceptions of archaeology as isolated events to the critical scientific investigation of connections within the landscape, with a focus on dynamic movement.

The logics of least cost

Thomas Meier

Affiliations: Institute for Pre- and Protohistory and Near Eastern Archaeology, University of Heidelberg

Least cost paths are popular computational approaches in modelling movement. This analysis offers hypotheses where ancient tracks and routes might have run, but frequently the results look so convincing that they are taken for facts of a past reality. Such approaches

tend to forget that "least cost" is a specific cultural logic – no matter whether it regards energy, time or money. In any case it is the logic of economic primacy and optimisation, which turns any movement into transport and does not know wayfaring (after Ingold). Altogether it is the logic of modern capitalism. Case studies, however, frequently demonstrate that routes did not follow least cost paths but other culture-specific rationales. A cross-cultural case study on Alpine traffic routes show that Roman roads were usually built according to the least cost-paradigm, as were routes from early modern times onwards. But all other times preferred very alternative routes at different heights and routeing (e.g. Mesolithic, late Neolithic, early and high Middle Ages). Nevertheless, least cost-analysis is a valuable tool – as long as we are aware that the results mirror a specific mentality. If such results are not meeting the archaeological landscape this does not necessarily imply that the analysis is wrong, but it may be a clue to a past mentality which is different from ours. Probably, least cost-analysis more frequently opens pathways into the ancient mind than it proves ancient paths on the ground.

The long-distance transport of Roman and early-medieval import goods: using a multi-proxy approach to model changing patterns of connectivity in the present-day Netherlands

Rowin J. van Lanen[1,2]

Affiliations: (1) Utrecht University, Faculty of Geosciences; (2) Cultural Heritage Agency of the Netherlands

To what extent long-distance transport in north-western Europe changed after the Roman period is generally unknown. Few historical sources are available and existing archaeological records are unclear and sometimes conflicting. Traditionally, research on the long-distance exchange of goods mostly has focussed on the spatial analyses of luxurious goods such as jewellery, weapons and religious artefacts. Relatively little attention has been paid to the spatial modelling of common exchange networks and transport routes. In this study we analysed the spatial distribution of imported timber to model long-distance transport of oak (a common good) to Roman and early-medieval Netherlands. By combining the provenance of exogenous timbers with data on modelled Roman and early-medieval route networks in GIS, we were able to reconstruct: (a) Roman and early-medieval trade networks in structural timbers; (b) changing transport routes in structural timbers; and, (c) model spatially shifting frequent-travel zones (i.e. sections of the network frequently used in a specific period) in the research area. To establish the significance of these patterns we compared the findings with import patterns of other commodities for daily use: pottery and stone household goods.

From oar to sail: The evolution of Bronze Age Mediterranean networks

Carl Knappett,[1] Ray Rivers[2] and Tim Evans[2]

Affiliations: (1) Art Department, University of Toronto; (2) Physics Department, Imperial College London

The early habitation of the Mediterranean was achieved with simple marine technology. However, the difficulty of sea travel and the low levels of long-distance interaction have meant that such early links do not constitute substantive maritime networks. In this paper we indicate ways in which, from such small beginnings, Mediterranean sea-based exchange has evolved through the Bronze Age to large-scale trade networks. In the evolution of maritime networks there is a symbiosis between technological improvements and the

growth of exchange that exploits this ability to travel longer distances. In this paper we explore the relationship between technology and network reach in the Mediterranean Bronze Age; the Early Bronze Age Cyclades, the Middle Bronze Age S. Aegean and the Late Bronze Age E. Mediterranean. By the standards of contemporary transport data, say, our Bronze Age data is wholly impoverished. As a result we fall back on modelling. We have a large range of models to choose from. Largely, they assume that the networks that arose were, in some sense 'good', otherwise they would have failed. Different assumptions about what it is to be 'good' are realised through different 'agency' underlying the network formation. With transportation, migration and state formation as goals we adapt freely from the successful models that address these issues in contemporary society; Bayesian 'indifference' models, intervening opportunity models, cost-benefit models. We shall see how the evolving marine technologies of these periods – particularly the transition from oar to sail – lend themselves to different social agency for network formation.

Mobility, risk and ritual in the Egyptian desert: Integrating GIS and other data to reveal the impact of dangerous terrain upon routes to ancient Egyptian mines and quarries

Hannah Pethen

Affiliations: Hatnub Epigraphic Project

This paper will show how a hermeneutic approach that integrated quantitative Geographic Information System (GIS) analysis of otherwise poorly understood cairns, with archaeological and epigraphic data, made it possible to investigate movement around ancient sites in the Egyptian desert, and the impact of remoteness and risk upon patterns of access. GIS viewshed analysis was treated as a tool to generate new data concerning the visibility of cairns in three ancient Egyptian mining or quarrying regions (Stelae Ridge, Serabit el-Khadim, and Hatnub). By interpreting that GIS data in the light of archaeological and epigraphic evidence, and with consideration for the ancient Egyptian cultural context, it was possible to move beyond limited past interpretations of the cairns as simple structures of unknown or 'ritual' purposes, and generate a more nuanced interpretation of their role as ritualised landmarks along access routes into the sites. Comparison of the visibility of the cairns showed that different choices had been made about where the cairns should be constructed at the different sites, revealing decisions about how visible and accessible each site should be, and from where. Consideration of these differences in the light of the sites' locations, from the edge of the Nile valley to the distant borders of Egypt, revealed how riskier landscapes, further from the safety of the Nile valley, exhibited more restricted access.

Mobility in landscapes of death: Exploring the value of mobility and visibility in the formation of Mycenaean death-scapes

Kalliopi Efkleidou

Affiliation: Aristotle University of Thessaloniki

Modelling movement and visibility is a recurring theme in GIS-based archaeological analysis since it is considered to provide an experiential approach to understanding past landscapes. Building on previous work, it is argued that modelling movement and visibility can help Aegean archaeologists understand from an alternative perspective the Mycenaean communities' practice of continuously increasing the distance between habitation and burial landscapes. By refining movement models in such ways as to take account of different cost surfaces (time, slope according to different modes of moving, cumulative

costs) possible least cost paths leading from settlements' boundaries to associated areas of burial practices can be produced. By refining visibility analysis, in order to include Higuchi viewsheds from the same settlement boundaries or from important localities, one can approach the qualitative attributes of viewing the crossing from the living-scape into the death-scape. The combination of the two analytical models has shown that the choice of the burial sites' location in Mycenaean times might have been partly dictated by a wish to visually control not the burial sites themselves, but the act of crossing into the death-scape. Through this approach, it is further argued that during the Mycenaean period the ritual of the funerary procession as spectacle became an increasingly important means for the Mycenaeans to display and negotiate their personal and group social, political and economic identities.

Visual journey along routes of Pomerania

Lukasz Banaszek[1,2]

Affiliations: (1) Institute of Prehistory, Adam Mickiewicz University in Poznań; (2) Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology, Vienna

A potential of modelling visibility and movement was recognized at the start of applications of GIS for archaeological purposes. Results of such a joint analysis show a complex phenomenon of perception in a changing landscape. Although both computations face significant limitations, the development of manifold processing techniques and prospection methods have already enriched archaeological interpretation in that field. Definitely airborne laser scanning has had a positive impact on modelling of both aspects mentioned above. Apart from a detection of new archaeological features, and rethinking of previous interpretation of known sites, ALS data is also used in computation of visibility and movement. When high resolution digital elevation models are being used, detailed results are obtained. Therefore, presumed/expected ancient routes can be modelled with a relatively high level of certainty. However, remains of ancient road system can be identified by means of ALS, too. The aim of this paper is to present an integrated approach in modelling visibility and movement. A number of case studies from Pomerania (North Poland) will be used to show that whilst travelling across the landscape particular features have been deliberately located in a view, whilst other remained hidden.

Sense, movement, and pilgrimage in rural Arkadia, Greece

Matthew F. Pihokker

Affiliation: Joukowsky Institute for Archaeology and the Ancient World, Brown University

The vicinity of Mt. Lykaion in southwestern Arkadia, the mountainous central region of the Peloponnese, Greece, is characterized by an exceptional number of rural sanctuaries that are often situated in remote and inhospitable locations. Despite the apparent inaccessibility of these cult places, pottery found in ritual contexts at many of these sites indicates that the region was a centre of significant cultic importance from at least the Late Helladic through to the Roman period, with a substantial and area-wide building program taking place during the late Archaic and early Classical periods. Moreover, archaeological and literary evidence alike indicate the presence of a complex network of roadways and trails linking the rural sanctuaries near Mt. Lykaion not only with each other, but further afield, with large synoicised urban centres throughout Arkadia. Broadly, this project aims to explore the application of Geographic Information Systems (GIS) in

analysing the diachronic interconnectivity between sites around Mt. Lykaion, providing a basis upon which to explore further sensory components of ancient Greek pilgrimage within a mountainous landscape. The natural world can be seen as an essential guiding element within the scheme of religious journey, both restricting and inviting movement, as well as negotiating interactions between pilgrims and their environment. Together with first-hand accounts of periegesis in the region (ancient journey), especially the 2nd century CE traveller Pausanias, I argue that the assemblage of rural sanctuaries was a vibrant and popular destination for pilgrimage throughout the Peloponnese, rather than a sparsely visited and isolated location.

Controlling connectivity on the frontier: Least Cost Analysis of the Roman roads of northern Britain

Graeme Erskine

Affiliations: University of Edinburgh

The Roman roads of northern Britain are vital to understanding the sporadic occupation of the area from the 1st – 3rd Centuries AD. Primarily for military use, the road network connected forts, fortlets and camps, facilitating the movement of troops throughout the region. Socially diverse non-military groups, both local inhabitants and those arriving with the army, would have also had access to the roads. Despite these varied users, however, military concerns would have been foremost when deciding road location; but what specific factors governed the routes the roads took? Least Cost Analysis (LCA) is a versatile tool for considering such questions. Conventionally, in archaeological investigations, such analysis is limited to topographical assessments, finding 'economically sensible' routes which adhere to less steep slopes. However, matters of connectivity, visibility and wider landscape features may all have had implications for the routes followed. By running multiple LCA iterations with varying inputs, it is possible to examine how far other factors may have influenced road location. More than a passive means of travelling from place to place, the roads were a crucial component of imperial control, dominating the landscape and subverting patterns of movement. Active choices were made to connect, or not to connect, specific sites; military needs therefore dictated the everyday movements of non-military groups. The significant infrastructural investment of the roads themselves, their connecting sites and their regular use by the military were a reminder of Roman dominance over other groups through everyday patterns of movement.

Experimenting with different network construction techniques to model the distribution of rural surplus production in the Dutch limes zone

Mark Groenhuijzen and Philip Verhagen

Affiliations: CLUE+ Research Institute for Culture, History and Heritage, Vrije Universiteit Amsterdam

The Roman military conquest and occupation of the Lower Rhine region between 12BC and 270AD resulted in a series of fortifications (the Dutch limes). The garrisons of these fortifications required fuel, wood and food. Recent research in the region has indicated that a shift from subsistence farming to surplus production of food was possible for the local population. Yet it remains largely unknown how this surplus could have been moved from the rural settlements to the military sites. Due to the limited transport-related

archaeological evidence in the region, we applied least-cost path modelling and network analysis to construct networks of local transport, and to investigate the role of individual sites within the network. However, using this approach generated a methodological issue: how do we know which connections to include or exclude in our network? In this paper we aim to tackle this question by experimenting with different methods to construct a local transport network from our least-cost paths, including our original model with an arbitrary cut-off point, and other techniques such as geographical distance, proximal point analysis, Delaunay triangulation and networks generated on a geographic criterion. We compare them in a model of the efficiency of distribution of rural surplus production from producers to consumers in a case study of the Dutch part of the Roman limes.

The farm-as-network: chasing the tendrils of agency across Iceland's late Medieval landscape

Gísli Pálsson[1,2]

Affiliations: (1) Umea University; (2) University of Iceland

It is well understood that aspects of daily life extend well beyond the site, and that understanding land use is in important ways a call for the understanding of landscape. The implications of that statement are less obvious, however. Forging links between places to any degree of certainty is difficult archaeologically, not to mention relating networks of connectivity back to the lived experience of the past. This paper reflects on some of these issues by drawing on the author's research into patterns of land use in 17th-18th century Iceland based on both archaeological and documentary evidence. Specifically, by mapping the relationships of reciprocal and common resource access described in documentary sources, as well as the propertied relationships between farms across the island, this paper considers the implications of conceptualizing farms as an assemblage of interrelated networks comprising a wide variety of places across the landscape. The paper follows on to assess the value of high-precision, but short-term data for a general modelling of land use in Viking Age and Medieval Iceland.

G. Landscape Archaeology in Practice

G1 Historic Landscape Photography

WEDNESDAY 24th AUGUST 13.30-14.50

VENUE: A144

Session organisers: *Nik Petek*

Affiliation: Department of Archaeology and Ancient History, Uppsala University

Session abstract:

Historic photos, stored in various archives, libraries, as well as private and public collections, have over the decades proven very useful in studying landscapes from an archaeological and environmental perspective. Aerial photos from and since WW1 have been used to identify archaeological sites and situate occupations and monuments within archaeological landscapes; they have been used to relocate "lost" cities in Mesoamerica; and they have been used to study environmental change, degradation, and recuperation over several decades while discussing the human role in shaping the landscape. Similarly, photos of explorers, colonial officials, and photography enthusiasts can be used to contrast with early descriptions of environments, and evaluate how past portrayals compare to today's state of the landscape through repeat photography and other methods. Historic photos are proving valuable and popular for identifying and analysing past environmental conditions and changes, be they due to climate change, industry, population or resource pressure. They can even be used to study population movements and settlement concentrations of transhumant groups. However, historic photos cannot be used uncritically, specifically when georeferencing and georectifying aerial photos. This session will discuss and explore how historic photos can be used to study landscapes and landscape change in archaeology; how to properly use this research material; and the available methodology currently engaging with historic photographs.

Paper Abstracts

Reconstructing the lost prehistoric and classical landscapes of western Thessaly, Central Greece, though combined historic aerial photography, Remote Sensing, GIS and archaeological survey

H.A. Orengo,[1] A. Krahtopoulou,[2] A. Dimoula,[3] A. Garcia-Molsosa,[4] K. Palaiochoritis,[2] Y. Papadias,[3] N. Saridaki[3] and E. Vliora[3]

Affiliations: (1) McDonald Institute for Archaeological Research, University of Cambridge; (2) Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Karditsa; (3) Aristotle University of Thessaloniki; (4) Catalan Institute of Classical Archaeology

Early 20th century pioneering explorations, followed by later important work by Greek and foreign scholars, brought Thessaly to the fore of Neolithic research in Greece and Europe. Over the last three decades the key role of Thessaly was challenged by the proliferation of research elsewhere in the country, especially in the north. For various historical reasons, western Thessaly remained in the periphery of theoretical and methodological developments and debates that shape contemporary prehistoric research in Greece. This rather tentative picture of the cultural record of the area was further obscured by extensive land reform and land reclamation accompanied by the implementation of irrigated agriculture and rapid urbanisation during the early 1970s. This resulted in the systematic flattening of the landscape and, therefore, of mounded habitation sites and various monuments, especially funerary tombs of all periods. This paper will present the results of a purposely designed workflow based on the use of historic aerial photography for the reconstruction of the pre-1970s cultural landscape. Our analysis allowed the detection and mapping of ca. 900 archaeological sites, funerary tombs, other types of constructed features and a variety of key off-site features such as ancient road networks and ancient field systems. Extensive and intensive surface survey employed a novel cloud-based finds management system combined with low-altitude aerial photography. The survey results provided a ca. 90% site detection rate for the aerial photography-based site detection methodology and offered new unique insights into the nature of the archaeological sites and off-site landscape features detected. Moreover, systematic pottery analysis resulted in the chronological adscription of sites. The combined results of all techniques employed have revolutionised the potential for contextualising hypotheses concerning occupation patterns, settlement dynamics, site hierarchy, as well as communication and mobility potential of the prehistoric communities of Western Thessaly.

Interactive map of Novgorod the Great's cultural landscape in the XIV-XV centuries

Yulia Petrova and Tatiana Laska

Affiliation: Saint-Petersburg State University

Centuries-long life of art and architectural monuments is inevitably followed by destruction and changes in their original appearance. Many landmarks in the surroundings of Novgorod the Great, which used to be the entire ensemble, are now partly lost. Archival documents containing various information about these monuments and the entire cultural landscape are stored in museums, libraries, archives and other depositories in Novgorod the Great and Saint-Petersburg. The photographs of these landmarks, taken before the Second World War are a priceless source of information. In our approach, we separate data on every object and put it into a single data base. The project's target is to present collected and systematized information in the format of an interactive web resource. This method means that separately developed virtual models of the selected landmarks will be brought together in a common environment model. Such a common model can help to show the background of a landmark's history including construction and operation periods as well as its current condition and possible view after reconstruction. Lost parts of the landmarks can be reconstructed in virtual models. The models will be a considerable supplement to traditional data bases and other information sources. A sufficient volume of initial data and further development of the project should make it possible to present the landmarks at different construction and post-construction stages, to show specifics of the built environment zoning and to display possible solutions for the buildings' reconstruction. Eventually, the model will show the surrounding landscape and neighbouring buildings at different times. Users will be able to see and feel the continuity of history.

Aerial and terrestrial landscape photography of WW1 as source for landscape archaeological characterisation of the current landscape

V. Van Eetvelde,[1] H. Van den Berghe,[1] B. Stichelbaut,[2] W. Gheyle,[2] N. Notte,[3] T. Saey,[3] M. Van Meirvenne[3] and J. Bourgeois[2]

Affiliations: (1) Ghent University, Department of Geography; (2) Ghent University, Department of Archaeology; (3) Ghent University, Department of Soil Management

During the First World War large series of aerial photographs were recorded by the different parties in the War. For the Western Front in Belgium more than 24,000 historical photographs have been collected, georectified and interpreted. This collection is a major source for a landscape archaeological research project aiming at the characterisation of the buried heritage of the former war zone within the present landscape. Complementary to this vertical perspective on the war landscape, a series of terrestrial photographs were collected, consisting of British and German series. The paper will present different examples of applications of aerial and terrestrial photography. First, it will give insights on the impact of warfare, with a focus on different war features like craters and military networks. Second, the aerial images are a major source for studying the landscape changes during and after the war. Combined with a series of aerial images of the 1940s it was possible to define landscape trajectories that indicate the degree of preservation or reconstruction of the pre-war landscape. These interpretations will be combined with LiDAR elevation models and geophysical prospection. Third, the opportunities of the terrestrial photographs will be discussed. They give a horizontal perspective of the landscape, which is complementary to the aerial photographs and can thus be used as a validation of the landscape situation during the First World War. The historical value of the series has been assessed and repeat photography of some of the terrestrial photographs has been carried out.

G2 Archaeological Approaches to Coastal and Island Landscapes at Risk

WEDNESDAY 24th AUGUST 10.50-14.50

VENUE: B153

Session Organiser: *Annalisa Christie*

Affiliation: University of East Anglia

Session Abstract

Three major challenges faced by maritime archaeologists at present are: how to address the impacts of coastal changes (as a result of erosion, sedimentation or rising relative sea levels) and human developments on maritime cultural heritage; how to characterise and record the archaeological features (palaeo-environmental and cultural deposits) on coastal and inter-tidal landscapes that are threatened by these factors expediently and

cost efficiently; and how to monitor and protect these sites in the mid- to long term. Examination of the archaeology of these environments, particularly those sites with palaeo-environemental as well as cultural remains, have the potential to inform our understanding of past adaptation to changing environments, which can contribute to discussions around issues of present-day sustainability and resilience in our interactions with the marine environment. This session will draw together papers from a range of geographic contexts that showcase the diversity of archaeology from island and coastal landscapes that are presently at risk from natural and cultural threats. It will provide an opportunity to evaluate how we might best be able to record, monitor and protect these sites for the benefit and enjoyment of future generations and will offer a forum to discuss how the datasets drawn from such surveys could be used to inform ongoing national (and international) discourse concerning strategies for modern adaptation to, and mitigation of, climate change and coastal development.

Paper Abstracts

Coastal archaeology at Risk: Adapting maritime approaches for regional requirements

Annalisa Christie

Affiliation: University of East Anglia

A major challenge for maritime archaeological heritage management (particularly coastal archaeological remains) is how to identify and record sites at risk of destruction from coastal changes as a result of natural and cultural process (e.g. erosion, sedimentation and coastal developments). In particular, how can we assess the impacts of these changes on these sites, when we don't know where or what they are; and how can we go about supporting the identification of sites financially? One approach used in Scotland has been to use volunteers to conduct low-cost inter-tidal and foreshore surveys in high risk areas to maximise the record of coastal heritage (the Scottish Coastal Heritage at Risk Programme). But how effective are such approaches in other regions and how, if at all, can they be adapted to suit local requirements? This paper will draw on examples from Tanzania and the Maldives to demonstrate the impact of coastal changes on archaeological sites and to explore how maritime archaeological approaches to identification, recording and management can be shaped to better address regional requirements.

Power, influence and risk in the !Khuiseb Delta on the Namib Coast, 1780–2016 AD

Jill Kinahan

Affiliation: University of Namibia

Independent indigenous Topnaar pastoralists at Walvis Bay on the Namib Desert coast were drawn into global commerce at the end of the eighteenth century. A hundred years later they were impoverished and peripheral to colonial settlement. Their reliance for subsistence on the endemic !nara melon which grows in the dunes of the delta and along the coast gave them not only a unique cultural identity, but cause to remain on their traditional land and to resist removal. Subaltern first to the invading Oorlam chief Jonker Afrikaner, and subsequently to British and then South African colonial authorities, the Topnaar today are finding ways of integrating into the modern Namibian economy

and asserting their rights over their land. Current threats come from national conservation interests, municipal and private sector development, mining and tourism. I present a brief background historical archaeology, and some of the risks to the archaeology of the area and to Topnaar authority through the subjective voices of a number of stakeholders. There may be parallels between the situation of the Topnaar in the Namib and the archaeology of indigenous communities in Australia, the Americas and elsewhere in the world.

A maritime cultural landscape approach to Kirkwall, Orkney

Beth Murray

Affiliation: University of the Highlands and Islands

Orkney throughout the ages has a rich maritime cultural heritage encompassing a range of archaeological materials and deposits. The archaeology is key to understanding Kirkwall, Orkney's largest town and the location of permanent settlement since the 11th century with a wealth of archaeological material relating to maritime activity. The location of Kirkwall at a significant portage point and the later establishment of Kirkwall as a Royal Burgh secured the success of Kirkwall as a maritime hub. Using a range of archaeological and historic material gathered through the use of desk-based assessment, map analysis and walkover survey, the changes to Kirkwall's waterfront can be mapped. These methods revealed the deliberate reclamation of a significant area of land while maintaining traditional access methods. The greatest threat to maritime cultural heritage in Kirkwall is modern development and re-use of the area, as much of the modern waterfront was laid down from the 19th century. Recent efforts have been made to preserve and reinstate historic features through a conservation area and regeneration project. Kirkwall has a wealth of maritime heritage inextricably linked and expressed in the material culture both in the past and the present.

The Wadden Area as a maritime cultural landscape

Linde Egberts

Affiliation: Vrije Universiteit Amsterdam

The Wadden Area is a large, maritime wetland that spans across the coasts of the Netherlands, Germany and Denmark. It is protected as a trilateral UNESCO World Heritage conservation area, first and foremost based on its ecological values. The cultural historical values of this landscape only played a marginal role in the preservation, protection and appropriation of the Wadden Area in previous decades. However this wetland area can also be viewed as a unique and complex cultural landscape that was influenced by uninterrupted human habitation since the Iron Age. Particularly significant are the remains of dwelling mounds, that enabled early medieval communities to adapt to the tidal environment since the early Middle Ages, and the land reclamations from the ninth century onwards. The underlying issue here is that natural and cultural values are implicitly seen as an irreconcilable dichotomy. Although the Wadden Sea itself is not inhabited by humans, it was and is intensively used for trading, fishing, hunting, grazing and even agriculture. Moreover, its physical and cultural influence reaches far inland. I argue that we need to approach the area as a maritime cultural landscape, in line with Christer Westerdahl's earlier work. This allows landscape researchers, heritage preservationists and politicians to understand, preserve and develop the cultural historical values of the Wadden as inextricably intertwined with its ecological values.

Challenges faced in the protection and management of the archaeological sites in Maldives

Shiura Jaufar

Affiliation: University of East Anglia

Maldives is an island nation in the Indian Ocean composed of a double chain of twenty six coral atolls, which are made up of 1192 islands encompassing a territory of 90,000 square kilometres, making it one of the most geographically dispersed countries in the world. Moreover, it is the lowest country in the world, with average ground levels of 2- 1.5 metres above sea level. This small coastal nation has been facing major challenges, most notably environmental (coastal erosion and the rising of sea levels) and human activities for development. Looking at the archaeology of Maldives, ever since its inhabitation about 2500 years ago, there remain several archaeological sites relating to the existence of past settlers on the islands, including pre-Islamic (predominantly Buddhist) and Islamic. These include several religious sites (such as temples, monasteries, shrines and mosques) and various other sites such as shipwrecks, bathing tanks, wells, cemeteries and other domestic features. Despite the importance of these sites, it has been a difficult and a major challenge to record, protect and manage these sites. This paper will thus discuss these factors threatening the archaeology of Maldives. Environmental factors such as coastal erosion and sea level rising are major threats that need urgent attendance. Moreover, there are no adequate laws in Maldives to protect these sites from anthropogenic destruction and since archaeology is a relatively new discipline, relatively little work has been done on these sites to protect them from the above threats, which will also be presented briefly.

Coastal and island heritage at risk along the European Atlantic façade: answers from the ALeRT project (Archaeology, Coasts and Climate Changes) (France)

Pau Olmos Benlloch,[1] Chloë Martin,[2] Elías López-Romero[3] and Marie-Yvane Daire[2]

Affiliations: (1) Institut Català d'Arqueologia Clàssica; (2) Université de Rennes 1 UMR 6566 CReAAH; (3) Durham University, Department of Archaeology

Facing the challenges of climate changes and human pressure on coastal and island cultural heritage along the European Atlantic façade, the principle of preservation by record appears as one of the most appropriate answers, based on the characterization, recording and monitoring of the archaeological and palaeo-environmental features at risk. This paper aims at presenting a dedicated strategy, resulting from an interdisciplinary approach carried out in Western France during the last decade (2006-2016), and targeting complementary goals: 1) a scientific process, based on the recording of field data on threatened sites and their monitoring, the analyses of environmental data illustrating the maritime landscape evolution and the characterization of the archaeological features; 2) public research development, involving volunteers in the recording of discovery or monitoring of coastal sites, supported by the creation of dedicated tools (i.e., networks, interactive database, SmartPhone app.); 3) development of tools for the regional and national heritage managers to prioritise protection and study strategies (i.e. reports and vulnerability maps); 4) support to the coastal management strategies, by providing managers with scientific and historical datasets in order to gain a better

understanding of the impact of coastal evolution on the landscape and cultural heritage (i.e. guides, public presentations). Through several case studies, this paper will illustrate the methodological adaptation to the complexity of the evolution of coastal, island and intertidal landscapes.

A cross-disciplinary approach to coastal heritage management

Elinor Graham, Tom Dawson and Joanna Hambly

Affiliations: SCAPE/University of St Andrews

Scotland's coastline contains a wealth of archaeological sites, thousands of which are being impacted by coastal change. Over the years, government bodies have worked with national and local organisations in a holistic way to develop plans and undertake projects. A series of Historic Scotland-sponsored Coastal Zone Assessment Surveys (CZAS) have provided baseline data by targeting vulnerable areas. They recorded both heritage assets and coastal vulnerability, including the 'point-of-time' erosional state. Covering more than 40% of the Scottish coastline, the surveys recorded over 11,500 heritage sites. The SCAPE Trust/University of St Andrews has used these data to prioritise action, taking account of each site's value and vulnerability. Recognising that things change rapidly at the coast, SCAPE initiated the Scotland's Coastal Heritage at Risk Project (SCHARP) in 2012. Employing a citizen science approach, members of local communities have updated and enhanced the prioritised CZAS dataset. The results of SCHARP are being mapped against the Scottish Government's National Coastal Change Assessment in order to further highlight national and local priorities. Monitoring alone does not save sites, and as protection *in situ* can be problematic, SCAPE also undertakes community projects at vulnerable sites using the concept of public value to help determine where to work. A variety of strategies, from innovative digital recording and excavation to relocating and reconstructing sites, have been deployed. This paper will showcase the diversity of Scotland's coastal archaeology, present the impact of coastal processes and highlight some of the methods employed to record, monitor and protect the resource.

Skomer Island, Wales. A sustainable archaeological approach to the investigation of an at risk prehistoric island landscape within a heavily protected environment

Louise Barker,[1] Oliver Davis,[2] Toby Driver[1] and Robert Johnston[3]

Affiliations: (1) Royal Commission on the Ancient and Historical Monuments of Wales; (2) Cardiff University, (4) University of Sheffield

Skomer Island lies off the south western coast of Pembrokeshire in Wales and is a heavily protected landscape managed largely for the benefit of its internationally renowned population of breeding seabirds. It is also a relict prehistoric landscape among the best preserved anywhere in the British Isles. Skomer is a challenging landscape to work in, one dictated by the weather and breeding seabirds. Its archaeology is also at risk, the ground surface is heavily burrowed, in places continuously, and these burrows are the seasonal home to breeding seabirds. The paper will showcase the Skomer Island Project, a collaboration between the Royal Commission on the Ancient and Historical Monuments of Wales, University of Sheffield and Cardiff University. It was initiated in 2011 and has four aims: 1. Develop a new landscape history of Skomer that takes account of the complex and multi-layered character of the field archaeology. 2. Establish absolute

chronological markers for key phases in the development of Skomer's landscape. 3. Reconstruct the environmental history of the island and assess the changing impact of human occupation. 4. Support the organisations responsible for Skomer in applying the research outcomes of the project to the conservation management of the island's historic and natural environment. The paper will look at the sustainable archaeological approaches employed by the project team to work within the delicate and heavily protected landscape. These include remote sensing - aerial photography, LiDAR, ground survey and geophysical survey as well as targeted excavation and palaeo-environmental work

G3 Geophysical approaches to landscape archaeology

WEDNESDAY 24th AUGUST 8.30-10.30

VENUE: A114

Session Organisers: *Phillipe De Smedt[1] and Immo Trinks[2]*

Affiliations: (1) ORBIT, Ghent University, Belgium; (2) Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology, Vienna, Austria

Session Abstract

Over the past decades geophysical archaeological prospection has matured to a means for assessing entire archaeological landscapes. Novel near-surface geophysical survey techniques now permit time- and cost-efficient archaeological investigation of areas that can surpass square kilometre-scale. For the first time, researchers are able to study the subsurface of wide areas non-invasively and at high resolutions by prospection methods such as magnetometry, ground-penetrating radar, electromagnetic induction, and earth resistance measurements. Often used alongside remote sensing methods, these techniques shed light on both archaeological and natural features buried in the shallow subsurface. As such, archaeo-geophysics is providing the basis for a new way of conducting landscape archaeology. In this session we propose to discuss the implications of large-scale and high-resolution geophysical prospection for landscape archaeology. The main emphasis will be on the different aspects landscape archaeo-geophysics can inform on, and on how these methods are being implemented into wider archaeological research frameworks. In addition, we plan to reflect on the implications these new research methods can have, or already impose, on commercial and developer-led archaeology. Along with the pitfalls of these techniques, we aim to discuss how different methods can help make or break biases in understanding landscapes. This session is aimed at prospectors (remote sensing experts, geophysicists, archaeological surveyors) working in the field of large-scale archaeological prospection, as well as users of the generated data, including archaeologists, historians and cultural heritage managers.

Paper Abstracts

Magnetometer survey at the Hünenburg. Understanding the landscape surrounding a fortified hillfort in Lower –Saxony, Germany

Immo Heske[1] and Martin Posselt[2]

Affiliations: (1) Seminar für Ur- und Frühgeschichte, Georg-August-Universität Göttingen, Germany; (2) Posselt und Zickgraf Prospektionen GbR, Germany'

Situated north of Harz Mountain close to Watenstedt, Lower Saxony, Germany the shallow mountain range of the Heeseberg bears a well-known Late Bronze Age and Early Iron Age fortified hillfort called "Hünenburg". It is part of a landscape comprising several well-known sites within a range ca. five kilometre in diameter. The case study of the Hünenburg, supported by the Deutsche Forschungsgemeinschaft (DFG), illustrates the importance of research at a landscape scale in prehistoric archaeology to understand the meaning and function of a separate site. Research activity has widened the view from a single site to a prehistoric landscape and its sites of different function (settlements, grave fields, depositions). Within the methodology to understand the meaning of the Hünenburg large-scale magnetometer survey enlarged the knowledge about already known sites and furthermore detected new aspects of landscape use during prehistoric periods. The 45 ha magnetometer survey tested by several small scale excavation trenches allows insight into the Late Bronze Age and Early Iron Age landscape. Preliminary results show that the Hünenburg towered over an intensively settled landscape during the time of the fortified hillfort in the Late Bronze and Early Iron Age. Furthermore, the same place was a centre of human activity in other prehistoric periods as well, e. g. in the Middle Neolithic (Stichbandkeramik). It has become obvious that the function of the Hünenburg can only be understood by researching the wider Hünenburg landscape. Magnetometer survey with its potential to survey large areas and to detect archaeological structures in detail as well as in their general layout, is a key aspect of this approach. The integration of these geophysical data within the study of the Hünenburg landscape form the core of this presentation.

Plough zone metal detector finds and land exploitation AD 400-1200 in the Limfjord region, Northern Jutland

Torben Trier Christiansen

Affiliation: Aarhus University

During the past three decades, thousands of metal detector finds have been recovered across most of Denmark, and recreational metal detecting has generally had a massive impact on Danish archaeology. Although the records of the finds handed in by the private detectorists have been produced in various ways over the years, the find spots have usually been systematically recorded. However, in most perspectives the vast research potential of this spatial data remains to be explored. In particular cross-regional studies have been neglected.One of the areas richest in metal detector finds is the Limfjord region in Northern Jutland, and the aim of this presentation is to discuss the results of GIS analyses of a large record of finds dated AD 400-1200 from this region. Not only overall changes in settlement but also wider zones of activity around the settlements seem to be reflected by the spread of metal detector finds, thus allowing a reconstruction of changing land exploitation patterns. This study attempts to deal with random data collection and

highlights the strengths and the weaknesses of an archaeological record produced by amateurs and shaped by the liberal Danish legislation on private metal detection.

Application of automated multi-method geophysical surveys: Project of restoration of Chambord Castle and RTE Powerline Corridor Project

Michel Dabas and Luc Forlivesi

Affilitiation: Geocarta, CNRS

Geophysical prospection techniques can allow us to better understand archaeological sites, regardless of their size, and integrated within their environmental context. Since the development of towed methods (electric, magnetic, electromagnetic, radar), effective positioning systems and powerful software for visualization, what was an exception (example of the magnetic surveys in the Vale of Pickering (UK)) can now be easily achieved; from these new large-area datasets, it is now possible to derive a continuous, high-resolution view of the near-surface in three dimensions. From a site-based approach, geophysicists are moving to a landscape-based approach. This change of scale, coverage, and resolution, not possible by standard archaeological excavation, has led to the concept of 'filling the empty space' (S. Campana, LAPET Lab., Sienna, Italy) between sites. Two examples will be discussed corresponding to two different scales. In the case of Chambord Castle (France), the various geophysical surveys over 6 hectares of gardens have helped to understand the medieval and post-medieval environment of this castle. This work was necessary for the restoration of the gardens in combination with knowledge from archaeological trenches. In this case, the faint traces left by the different stages of the gardens and a complex evolution of this swampy environment have made the task of interpretation a challenge. Without the help of old paintings and paper maps, the interpretation would have been very poor. The second example corresponds to a larger area (220 ha project for burying a power line) where geophysics was used without ground-truthing by archaeological trenching. This project is unique in that it has used a systemic approach, typical for understanding complex projects. The different threats associated with different problems are not studied separately, but as a whole thanks to a set of different geophysical maps showing different physical parameters of the soil and sub-soil. All geophysical methods used high speed towed systems that enable metric spatial resolutions (ARP® electrical method, AMP magnetic and EMP electro-magnetic). The project steering was operated thanks to a real-time GIS and collaborative web-GIS. This innovative approach enables the assessment of different areas linked to different stakeholders: UXO, geological risk (cavities), archaeological risk, etc. Besides these risks, the knowledge of the sub-soil was used in the framework of precision agriculture by farmers and by the contractor (RTE) for the problems linked to the heat loss of the buried cable. The challenge for such a project was related to its size and to our capacities to handle such a huge amount of data (like for example in the BREBEMI project in Italy). Like in development-led archaeology, the time for giving the final interpretation and report is very limited. Clearly for both projects, even if the time for acquiring data has considerably decreased, time for interpretation has not gone the same way and remains one of the main limitations.

Geophysics and preventive archaeology: Comparison with trial trenching on the CSNE project (France)

Guillaume Hulin,[1] D. Bayard,[2] P. Depaepe,[3] A. Koehler,[1] G. Prilaux[4] and M. Talon[4]

Affiliations: (1) Inrap, 7 rue de Madrid, 75008 Paris; (2) SRA Picardie, 5 rue Henri Daussy, 80000 Amiens; (3) Inrap, 518 rue Saint Fuscien, 80090 Amiens; (4) Inrap, 16 rue du Général Leclerc, 80400 Croix-Moligneaux

Many cases are published about the benefits of geophysical techniques in preventive or rescue archaeology. Although these non-invasive techniques are clearly beneficial for archaeology such as a rapid coverage for a relatively low cost, important limits occur. A good knowledge of these limitations is important in order to precisely estimate the reliability of these methods. The Canal Seine-Nord Europe (CSNE) project offers a good opportunity to compare geophysics and trial trenching on a preventive archaeological project. This project is located in the north of France and consists of a 106 km long canal on a surface of 2500 ha. This wide-gauge canal will link the Parisian Basin to the north of Europe to facilitate the transport of merchandise. The exceptional dimensions of this project, which is on average twice as wide as a motorway, with earthworks reaching depths of 45 m, involves major issues during the archaeological evaluation phase. In 2009, about 60 ha of magnetic and electric surveys were carried out by Geocarta for the developer contractor of this project (Voies Navigables de France). After this first step, trial trenches, regularly spaced on the same area, were undertaken as the French law requires. These trenches covered 10% of the whole area and were performed by the Institut National de Recherches Archéologiques Préventives (Inrap). Soils are luvisols on decarbonated loess which are particularly common in the northern part of France. At the end, thirteen archaeological sites were discovered on this 60 ha area. Twelve of them were detected by trial trenching and three by geophysics. Comparison between the two approaches shows that geophysics mainly detected ditches. However, for the discovered sites, the most important archaeological features were protohistoric and Roman graves as well as protohistoric post-hole based dwellings. Based on the trial trenching results, four excavations were carried out and three of them concerned this type of archaeological feature which were totally undetected by geophysics. This example clearly shows that geophysics cannot be used as the sole technique for archaeological evaluation in this context. The main limiting factors are the size of archaeological remains and the soil itself. Luvisols seem to create poor geophysical contrasts notably for magnetic survey. Using geophysics on this type of soil or, more generally, on complex or heterogeneous soils, has the consequence of potentially missing an important part of the archaeological features, whereas a lot of them are of high scientific interest. Although trial trenching gives a view on a limited area, in most of the cases this approach remains the most efficient way to characterise an archaeological landscape and take the best decision concerning future excavations. In some cases, combining both methods would be ideal but would result in increasing the costs of the archaeological evaluation.

Cone Penetration Testing in combination with geophysical approaches for archaeological landscape mapping: Prehistoric landscape reconstruction in the Scheldt floodplain (NW Belgium)

Jeroen Verhegge, Timothy Saey and Philippe Crombé

Affiliations: Ghent University

Well-preserved Late Glacial to Mid Holocene palaeo-landscapes containing Final Palaeolithic to Early Neolithic sites have been found buried deeply below Holocene peat and estuarine floodplain deposits of the Scheldt River (BE). In the past, these finds occurred by accident during harbour infrastructure works and triggered prompt rescue excavations. Therefore coring, electromagnetic induction survey and cone penetration

testing (CPT) were introduced to allow minimally invasive archaeological palaeo-landscape mapping ahead of planned construction works. CPTs are used for geotechnical investigations of soft soils during the first planning stages of construction projects. As a result, CPTs are often already (freely) available by the time an archaeological evaluation is started. During a cone penetration test, cone tip resistance and local sleeve friction are registered continuously, while an electric conus is pushed into the soil at 2 cm/s by metal rods. The data can be related to sediment texture and consolidation using soil behaviour models but validation by coring is advisable. Firstly, available CPT data from geotechnical research can be used ahead of archaeological palaeo-landscape mapping, e.g. to select appropriate geophysical survey, coring techniques or other methods. Secondly, CPTs can also be carried out during the archaeological evaluation at well-chosen locations to complement and validate sedimentological interpretations of geophysical survey data instead of coring. Geophysical sensors can also be integrated within the conus and measure geophysical properties *in situ* to calibrate geophysical subsurface models. Thirdly, CPT data can be collected as an alternative when geophysical survey is impractical and/or ineffective. For example, due to high vertical data resolution even deeply buried and thin soil horizons within seemingly geophysically homogeneous sediments can still be mapped using CPTs. Finally, CPTs could also be considered as a less invasive validation alternative to coring as no soil is removed. The effectiveness of CPT will be illustrated through recent prehistoric palaeo-landscape evaluation studies, mapping deeply buried dunes, natural levees and point bars along the Scheldt River. These are known as favoured locations for Final Palaeolithic to Early Neolithic human occupation. The results indicate that CPTs can contribute significantly to mapping deeply buried prehistoric (and more recently formed) palaeo-landscapes in an archaeological evaluation context of soft soils in estuarine and alluvial floodplains. Applications range from the determination of appropriate palaeo-landscape evaluation strategies during desktop studies to actual palaeo-landscape mapping both as a primary mapping method or to complement near-surface geophysical mapping methods.

G4 Exploring maritime landscapes by multi-proxy approaches: Combining geomorphological, palaeofaunal and geophysical methods

TUESDAY 23rd AUGUST 16.30-18.30

VENUE: B115

Session Organisers: *Anna Pint,[1] Steffen Schneider[2] and Martin Seeliger[1]*

Affiliations: (1) Department of Geography, University of Cologne, Germany; (2) Lower Saxony Institute for Historical Coastal Research, Wilhelmshaven, Germany

Session Abstract

When the Holocene marine transgression came to a halt around 6000 years BP, the (from now on) more or less stable sea level enabled ancient societies to settle the coasts worldwide permanently. Lambeck and Purcell (2007) refer to this moment as the "dawn of civilisations". Since then, the interactions between expanding settlements and erosional-sedimentational processes as well as between fluctuating sea levels and migrating shorelines have left a specific fingerprint in the geoarchives of the coastal regions. In order to reconstruct the human and landscape history of these coastal, maritime landscapes, it is necessary to correctly identify and interpret this fingerprint. To fully meet these requirements, the whole range of scientific disciplines concerned with coastal research has to collaborate. Recently, several interdisciplinary studies have shown that the combination of geomorphological, palaeofaunistical and geophysical methods is an especially powerful and effective approach to evaluate coastal geoarchives. Therefore, this session aims to highlight the special potential of the combination of geomorphological, palaeofaunistical and geophysical methods. We call for oral and poster presentations.

Paper Abstracts

Micropalaeontological analyses in geoarchaeological investigations at the southern Baltic Sea coast

Peter Frenzel

Affiliation: Institut of Geosciences, University of Jena, Germany

Micropalaeontological analyses are a very useful irregularly applied method to support archaeological investigations. Aquatic sediments are especially interesting because of their richness in microfossils. Examples from excavations along the southern Baltic Sea coast, including the old Hanseatic cities of Greifswald, Stralsund and Wismar, are presented to promote the use of this versatile tool in geoarchaeology. Ostracoda, Foraminifera, Mollusca, Chironomidae, ephippia of cladocerans, oogonia of charophytes, statoblasts of freshwater Bryozoa, gemmulae of freshwater sponges, scolecodonts of Polychaeta, fruits and other are groups to be found in often high numbers within the sand size fraction of sediment samples providing information about environmental conditions of the past. Using an indicator taxa approach with mutual ecological range methods, ecological classifications, transfer functions, environmental driven intraspecific morphological variation and shell chemistry analyses allows the reconstruction of habitat types, salinity, biological productivity, oxygen availability, water turbulence, temperature and other factors. Furthermore, presence and preservation of microfossils may indicate taphonomic and sedimentological processes. Microfossils are not only excellent proxies for environmental conditions of the past, they may indicate trading connections as well. An interesting example is the discovery of medieval ballast sands in the old harbour of Wismar containing an intertidal microfauna with estuarine influence deriving from the southern North Sea coast. The analysis indicates ship trade between Wismar and ports at the southern North Sea coast in the mid-15th century.

Understanding the palaeoenvironmental setting of Mid- to Late Holocene coastal archaeological sites: an example from Japan

Yusuke Yokoyama

Affiliation: Atmosphere and Ocean Research Institute, University of Tokyo

The Earth's Quaternary surface has been impacted by the growth and decay of large Northern Hemisphere ice sheets acting in harmony with major variations in ocean circulation amplified climate variations which resulted in severe and rapid climate swings throughout this interval. Waxing and waning of the ice sheets by as much as 3 km situated in North America and Northern Europe had significant influence on internal properties of the Earth namely uplifting the areas where former ice sheets are located, whereas continuous subsidence is observed in peripheral areas. The effects are not limited to the Atlantic regions but are also evident in the Pacific (where the sites are situated far away from the former glaciated region – i.e. far-field) owing to the increase in loading of seawater onto the entire Pacific Ocean basin after deglaciation. Japan is located in such a region where the coastal zone is affected by regional redistribution of mantle causing gradual uplifting of coasts. This glacio-hydro-isostatic-adjustment (GIA) is produced by the isostatic response of solid Earth. Many areas of the Tokyo region, for example, were inundated during the Mid-Holocene (ca. 7,000 years ago). The Mid Holocene is one of the important periods for Japanese archaeology since a typical early pottery type called Jomon is widely found. Large shell mounds are found around Japanese coastal areas and archaeological remains are also found in nearby locations. Since GIA is about 1,000 years or longer in the time scale response of solid Earth, it is important to take into account the coastal migration from GIA together with the tectonic deformation of the landscape. In this presentation, I would like to introduce overviews of GIA and its consequence of coastal migration. Several examples including underwater Jomon sites in southwestern Japan will be presented to illustrate this.

Transformations of maritime and island landscapes in western France over the last 8,000 years: a long story of the links between humans and the environment

Pierre Stephan,[1] Yvan Pailler,[2] Serge Suanez,[1] Aurélie Penaud,[3] Clément Lambert,[3] Muriel Vidal,[3] Yves-Marie Paulet,[4] Stéphane Blanchet,[5] Clément Nicolas,[5] Gwendoline Gregoire,[6] Axel Ehrhold,[6] Gwen Jouet,[6] Pascal Le Roy[3] and Thierry Garlan[7]

Affiliations: (1) CNRS (UMR LETG-Brest, Géomer Laboratory), European Institute for Marine Studies, University of Brest; (2) CNRS (UMR 8215, Trajectoires Laboratory), Université de Paris 1; (3) CNRS (UMR 6538, Domaines Océaniques Laboratory), European Institute for Marine Studies, University of Brest; (4) CNRS (UMR LEMAR laboratory), European Institute for Marine Studies, University of Brest; (5) CNRS (UMR 6654, CReAAH laboratory), University of Rennes 1; (6) Ifremer (unit of Marine Geosciences); (7) SHOM

For several years, research work has been conducted in the western part of the French Atlantic coast to study changes in coastal and island landscapes and their links with past societies. This interdisciplinary research is conducted as a French iLTER (Long-Term Ecological Research). This paper aims to synthesize the results and to present the latest advances in this field. Our efforts have focused on a better understanding of the Holocene Relative Sea-Level (RSL) rise using salt-marsh foraminifera. The RSL data were used to perform simulations on the paleogeographic changes from bathymetric and terrestrial Lidar data. This work was crossed with an extensive program of archaeological

excavations and shed new light on the living conditions of the island societies of the Neolithic and the Bronze Age. Efforts have also been made to reconstruct the transformations of vegetation landscapes. Results highlight deforestation processes due to the development of agriculture and metallurgy practices. Ongoing work continues the analysis of sediment cores and is now trying to reconstruct the climatic signal, especially periodic cold events that characterize climate variability in the North Atlantic Ocean. Work is also being conducted on underwater landscapes to better document some archaeological remains such as fish weirs. Biologists are interested in several shell middens discovered on the islands of the Iroise Sea and use a sclerochronological approach to study changes in the marine and coastal environments. These different approaches help refine our vision of landscape transformations during the mid- to late-Holocene period.

Land use and vegetal biodiversity in the Iron Age coastal landscape of Brittany (France)

Roy van Beek,[1] Dominique Marguerie,[2] Francoise Burel[2] and Annie Antoine[3]

Affiliations: (1) Universite de Rennes 2 (CERHIO)/Universite de Rennes 1 (ECOBIO)/ CNRS; (2) Universite de Rennes 1 (ECOBIO); (3) Universite de Rennes 2 (CERHIO)

Biodiversity has been a popular research topic in the last decades. With the rapid current loss of mondial biodiversity, estimated at about 5 % per decennium, it is easy to understand why. Palaeo-ecological research can provide insights into the relations between past vegetal biodiversity and environmental change. Climate changes and human activities are generally accepted to be the prime drivers behind these processes. Nevertheless, detailed analyses of the exact correlations between past human agency and vegetal biodiversity in Northwest Europe are still quite rare. In this paper we aim to reconstruct and explain spatio-temporal trends in past vegetal biodiversity by integrating data on vegetation dynamics, human subsistence economy and land use patterns. The coastal landscape of Brittany (North-Western France) during the Second Iron Age (450-50 BC) is selected as a case study. Compared to many other parts of Northwest Europe, Brittany is rich in high-resolution palaeobotanical data. These allow reconstruction of the main long-term trends in vegetal biodiversity, and more generally of the changing fabric of the Breton landscape. At the same time, increasingly detailed images of the Iron Age rural landscape start to emerge due to a steep increase in archaeological data (aerial photography, surveys, programmed and development-led excavations). In this paper we aim to integrate these different types of data, and to compare trends in coastal and inland areas.

Palaeoenvironmental and coastal changes within the context of early Phoenician colonization in the southern Iberian Peninsula

Simon Matthias May,[1,2] Dirce Marzoli,[2] Pierre Moret,[3] Dominik Brill,[1] César León Martín,[2] Helena Jiménez Vialás,[3] Iván García Jiménez[4] and Helmut Brückner[1]

Affiliations: (1) Institute of Geography, University of Cologne, Albertus-Magnus-Platz, 50923 Cologne (Köln), Germany; (2) German Archaeological Institute (dept. Madrid), Calle Serrano 159, 28002 Madrid, Spain; (3) Laboratoire TRACES – UMR 5608 du CNRS, Université de Toulouse, Allée A. Machado, 31058 Toulouse, France; (4) Conjunto Arqueológico de Baelo Claudia, Área de Investigación y Conservación, Ensenada de Bolonia s/n, Bolonia, Tarifa (Cádiz) 11391, Spain

New chronological data recently resulted in a re-evaluation of the timing of initial Phoenician colonization in the southern Iberian Peninsula, and follow-up archaeological studies aimed at better understanding the early contact with the local indigenous population. Two of the most important Iron Age settlements in the southwestern Iberian Peninsula, La Silla del Papa (Cádiz) and Los Castillejos de Alcorrín (Málaga), have been subject to archaeological investigations during the recent past, and ongoing geoarchaeological research embedded in a German-French DFG-funded interdisciplinary project ("Archeostraits") aims at (i) deciphering palaeoenvironmental and coastal changes in the surroundings of these two settlements since the mid-Holocene; (ii) constraining palaeoenvironmental conditions during early Phoenician colonization; and (iii) better understanding human-environment interactions during the Iron Age. Based on a combination of sedimentological, geochronological and geophysical investigations, we here present the first data collected within the framework of "Archeostraits". The combination of electrical resistivity tomography (ERT) and coring transects along the lower Río Guadiaro (Málaga) allow for the differentiation of successive palaeoenvironments and for establishing a local chronostratigraphy for the sedimentary infill of the valley. Our results suggest that floodplain evolution in the lower Guadiaro valley took place before the Phoenicians established first colonies along the coast. In the eastern part of the Laguna de La Janda (Cádiz), fluvial deposits of the Río Almodóvar interrupt periods of fine-grained, limnic to semi-terrestrial sedimentation. Future work will include microfaunal and pollen analyses of suitable sediment cores, potentially allowing us to relate our findings to local or even regional palaeoclimatic and sea-level changes.

Going beyond ports: Combined perspectives into port systems from archaeological spatial analysis, geo-archaeology and geophysics

Simon Keay,[1] Pascal Arnaud,[2] Maria del Carmen Moreno Escobar,[1] Nicolas Carayon,[1] Ferreol Salomon[1] and Kris Strutt[1]

Affilations: (1) Department of Archaeology, University of Southampton (Southampton, United Kingdom); (2) History Department, Université Lumiere Lyon 2 (Lyon, France)

The ERC-funded "Rome's Mediterranean Ports" (RoMP) Portuslimen Project is promoting an inter-disciplinary approach to the study of Roman Mediterranean ports. Moving away from views focused on ports as isolated entities, the project is developing a new perspective that draws upon very different sources of information, such as literature, iconography, law, epigraphy, and material remains, and methodologies, such as archaeology, geophysics, geoarchaeology, epigraphy, philology and Roman law. This inter-disciplinary approach is starting to provide a more holistic understanding of the complexity, functioning and development of ports systems and port networks across the Mediterranean in the early Imperial period. As part of this new approach, special attention is being paid to the spatial relationships of a broad range of port sites and their relationships to their natural terrestrial and maritime surroundings, issues that are being explored by means of a combined application of geophysics, geoarchaeology and the spatial analysis of archaeological sites.

Undertaking this necessitates the formulation of the questions that are most appropriate to these methods. The present contribution will focus on the methodological approach being taken by the Portuslimen project in regard to the spatial analysis of ports, most notably in the areas of exploratory data analysis, visibility analysis, connectivity and accessibility analysis. It is done in the hope that it will promote discussion with researchers working in cognate areas.

Poster Abstracts

A. Integrated Approaches in Landscape Archaeology

A1 Living In A Landscape – How to Incorporate the Short-Term in Landscape Archaeology

La Paix Dieu, a Cistercian abbey in the Meuse region. Geographical, archaeological and historical approaches of a medieval occupation and its impact in the present regional landscape

Jacques Verstraeten,[1] Olivier Collette[2] and Virginie Boulez[3]

Affiliations: (1) Association Pays Mosan asbl; (2) Walloon Public Service – DGO4 – Heritage Department; (3) Institut du patrimoine wallon – IPW

During the 13th century, in the Meuse region, the only available areas for permanent settlement were on the wooded slopes that bordered a large plateau which had been cultivated for a long time. The nuns of a Cistercian community at La Paix Dieu transformed this unfavourable context and used the available resources to settle over the long term. The traces of this occupation are still present in the landscape and are to be developed. Some concrete examples illustrate the passing on of this patrimonial heritage.

The landscape of iron production from prehistory to the Early Modern Period in present-day Latvia

Dita Auzina[1] and Bernt Rundberget[2]

Affiliations: (1) University of Latvia; (2) Oslo University Museum of Cultural History

Since the first successful attempts to produce iron, this activity has affected the landscape around it through the extraction of recourses, requiring infrastructure and creating pollution. However, the existence of iron production has been strongly dependent on the landscape, its resources and the possibilities for connecting with surrounding communities. This poster explores the agency in iron production and its landscape, as well as changes trough time in present-day Latvia. The earliest known archaeological remains of iron production in the study area are from the 2nd-4th century AD, when the success of production was directly dependent on the landscape. By contrast, iron manufacturing in the Duchy of Courland (16th-18th century) was an important factor in the process of transformation of the landscape. By using an inter-disciplinary approach including archaeology, history and the natural sciences, the changes in landscape-production agency are analysed.

A2 Interactions in Archaeology

Interaction patterns at the transition from hunter-gatherer to sedentary societies – A case study from the surroundings of Göbekli Tepe

Ricarda Braun,[1] Daniel Knitter,[1] Brigitta Schütt[1] and Ricardo Eichmann[2]

Affiliations: (1) Department of Earth Sciences, Freie Universität Berlin; (2) Orient Department, Deutsches Archäologisches Institut

We present a diachronic analysis of archaeological sites aimed at examining whether the change in economic behaviour at the transition from hunter-gatherer to sedentary societies influenced modes of interaction, eventually causing to the abandonment of Göbekli Tepe (southeastern Turkey). This Pre-Pottery Neolithic site is one of the earliest known cultic places and is considered as the oldest example of monumental architecture in this mountainous region of Anatolia. A wider contextualization of Göbekli Tepe and its regional framework has previously been missing. Furthermore, although numerous sites in the surroundings of Göbekli Tepe are known, there has been no previous systematic comparison of these. Therefore, published data on site locations of different cultural periods was reviewed and complemented by new surveys using remote sensing data. All in all, around 1100 sites were recorded, of which about 740 include chronological information. Using spatial point pattern analyses we assess the influence of environmental conditions on the distribution of sites as well as the potential interactions between them. The results of the study not only reveal new insights into the function of Göbekli Tepe in relation to its regional framework, but also into changing network structures in the hitherto less investigated environs of this site.

A4 "Cultural Landscapes: What For?" - Demonstrating the Social Impact of Our Work

Landscape archaeology and democratic participation: The Apennines of Pistoia case study

Cristina Taddei,[1] Simonetta[1] and Giampaolo Francesconi[2]

Affiliations: (1) Independent researchers; (2) Società Pistoiese di Storia Patria

This poster describes an ongoing project undertaken by a team of archaeologists, historians, naturalists and volunteers, which has involved the local community, the local government and the national offices for Cultural Heritage (Soprintendenza archeologica e Soprintendenza per i Beni Architettonici, Paesaggistici, Storici, Artistici ed Etnoantropologici). The project began as archaeological research and has developed in a participated program of territorial promotion. The project has two aims. The first is studying the medieval landscape with particular attention to the system of roads and fortresses, while the other is engaging the local community and the public government in protecting the remains and the memories of the medieval landscape. The implementation of the project resulted in a virtuous link between local and regional stakeholders. The involvement of people and of institutions has increased quantitatively and qualitatively during the project. Most recently, a local volunteer association not only collaborated in the fieldwork but also financed the

project drawing from a regional fund for voluntary work. The project has been monitored and evaluated with questionnaires and interviews and with didactic activities. The main results achieved thus far are a better understanding of the cultural value of the landscape for the citizens and for policy makers, and more consideration from the local and regional media and from the tourists. It could be a model of action for other small communities and marginal areas.

From collective archaeology to politics, or how can an archaeological survey affect the political and identity fate of a territory? The case of Banassac ancient terra sigillata workshop (France)

Audrey Roche

Affiliation: Archéolozère

Running on from the study presented at LAC2014, a further study was undertaken to measure the social and political impact of the results of archaeological survey around Banassac. First considered as a village of potters, the site was now presented to the population as a huge Roman villa taking place in an integrated economic context of associated productions of terra sigillata, pine pitch and iron. We were interested in knowing the answers to a number of questions: How would the population react to the complete rewriting of 'their' story? Does the study bring a new vision of their territory? Does it change their representation of what they call their "ancestors"? Can the results influence the political and economic decisions of territorial and touristic marketing? What effects (positive or negative) does the researcher have to take into account when explaining such disturbing results? The poster will first review the original collective methodology of the archaeological survey, then provide details of the issues and methodology of the social study (polls among people following the meetings ; polls in the towns and villages around, who did not know the results ; individual interviews to deepen the understanding of phenomena), and finally presents the results. This study provided an opportunity to measure the impact of the rewriting of an archaeological story on the vision of the territory held by local inhabitants; it raised questions about identity and political choices of development: in the context of ongoing French territorial reform, how can an archeological study lead to essential questions about life tomorrow?

B. Landscape Historical Ecology and Climate Change

B1 Land-use and Anthropogenic Land-cover Change over the Holocene - Information of Value for Climate and Environmental Research

Global land-cover and land-use change of the last 6000 years for climate modelling studies: the PAGES LandCover6k initiative

Marie-José Gaillard,[1] Kathleen Morrison,[2] Marco Madella[3] and Nicki Whitehouse[4]

Affiliations: (1) Department of Biology and Environmental Science, Linnaeus University, Kalmar, Sweden; (2) Department of Anthropology, University of Chicago, USA; (3) Department of Humanties, University Pompeu Fabra (UPF), Barcelona, Spain; (4) School of Geography, Earth and Environmental Sciences, Plymouth University, UK

The goal of the PAGES LandCover6k initiative is to provide relevant, empirical data on past anthropogenic land-cover change (land-use change) for climate modelling (e.g. the CMIP5 initiative). Land-use change is one of many climate forcings and its effect on climate (past, present or future) is still debated. The LandCover6k working group infers land-use data for the past 6000 to 10000 years from fossil pollen records from lake sediments and peat deposits, and from historical archives and archaeological records. The working group is divided into three activities: i) pollen-based reconstructions and mapping of past land cover using pollen-vegetation modelling approaches and spatial statistics; ii) upscaling and summarizing historical and archaeological data into maps of major land-use categories linked to quantitative attributes, and iii) the results of i) and ii) are then used to revise existing Anthropogenic Land-Cover Change (ALCC) scenarios, the HYDE database3 and KK4. The products i)-iii) are meant to be suitable for climate modelling. The LandCover6k working group focuses on regions of the world where humans have had a significant impact on land cover through deforestation and diverse agricultural practices, i.e. the Americas, Western and Eastern Africa, Europe, and Asia. In Asia, the emphasis has been placed so far on China, India and Japan.

Early state formations in south east Georgia, Caucasus - response and impact on changes in the climate and environment

Mikheil Elashvili,[1] K. Pitskhelauri,[2] G. Kirkitadze,[1] L. Navrozashvili,[1] L. Adikashvili,[1] G. Asatiani[1] and A. Nadaraia[1]

Affiliations: (1) Cultural Heritage and Environment Research Center, Ilia State University; (2) Georgian National Academy of Sciences

Study of past changes in environment and their effect on human society delivers key information to project future changes and their effects. Our study focuses on the Caucus region of south-east Georgia, which represents a natural arean of long term

changes in the environment. Our study area covers the semi-arid Shiraqi highland, which is characterized by annual precipitation of <600mm and today is an open, dry steppe landscape. Geomorphologically, the Shiraqi highland represents an 800 km2 area of almost flat plateau with an average height of 500-600m asl, surrounded by chains of mountains creating natural barriers. There are almost no settlements in the area, and it is devoid of water resources today. However, data collected recently using remote sensing and archaeological studies provide evidence of early human habitation of this area starting from the Palaeolithic and forming a constant chain of active settlement through the time, until sudden abrupt abandonment at the end of the Bronze-Early Iron Age. Selected sites were investigated in details using vibro coring and aerial photogrammetry. Archaeobotanic and soil studies also show that the region was covered by forests instead of steppes; hydro-modelling shows the possibile existence of a well-developed water network with a shallow lake in the centre of the highland. All these provide evidences of early state formation on the Shiraqi highland under favourable paleo-environmental conditions. The goal of the current study is to shed light on historic changes in the environment of the region, its natural and anthropogenic factors and consequently response of human society on these changes.

Reconstructing anthropogenic landscape transformation in the surroundings of the ironwork Peitz (SE Brandenburg, Germany) - 16th to mid-19th centuries

Alexandra Raab,[1] Thomas Raab,[1] Anna Schneider,[1] Florian Hirsch,[1] Melanie Takla,[1] Alexander Nicolay,[1] Alexander Bonhage,[1] Frank Müller,[1] Karl-Uwe Heußner[2] and Horst Rösler[3]

Affiliations: (1) Brandenburg University of Technology Cottbus-Senftenberg; (2) Deutsches Archäologisches Institut, Berlin; (3) BLDAM, Germany

Various sources provide information about land use history and landscape transformation. For a variety of reasons, the quality of information differs and is often discontinuous or incomplete. In this interdisciplinary study we take advantage of comprehensive archaeological data gathered by large-scale excavations that were necessary because of opencast lignite mining in Lusatia, Brandenburg, Germany. By using a GIS we integrate these archaeological findings with results from archival and literature studies, from historical maps, from landforms and soils as well as from analyses of shaded-relief maps derived from up-to-date LiDAR data. The long-term aim is to develop a palaeoenvironmental model and thus to reconstruct landscape changes caused by human activities. The focus of the study is the Peitz ironwork in SE Brandenburg, which was a large consumer of commodities for about 300 years. During the time it operated, extensive transformations are supposed to have affected the landscape in the vicinity because of wood consumption and especially charcoal production. Digital datasets about forested areas for different timespans reconstructed from historical maps were made available. In combination with dendrochronological dating of charred trees, the spatiotemporal dimension of charcoal kilns was determined. Also, sites of former bog iron ore mining could be identified. Moreover, the different sources contain further information about other forms of land uses such as agriculture, pastoralism and even viticulture. In conclusion we can highlight that the mosaic of past land use systems is different from the modern structure but that major changes in the forests have been retained.

Environmental and climatic changes during the late Holocene in Hjaltadalur, Skagafjörður, northern Iceland, interpreted from peat core analyses and pollen identification

Magnus Hellqvist, Jenny Johansson, Elisabeth Almgren and Ragnheidur Traustadottir

Affiliation: Department of Earth Sciences, Uppsala University

A landscape analysis based on a combination of several proxies including pollen analysis, loss on ignition, radiocarbon dating, sediment analysis and tephra analysis was undertaken on samples from Hjaltadalur, northern Iceland. The central settlement in the valley, Hólar, is an important site that was once the religious and cultural centre of northern Iceland. Sampling was done in wetlands and one mire (Viðvik) was chosen as the main study site for sampling and analyses. The results provide useful information and insights into temperature fluctuations and climatic development during the late Holocene. In the pollen record there is a transition from a warm and dry forest-like landscape to a cooler, more humid, open landscape during the last 5000 years, with a marked shift from a warm and dry to a cool and humid climate around 2500 years ago. Human activities are reflected by a distinct peak in the Compositae-pollen curve in the uppermost sequence of the sediment core that is indicative of the settlement period during the years AD 870-930. The climatic transition, which contributed to a reduction of the birch population, started before human settlement and the Landnám period (AD 870-930) and thus implies that humans were not solely responsible for the birch decline and the transition of the landscape from forest-like conditions to a more open environment, although the subsequent Viking Age and later settlements continued the afforestation trend.

A framework for defining and characterizing livestock production land use in global change studies

Leanne N. Phelps and Jed O. Kaplan

Affiliation: Institute of Earth Surface Dynamics, University of Lausanne

Pasture is the single most extensive form of land cover globally, currently comprising at least 25% of the earth's ice-free land surface. Livestock production land use influences the earth system in a variety of ways, including local modifications to biodiversity, soils, and nutrient cycling; regional changes in albedo and hydrology; and global changes in greenhouse gas and aerosol concentrations. Different expressions of livestock production have very different influences on the environment, yet distinctions between systems are effectively missing from global change studies. Whether describing the present or the past, the most popular global land cover inventories present only a single, usually poorly defined category of "pasture" or "rangeland" with no characterization of land use. Consideration of land use systems in global change studies is improving, however there is still a marked lack of bottom-up, evidence-based methods. It is high time to incorporate cross-disciplinary evidence of livestock production systems into global environmental change studies, both for the present and the past. We present a framework - rooted in ethnography, archaeology, and the political economy of the modern world - that clearly defines and characterizes the range of livestock production land use variables that must be considered for the past and present. Our framework may find applications in land use inventories and scenarios, land cover modelling, and studies on sustainable land use in the past, present and future.

B3 Landscapes, Archaeology, and the History of the Commons

The "short range" transhumance trails: common resources and jurisdictional findings for the history of Alpine landscape

Beatrice Palmero

Affiliation: Università del Piemonte Orientale

This poster presents four case studies of community pasture management in relation to the historical and spatial development of villages spread along the so-called Mediterranean Alps. In this context, the structuring of a "short range" transhumance plays a crucial role in the reorganization of the commons and in the transformation of the Alpine environment between Liguria and Piedmont in the fifteenth century. The transhumance trails which allowed entry and passage in the municipal area and the displacement routes towards the communal or collective pasture stations therefore represent the jurisdictional features of rural landscape organization. These pastures rights are actually connected to municipal regulations of access and movement in the territory, stored as "customary uses" or renewed through "inter-neighbour conventions". Thanks to the meticulous topographical coding which characterizes them, they can reveal interesting archaeological clues to help evaluate the relationship between the development of Alpine grassland and woodland conservation in long-term historical perspective. Finally, the poster explores how to best store archival material generated by an archaeological investigation of the historical dynamics of commons organization and the transformation of Alpine landscape.

B4 Environmental Humanities: A Rethinking of Landscape Archaeology?

"Harvesting memories": Integrated approaches of human ecology and landscape archaeology in rural Sicily, the case of Castro Valley and Mt. Barraù (Corleone, PA)

Angelo Castrorao Barba,[1,2] Giuseppe Bazan,[1] Antonio Rotolo[3] and Pasquale Marino[4]

Affiliations: (1) Centre for Research on Technology-Environment Interaction – CIRITA, University of Palermo; (2) External collaborator of the Archaeological Heritage Office of Palermo; (3) University of Konstanz; (4) Bona Furtuna LLC

The "Harvesting Memories" project focuses on the study of the long-term transformation of the historical landscape in a rural area of Central-Western Sicily (Castro Valley and Mt. Barraù, Corleone – Palermo). In order to achieve a global comprehension of the landscape, which we consider to be a diachronic result of the interaction between humans and their surrounding environment, our main research threads focus on socio-historical and environmental transformation. To this end we are applying an holistic approach, resulting from the cross-pollination of different methodologies: 1) Archaeological research: field survey and pottery studies allow the reconstruction of the historical settlement patterns from Prehistory to the Modern Age; 2) Archival research: the study of Late Medieval and Modern written sources (contracts, wills, chronicles) produces direct and relevant insights on the past land uses; 3) Historical cartography: ancient topographic maps and land registries, treated both from a qualitative and quantitative approach, are a rich source of information on the evolution of the layout of rural districts and their uses; 4) Potential Land Evaluation: this methodology synthesizes the data produced from the above mentioned

methodologies and, given a set of known technological variables and potential uses, interpolates landscape models, together with its suitability and potential uses.

Geological findings in unique streets of Diemen, The Netherlands, reveal different anthropogenic substrate control

Ronald van Gelder, Sjoerd Kluiving, Inger Leemans, Ruben den Ouden and Jan Goedhart

Affiliation: Vrije Universiteit Amsterdam

We present initial results of a research project focusing on identification of the Anthropocene as an antropological phase in geological reality. The 12th century Dutch old village of Diemen is located on a Holocene soft peat and clay substrate. All houses in the village have been built on long wooden piles that are founded on the first sand layer of the last Ice Age at 12 metres below National Ordnance Datum (NOD). In the 1930s, a new quarter was constructed completely founded on wooden piles. Based on historical records we know that streets were partly finished in 1934, while other roads were constructed in 1936. The research question is whether a clear distinction can be observed between the natural soil layers and the anthropogenic added layers. Results show that we need to discriminate between soils below roads constructed in 1934 and those in 1936. Below the 1934 roads there is a clear distinction between natural soil layers consisting mainly of peat and cultural laid layers consisting of weak silty sand or silty peat. Below the 1936 roads this distinction is completely missing – anthropogenic layers make it impossible to core through the ground surface, which consists of weak silty sand, added with slag- and brick rubble. Plausible historical explanations will be given for the discrepancy found between the soils below 1934- and 1936-roads. Moreover, this study highlights the argument for the necessity of an anthropogenic time-frame in geology, due to strong antropological influences.

Nature and society: an integrated multi-perspective landscape approach in practice

Oscar Jacobsson

Affiliation: Independent researcher

This poster discusses the complex character of landscape and exemplifies how this complexity can be analysed in practice. For many years, the relationship between nature and culture has been simplified in ways which limit our understanding of landscape relations, and which is clearly tied to different "schools of thought" within European historical landscape research and preservation. The major differences between these "schools" limits interdisciplinary communication and a full understanding of landscape. Instead, this paper argues that this range of perspectives can be effectively combined to illuminate the complexity of landscape rather than seeking a generalised simplification. By combining morphological, socio-economic and representational perspectives the relationship between nature and culture can be more clearly analysed in an integrated manner. The paper exemplifies how this approach can be used in practice by investigating the village of Östra Frölunda and its surroundings in south-western Sweden. Historical landscape relations as analysed through the material from this location can be characterised by many different themes which individually contribute to the understanding of the area. However, it is first by analysing these themes in combination that a more interesting picture arises, contributing to a historical landscape analysis that is less human-centric and which provides a solid base for a discussion of the relationship between humanity and nature on a wider level.

C. Landscapes and Water

C1 Perceptions, Use and Engineering of Water

Hinba in Ultimum Terrae – A landscape analysis of the lost monastery of St Columba

Beatrice Widell

Affiliation: Department of Archaeology and Ancient History, Uppsala University

This poster explores the unknown location of the satellite monastery of Iona, Hinba insula (Eng. Transl. "island"), founded by the Irish Saint Columba in the sixth century in western Scotland. It is argued that if we attempt to understand the mental map of abbot Adomnán as he outlines in the Vita Columbae (VC), the hagiography in which Hinba is mentioned, and study how it may be reflected in the physical landscape and archaeological remains, we can trace Hinba's whereabouts more comprehensively. The poster presents two maps constructed in ArcGIS that later are merged: the first is my interpretation of Adomnán's cognitive map of Hinba with the places and spaces in VC and the second a topographical map of the area including the early Christian archaeology. The merge showed primarily that the concept of '*insula*' as Hinba is constantly called, has a more complex meaning than just an island and instead consists of a series of perceptions that are also experienced on mainland sites: a spiritual need for being located close to dangerous water, isolation and sacredness. The study shows thus that the landscape setting of monasteries is more complex than earlier presumed, as the spiritual experience involved the entire surrounding landscape, for instance travelling to the monastery by water which was an ordeal of faith. The resulting sites that could possibly be Hinba, are the two potentially monastic sites Kilmaha and Killevin, located close to lakes on the mainland. This contradicts earlier attempts, which have located the monastery upon Hebridean islands.

Evolution and social organization of the ancient dry zone hydraulic civilization in Sri Lanka based on historical and archaeological materials

Nuwan Abeywardana,[1] Wiebke Bebermeier,[2] Ingo Middelhaufe[2] and Brigitta Schütt[2]

Affiliation: (1) Department of Archaeology, University of Peradeniya, Sri Lanka; (2) Institute of Geographical Sciences, Freie Universität Berlin, Germany

The slightly rolling landscape of the north in the central province in Sri Lanka is characterised by a semi-humid climate, with a deficit in rainfall occurring during the summer months. For 2000 years the cultivation of rice has been based on traditional water harvesting techniques providing water for irrigation. Reservoirs, locally called tanks or wewas, are the corner stones of this highly sophisticated system. Approximately 10,000 tanks still in use today are located cascade-like along shallow valley courses. They are connected by canals and spillways and build a complex system of floodwater harvesting, water storage and water distribution. Beside the use for paddy field irrigation the stored water is utilized for domestic purposes (e. g. bathing). The desiccated tank beds serve as pasture for the cattle and deposited sediments are used as raw material for brick production. Thus, the

tanks characterise over the last 2,000 years the cultural landscape of north central Sri Lanka and have become an identity generating factor of the everyday rural culture. Operating such systems requires a hierarchical administration being in charge for planning and conducting maintenance as well as construction measures. A large number of inscriptions and ancient chronicles give evidence for the social organization as well as the physical and social functions of these systems. This poster will present the formation and evolution of the dry zone hydraulic civilization and its social organization based on the historical and archaeological materials.

New Insights into Petra's Rural Water Management System: A Geoarchaeological Approach

Sarah Isselhorst,[1] Laura Weis,[2] Will M. Kennedy,[3] Jonas Berking,[1] Stephan Schmid[3] and Brigitta Schütt[1]

Affiliation: (1) Freie Universität Berlin, Department of Earth Sciences, Physical Geography, Exzellenzcluster 264 Topoi; (2) BTU Cottbus, DFG Graduiertenkolleg 1913, Humboldt Universität zu Berlin, Lehrbereich Klassische Archäologie, Winckelmann-Institut; (3) Humboldt Universität zu Berlin, Lehrbereich Klassische Archäologie, Winckelmann-Institut, Exzellenzcluster 264 Topoi

The highly advanced water supply system of Nabataean Petra is an already well-researched subject that has been a major scholarly focus for many years. Detailed hydro-technological and archaeological studies have revealed the high standard and vast technological abilities of Nabataean hydraulic engineers, who managed to control extremely disadvantageous natural landscape settings as well as arid climate conditions. Whereas current research concentrates strongly on water technologies within Petra's urban center, this poster will explore the Nabataean water distribution system outside the city limits and focus more on Petra's rural surroundings. The aim is not only to evaluate how the applied water technologies responded to local climate and natural landscape conditions, but also how hydraulic engineering choices affected settlement strategies within Petra's immediate hinterland. Thus, an interdisciplinary geoarchaeological approach applying modern GIS-based methodologies is applied.

Traditional water management in a semi-arid environment, SE Spain

Sarah Isselhorst

Affiliation: Freie Universität Berlin - Department of Earth Sciences - Physical Geography, Exzellenzcluster 264 Topoi

In Spain, different water management strategies are known to have persisted at least since antiquity. Especially in the Mediterranean regions, with their strong seasonal climates, water management is a necessary instrument to enable economic development in areas of less-favorable natural environments. Therefore, the concentration, transport and storage of water enables the bridging of dry seasons for intensive agriculture. The presented study site of Vélez Blanco is located in the northern-eastern part of the Andalusia. The Vega of Vélez Blanco and its traditional irrigation community is a prime example for uninterrupted water management history in southern Spain. It has operated for many generations and is still in use today. The Vegas natural character and the favorable location connected to the headwater area of a large aquifer, ensures perennial availability of irrigation water for intensive agricultural production. Traditionally, the spring waters are managed by

the local irrigation community. The self-organized community is responsible for the distribution and jurisdiction of irrigation water, as well as for the maintenance of the technical infrastructures and for the allocation of water rights by auctioning fixed amounts of irrigation water. Almost uninterrupted records of these traditional water auctions date back to the late 1920s, representing a unique archive. Based on knowledge about similar structured systems of the Region, it is assumed that irrigation farming has been practiced in the vega of Vélez Blanco at least since the Muslim period (7th cent. C.E.). Preliminary results of the current analysis of water auction records in relation to climate data, key agricultural elements and the demographic development of the region will be presented. Based on this, interactions and relations between the natural environment and socio-economy shall be investigated.

C3 Water Harvesting Systems as Key for Understanding Human Management of Arid Environments

Water harvesting systems in the dry zone of Sri Lanka

Ingo Middelhaufe,[1] Nuwan Abeywardana,[2] Wiebke Bebermeier[1] and Brigitta Schütt[1]

Affiliations: (1) Institute of Geographical Sciences, Freie Universität Berlin, Germany; (2) Department of Archaeology, University of Peradeniya, Sri Lanka

The cultivation of rice in the semi-arid and dry-sub humid zone of Sri Lanka is based on 2,000 years of traditional water harvesting techniques: During two monsoonal periods, rainfall and surface-runoff are stored in humanly constructed reservoirs, so called *wewas*, and used for irrigation throughout the year. In the hinterland of the ancient capital of Anuradhapura (437 BC to 1017 AD) these tanks were aligned predominantly along shallow valleys forming so called tank-cascade systems. In contrast, in the surroundings of the successional capital of Polonnaruwa (1055 to 1215 AD), water storage systems were characterised by single large scale tanks. During their zenith, up to 30,000 tanks were installed, of which one third are still in use. In both regions water harvesting and water storage systems are adapted to specific environmental and socio-economic conditions. The implementation of the tanks is being studied under a comparative approach in a joint project at the Freie Universität Berlin (Germany) and the University of Peradeniya (Sri Lanka). Assessment of the vulnerability and resilience of the natural and social systems linked with water harvesting systems is a particular focus of the research project, combining geographical and archaeological studies. The poster aims to introduce the theoretical and methodological approach of the interdisciplinary project. Further, the first results from field work and laboratory analysis of alluvial sedimentological records from the floodplain of the River Malwathu Oya, in the vicinity of Anuradhapura will be presented.

C5 The Ever-Changing Environment: Landscape Archaeology in River Landscapes

The oxbow lake in Augusta Treverorum/Treves

Christoph Lindner

Affiliation: University Osnabrück

This research deals with an oxbow lake on the Moselle and its filling to the north of the ancient Gallo-Roman metropolis Augusta Treverorum/Treves. In 1925, the swampy area and organic finds were first excavated in the Ritterstraße (today: Bruchhausenstraße). Despite being such an interesting archaeological archive the oxbow lake remained unnoticed in the following decades and was rediscovered only by H. Löhr in 1994; afterwards it was documented several times. The oxbow lake is situated to the north of the ancient settlement. First of all, the lake/swamp was probably used as sewage farm. From Flavian times, it was gradually filled up presumably from north to south, perhaps as part of a larger plan for the development of Treves. The archaeological evaluation of those structures in the area of the oxbow lake will give a better understanding of the development of Roman Treves itself. Of special interest is research on the mutual interactions between topographical circumstances and anthropogenic settlement structures. Rarely explored fields of research like waste and sewage disposal in Roman towns will be part of the study. The results of interdisciplinary co-operation and the use of modern technologies will enable a precise interpretation and dating of findings.

Modelling Roman and early-medieval route networks and their stability in delta landscapes

Rowin J. van Lanen[1,2] and Harm Jan Pierik[1]

(1) Utrecht University, Faculty of Geosciences, Utrecht; (2) Cultural Heritage Agency of the Netherlands, Amersfoort, the Netherlands

The Roman Empire featured an extensive network of routes (e.g. roads, waterways) connecting many parts of Europe and northern Africa. The orientation of these land and water routes often represents a certain degree of logic, often closely related to local landscape conditions. In many parts of "Roman Europe" the landscape can be regarded as relatively stable, this is however not true for the north-western part of the frontier in the present-day Netherlands. This region is relatively low-lying and for large parts characterized by the presence of three major rivers: the Rhine, the Meuse and the Scheldt. Although these rivers exposed the landscape to strong fluvial influences and frequent flooding throughout the Holocene, they also played a crucial role in military and economic activities during the Roman and early-medieval periods. This study presents a method to model probable Roman and early-medieval route networks in this delta landscape and calculates their stability through time, even if these are invisible in the present-day landscape. The dynamic nature of the delta forced people in this region to adapt to ever-changing circumstances. Route networks connecting settlements over a variety of distances will have shifted between periods, because of natural and/or cultural causes. The nature of these network changes shed light on the complex interaction between settlements and surrounding landscape conditions.

A unique 8000-year continuous botanical, sedimentological and archaeological record at Well-Aijen, Meuse valley, the Netherlands.

J.A.A. Bos, F.S. Zuidhoff and A. Müller

Affiliation: ADC-ArcheoProjecten, the Netherlands

Continuous high-resolution Holocene palynological records from the Meuse river valley were missing until recently. Most sediment records reflect short time-intervals

or are characterised by hiatuses. In 2011, a deep infilling of a residual channel of the Meuse was recovered at Well-Aijen. In order to investigate environmental and inferred climatic change during the Holocene, detailed botanical and sedimentological analyses were carried-out at a high-temporal resolution. A chronology of the 8000-year record was provided by five AMS 14C dates. The record reflects the Boreal to early Roman Period. The location of the residual channel is unique as the river floodplain and nearby terraces were inhabited almost continuously from the Mesolithic to Roman period. Based on the botanical analyses a direct relation was made between human occupation and vegetation changes in the landscape, and introduction of domesticated crops. During the Early Holocene dense mixed woodlands developed and Mesolithic hunter-gatherers were occupied the river floodplains. Around 4365 BC (Neolithic) small-scaled openings were made in the woodlands for cereal cultivation. In the Iron Age, large floods occurred, caused by the deforestation of the hinterland, and people were forced to move to the higher terraces. This situation continued during Roman and Medieval times.

C6 Archaeology of Water Landscapes

A natural spring as a water resource in a landscape changing from sea to land in south-central Sweden

Magnus Hellqvist

Affiliation: Department of Earth Sciences, Uppsala University

A natural spring that was revealed during archaeological excavations in Nibble (west of Enköping, Sweden) was investigated through the excavation and analysis of insect remains in order to understand landscape development in a landscape changing from seabed to terrestrial land. Sweden has been heavily affected by uplift following the terminal glaciation (Weichsel) in Scandinavia. The study area rose above sea level around 1200 BC. The spring was found in connection with the northern part of a large settlement and religious area, dating from the Younger Bronze Age and Pre-Roman Iron Age (1100-300 BC). However, 14C-dating from the lower and upper parts of the spring yielded a stratigraphic age range of 670-870 to 660-810 AD, respectively, and we conclude that the site was probably abandoned in the late Iron Age (600-800 AD). A half-circle boulder construction at the site provides clear evidence that the natural spring was used and maintained early in prehistory, probably during the Bronze Age, and potentially cleaned at irregular periods. The insect assemblage was dominated by beetles (Coleoptera) indicative of open landscapes, grazing land and forested environments, suggesting that the spring was situated between arable land and forests, close to the former coastline. The high frequency of ground beetles (Carabidae) revealed the former ground conditions, correlating well with inorganic to organic composition. Two presently IUCN Red-Listed species that do not occur in the current fauna were found, indicating a radical change in the agricultural landscape over the last 1200 years.

D. Frontier Landscapes. Landscape Frontiers

D1 Crossing Boundaries: Exploring the "Limits" of Landscape

Human-landscape agency in Aguas Buenas: Pre-Hispanic mound and petroglyph complex

Dita Auziņa

Affiliation: Leiden University

Aguas Buenas in Central Nicaragua is a monumental mound and petroglyph site and appears to be the result of human-landscape agency. Here, the building strategies were informed and inspired by the natural features and the resulting construction completely transformed the landscape. The mapping and creation of a Digital Evaluation Model (DEM) of the site revealed unique geometrical patterns in the mound distribution. Conversely, these factors are unreported in ethnographic interviews and are not experienced at the site, with an emphasis instead placed on the presence of the river and mountains. This case study will present an approach to understanding the landscape of Aguas Buenas through the visualisation of maps and the experience of natural phenomenon. By applying different methods, diverse questions will be raised and new interpretations will be offered. By comparing these differences, the merits of both methods will be presented.

Capturing the essence of mining landscapes: The case of Sounion National Park, Greece

Maria Kayafa

Affiliation: Lavrion Center for Environmental Education

From a historic point of view, mining enterprises are notoriously disruptive to the natural environment, leaving behind scarred landscapes, both on the surface and underground. Their topography is distinctive and includes mining galleries and shafts, industrial installations, heaps of slag and other by-products, mining settlements. However, after all the mining and metallurgical operations stop - and this is bound to happen due to the exhaustion of the mineral deposits sooner or later - mining landscapes, if left undisturbed, may revert to their former state usually encompassing the anthropogenic features found in their confines and transforming them into monuments. Mining landscapes are therefore a particular category of cultural landscapes, beyond the classical and the picturesque, that are often ideal settings for showcasing the high cost of technological achievements on the environment and at the same time invoking nostalgic images of times past. This poster aims to explore the ambiguity caused when one is faced with mining landscapes, using as a case study the mining district of Lavreotiki in Greece, which largely incorporates Sounion National Park. This ambiguity extends not only to the emotional response of the visitor/observer (ranging from repulsion to compelling), but also to his/her cognitive response which refers to the understanding and interpretation of the landscape. In analysing the features of the park, this paper will also discuss the merits of balanced developmental

plans that would enhance the interplay between geology, archaeology, landscape and cultural heritage.

The Dynamics of a Frontier Landscape: the Lower Rhine from 50 BC to AD 500

Kai Radloff

Affiliation: Römisch-Germanische Kommission des DAI

Archaeology has a rather ambivalent relationship with borders: on the one hand borders appear quite often, for example as a result of distribution maps or site catchment analysis, on the other hand, the connection of these results with political or even ethnic entities is highly controversial. And yet, despite this, there is also one historic border, which was often defined as a political, ethnical and cultural line of separation: the Roman frontier. Known from written sources and even visible due to large-scale military installations, it is one of the "undisputed borders" within archaeology. However, this leads to another problematic situation: although the frontier is considered a zone and more permeable in general, its linear military structures are still used to define the borders of the study regions in Roman period archaeology. But what can we actually learn about its formation process by just looking at either one or the other side? The goal of the study presented in the poster is to contextualise the Roman frontier by analysing and comparing the landscape on both banks of the Lower Rhine. It raises the question of what we can find out about this dynamic process of socio-political change, which set in after the Roman occupation. How did the occupied territory develop in comparison to the unoccupied? With its focus lying on alterations within the settlement pattern, the project explores how the borderland emerged, persisted and changed between 50 BC and 500 AD up the River Maas and down the River Ijssel.

D2 Exploring the Rural Edge – Outland Landscape Exploitation and Resource Colonization

The invisible outland use: Plants in domestic use, trade and in antiquarian practice – a methodological problem

Eva Svensson[1] and Annie Johansson[2]

Affiliations: (1) Karlstad University; (2) Länsstyrelsen Värmlands län

In past times, many plants were used for a number of purposes and loaded with different meanings and qualities. For instance plants were of crucial importance as medicines, in food production, and in dyeing. In this paper plants as resources in past outland use will be discussed. It will be pointed out that the importance of plants in past societies is hard to access as traces of them and their uses are not visible in the archaeological records from excavations and surveys. There are occasional peepholes such as the hanging tapestry from Överhogdal from the 10th-12th centuries AD. The figures on the tapestry were woven in wool from Nordic sheep and dyed in colours made from plants non-native to the area; alizarin from madder, 'indigo' from woad and weld. Either the plants or the colours must have been traded to the area. If plants were commodities, they were either grown or managed for harvest, and likely processed before being traded. Also, plants regularly used

in domestic purposes were most likely managed in some ways to ensure their availability. Today we lack knowledge of how cultivation and management of many plants, apart from cereals, have been expressed in the landscape. Studying past uses of plants thus presents a methodological problem, as potentially useful methods such as pollen- and macrofossil analyses, are dependent on locating relevant sampling sites. One alternative way for locating sampling sites, and connected antiquarian problems, discussed from a pilot study, is the mapping of biological heritage.

D4 The Landscape of The Mining District of Bergslagen - In the Borderland Between the Agricultural Areas and the Large Wooded Areas

Lost landscapes at Sala, eastern Middle Sweden

Anette Färjare,[1] Anna Ulfhielm[2] and Roger Wikell[3]

Affiliations: (1) Eldrun arkeologi och Landskap; (2) Almunga AB; (3) Wikell Arkeologi

Large parts of Sweden are covered with forests. The landscape is dominated by modern high tech forestry. This was also the case with a forest that in 2014 was the site of the "Sala forest-fire". On the 31st of July a spark from a forest machine started a wild fire that soon was out of control. In one week 34 100 acres of valuable forest burnt down including several nature reserves. But as soon as the smoke was gone researchers realized that a window was open to lost landscapes. We know from historical records that this forest area had been intensively used for traditional forestry and foremost for iron fabrication. The cultural landscape is dominated by places for making charcoal, mines for iron, quartz and other minerals. Also smiths and evidence for iron manufacturing are common. Charcoal was made and supplied mainly for the Engelsbergs Ironworks – today a World Heritage Site which began its production in the 15th century and ceased in 1919. Here and there also small crofts have been located on small spots with good land. The Sala forest also hides another landscape. In the early postglacial period the forest was an archipelago due the land up lift. Raised beaches can be traced on the highest mountain, Hoberget, today 178 metres above sea level, all the way down through the landscape. The archipelago was early on found by seal-hunters who came here by boat. The Stone Age sites are found at natural harbours. Shore line dating indicates that the pioneers came here 10 000 years ago. With historical maps, modern maps and Lidar data analysis, cultural landscapes were reconstructed and a successful survey was performed in 2015.

E. Mediterranean Landscape Archaeology

E1 Cross-Disciplinary and Integrative Approaches to Human-Environment Interactions in Mediterranean Landscape Archaeology

Portraying the Iron Age settlements in Central Macedonia: The case studies of the Thermaic Gulf, the prefectures of Kilkis and Chalkidike

Spyros Vasiliou

Affiliation: Hellenic Ministry of Culture and Sports, Ephorate of antiquities of Chalcidice and Mount Athos

This poster discusses "colonizations" and ethnic boundaries during the Iron Age and the Early Archaic Period in Central Macedonia, and coastland, inland sites and zones of stress and communication. The four principal types of settlements based on their physical characteristics which reflected the initial decision (collective ?) of their establishment are: A. naturally defensible hills; B. Low flat elevated ground (so called "trapeza"), often attached to a prehistoric "toumba"; C. Coastal promontory with nearby sandy seashore; D. "Toumpa" (tell, mound). Travelling around the highly historical landscape of central Macedonia in northern Greece someone could cross easily through spatially dispersed references of human societies and their pursuits in the past. The extremely dense information of this cultural landscape surround the traveller like a fairy tale without start and end. As a result, it is possible to reflect on the selected position each settlement in the given environment during a relatively short period of time (1100/1050 – 700 BC). This period is seen as a time of major transformation of the population dynamics through mobility and the adoption of new patterns of growth leading to the emergence of a new system of towns in the Archaic Period. Crucial components which triggered the social structures and processes were colonization efforts, mainly via sea routes, by southern Helladic groups. This poster is an initial overview of the theme and part of an ongoing landscape study.

Archaeology and spatial analysis: the case-study of Rocchicella Mineo (Catania-Italy)

Sebastiano Muratore

Affiliation: Institut für Klassische Archäologie, Eberhard Karls Universität Tübingen

The Hellenized indigenous settlement of Palikè, founded by the Sicilian leader Ducezio on the hill of Rocchicella during the fifth century BC, is located in a strategically important point as a communication link between the east and south coast of Sicily. All ancient authors speak of Palikè and its sanctuary dedicated to Palici Gemini and the volcanic lakes, with the rituals attached to them. Archaeologically, thanks to the peculiarities of the place, the site appears to have been inhabited since the most ancient times and analysis of these phases is has been the focus of a series of investigative excavations and surveys for several years. By applying spatial analysis of the site within a GIS and doing remote sensing analysis, the project aims to better understand the areas subject to human intervention in ancient times and during the modern age, and determine the territorial limits of human activity here.

Human-environment interactions at the Phoenician site of Ayamonte (Huelva/Spain): – Insights from terrestrial borehole data

Torsten Klein,[1] Wiebke Bebermeier,[1] Jan Krause,[1] Dirce Marzoli[2] and Brigitta Schütt[1]

Affiliations: (1) Freie Universität Berlin; (2) Deutsches Archäologisches Institut

Archaeological findings indicate that the coastal range running parallel to the Atlantic coast and crossing the Guadiana estuary has been populated continuously since the Late Bronze Age/Early Iron Age. Most recent excavations document that in the 8th/7th century BCE the ridge, where today the settlement Ayamonte (Lower Andalusia/ SW-Spain) is located, was populated by Phoenician colonists. A sedimentological study based on six sediment cores arranged along two transects on slopes in the vicinity of the Phoenician site of Ayamonte was conducted. The sediments extracted from the colluvial deposits cover the last 4000 years and record signals of human-environment interaction and changes of the depositional environment. The collected data show that the past four millennia are characterized by alternating phases of geomorphological stability and activity. While the sedimentological results suggest that the Little Ice Age and Sub-Boreal mark phases of increased slope activity, proof of geomorphological stability during the Medieval Warm Period is given by the occurrence of a local palaeosol. Lead concentrations in the colluvial deposits indicate that prehistoric metallurgy can be traced back as early as the Bronze Age. The results illustrate that the sensitive local Mediterranean landscape around Ayamonte was characterized by strong geomorphic activity during phases of intense settlement activities and increased mining. During the Roman Era and the Early Modern Era, both epochs of strong mining activity in SW-Iberia, significant erosion occurred at the slopes around Ayamonte. Whereas, during the Muslim domination of Iberia, the abandonment of mining activities coincides with a phase of relative landscape stability.

Results of a minimal invasive prospection of a prehistoric settlement hill in the Bakırçay valley, Western Turkey

Marlen Schlöffel,[1] Steffen Schneider,[2] Christoph Schwall[3] and Barbara Horejs[3]

Affiliations: (1) Osnabrück University; (2) Lower Saxony Institute for Historical Coastal Research; (3) OREA, Institute for Oriental and European Archaeology, Austrian Academy of Sciences

This study couples geomorphological, archaeological and geophysical methods to investigate the prehistoric landscape of the Bakırçay valley in Western Turkey. The investigations focus on a settlement hill called Çiftlik, c. 10 km to the east of the Aegean coast and 18 km to the west of the ruins of ancient Pergamon. In the modern landscape, the settlement hill is hardly identifiable and shows signs of extensive modern modification by agriculture and building measures. Until now, there is almost no information on the original dimensions of the settlement hill, its exact age or the thickness of the preserved cultural layers. This paper presents the first results of investigations based on the analysis of drilling cores, surficial archaeological findings and magnetic prospection.

The Impact of the Roman military on the rural landscape: The view from north-east Iberia

Mateo González Vázquez

Affiliations: Universitat de Barcelona

In a geographical area comprising most of the Catalan coastal depression and pre-coastal

plains, bell-shaped storage pits are one of the more common archaeological features. The chronological distribution of the use of subterranean storage in Iron Age Iberia reveals an extended use of this storage strategy between the fifth and the first centuries BC, with an absolute and unprecedented predominance during the second century. The expansion during the second century BC has often been interpreted as an intensification of agricultural activities in order to meet Rome's military needs. This presumed intensification of agricultural activities has also been uncritically tied to the introduction of taxation by Rome and the emergence of a new economic order. This explanation, however, runs the risk of conflating subterranean storage with storage in general. The security reasons attached to these concealed storage facilities, nonetheless, have been omitted -or only briefly touched on- in most archaeological studies on storage pits in north-east Iberia and other Mediterranean regions. The (often subterranean) concealment of grain surplus from a new and potentially oppressive socio-political order has occurred in many regions and over different time periods. In this poster, based on ethnohistoric and archaeological records, I argue that extensive pit fields in north-east Iberia and their significant growth during the second century could have originated as a result of the need for local communities to secure their subsistence in defence of an invading force and the appropriation of surplus.

The Avellino Event. Distal impacts of the great Bronze Age eruption of Mt. Vesuvius

L. Alessandri,[1] P. A. J. Attema,[1] M. Doorenbosch,[2] M. H. Field,[2] J. Sevink,[1] W. Van Gorp[1] and P. M. Van Leusen[1]

Affiliations: (1) Institute of Archaeology, University of Groningen; (2) Faculty of Archaeology, Leiden University

The Avellino Event Project is a 4-year research program (2015-2019) to study the distal environmental and societal effects of the great Bronze Age eruption of Mt Vesuvius (ca. 1995 cal BP). It aims to find evidence for a northward migration of the EBA population of Campania. The poster sets out the research plan and the results obtained in coring campaigns during its first year.

Healing nature. The environment of healing spas in Roman Thrace

Mariya Avramova

Affiliations: The Antiquity of Southeastern Europe Research Center, University of Warsaw

Ancient medicine recognized the importance of nature for maintaining and restoring health. Its effect on physical well-being was a subject often undertaken by doctors in medical treatises, the earliest and most famous of which is "On Airs, Waters, and Places", one of the texts in the Hippocratic corpus. Healing spas were an important part of treatment of diseases in ancient Greece and particularly in ancient Rome. Roman spas were focused on natural resources, e.g. mineral water. In Italy they were usually founded in places with a view of water or a spectacular view, however the most important criteria seems to have been the presence of mineral water springs. The main goal of the presented research is to analyse briefly three case studies of spas in Roman Thrace and look for a connection between the information from the "On airs, waters and places", the features of the landscape surrounding Italian spas and the presented examples of spas in Thrace. Such an analysis proves that in spite of the few presented examples, it is possible to observe some patterns especially regarding the geographical position and climate of spas in the discussed region. However, the small number of case studies cannot give a definitive answer as to the overall policy of founding spas in Roman Thrace.

F. Mobility and Landscape

F1 Rethinking Mountain Cultural Landscapes: integrated analysis on pastoralism and transhumance

Archaeological risk assessment of mountain archaeological heritage

Pau Olmos Benlloch

Affiliations: Institut Català d'Arqueologia Clàssica

Mountain areas are especially sensitive to climate change and anthropogenic pressure which has increased damage risk to mountain archaeological heritage. The remains of livestock activities are susceptible to natural hazards, including flooding, erosion and mainly landslip. At the same time, the decline of traditional activities has an important impact on the conservation of the archaeological record. In this work we propose a methodology for risk assessment of mountain archaeological heritage based on a multidisciplinary approach and the integration of archaeology, history, climatology and geomorphology datasets resources. Our goal is to implement a procedure for observing and quantifying the risks threatening mountain archaeological heritage. This methodology is based on the observation of a series of variables, concerning natural and anthropic threats and the frequency of damages, and the vulnerability and archaeological interest of the archaeological structures in the context of a cultural landscape, in order to produce evaluation outputs (risk map) in a Geographical Information System to alert local communities and heritage managers from sites at-risk and adapt heritage management strategies. This methodology should be adapted to each mountain cultural landscape. However, our initial study case will be placed in the Vall de Núria/Coma de Vaca area (Spanish Pyrenees), due to the availability of data sets and the archaeological importance of this sector. Our final aim is to raise social awareness of this fragile heritage and provide tools to integrate locals in risk assessment and in cultural heritage management.

Beyond the pale: reflecting on indigenous mountain culture in the Lake District, Cumbria, UK

Steve Dickinson

Affiliation: The Prehistoric Society

The Lake District, Cumbria, UK, is a mountain landscape currently under consideration by UNESCO for World Heritage Site status. Since the times of Turner and Wordsworth, the area has developed identities constructed as an edifice of post-Enlightenment cultural values; values which UNESCO is invited to acknowledge and to legitimise. Prehistoric and early historic peoples effected large-scale transformations in the landscape of the District. From the Neolithic onwards, deforestation and enclosure for pastoralism have led to a 21st century highly managed environment beset by conflicting contemporary concerns; for example: access, tourism, the sustainability of farming in 'marginal' areas, the effects of climate change. In the debate around these concerns, past uses of the montane Lake District for hunting and for transhumance have been side-lined. Fox hunting, (on foot, with dogs), in the area still survives; carried out and supported largely by indigenous pastoral farming communities. These, and other Lakeland traditional

activities, are often under-acknowledged, yet they, and their deep heritage, provide a powerful counter-perspective to narratives that rely largely on themes of 'discovery' of the area from the 18th century onwards by poets, painters and writers. Indigenous values in this area have a grounding in archaeological evidence for montane prehistoric and early historic pastoralism, transhumance and hunting. Exploring this evidence alongside that from recent history articulates Lake District social identities of difference, of gender, of alternative stories.

The Byzantine Monastic Cultural Landscapes: Theodosian Land Walls in Istanbul and Mount Olympus (Uludağ) in Bursa

Figen Kivilcim Corakbas

Affiliation: Faculty of Architecture and Design Department of Architecture, Anadolu University

Dating back to the reign of Theodosius II, that is the first half of the 5th century AD, the Thedosian Walls in Istanbul are considered to be one of the greatest achievements of late antique military architecture. The Theodosian Walls are 5.7 km long. Their defence system consists of a moat (taphros), outer terrace (parateichion), outer wall (mikron teichos), inner terrace (peribolos), and inner wall (mega teichos). The first phase of the Theodosian Walls was completed in 413 AD. Before the Theodosian Walls, the west border of Constantinople was determined by the Constantinian Walls, of which no remains exist today. According to Cyril Mango, the two reasons behind the construction of the Theodosian Walls might be the defence of agricultural territory and three huge open-air cisterns, as well as the defence of the settlement itself. As a result, in the Byzantine era, the area between the Constantinian Walls and the Theodosian Walls was composed of agricultural territory and numerous monasteries. The Istanbul Land Walls was registered on UNESCO's World Heritage List in 1985, as one of the four Historic Areas of Istanbul. Olympus Mountain (Uludağ) in Bursa hosted over 200 monasteries in the Byzantine era. Today, it is registered as a national natural heritage site. Its Byzantine monastic cultural landscape is still under-studied. This poster aims at analysing the two Byzantine monastic landscape referred to above, in terms of their tangible and intangible heritage qualities.

F3 Mobility, stability and human-landscape interaction in the archaeology of Asia

The world of the Steppe: The movement of landscape change traditions from Central Asia to the Southern Trans Urals in the Late Bronze Age

Nikolai Shcherbakov,[1] Alexandra Golyeva,[2] Iia Shuteleva[1] and Tatiana Leonova[1]

Affiliations: (1) Bashkir State Pedagogical University named after M.Akmulla, Ufa; (2) Institute of Geography, Russian Academy of Science

In the Late Bronze Age (1930 – 1750 BC) several groups of people - the Srubnaya and Andronovo (Alakul) archaeological cultures - permeated the territory of the Southern Urals. The population of the Srubnaya archaeological culture came to the Southern Urals

from the territory of the Volga region Steppes, and the population of the Andronovo (Alakul) archaeological culture originated from Central Asia, the Steppes of Kazakhstan and Southern Trans Urals. Palaeopedology studies have helped determine that landscape change occurred on the basis of the Steppe traditions of the Andronovo (Alakul) population. Specifically, the ways cultural layers formed in ancient settlements and earthen burial mound construction were distinctive of natural desert conditions, i.e. typical for extra-arid climate. Gypsum was one of the attributes of the cultural layer formation and housing construction. Palaeopedology analyses determined the chemical composition of mainland horizons (carbonate or gypsum), whether gypsum was used in the cultural layer formation, and if there are any similarities between given cultural layers among similar settlements in the Kasburun archaeological micro-region in the middle course of the Urshak river. Here, materials from a group of seven settlements were examined. In the course of investigating the funerary complexes, research questions concerning designation of a surface level buried under the mounds and the presence or absence of any biological materials in burials and vessels were set. For the set tasks, solution on two of the seven settlements specimens were selected, the amount of total phosphorus, gypsum and mineral carbonates and the composition of cations and anions of the aqueous extract (the salts composition and concentrations) were determined. The fragments of calcite plates are present in the mounds, which is the attribute of the Andronovo (Alakul) tradition burial rite. This research was sponsored by the RFH and the RB in the framework of a scientific project number 16-11-02003 a/u.

F4 Landscapes of mobility: the use of computational approaches in modelling ancient patterns of connectivity

The cultural landscape of the Hamedan plain according to Rank-size and Shanon Entropy Rule during the late Chalcolithic period

Behzad Balmaki

Affiliations: Department of Archaeology, Islamic Azad University of Hamedan

The plains of Hamadan are one of the most important areas between the Central Zagros region and Central plateau of Iran. Studying their role in shaping social and economic complexity and the formation of urban infrastructure during the late Chalcolithic is the focus of this research. Regarding the changes in climate from the sixth millennium B.C up to now, studies of the current situation can also inform understanding of the biological patterns and ecological behaviour of the area in the Chalcolithic. In this study, 39 sites were identified and were archaeologically investigated. In the analysis of the spatial data, rank-size and entropy analysis indices were both used to complement each other's results, despite computational difficulties. The value of the rank-size distribution indicates a close relationship between settlements and upper level sites, related to expansion onto the plains and adjacent of regions. The existence of one hectare areas, which is important in concaving the logarithmic graph of the rank-size analysis and increasing the entropy index, indicates the lack of organization and the need for making complexities and social infrastructure in the late Chalcolithic period, such as participating in production of agricultural products and rural communication networks in the Hamadan plain. The result of this analysis indicates that there was no central place or centralised system of settlement organisation.

Moving and seeing in a centuriated landscape: Archaeological spatial analysis applied to Roman territories in northeast Tarraconensis

Maria del Carmen Moreno Escobar,[1] Josep M. Palet[2] and Hèctor A. Orengo[3]

Affiliations: Department of Archaeology, University of Southampton; (2) Catalan Institute of Classical Archaeology (GIAP-ICAC); (3) McDonald Institute for Archaeological Research, University of Cambridge

Centuriations have been traditionally perceived as a tool used by Rome for exercising its control over newly conquered territories and/or of communities whose loyalty came under question. However, the last decade has seen a renovation in the archaeological study of centuriated landscapes as new research perspectives have been incorporated into the study of the organisation and development of Roman territories. Such renewal is linked to the adoption of methodological and theoretical approaches from landscape archaeology, which have allowed this discipline to overcome its over-emphasis on morphometric analysis, which characterised it during the 1990s. Not the least of these new innovations is the generalised use of GIS and related geospatial techniques. This renovation is allowing researchers to reconsider centuriations under a new light and to enhance different aspects, which are not directly related to economic or productive issues, such as the symbolic dimensions of this form of territorialisation. Furthermore, the application of post-processual theoretical approaches could provide further insights and deepen our understanding of the meanings and values associated with these features, which so radically transformed the territories of Roman urban centres. Making use of different techniques of archaeological spatial analysis, this poster aims to explore movement and vision across and towards these territorial features in the surroundings of Barcino during the Early Empire. It is argued here that such an approach will help with analysing the conceptualization behind the making of a centuriated landscape and identifying possible relationships between the city of Barcino and its territory, thus enhancing our comprehension of the urbs-ager dynamics during the Roman period.

An attempted predictive model for Early Mesolithic England

James Williamson

Affiliation: Lund University

This poster is based on my MA Thesis at Lund University in 2015. The Early Mesolithic of England has been studied in detail over the past 50 years, and a large amount of important literature has been produced on this period, and on Star Carr in particular. Despite this, a predictive model for this period has never been attempted. Site discovery for this period thus relies upon finding flint scatters through field walking and accidental discovery during research excavations. Predictive modelling has been used to describe site appearance, and has shown some success in the Netherlands and North America as a cost efficient alternative to individual desk based assessments of sites in commercial archaeology. Predictive models have also been used as a tool in archaeological research, and may be a promising opportunity for site prospection. My study aimed to create a predictive model which could be used to prospect for archaeological sites and to discuss site use within the Mesolithic. There will be a discussion of scale within analyses of the Mesolithic in England. Further, the reasons for the negative results from this research will be discussed.

G. Landscape Archaeology in Practice

G3 Geophysical approaches to landscape archaeology

Insights into Cucuteni settlements: geophysical prospection for understanding settling patterns in north-eastern Romania during the Chalcolithic

Andrei Asăndulesei,[1] Cotiugă Vasile,[2] Ștefan Caliniuc,[1] Nicu Cristi,[1] Tencariu Felix,[1] Balaur Radu,[1] Mihu-Pintilie Alin[1] and Mihaela Asăndulesei[1]

Affiliation: (1) Interdisciplinary Research Department - Field Science, "Alexandru Ioan Cuza" University of Iași, Romania; (2) Faculty of History, "Alexandru Ioan Cuza" University of Iași, Romania

With regard to the Cucuteni culture, considered the last great Eneolithic civilisation of Europe, archaeological research has a long tradition in Romania, going back to the late 19th century. Nevertheless, the number of sites that have been exhaustively excavated is extremely limited (Hăbășești, Târpești, Trușești). Rarer still are the situations in which the investigations were extended to outside the fortification or delineation works. As such, from only the information provided by the limited excavations, it is difficult to advance hypotheses regarding the complexity of the cultural landscape during the Eneolithic. Considering the above, our main aim was to ascertain certain types of internal organisation of dwellings (including those already supposed and circulated in the dedicated literature for this region: groups, rows, circles, and scattered) or the typology of the fortification works, where they are present, in Cucutenian sites from north-eastern Romania. In this sense, we found that extending non-invasive research, based on the integration of the main prospecting methods (air photography, geophysical surveying), was a feasible solution for addressing the shortcomings faced by previous research. We present the results of geophysical investigations conducted at five Cucutenian sites from the aforementioned area, with an exposition of the literature on their planimetric evolution, fortification and delineation works, from one cultural phase to the other. The data obtained provides clues for a novel internal organisation of dwellings that can be regarded as the incipient form of the type best exemplified in the Trypillian area under the form of megasites with radial arrangement of structures.

Methodological results of geoarchaeological studies conducted in the Raganello Basin (Southern Italy), 2010-2014

P.M. van Leusen, K.L. Armstrong and W. de Neef

Affiliation: University of Groningen, Institute of Archaeology

This poster highlights the most significant results obtained from combined earth, scientific, geophysical and archaeological studies at a series of locations selected to be representative of rural pre- and protohistoric settlements in typical Mediterranean landscape zones. It answers questions such as 'Which geophysical methods work best for site detection and

mapping in these landscapes?', 'What are the typical anomalies encountered?', 'How are these generated from the subsoil features?' and 'How can coring, test pits and computer modelling be most effectively employed to support and test interpretations of geophysical anomalies?' The poster will point to more detailed publications as well as set out lines for further research.

G4 Exploring maritime landscapes by multi-proxy approaches: Combining geomorphological, palaeofaunal and geophysical methods

Pergamum's maritime satellite city Elaia (NW Turkey) – Coastal evolution and sea-level change

Martin Seeliger,[1] Stefan Feuser,[2] Peter Frenzel,[3] Anna Pint,[1] Felix Pirson,[4] Svenja Riedesel,[1] Lyudmila S. Shumilovskikh[5] and Helmut Brückner[1]

Affiliations: (1) Institute of Geography, University of Cologne, Köln (Cologne); (2) Heinrich Schliemann-Institute of Ancient Studies, University of Rostock, Rostock; (3) Institute of Earth Sciences, Friedrich Schiller University of Jena, Jena; (4) German Archaeological Institute (DAI), İstanbul; (5) Albrecht-von-Haller-Institute for Plant Sciences, Department of Palynology and Climate Dynamics, Georg-August-University Göttingen, Göttingen

During Hellenistic times, when the Pergamenian Kings established their powerful realm in Asia Minor, they were in need of a harbour. They found it in the city of Elaia near the mouth of the Kaikos River. Within this archaeological and historical setting, our geoarchaeological approach aims at reconstructing the landscape history around this harbour city, and spatio-temporal scenarios based on the study of terrestrial and semi-aquatic sediment cores. This poster presents new results in the context of late Holocene sea level fluctuations in this area. Due to intense microfaunal evidence we are able to establish a relative sea level curve (RSL) for the Bay of Elaia based on the distribution of ostracoda and foraminifera. In addition, we used the remains of the Hellenistic harbour breakwater to gain information about the sea level at that time. This curve is in good agreement with the Lambeck Model and with further studies along the shores and the islands of the Aegean .

Microfossil studies on harbour sediments of ancient times from the west coast of Turkey – a review

Anna Pint,[1] Peter Frenzel,[2] Martin Seeliger,[1] Friederike Stock[1] and Helmut Brückner[1]

Affilations: (1) Institute of Geography, Universität zu Köln, Köln; (2) Institute of Earth Sciences, Friedrich-Schiller-Universität Jena, Jena

The complexity of the coastline is of crucial importance for the existence of harbours. On the west coast of Turkey, well protected and deeply incised embayments provided ideal locations for harbours during antiquity. Their connection to the hinterland via rivers made these locations even more attractive. In addition to sedimentary and geochemical

analysis, the microfaunal research is of major importance for understanding their evolution and history as outline din this poster. We concentrated our studies on Ostracoda and Foraminifera, two classical groups of calcareous microfossils of 0.2 to 1 mm in size on the average. Both groups occur in large numbers in most types of marginal marine waters. Micropalaeontological studies on harbours follow the uniformitarian approach, i.e. the modern ecology of species is the base for palaeoecological reconstructions of the ancient environment. Concerning the microfossil inventory, harbours are very similar to lagoons in habitat type and ecology due to their protected position. Often, the sedimentation rate is higher than in natural lagoons. Silting up of a harbour leads to the separation from the sea followed by a freshening of the water body, similar to a coastal lake, with a characteristic freshwater fauna. This marked change in the faunal composition indicates the end of the harbour activity.

Landscape and settlement history of the German North Sea Island Föhr - First results of a geoarchaeological case study

Steffen Schneider,[1] Bente Sven Majchczack,[1] Dennis Wilken,[2] Tina Wunderlich,[2] Frank Schlütz[1] and Andreas Stele[3]

Affiliations: (1) Lower Saxony Institute for Historical Coastal Research; (2) Institute of Geoscience, Applied Geophysics, Christian-Albrechts-University of Kiel; (3) Institute of Geography, Osnabrück University

The project 'Trading terps and Geest fringe castles – medieval trading ports on the German North Sea coast' (DFG SPP 1630 'Harbours') aims at the investigation of early medieval harbours and landing sites along the East and North Frisian coast as well as the reconstruction of the sites' paleotopography. The present case study focuses on two bay-like depressions on the southern coast of the island of Föhr and couples geomorphological, archaeological, geophysical and archaeobotanical methods. The case study analyses the medieval settlement landscape as well as the paleogeography. An important aspect of the investigations is whether the bay-like depressions were used as medieval trading sites, and whether they were navigable and usable as harbours. This poster presents first results of the investigations.

A micromophological perspective on major sediment facies documenting Palaeolithic to Neolithic occupations in rock shelters of Northeastern Morocco

Martin Kehl,[1] Alessandro Póti,[2] Jörg Linstädter,[3] Abdeslam Mikdad[4] and Gerd-Christian Weniger[2,5]

Affiliations: (1) Institute of Geography, University of Cologne; (2) Institute of Prehistoric Archaeology, University of Cologne; (3) Commission for Archaeology of Non-European Cultures (KAAK), German Archaeological Institute, Bonn; (4) Institut National des Sciences de l'Archéologie et du Patrimoine, Rabat, Morocco; (5) Neanderthal Museum, Mettmann, Germany

The coast and hinterland of Northeastern Morocco provided attractive places for hunter-gathers and early farmers as indicated by the presence of numerous rock shelter sites documenting Middle to Upper Palaeolithic (MP/UP) as well as Epipalaeolithic to Neolithic occupations. Over the few last years, we have studied the sediment sequences of Ifri Oudaden

(IOD), Ifri n'Etsedda (INES), Ifri n'Ammar (IA) and Ifri el Baroud (IB) in order to elucidate site formation processes and former land use. Besides other methods, micromorphology was used as it provides an indispensable tool for identifying sediment components and deposition processes. Undisturbed sediment samples were extracted from selected sediment profiles of the abovementioned sites and 74 thin sections, 6 cm x 8 cm large, were prepared according to standard procedures. A flatbed scanner and a petrographic microscope were used to characterize the composition and deposition processes of the following main sediment facies. Sandy layers of the MP and Early Iberomaurusian (UP) at the site IA testify to aeolian input into the cave during occupation. Post-depositional mixing appears to have been a common process in these levels. Mollusc shells are very few and obviously constituted minor elements of the nutritional diet. This also holds for the site IB, but here lamination and differential compaction argues against post-depositional mixing. With the onset of the Late Iberomaurusian, nutrition changed and consumption of terrestrial molluscs (all sites) and later also of sea food (IOD) followed by dumping and partial crushing of the shells caused rapid accumulation of shell-rich facies. Finally, the penning of ovicaprids led to accumulation of dung-rich layers in Early Neolithic times (IOD). Overall, besides identification of the mineralogical and organic composition of the facies, it was possible to distinguish between undisturbed and disturbed facies as based on the presence or absence of micromorphological features such as microlamination or differential compaction due to trampling.

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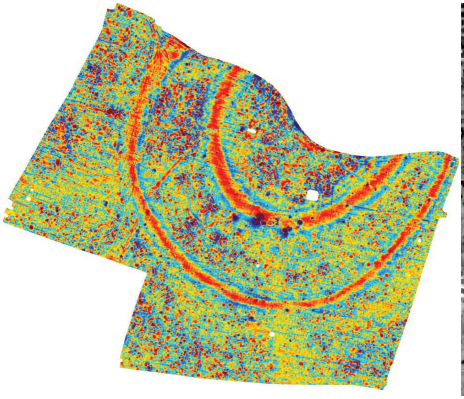
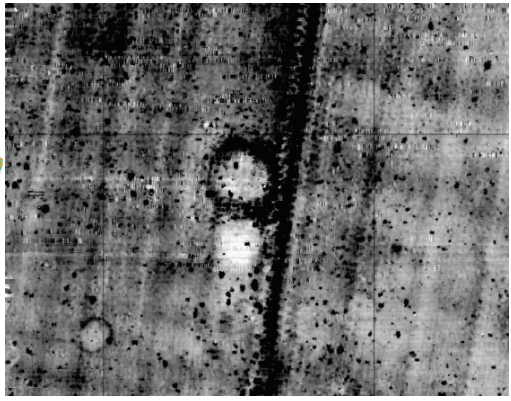
Some of the impressive results include a 284 ha magnetic map around Stonehenge as well as the Bronze Age Settlements in Vrable, Slovakia as seen below.



Bronze Age Settlement in Vrable, Slovakia located with the vehicle towed system MAGNETO® MX



Various barrows near Stonehenge, UK located with the electromagnetic system AMOS

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