

GEORGE BODI
ANDREI ASĂNDULESEI
CODRIN DINU VASILIU
MARCEL MÎNDRESCU
LUCREȚIU MIHAILESCU-BÎRLIBA
IONUȚ VASILINIUC
(Editors)

Book of Abstracts

Online Section

7th International Landscape Archaeology Conference

10 - 15 September 2022
Iași - Suceava, România

Book of Abstracts. Online Section

7th International Landscape Archaeology Conference

**10-15 September 2022
Iași - Suceava, Romania**

Editors:

George Bodi, Andrei Asăndulesei, Codrin Dinu Vasiliu,
Marcel Mîndrescu, Lucrețiu Mihailescu-Bîrliba, Ionuț Vasiliniuc

ORGANIZING INSTITUTIONS

“Alexandru Ioan Cuza” University of Iași

Faculty of Biology, Faculty of Geography, Faculty of History, “Arheoinvest”
Research Center

Romanian Academy, Iași Branch

Institute of Archaeology, Geography Group, “Gh. Zane” Institute for Economic and
Social Research

“Moldova” National Museum Complex of Iași

Moldavia’s History Museum

International Association of Landscape Archaeology

“Ștefan cel Mare” University of Suceava

Faculty of History and Geography

“Geoconcept” Applied Geography Association

Rural Development Research Platform

SCIENTIFIC COMMITTEE

Dr. Andrei ASĂNDULESEI (“Alexandru Ioan Cuza” University of Iași, Arheoinvest Research Centre)

Dr. Adrian BĂLĂȘESCU (Romanian Academy, “Vasile Pârvan” Institute of Archaeology)

Dr. Luminița BEJENARU (“Alexandru Ioan Cuza” University of Iași, Faculty of Biology)

Dr. George BILAVSCHI (Romanian Academy, Iași Branch, Institute of Archaeology)

Dr. Lucrețiu BÎRLIBA (“Alexandru Ioan Cuza” University of Iași, Faculty of History)

Dr. Carmen CUENCA-GARCÍA (Norwegian University of Science and Technology (NTNU), NTNU
University Museum, Department of Archaeology & Cultural History)

Dr. Jorg FASSBINDER (Ludwig-Maximilians-University, Geophysics Dept. Earth & Environmental Sciences)

Dr. Angelica FEURDEAN (Goethe University & Senckenberg Biodiversity and Climate Research Center)

Dr. Mihai GLIGOR (“1 Decembrie 1918” University of Alba Iulia, Faculty of History and Philology)

Dr. Neli JORDANOVA (Bulgarian Academy of Sciences, National Institute of Geophysics, Geodesy and
Geography)

Dr. Sjoerd KLUIVING (Vrije Universiteit Amsterdam, Faculty of Humanities)

Dr. Felix MARCU (National Museum of Transylvanian History)

Dr. Dorel MICLE (West University of Timișoara, Centre for Interdisciplinary Research on Mobile and
Imobile Archaeological Heritage “ARHEOTIM”)

Dr. Mihai NICULIȚĂ (“Alexandru Ioan Cuza” University of Iași, Faculty of Geography)

Dr. Cristi PATRICHI (Romanian Academy, Iași Branch, Geography Group)

Dr. Philippe DE SMEDT (Ghent University, Department of Environment & Department of Archaeology)

Dr. Senica ȚURCANU (“Moldova” National Museum Complex of Iași, Museum of History)

Cover: Manuela Oboroceanu

ISBN online: 978-606-714-716-2

© Editura Universității „Alexandru Ioan Cuza” din Iași, 2022

700109 – Iași, str. Pinului, nr. 1A, tel./fax: (0232) 314947

<http://www.editura.uaic.ro> e-mail: editura@uaic.ro

Director: prof. univ. dr. Constantin Dram

Book of Abstracts. Online Section

**7th International Landscape Archaeology
Conference**

10-15 September 2022. Iași - Suceava, Romania

Editors:

George Bodi, Andrei Asăndulesei, Codrin Dinu Vasiliu,
Marcel Mîndrescu, Lucrețiu Mihailescu-Bîrliba, Ionuț Vasiliniuc



Editura Universității „Alexandru Ioan Cuza” din Iași

George Bodi. Senior researcher for the Institute of Archaeology of the Romanian Academy, Iași Branch. Domains of interest: prehistoric archaeology, archaeometry, landscape archaeology, archaeological theory. Author and co-author of five monographs and over 40 research papers.

Andrei Asăndulesei. Researcher within the Institute of Interdisciplinary Research - Department of Exact Sciences and Natural Sciences of the "Alexandru Ioan Cuza" University of Iași. His research interests focus on prehistoric archaeology, geophysical surveys, archaeological topography and cartography, aerial photography, GIS applications in archeology. He was awarded research internships at various academic centers in Europe, including the University of Vienna - *Ludwig Boltzman Institute for Archaeological Prospection and Virtual Archeology* (Austria) and the *Ludwig Maximilian University* in Munich, Department of Geophysics. He is the main author, or co-author, of numerous works published in specialized journals or volumes in the field of interdisciplinary research in archeology.

Codrin Dinu Vasiliu. Scientific researcher at the Institute of Economic and Social Research „Gh. Zane”, of the Romanian Academy, Iași Branch. Research fields: hermeneutics, critical theory of photography, digital culture, anthropozoology, rural anthropology.

Marcel Mîndrescu. Associate Professor and Senior Researcher at the Geography Department of „Stefan cel Mare” University of Suceava and president of the Geoconcept Association of Applied Geography. Research topics: geomorphology, hydrology (limnology), environmental geography, paleolimnology, natural and anthropogenic risks, climate changes. Leader of the Carpathian Climate and Environment Working Group endorsed by Past Global Changes (PAGES), member of the scientific committee of Science for Carpathians (S4C) and chair of South East Europe Mountain Research (SEEMoRe-MRI). Marcel Mindrescu has supported cooperation and interdisciplinarity in geoscience in the Carpathian-Balkan area as illustrated by the international conferences he has organized and the publication of 3 special volumes of Quaternary International which he has initiated and guest edited.

Lucrețiu Mihăilescu-Bîrliba. Professor at the History Faculty of the "Alexandru Ioan Cuza" University of Iași. Research interests: Roman social and economic history, Roman Archaeology, demography in Antiquity. Author and co-author of seven monographs (five published by international publishing houses) and author of over 140 scientific articles.

Ionuț Vasiliniuc. Lecturer at the Department of Geography, „Alexandru Ioan Cuza” University of Iași. Research interests include soil science, geomorphology, natural hazards and risks. Single author or co-author of over 60 scientific papers and 8 books, one of them awarded the „Nicolae Cernescu” prize of the Romanian Agricultural and Forestry Science Academy.

CONTENTS

SESSION 01. Landscape Archaeology in the Near East	7
SESSION 02A. Global Perspectives on Landscape Archaeology - Contrasting African and European Experiences. So Far, So-So: Harnessing the Potentials of GIS and Remote Sensing Applications in African Archaeological Research.....	15
SESSION 02B. Global Perspectives on Landscape Archaeology - Contrasting African and European Experiences. Geophysical Perspectives for Reconstructing Past Environments – Communicating the Potential of Multi-Disciplinary Synergy among Prospection Methods, Laboratory Analyses and Modelling.....	21
SESSION 03. The Long-Term Perspective on Sustainable Landscapes	31
SESSION 04. People and their Scapes: Dialogues from the Global South.....	39
Part 1. Looking Through the Scapes	41
Part 2. Echoes Through the Scapes	46
SESSION 05. The Past, Present and Future of Earthworks: Towards an Integrated Approach	55
SESSION 06. How Does the Waterscape Influences, Affects and Infers the Human Community's Development, Evolution, Vulnerabilities, and Resilience Over Time?.....	69
SESSION 10. Photography and Landscape Archaeology	81
SESSION 11. Long-Term Dynamics of Human-Environment Interaction: The Case of Prehistoric Multi-Layered Settlements.....	87
SESSION 12. Roaming Through Open Landscapes: Late Pleistocene Hunter-Gatherer Adaptations in Central and Eastern Europe	97
SESSION 13. Modelling the Landscape. From Predictivity to Postdictivity.....	109
SESSION 14. High-Resolution Digital Elevation Models, GIS and Remote Sensing in Support of Landscape Archaeology Reconstruction, Dynamics and Management.....	127
SESSION 15. Bioarchaeology: Exploring the Interrelationship of Human and Natural Systems.....	153
SESSION 16. Landscapes as Living Archives: "Multi-Proxy" Approaches to Profiling Socio-Ecological Changes Over Time and Across Space.....	165
SESSION 17. Affective Landscape and Rational Identities: Sensory Approaches in Landscape Archaeology.....	173
SESSION 19. Reflections on the New Models of Economic Exploitation of the Territory and their Impact on Landscapes, and Proposals of Management from an Archaeological Perspective.....	187
SESSION 20. Waterscape Archaeology: Multi-Scalar Human – Environment Interactions in Coastal Lagoons.....	195



SESSION 01. LANDSCAPE ARCHAEOLOGY IN THE NEAR EAST

Session Organizers:

Bülent Arıkan, Istanbul Technical University, Turkey

Linda Olsvig-Whittaker, École Biblique et Archéologique Française de Jerusalem, Israel

Mike Freikman, Ariel University, Israel

Keywords: Palimpsest, reconstruction of landscapes, modeling

Session description:

The Near East is one of the regions that has been the scene of the longest human activities. The wide variety of environmental and climatic conditions in the region resulted in cultural diversity that persisted throughout the history. Today, the Near East is the embodiment of ‘palimpsest landscapes’ after numerous cultures and civilizations inhabited its diverse landscapes. Archaeologists have been taking advantage of these palimpsest landscapes and turning them into natural laboratories to quantify and assess how human-environment interactions evolved in this part of the Old World. More specifically, their research involves understanding anthropogenic impacts, reconstructing the past landscapes, and modelling past landscape-culture interactions at micro-, meso-, and macro-scales. Although the broader topics in the Near Eastern archaeology are welcome, this session aims to reflect the wide variety of landscape-based research in the region. Some of the presentations will include cutting-edge scientific research that provide new data in the light of new methods while others will present more traditional archaeological methods to answer questions pertinent to human-environment interactions.

An Evaluation of the Side Antique Urban Settlement from the Viewpoint of Cultural Landscape in 2008

Hatice Karaca Betun, T. C. Kültür ve Turizm Bakanlığı Ankara Rölöve ve Anıtlar Müdürlüğü, Ankara, Turkey

Keywords: Cultural Landscape, Planning Historical Sites

Abstract: The objective of this study is to analyze the effects of human life and physical environment on cultural landscape and conversely, the effects of cultural landscape on human life and physical environment.

Differently from all other creatures living in nature, humans alone possess the ability to produce and to transform their own environment. Thanks to this ability, humankind altered and formed its own environment throughout its long history for various reasons in good or bad ways. At times, these reasons stem from basic needs (food, clothing, shelter etc.) and at other times, they depend on lifestyle choices such as belief, conformism, or aesthetic concerns.

Regardless of the rationale, the changes that humans made in their habitat have been transformed into settlements constituted by the indigenous culture of each group. In addition, in the course of time these changes have equally shaped and, to a large extent, destroyed the natural environment.

Historically, both natural environments and human settlement areas have been transformed in parallel with human cultural development. However, this transformation is generally based on the destruction of the old and its replacement by the new.

The concept of “cultural landscape” was coined to investigate how humans shape and ascribe meanings to the living spaces that come about as the result of the changes and arrangements that they themselves have effectuated over time. It aims to make human habitats aesthetically richer and reconcile them with nature and history. The reasons this concept has regained importance are twofold. First, the effects of rapid population increase and globalization are endangering culturally and naturally significant sites all over the globe. Second, it has equally become important to correctly use these sites and increase their touristic potential. The preservation of cultural landscapes has also become an important matter in Turkey, which possesses uniquely valuable cultural and natural sites.

In this work, Side is the case study. Side is a city on the southern Mediterranean coast of Turkey. It lies near Manavgat and the village of Selimiye, 78 km from Antalya. Side’s coordinate numbers are: 36.7898759,31.2959079.

The reason for why Side was chosen is that it has the ancient Roman settlement artifacts on the surface with modern and old city together. This situation is good for the search of this work.

Presentation Type: Communication

Landscape Changing, Lifestyle Changing: From Mesolithic to the Neolithic in Southeastern Caspian Sea

Seyyed Kamal Asadi, Department of Archaeology, University of Mazandaran, Iran
Rahmat Abbasnejad Seresti, Department of Archaeology, Faculty of Arts and Architecture, University of Mazandaran, Iran

Keywords: Mesolithic-Neolithic, Neolithization, Paleo-Climatic, Caspian Sea, Landscape Changing

Abstract: The southeastern region of the Caspian Sea, specifically eastern Mazandaran, indicates an incredible and rich environment that presents three major landscapes: the highlands, the plains, and the coastal shores (littoral). Each of these three landscapes provides a vast and reliable food and raw material source for the inhabitants nowadays. But through the times, especially from the Mesolithic to Neolithic era, this region witnessed changes caused by regressions and transgressions of Caspian Sea levels and climatic changes. These paleo-climatic events played an important role in the lifestyle of Mesolithic people and changed their ways of the food providing process. The late Khvalynian transgressions and Mangyshlak regressions are the great climatic changes that happened in the Mesolithic and Neolithic periods. The faunal remains from caves and sites such as Hotu, Kamarband (Belt), Al Tapphe, Komishan Cave, and Komishani Tappeh indicate a great shift in sustenance which may lead them to the Neolithization and Neolithic era and Domestication of species. Evidence shows that in the first part the maritime species were the main food source and in the second part goats, sheep, gazelle, and other animals were the better choices. The authors attend to investigate this hypothesis through the archeological and environmental evidence from excavations and field surveys.

Presentation Type: Communication

Holocene Landscape Changes around Faysalliyah Archaeological Site, South Jordan

Michal Wasilewski, Jagiellonian University, Institute of Archaeology, Krakow, Poland

Piotr Kołodziejczyk, Jagiellonian University, Department of Archaeology, Krakow, Poland

Keywords: heritage, geomorphology changes, OSL dating, geoarchaeological reconstruction

Abstract: The area under investigation of Polish Heritage-Landscape-Community Project (HLC): Faysalliyah – is located in the South Jordan, in the Edom Mountains.

The contemporary landscape of Faysalliah is dominated by rolling hills cut with seasonal rivers valleys. The archaeological artefacts in this area are dated from the Paleolithic through all epochs to post-Medieval times.

Based on the cartographic geological prospection, raw materials description and analysis, geological test trench, sieve analysis, archaeological stone tools determination, and OSL dating the paleo-landscape reconstruction was undertaken.

The presented summary gave the picture of a dynamically changed landscape and climate. From rather moist, with perennial rivers through aridisation with seasonal rivers to incidental rains and flash floods. The geomorphology changed from the rather flat with shallow river valleys to more acute with rapidly cut, degraded rivers.

Today human activity influences the landscape in a very significant way. The deep well drilling, mechanized agriculture, and lastly the erecting of wind turbines causes acute changes of geomorphology and historic-archaeological heritage.

Presentation Type: Communication

Agent-Based Modeling in Anatolia; Simulating the Complex Adaptive Systems in Archaeology through Changes in Land Use and Landscape Changes

Bülent Arıkan, Istanbul Technical University, Eurasia Institute of Earth Sciences, Turkey

Keywords: land use, agent-based modeling, Holocene, complexity

Abstract: Landscape change and land use patterns are integral parts of modern archaeological research. Focusing on the complex adaptive systems, this presentation will emphasize how different cultures across the Anatolian Peninsula during the Holocene might have adapted to climatic changes as well as anthropogenic changes that emerged. The visualization of these impacts will be achieved through agent-based modeling. The results will be quantified and compared for changes in production capacities, changes in vegetation cover and surface processes as well as changes in population densities. Case studies will be presented across Anatolia, which will reveal how cultures in diverse environmental settings dealt with changes in climate and landscape.

Presentation Type: Communication

Settlement Patterns at the Northern Fringes of the Hittite Empire

Margherita Andrea Valsecchi Gillmeister, Freie Universität Berlin, Germany

Dirk Paul Mielke, Westfälische Wilhelms-Universität Münster, Germany

Keywords: Central Black Sea Region, Late Bronze Age, survey

Abstract: It is intensively debated that the formation of the Hittite state and its historical development had influenced massively the settlement history of North Central Anatolia and the Central Black Sea Region. However, the correlation of the historical information from the Hittite written sources and archaeological evidence is still dissatisfying, since until today no comprehensive study of all the available material exists. Mostly, historical conclusions were based on selected information, and furthermore, most studies lack of a critical evaluation of archaeological evidence. Since the region in question is very important for the Hittite history, a reassessment of the archaeological information concerning the settlement history of the Late Bronze Age is intended to provide a source-based overview of the settlement patterns at the northern fringes of the Hittite empire.

Presentation Type: Communication

Climate and Life on South of Kahramanmaraş Region during the Neolithic Age: The Macrophysical Climate Model Approach

Arman Tekin, Department of Archaeology, Hacettepe University, Turkey

Keywords: Neolithic Age, Macrophysical Climate Model, Kahramanmaraş, Domuztepe,

8.2 ka Climate Event

Abstract: Climatic changes and the impact of these changes on communities' lifestyles are a matter of ongoing research. Climate has been one of the efficient factors influencing their evolutionary process. This mutual interaction has paved the way for social, cultural, and economic change depending on communities gaining dominion over the natural world in time. In particular, the Holocene period started with the end of the Young Dryas climate event, which caused cold and harsh environmental conditions. The beginning of the transition to sedentary life and many advances became the preparer of the Neolithic Age.

Kahramanmaraş has a key role in serving as a gateway between Anatolia and Mesopotamia. This study aims to model the climate changes during the Neolithic Age in the south of Kahramanmaraş with the help of a paleoclimate model and publications on archaeological and geological studies. According to the data we obtained from the archaeological studies, a total of 49 archaeological sites associated

with the Neolithic Age were identified. Including Domuztepe Mound, 19 archaeological sites are associated with the Late Neolithic Period.

Within the scope of this study, R Studio software will be utilized to analyze the statistical data. Also, open-source GRASS GIS software will be used to collect and combine the spatial data in the studied area on the computer. After inputting into the geographic information systems interface and conducting spatial analysis, data will be displayed and output in an appropriate format. In line with all obtained data taken from the analyzes, Macrophysical Climate Model (MIM) will be applied to comprehend how past climatic changes affected the Neolithic Age communities.

According to the preliminary data obtained within the scope of this study, archaeological and geological studies provide some evidence for both the Younger Dryas-Holocene transition and the 8.2 ka climate event in Kahramanmaraş and surrounding regions. Some proxy data show that with the beginning of the Holocene, amounts of some flora and fauna types prominently increased. Furthermore, the abandonment of Domuztepe Mound in 7400 BC is remarkable from this perspective. Depending on this situation, the environmental effects of large-scale climatic events such as the 8.2 ka climate event in this region and its socio-cultural and economic impacts on communities will be scrutinized within this research.

Presentation Type: Communication

Between High Mountains and the Sea, Ecological Diversity and Human Adaptability in the Telar Drainage Basin, Southern Caspian Sea

Elham Ghasidian, Neanderthal Museum, Mettmann, Germany

Mahdi Abedini Araghi, Institute for Savadkouh Historical Caves Research, Doab Mazandaran, Iran

Amhad Bavand Savadkouhi, Institute for Savadkouh Cultural and Historical Research, Ghaemshahr, Mazandaran, Iran

Mohammad Keshavarz Divkolaie, Università degli Studi "La Sapienza" di Roma, Scienze matematiche, fisiche, naturali, Italy

Mahdi Khalili, Department of Archaeology, Faculty of Arts and Architecture, University of Mazandaran, Babolsar, Iran

Rezagholi Jahansouz, Department of Archaeology, Faculty of Arts and Architecture, University of Mazandaran, Babolsar, Iran

Saman Heydari-Guranm, Neanderthal Museum, Mettmann, Germany

Keywords: Iranian Plateau, Caspian Sea, Alborz Mountains, Pleistocene, Holocene, Hominins

Abstract: Sourced from the northern slopes of the Alborz Mountains, Telar River is around 147 km long and its drainage basin covers an area of ca. 2800 km². This vast area offers a heterogeneous environment and biomes including sand dune, wetland,

forested mountains, and high bare rugged mountains. It is the host of most endemics in the whole Iranian Plateau. The location of this region between the Caspian Sea and the Alborz Mountains provided an exceptional environment, which differentiates it from other parts of Iran.

The region's heterogeneity allows us to present a biogeographical zoning for this region to explain the interplay of climate, topography, and human activities. Considering archaeological evidence from across Telar basin, this contribution presents a chronological overview on the important phases of human/environment interactions and their developments from Pleistocene through the Holocene. We hypothesize that this basin acted as a migration corridor in different time periods for both humans and animals.

The availability of resources in the entire zones of Telar Basin left no restriction on human settlements in different periods. These landscapes offer a wide variety of niches, and other resources including raw materials and food.

Presentation Type: Communication

**Between Micro- and Macroscale:
A Supra-Regional Perspective on the Early 4th Millennium BCE "Crisis"
between Southern Levant and Northern Mesopotamia**

Johnny Samuele Baldi, CNRS (UMR5133 Archéorient, Lyon), France

Keywords: Jordan Valley, Zagros Piedmont, Early 4th millennium BCE, proto-urban territories

Abstract: For decades now, surveys and excavations focusing on Western Asian late prehistory have shown that a clear break in population dynamics and settlement pattern occurred at the beginning of the 4th millennium in areas even very distant from each other. In the southern Levant, this shift marks the end of the Chalcolithic and the beginning of Early Bronze Age, while in northern Mesopotamia this phase falls between the end of Late Chalcolithic 2 (LC2) and the beginning of Late Chalcolithic 3 (LC3). This paper does not intend to establish any forced connections between remote regions, especially as reliable data is lacking for this period for intermediate areas such as the Syro-Lebanese corridor. However, the traditional explanations, i.e. a climatic crisis in the Jordan Valley and the arrival of the Uruk "colonization" (from southern Mesopotamia) in North Mesopotamia now seem wholly inadequate to account for this phenomenon. Recent landscape data from two disparate micro-regions – the area around Tell Abu Habil in the Jordan Valley and the sector around Lake Dukan in the Zagros Piedmont – seem to suggest that this alleged "crisis" not only had very dissimilar patterns according to ecosystems and geographical contexts, but sometimes also involved surprisingly similar reorganization measures. Similar results for the same period have been obtained

from old surveys in northern Mesopotamia (in Syrian Jazeera, in the Zammar region, in the Balikh or Orontes Valleys), from very recent and ongoing surveys in Iraqi Kurdistan (in Eastern Jazeera, in the region east of Nineveh, and in the Shahrizor and Diyala Valleys), but also, for the southern Levant, from recent work in Israel and western Jordan. Although the extreme difference of the landscapes, and even in the absence (in both cases) of major inhabited centers, the structuring of the territories and the response to the “crisis” seem to follow complex logics, the similarities of which might suggest proto-urban paths that are, of course, extremely different, but not accidentally parallel and synchronous.

Presentation Type: Communication



SESSION 02A. GLOBAL PERSPECTIVES ON LANDSCAPE ARCHAEOLOGY – CONTRASTING AFRICAN AND EUROPEAN EXPERIENCES

So Far, So-So: Harnessing the Potentials of GIS and Remote Sensing Applications in African Archaeological Research

Session Organizers:

Akinbowale Mark Akintayo, University of York, United Kingdom

Pamela Ochungo, British Institute in Eastern Africa, Kenya

Nadia Khalaf, University of Exeter, United Kingdom

Mamadou Thior, IFAN Cheikh Anta Diop, Dakar, Senegal

Nicolas Serge Sagna, University of the Witwatersrand, South Africa

Keywords: Africa, GIS, Remote sensing, Predictive modelling, Monitoring

Session description:

In the last 30 years, archaeologists have maximized the inherent possibilities in the use of geospatial technologies for studying archaeological landscapes and heritage sites. Moreover, advancement in GIS and remote sensing technology has revolutionized methods of archaeological research. New methodologies have been developed for carrying out archaeological surveys, site prediction and identification, and heritage management. However, the pace of applying these techniques in Africa is rather slow and few Africanist archaeologists have maximized these possibilities of using GIS and remote sensing methods in landscape approaches for archaeological inquiries. This session therefore welcomes current research on how archaeologists can leverage on these capabilities for archaeology in Africa, particularly in predictive modelling of archaeological sites location, archaeological identification and mapping of tangible heritage sites, monitoring and preservation of cultural landscapes to engender robust archaeological scholarship.

Detecting and Mapping an 'Ephemeral' Settlement of the Pastoral Neolithic at Luxmanda, Tanzania

Tom Fitton, Department of Archaeology, University of York, United Kingdom

Daniel A. Contreras, Department of Anthropology, University of Florida, USA

Agness O. Gidna, Department of Cultural Heritage, Ngorongoro Conservation Area Authority, Tanzania

Audax Z. P. Mabulla, Department of Archaeology and Heritage Studies, University of Dar es Salaam, Tanzania

Mary E. Prendergast, Department of Anthropology, Rice University, USA

Katherine M. Grillo, Department of Anthropology, University of Florida, USA

Keywords: Geophysics, GIS, Pastoralist Neolithic, Tanzania

Abstract: Common assumptions about the ephemeral archaeological signature of pastoralist settlements have limited the application of geophysical techniques in the investigation of past herding societies both in Africa and beyond. Recent work has demonstrated however that herding communities may leave substantial material and residual records behind. This means that short-term or ephemeral occupations can be detected, and archaeologists can now begin to reconstruct ancient mobility patterns instead of dismissing mobility as a prohibitive archaeological problem.

In this paper the authors present a combined geophysical survey and GIS analysis of Luxmanda, Tanzania, the largest-known settlement documented for the Pastoral Neolithic era in eastern Africa (c. 5000–1200 BP). A key goal of fieldwork at Luxmanda is to understand the site's spatial structure by attempting to identify features (e.g. hearths, livestock pens) and patterns in the structure of refuse deposits that might speak to social dynamics at the settlement.

Our comparison of the results of magnetometry survey, surface collection, auger coring and formal excavation reveals spatial heterogeneity in activity areas at the site. The results demonstrate the potential of fluxgate gradiometry for the identification of archaeological features at a category of site where evidence for habitation was long thought to be undetectable. The study provides comparative data to enable archaeologists to identify loci for future investigations of mobile populations in eastern Africa and elsewhere.

Presentation Type: Communication

Applying Cosmo-SkyMed and Sentinel-2 Imagery for Impact Assessment of Dams on Cultural Landscapes: A Sustainable Methodology for Cultural Heritage Preservation in Africa?

Federico Zaina, Politecnico di Milano, Italy

Deodato Tapete, Italian Space Agency (ASI), Italy

Keywords: Cultural heritage, Dams; Risk assessment, COSMO-SkyMed, Sentinel-2

Abstract: Over the last two decades, remote sensing of satellite imagery for cultural and natural heritage (CNH) risk assessment has significantly increased. At the same time, protection and safeguarding of CNH have been raised higher in international agendas and what satellite technologies can specifically do towards this scope is the subject of reflections at least at the European level (e.g. Copernicus Cultural Heritage Task Force).

Among the most dangerous threats, the construction of dams resulted in the flooding of thousands of archaeological sites worldwide. Despite this pervasive effect, specific regulations as well as tailor-made methodologies to document and monitor this type of damage are spotty and suffer from a lack of coordination by authorities, while support from ad hoc legislations is also missing in many countries. Moreover, rescue archaeology mitigation strategies mostly rely upon ground-truthing activities and aerial imagery. The limits of the current research approaches could be effectively overcome by developing protocols including research workflows integrating remote sensing of satellite imagery to the current methodologies.

The need for the implementation of satellite imagery remote sensing is even more urgent in those geographical contexts, like Africa, where besides the ample spatial scale of the areas to be monitored, archaeologists and heritage experts working both in the public and private fields need to acquire skills in user-friendly open-access tools to carry out their research.

To fill this gap, we developed a research workflow building on a multidisciplinary collaboration between image analysts and archaeologists. In this presentation, we demonstrate the potential of the COSMO-SkyMed Synthetic Aperture Radar (SAR) constellation of the Italian Space Agency (ASI) and Copernicus Programme Sentinel-2 open access multispectral satellite imagery provided by the European Space Agency (ESA), applied to different state-of-the-art remote sensing methods for quantifying the archaeological evidence within a prospective reservoir area before dam construction. These open-access and licensed images integrate each other providing both landscape (multispectral imagery) and small-scale archaeological feature (SAR) identification, global spatial coverage, high temporal revisit and ease of data handling.

We showcase the feasibility of this methodology in a case study from central Africa: The Grand Ethiopian Renaissance Dam along the Ethiopian Blue Nile River.

The history and archaeology of this region are barely unknown and the difficulty of accessing the prospective reservoir area makes the application of remote sensing of satellite imagery a perfect tool for assessing the impact of dams on the local heritage.

By tasking satellite imagery acquisition based on temporal and environmental variables coupled with distinctive elements like shape, color, unexpected irregularities of elements of the territory and ancient features, we were able to detect the presence of numerous heritage places, namely villages and potential archaeological sites characterized by architectural techniques, material culture and structures that closely resemble the old cultural traditions.

The workflow proposed in this research is designed to be integrated ground-truthing methodologies into two dedicated protocols named Pre-Construction Archaeological Risk Assessment (PCARA) and Pre-Flooding Rescue Archaeological Program (PFRAP) which could eventually become a standard procedure for rescue archaeology in dam areas.

Presentation Type: Communication

Territory, Settlement, Use and Occupation of the Landscape in the Central Thebaid (Egypt). Between the beginning of the First Intermediate Period and the End of the Middle Kingdom

José Pérez Negre, University of Alcalá Henares, Spain

Keywords: Landscape, Thebes, Nile, Upper Egypt

Abstract: The current knowledge about the city of Thebes and its hinterland is fundamentally focused on the evolution of the town and its territory from the New Kingdom. The present paper has focused mainly on the study and evolution of the landscape between the beginning of the First Intermediate Period and the end of the Middle Kingdom, while its spatial framework corresponds to the area between the third and the fifth nome of Upper Egypt, that is, in the central territory of the so-called Thebaid. The methodology used comes from comparative territorial models and the Landscape Archaeology (Thiessen polygons, Nearest Neighbor Theory, visibility, and connection between geographical areas), in addition to the analysis of the documentary and archaeological sources. The work has also focused on landscape evolution and the resulting modeling of anthropic action. In this sense, the study of the plot structure and the wadi network, with the consequent processes of erosion and deposition, has allowed to establish a possible route of the channel of the Nile River, a fluvial modeling on the other hand very changeable in this concrete zone, between Qena and Luxor. The result of the study is the obtaining of a population and administrative model that reflects the geopolitical idiosyncrasy on the area: a settlement characterized by an evident population dissemination, with centers approximately equidistant from each other, without the existence of an

administrative center of first order, in the style of the New Kingdom. On the other hand, the analysis also focuses on the roads and communications routes, both in the western desert and in the east, towards Lower Nubia and the Red Sea (the port area of Mersa-Gawasis) respectively.

Presentation Type: Communication

**Engendering Sustainable Cultural Heritage Preservation:
A Case Study of Sukur Cultural Landscape in Northern Nigeria –
Preliminary Report**

Akinbowale Mark Akintayo, Department of Archaeology, University of York, United Kingdom

Keywords: Sukur Cultural landscape, World Heritage Site, Nigeria, classification, change detection

Abstract: Sukur cultural landscape is a World Heritage Site in Madagali Local Government Area of Adamawa State, Nigeria. Situated along Nigeria/Cameroon border at an elevation of 1045 m, the ancient hilltop settlement was famous for iron smelting technology, flourishing trade and a strong political institution that dates to the 16th century CE.

Archaeological excavations in the area have yielded iron-smelting furnaces, shaft, and bellows close around houses, pointing to a complex socio-economic relationship that existed within this area. Over the centuries, the cultural landscape of Sukur has survived plethora of natural and human-induced disasters, and as such, has remained relatively unchanged. However, the northern part of Nigeria has witnessed significant destruction from the activities of the boko haram sect and Adamawa State is one of the states that has suffered devastating blows regarding the destruction of lives, properties, and the environment since 2009. Therefore, this study is aimed at evaluating the land-use land-cover (LULC) analyses of the cultural landscape of Sukur. Multitemporal Landsat 5, 7, and 8 satellite imagery covering the period 1991 to 2021 will be analyzed at a temporal resolution of 10 years, classified using supervised classification via the Random Forest machine learning algorithm to extract all the identifiable classes (bare land, shrubs, grassland, open forest, built-up areas, croplands, and water bodies). Afterwards, change detection analyses would be performed to identify and quantify spatio-temporal changes that have taken place around the site and landscape degradation indices to discuss the integrity of the landscape.

Presentation Type: Communication



SESSION 02B. GLOBAL PERSPECTIVES ON LANDSCAPE ARCHAEOLOGY – CONTRASTING AFRICAN AND EUROPEAN EXPERIENCES

**Geophysical Perspectives for Reconstructing Past Environments –
Communicating the Potential of Multi-Disciplinary Synergy among Prospection
Methods, Laboratory Analyses and Modelling**

Session Organizers:

Neli Jordanova, National Institute of Geophysics, Geodesy and Geography,
Bulgarian Academy of Sciences, Bulgaria

Philippe de Smedt, Ghent University, Belgium

Carmen Cuenca-Garcia, NTNU, Norway

Jorg Fassbinder, Munich University, Germany

Keywords: soil, geophysics, environmental archaeology, geoarchaeology,
archaeological prospection

Session description:

Along with many of its key environmental functions, soils make up a unique archive for natural and anthropogenic processes since the last glacial epoch. While hiding many – often elusive – traces for ancient human occupation, the nature and condition of this soil cover is equally crucial in preserving our buried past. Soil-related research therefore plays an important role for revealing and conserving archaeological sites and landscapes. Geophysical methods have recently complemented, traditional soil investigation, to provide high precision and sensitive tools for uncovering soil information related to the entire suite of environmental variables (climate, topography, vegetation, etc.) and anthropogenic influence, across the full range of archaeologically relevant spatial scales. From soil horizons to entire archeological landscapes, geophysical methods provide insight into the presence, nature, and environmental setting of archaeology.

The session, building on the initiatives from the SAGA COST action (CA17131), aims to discuss the value of multidisciplinary approaches to archaeological research. With particular emphasis on the integration of geophysical methods and a soil-based

perspective, we welcome scientific contributions on integrative concepts for delivering sound archaeological information, demonstrating the advantages and pitfalls of such approaches. Alongside broad perspective overviews, we invite discussions of case studies on geophysical prospection approaches, environmental and chronological studies (e.g. environmental and archaeomagnetism), as well as geophysical approaches to studies of archaeological deposits (e.g. geochemical characterization).

Diachronic Landscape Archaeology of the Late Neolithic and Copper-Age in Transylvania and Moldova (Romania) – Priority Region Neamț Depression

Carsten Mischka, Institute for Pre- and Protohistory Friedrich-Alexander-Universität Erlangen-Nürnberg Erlangen, Germany

Doris Mischka, Institute for Pre- and Protohistory Friedrich-Alexander-Universität Erlangen-Nürnberg Erlangen, Germany

Constantin Preoteasa, Neamț National Museum Complex, Romania

Vasile Diaconu, Neamț National Museum Complex, Romania

Keywords: Late Neolithic, Copper Age, Neamț depression, geophysical methods

Abstract: Since 2015, a joint survey-project of the Neamț National Museum Complex and the Institute of Pre- and Protohistory, Friedrich-Alexander-University Erlangen-Nürnberg aims for the research of neolithic and copper age settlement patterns in Neamț county. It is especially focused on geomagnetic surveys in the Neamț depression, with 16 sites surveyed until now. The sites get first surveyed by a multi-channel gradiometer; a terrain model is made by SfM from drone photography. A second stage, performing gridded surface collections on all the sites just started. Due to the multilayered character of many of the sites, not only structures of the Precucuteni- and Cucuteni culture are recorded. Also, younger periods are covered, mainly Noua culture (Late Bronze Age), according to the surface finds. This leads “en passant” also to a significant increase of knowledge on the bronze age in Neamț depression, not only derived from small excavations, but from multi-hectare observations. At least at Tarpesti and Topolita-La Izvoare, not only the ubiquitous settlement pits, but also house plots were discovered. The site of Vanatori Neamț “La Izvoare” delivered not only the plots of pit-dwellings and houses constructed from posts, but also a ditch, dividing the settlement’s center from the promontory’s edge.

Presentation Type: Communication

Geophysical Prospecting of Prehistoric Copper Mines in the Ai Bunar Area, Bulgaria

Petya Trifonova, National Institute of Geophysics, Geodesy and Geography - Bulgarian Academy of Sciences, Bulgaria

Metodi Metodiev, National Institute of Geophysics, Geodesy and Geography - Bulgarian Academy of Sciences, Bulgaria

Hristo Popov, National Archaeological Institute with Museum - Bulgarian Academy of Sciences, Bulgaria

Plamen Georgiev, National Archaeological Institute with Museum - Bulgarian Academy of Sciences, Bulgaria

Krastju Chukalev, National Archaeological Institute with Museum - Bulgarian Academy of Sciences, Bulgaria

Ruslan Stojchev, Institute of Art Studies - Bulgarian Academy of Sciences, Bulgaria

Keywords: geophysical prospecting, geoarcheology, ancient copper mines, Ai Bunar, Bulgaria

Abstract: The new stage of archeological research at the Ai Bunar site began in 2018 with airborne laser scanning (LiDAR) of 22 sq. km. west of town of Stara Zagora, and subsequently field search and verification of information. Inside the region of one of the earliest and largest industrial chalcolithic ore mines in European prehistory are identified several ore pits, many of which were unknown so far. They are remains of open pit ore mining and have similar characteristics, configuration, and orientation. Having typical negative linear shapes on the surface, they are located in rocks with intense copper mineralization and general NE-SW strike following that of the ore veins.

Based on the LiDAR verification and large-scale mapping, in 2019 a detailed preliminary study with non-destructive geophysical methods of single registered mining structures (rupees) was performed. As a method is chosen resistivity tomography with a resistivity meter 4 Point Light HP from LGM-Lippmann, Germany which provides quantitative information about the induced polarity (IP) of the soil. The aim of the research is to investigate the buried prehistoric ore pits using electro resistivity measurement on profiles, and to make an attempt to more accurately determine its characteristics in up to 4-5 m depth. Starting with the areas of ore known from the excavations in 1972-1973, and subsequently correlated with measurements of some of the newly registered in 2018 structures. The obtained inversion models of the electrical resistivity showed very good correspondence with the information on the stratigraphy and structure of the aggregate of the ore workings given by Chernykh (1978). From the new research profiles, two places have been marked as a perspective for further investigation.

Based on these findings, the research activities were continued in 2021 with field geomagnetic survey - areal and profile, combined with VLF recordings. We used the advantage of the field-portable equipment provided with its own GPS sensor due to the complicated terrain and the dense vegetation. Four areas were studied - one in the site of Excavation 3 and Excavation 4 (according to Chernykh, 1978), as well as two new areas - one in the southeastern part of the terrain (coinciding with geophysical profiles from 2019) and one unexplored in the southwestern part of the terrain. The magnetic field and polarization were measured on profiles with a field magnetometer GSM19-GWV v.9.0 and VLF sensor from GEM Systems (Canada).

Measurements aimed to establish two main patterns, which are based on differences in the magnetic properties of rocks and soil: 1. soil-filled areas of ancient

ore mass and 2. ancient ore processing tools (andesite hammers/clay remains). The host rocks (limestones and marls) are characterized by very low measured values of magnetic susceptibility whereas the soil susceptibility measured in excavation sites is approximately 10 times higher, which means that a noticeable anomaly of the total magnetic field vector will be registered.

After filtering and processing of the measurements, the interpretation is given in the form of maps, profile sections and lists of identified anomalous objects that must be checked on the terrain.

Presentation Type: Communication

Early Iron Age Enclosures and Landscape Archaeology in the Middle Dniester Region

Aurel Zanoci, Moldova State University, Chişinău, Republic of Moldova

Mihail Băţ, Moldova State University, Chişinău, Republic of Moldova

Keywords: Early Iron Age, magnetometer survey, enclosures

Abstract: Interdisciplinary research conducted at the beginning of the 21st century in the Middle Dniester Region revealed the existence of a hitherto little-known feature of the prehistoric habitation of the Early Iron Age period. We are talking about the discovery in the Saharna culture area (10th-9th centuries BC) of round or semi-circular enclosures, the area of which is about 0.20-0.50 hectares. So far, such habitation structures have been attested at the sites of Saharna Mare "Dealul Mănăstirii", Saharna "Rude", Saharna "Ţiglău", Horodişte "La Şanţ", Ţahnăuţi, Ţareuca and others. The involvement of magnetometer survey to detect them often played a decisive role in the research process. Magnetometric data revealed the presence of linear anomalies, which, as shown by archaeological excavations, indicated the remains of defensive structures (a rampart of wood, earth and stone) and the presence of an adjacent ditch.

Usually, these enclosures are flanked by one or more civil settlements, the area of which varies from 3 to 10 hectares. The magnetometer survey on some of them (Saharna "Rude", Saharna Mare "Dealul Mănăstirii") allow us to study the settlement of the territory by human communities of that period.

Thus, the purpose of this presentation is to reveal the results of interdisciplinary investigations, along with the analysis of the dynamics and specificity of the habitat.

Presentation Type: Communication

Some Results of Magnetometry Prospection of Cucuteni-Trypillian Site Zalukva on the Upper Dniester (Ukraine)

Roman Kuderavets, Carpathian Branch of Subbotin-Institute of Geophysics of the NAS of Ukraine, Ukraine

Taras Tkachuk, National Preserve "Davniy Halych", Ukraine

Ihor Chobotok, Carpathian Branch of Subbotin-Institute of Geophysics of the NAS of Ukraine, Ukraine

Yevhenij Nakalov, Carpathian Branch of Subbotin-Institute of Geophysics of the NAS of Ukraine, Ukraine

Natalia Pyrzhok, Carpathian Branch of Subbotin-Institute of Geophysics of the NAS of Ukraine, Ukraine

Oleksandr Menshov, Taras Shevchenko National University of Kyiv, Institute of Geology, Kyiv, Ukraine

Ihor Krechoveckyj, National Preserve "Davniy Halych", Ukraine

Andrij Fihol, National Preserve "Davniy Halych", Ukraine

Oleh Melnychuk, National Preserve "Davniy Halych", Ukraine

Keywords: archaeological prospection, Cucuteni-Trypillian culture, magnetometer survey

Abstract: From 2019 to 2021 the Department of Archeology of the "Davniy Halych" National Reserve carried out an archaeological research excavation on the settlement of Zalukva in the Upper Dniester region, near the town of Halych. The site is on the left bank of the river Lukva, approximately 3 km from its confluence with the river Dniester. The purpose of the project was to study the material culture and chronology of a Cucuteni-Trypillian culture settlement. To this end, an area 6 × 3 m was excavated to a depth of 0.45 - 0.50 m. There, just above the sterile yellow loess, deposits of burnt clay were uncovered. This is interpreted as the remains of a clay-plastered structure relating to the Cucuteni-Trypillian culture and dating to the Early Neolithic. In the northern part of the excavation area a cluster of artefacts were recovered that included portions of 10 querns (for grinding grain), fragments of clay plaster, numerous sherds of pottery, along with 20 fragments of river stone. On stylistic grounds, the pottery is of the Cucuteni-Trypillian culture and can be assigned to stage B II.

In addition, a magnetometer survey was carried out in May 2021. This covered an area of 0.14 hectares and centered on the Cucuteni-Trypillian culture activity discovered during the excavation. The equipment used was a PMP-5B proton magnetometer. The modulus of the full vector of the magnetic field T was measured with an accuracy of ±1 nT along with profiles with a step of 0.5 m and a distance between the profiles of 1 m.

This work led to the identification of several distinct magnetic anomalies, which are most likely related to the excavated Cucuteni-Trypillian archeological site. Here

the remains of dwellings are represented by a layer of highly magnetized burnt clay with a magnetic susceptibility (MS, χ) of calcined red-brown clay at a depth of 0.50 m in the southern wall of the excavation, $\chi = (700-800) 10^{-8} \text{ m}^3 / \text{kg}$.

The largest magnetic anomaly (64 m²), is located near the center of the site. It consists of one positive magnetic anomaly with an amplitude of more than 80 nT, oriented from south-west to north-east. This anomaly runs up to the edge of the excavated area and the two are clearly part of the same complex of activity. A second positive anomaly, but with a smaller amplitude (20 nT), lies in the northern portion of the study area, oriented in east-west. Between them is a circular, negative anomaly (up to -40 nT). Approximately 14 m to the north-west of the center of the largest anomaly is another with an intensity of over 100 nT. In terms of its morphological features, size, amplitude, and orientation, it is surprisingly like the previous. Taken together, the archaeological excavation proved the existence of Early Neolithic settlement related to the Cucuteni-Trypillian culture at this location, while the magnetometer provided a tantalizing glimpse of the potential scale of that settlement. Without further, targeted excavation and survey it is too early to talk about the scale of the settlement, building plans, or even the original number of structures. Nonetheless, it appears safe to say that the recorded structures share the same south-west to north-east orientation and that there was an average 8-10 m space left between buildings. Looking towards future research, it is clear that the results of the non-invasive magnetometer survey may be used as a guide to purposefully and productively target archaeological features and structures for detailed investigation.

Edited by Robert M. Chapple

Presentation Type: Poster

Sedimentological Dynamics of Neanderthal Occupation Levels in “La Sima” Cave (Seville, Spain): Physico-Chemical Analysis Application to Geoarchaeological Interpretation

Eusebio Jesús Medina Luque, Universidad de Córdoba, Spain

José Antonio Caro Gómez, Universidad de Córdoba, Spain

José Manuel Recio Espejo, Universidad de Córdoba, Spain

Juan Manuel Garrido Anguita, Universidad de Córdoba, Spain

Genaro Álvarez García, Sociedad Espeleológica Geos (Exploraciones e investigaciones subterráneas), Spain

Cesar Borja Barrera, Universidad de Sevilla, Spain

Fernando Díaz del Olmo, Universidad de Sevilla, Spain

Marta Cañete Gómez, Universidad de Córdoba, Spain

Keywords: Sedimentological, physico-chemical and geoarchaeology

Abstract: A physico-chemical characterization of a sedimentary profile of the “La Sima” cave (Constantina, Seville, Spain) is carried out. The data obtained confirm its usefulness in geoarchaeological studies and support the results of the archaeological researches. Physical chemistry parameters such as organic carbon, organic matter calcination, hygroscopic humidity, electrical conductivity (salinity), texture, as well as the total chemical elements analysis are identified as the most useful for the geoarchaeological interpretation of the profile.

The stratigraphy of the site comprises 6 geoarchaeological units (GU) with a total depth of 4 meters. GU1 and GU2 correspond to a modern phase of spoliation, GU3 to a natural fill, and GU4 and GU5 present numerous lithic industries of a Mousterian character, remains of fauna and evidence of ephemeral combustion structures which, chronologically are located in the Upper Pleistocene (45 ka approx.).

The organic matter ignition content (O.M. ig. %) presents values between 1.92 and 4.69 % with values below 3% being more frequent in the upper levels (GU1 to GU3), while between 2.80 and 3.30 m we find higher percentages (>3%), coinciding with the highest concentration of fire, bone and lithic remains in the deposits GU4 and GU5. The electrical conductivity (E.C.) present very constant values around 0.50 mhs/cm, although at the depth of 3.25 m (GU5) the highest value appears with 2.13 mhs/cm. Magnetic susceptibility (M.S. $\chi \times 10^{-9}$ m³/Kg) shows a frequency of very high values, and, although there are discordant episodes, the general tendency is towards an increase from the upper levels towards the base of the profile, with GU4 and GU5 showing quite homogeneous values.

Phosphorus content (P₂O₅ mg/100g), one of the main indicators of the influence of anthropogenic action on the deposit formation, is only present in some cases.

Significantly, below 2.8 m and up to 3.25 m, the highest indices are present with value of 10.3 mgr/100 in a sample from GU5. In the case of textures, looking at exclusively at the values of the final section of the GU4 and GU5 (between 2.80 and 3.25 m), the values of fines (silt and clay) remain very constant (between 70% and 80%).

X-ray fluorescence spectroscopy (XRF) carried out indicates that the sedimentary filling occurred gradually, showing small variations in most of the major elements except in the Ca contribution, where the differences are more significant. In any case, the graphs show a clear trend in elements as significant as Fe, Mn, Si, Ca, and P, which, from a depth of 2.5 m, show a change in opposite direction coinciding with the samples collected between 3.00 and 3.50 m (GU4 and GU5). This could indicate a change in the composition of the sediment and/or a change of environment sedimentation.

We interpret these results as evidence of a phase of stability in the natural dynamics of the cave that would have favored its occupation by Neanderthal human groups.

Presentation Type: Poster



SESSION 03. THE LONG-TERM PERSPECTIVE ON SUSTAINABLE LANDSCAPES

Session Organizers:

Filippo Brandolini, Newcastle University, United Kingdom

Louise Rayne, Newcastle University, United Kingdom

Michael Storzum, Newcastle University, United Kingdom

Sam Turner, Newcastle University, United Kingdom

Keywords: Sustainability, Remote Sensing, Computing Archaeology, Climate change, Human Resilience

Session description:

In the face of the present global challenge of climate change, sustainability of environments is sought. The sixth assessment report of the IPCC highlights the risks of climate change to many vulnerable landscapes, some of which represent locations where human occupation and cultivation have continued for thousands of years. The UN Sustainable Development Goals (SDGs) offer ways of tackling issues such as clean water (goal 6), climate action (13) and life on land (goal 15).

Despite these initiatives, in order to tackle such significant challenges, a long-term perspective is needed. Humanities can actively contribute to this movement by exploring the interactions of social and environmental systems over long periods of time and generating insights for potential future applications. In particular, archaeological science can reveal how past societies dealt with problems such as environmental crises, political and social changes. Many of these are traceable in the landscape through the impacts on past cultivation and settlement, with new technologies such as remote sensing, machine learning, agent-based modelling (ABM), spatial statistics, and photogrammetry offering ways of recording vast quantities of data about human mitigation strategies over time.

Adaptations to climatic and environmental variations, strategies for the exploitation and management of natural resources, changes in land use, and examples of resilience or fragility of human societies are commonly detected in archaeological landscapes. In the context of the current climatic shifts, such information allows us to build narratives for the public about the risks human

communities face due to a rapidly changing environment. It is increasingly acknowledged among scholars and policymakers that the current character of socioecological systems depends on their long-term evolution, which only archaeological studies can interpret.

This session will explore the multifaceted aspects of the archaeology of sustainability and sustainable archaeology. Papers presenting and discussing archaeological, ethnoarchaeological, and geoarchaeological evidence of past land-use changes, resilience, and sustainable exploitation of natural resources are welcomed. Papers reporting on extant challenges for the sustainability of research and management of archaeological cultural heritage and the application of new technologies, as well as discussing topics on the future agenda for global sustainable archaeology are solicited. We also seek contributions that explore the theoretical and methodological challenges of this topic.

Cisterns of the Tarsus Anthroscape: Wisdom against Drought

Haluk Bozdoğan, Municipality of Tarsus, Turkey

Osman Polat, Municipality of Tarsus, Turkey

Sevda Polat, East Mediterranean Research Institute, Tarsus, Turkey

Yaprak Tanrıverdi, Adıyaman University, Adıyaman, Turkey

Erhan Akça, TEMA Foundation, İstanbul, Turkey

Selim Kapur, University of Çukurova, Adana, Turkey

Keywords: Tarsus, drought, anthroscape, Mediterranean

Abstract: The continuity of a culture is dependent on using natural resources sustainably while also being prepared for crises, as nature has never been in a stable structure. People have constructed human landscapes by shaping the environment following the transition to settled life to meet their demands from natural resources, which we term anthrosapes. These anthrosapes have evolved into sustainable land use models, providing not only for their basic necessities for food and shelter, but also for their security from natural extreme events. Of course, not every anthroscape, such as the salinization of Mesopotamian soils, was successful in the historical narrative. Tarsus, on Anatolia's Mediterranean coast, has proven to be a successful anthroscape with its continuous settlement for ten thousand years. Limited water and erosion have been the issues that have threatened the security of life throughout history because Tarsus is located on a semi-arid and sloping topography that extends from 5 m to 2000 m within 50 km of the city center. The knowledgeable residents of Tarsus utilized the natural limestones that make up the mountainous region to create terraces against erosion and constructed cisterns in the karstic landscape for water harvesting. To overcome both erosion and water problems, the wise people of Tarsus used limestones taken from the mountainous region to build a terrace against erosion, and they stored water by building cisterns in the karst land. Terraces and cisterns both provided drought resistance by holding water in the soil and wells. Villagers, shepherds, and nomads used cisterns until the 1980s, but related to current irrigation structures, their utility declined, and maintenance were neglected. However, droughts have become more common in recent years, along with a decrease in modern water resources, emphasizing the significance of restoring cisterns to its former glory. The cisterns in just one Tarsus village have been calculated to ensure water security of the locals for at least 5 years, according to our study. In this respect, they have been demonstrated to be successful adaptation structures to combat drought, whose impacts are becoming more noticeable in the 21st Century. Consequently, cisterns are being preserved via the efforts of the Tarsus Municipality as a primary component of the city's thousands-year-old cultural legacy.

Presentation Type: Communication

Moving Around: Spatial Patterning of Middle-Upper Paleolithic Occupation in Portuguese Extremadura

Daniela Filipa Silva Maio, ICArEHB (Interdisciplinary Center for Archaeology and Evolution of Human Behaviour), Portugal

João Miguel Mico Cascalheira, ICArEHB (Interdisciplinary Center for Archaeology and Evolution of Human Behaviour), Portugal

Célia Maria Alves Gonçalves, ICArEHB (Interdisciplinary Center for Archaeology and Evolution of Human Behaviour), Portugal

Keywords: Computational Archaeology, Climate change, Heinrich Events, Portuguese Extremadura, Middle-Upper Paleolithic Transition

Abstract: The aridity of the Mediterranean during the Heinrich Events (HE) appears to have limited settlement refugia to an extreme extent that communication networks and cultural dynamics broke down and were subsequently reorganized under different socio-cultural conditions. These turnover periods can be explained by the emergence of new techno-complexes. For instance, the replacement of Mousterian by Aurignacian during HE4, associated to the final (macro-scale) extinction of Neanderthals and their widespread replacement by Homo Sapiens. Although some of these topics have already been the subject of in-depth studies, very few have focused on analyzing the settlement patterns between different time scales in a certain geographical area. So, in order to contribute to the development of the study of this period and to fill the existing gaps, this presentation will describe human occupation and settlement strategies in Portuguese Estremadura during the events H4, H3 and H2, between 45 and 20 thousand years ago. The main objectives are to define patterns of resilience and/or disruption in the organization of space differentiate and compare adaptive choices based on the cultural particularities of Homo Neanderthal and Homo Sapiens.

In this sense, the results of the creation of an Archaeological Spatial Model through multi-criteria analysis are presented. This relied on a statistical, descriptive, and univariate methodology, using dependent variables (archaeological sites) and independent (lithology, altitude, water courses, distance to the coastline). In a first phase, the cartography of the region was collected, which allowed the creation of the Digital Terrain Model, and the respective thematic mapping (e.g., slope, aspect, topographic position index maps). After, the selection of variables, statistical tests were carried out to assess the differences and similarities between each period.

This work will allow to show results about: (1) the human–climate interactions in this area into four major periods, corresponding to the traditionally defined techno-complexes and, (2) track long-term shifts in human ecology, providing a better understanding of how communities were able to adapt to different environmental conditions in the period of interest.

Presentation Type: Communication

Sustainability and Valorisation of the Duero River Borderland Landscape: Using Integrated Approaches for Heritage Landscape Analysis

Kyle Patrick Hearn, Universidad Pública de Navarra, Spain

Keywords: Historic Landscape Characterisation, Remote Sensing, Ethnography, Landscape abandonment, Diachronic analyses

Abstract: The Duero River border region between Spain and Portugal possesses a shared history of human influenced ecosystems based on the maintenance and sustainable management of the agrosilvopastoral use of the land since pre-Roman times. From the mid 20th century, however, the landscape has suffered from massive outmigration resulting in significant rural abandonment. Consequently, the once historically managed cultural landscape is evolving to a more homogenous vegetative one now maintained under potentially unsustainable natural park preservation strategies. With population loss has also come a disconnection with the archaeological and historical past of the landscape and its management and use.

This paper utilizes an integrated approach that incorporates “bottom up” ethnographic perception and “top down” methodologies from satellite spectral analysis and Historic Landscape Characterisation (HLC) to characterize and document diachronically the land use and land cover evolution of this region. In both nations, remaining stakeholders perceived the current changes and threats facing the landscape. Remote sensing analysis revealed a temporal increase in forest cover throughout the region over a 34-year period. HLC, complementing attributes of the spectral analysis, demonstrated aspects of land use change spanning from the protohistoric period to the present. Land use and land cover have seen drastic changes in recent decades marked by wildfire and a rapidly declining population. Understanding the historical evolution of this rural landscape can provide for more effective management and its sustainability.

Presentation Type: Communication

A Synthesis of Recent Landscape-Archaeology Research in the Mississippi Delta, USA

Elizabeth L. Chamberlain, Wageningen University, Netherlands

Jayur Mehta, Florida State University, USA

Jakob Wallinga, Wageningen University, Netherlands

Tony Reimann, University of Cologne, Germany

Matthew Helmer, Louisiana State University, USA

Keywords: Earthen Mounds, Landscape Reconstruction, North American Archaeology, Optically Stimulated Luminescence Dating, Sustainability

Abstract: Archaeological sites hold the only millennial-timescale records of human adaptation to environmental change in North America. Such information is dearly needed in the Mississippi Delta, USA, a delta that has experienced rapid land loss over the past century. In this landscape, sustainability and cultural resilience must be at the foreground of conversations about coastal management. Here, I summarize recent studies by our team in the Mississippi Delta. Our research includes sediment dating and landscape reconstructions coupled with archaeological investigations of prehistoric earthen mounds and middens. Results reveal the relationship of prehistoric settlement patterns to delta evolution and offer insights into coastal human-landscape interactions across time. We document 20th-century loss of many mounds due to coastal erosion, industry, and other land-use practices. Considering their value to societies past and present and their role in promoting landscape heterogeneity, we propose earthen mounds are keystone landforms that foster cultural and biophysical resilience. Present-day approaches to sustainable delta management should therefore include archaeological sites.

Presentation Type: Communication

Think Globally, Act Locally: A Probabilistic Model for Climate Impacts to Coastal Resources along the Delaware Bay, USA

Heather Wholey, West Chester University, Department of Anthropology and Sociology, USA

Daria Nikitina, West Chester University, Department of Earth and Space Sciences, USA

Keywords: Cultural heritage, Preservation planning, Climate change, Probabilistic model, Delaware Bay

Abstract: The future projections of the global mean sea level (GMSL) reported by the IPCC are based on a range of greenhouse gas emissions scenarios and suggest that 70% of all coastlines will experience a rise in sea level by 2100. Moreover, GMSL is

expected to continue to rise even beyond 2100. This threatens coastal communities, economies, and ecosystems around the world. However, GMSL rise projections provide insufficient information for local vulnerability assessments, mitigation, and adaptation plans. Local decisions require projections that include probabilistic estimates and accommodate for local non-climatic factors influencing relative sea level (RSL) for various time frames. The probabilistic sea-level projections for 21st and 22nd centuries were derived from Kopp et. al. (2014), using a global network of tide gauge sites and three Representative Concentration Pathway (RCP) scenarios of greenhouse gas emissions. Assimilating GMSL rise and regional observations from the tide gauges can be used to create local low, intermediate, and high sea level rise projections that can also be linked to storm surge projections (Kopp et al., 2014). We use a GIS-based interdisciplinary approach to examine and assess climate driven impacts to cultural heritage resources of the Delaware Bay coastal zone. Much of the shoreline is currently surrounded by salt marshes that act as a buffer to storms by attenuating waves and currents. In general, the salt marshes have been keeping pace with rising sea level by accreting vertically. However, in recent decades they have been declining at the rate of $\sim 0.63 \text{ km}^2$ per year (Partnership for the Delaware Estuary, 2017), primarily due to shoreline erosion. Accelerated SLR will eventually outpace marsh accretion, increasing susceptibility to erosion and storm surges. We apply these Probabilistic sea-level planning scenarios along with NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) projections to identify sites and landscapes at high risk for inundation or impact from storm surges by the years 2030, 2050, 2080, 2100. Kopp's et al., (2014) model also allows development of SLR predictions under complete probability distributions, and so we are also able to identify cultural resources that will be inundated at any percentage rate. The results are not only useful for preservation and other types of resources planning, but also in illustrating the message that these outcomes are not foregone; humanity and our decisions today have a role in creating a more sustainable future.

Presentation Type: Communication



SESSION 04. PEOPLE AND THEIR SCAPES: DIALOGUES FROM THE GLOBAL SOUTH

Session Organizers:

Ahana Ghosh, Indian Institute of Technology, Gandhinagar & Social Science, India

Aishwarya Prashant Mhaske, Heritage Science and Society School of Humanities,
National Institute of Advanced Studies – Bengaluru, India

Keywords: Landscape archaeology, South Asia, macro and micro landscapes, Phenomenological landscape, culinary scapes, gender scapes, sacred scapes, taskscape, Heritage scape

Session description:

The concept of 'landscape archaeology' in South-Asia articulates the dynamic relationships and experiences between humans and their ecological niches. It's an anthology of man-land experiences embedded in different cultures irrespective of space and time. It has already been established that particular space has a direct or indirect influence on cultural developments and dynamics of human society, conversely, humans shape their immediate landscape pursuant to their necessity since the past. However, South-Asia has diverse scapes characterized by distinct cultural patterns, prevalent in different developmental trajectories in the socio-cultural locals. To date, South-Asian scapes have been studied primarily from environmental and climatic lenses. For, last few decades, various interdisciplinary tools have been implemented for a holistic understanding of the man and land relationships of past societies. Diverse analogies like ritualistic patterns, on and off-shore maritime interactions, ambits of artisans, and literary traditions have been engulfed in the archaeological study of the South-Asian landscape. In this background, we ask the role of the small scapes as a functional unit or an integrated segment in a larger landscape? We enquire how human behavior has characterized/utilized the human scapes for ages in the diverse topography of South Asia? How did even macro and micro scapes resonate the fervours like 'gastropolitics' or 'societal raptures'? We inquire about the ancient sacred geography, old maritime networks, and cultic practices, which have redefined the relationships between the humans and their scapes of that particular terrain for ages. The theme

of this session aims to focus on those previously unexplored approaches, which are also conducive tools for understanding the 'Phenomenology' of different microcosms located in diverse corners of South-Asian topography. The conjectures like 'culinary landscape,' 'gender scapes,' 'tasks capes,' 'sacred scapes,' 'traditional knowledge scapes,' and 'heritage scapes' will be addressed within this session.

The proposed session invites contributions that focus on the above praxis and dynamic relationships between people and their scapes (smaller within the larger), preferably from Global South. We look forward to exploring the constant connectivity and mobility within a landscape, followed by the continuous utilization of landscape since the past throughout different periods in South Asia. Through our papers, we aim to explore the jigsaw puzzle of the myriad archaeological scapes of the Subcontinent and try to connect the zigsaws (scapes) for a holistic understanding of the physical and meaningful aspects of the human and scape relationship.

Part 1. Looking through the Scapes

The Temple Binary at Malaprabha River Valley

Kuili Suganya, National Institute of Advanced Studies, Bengaluru, India

Keywords: Early Chalukyan architecture, Aihole, Temple architecture, World Heritage Sites, Protected monuments

Abstract: In this paper, I explore the temple binary as perceived by Malaprabha River Valley residents to bring to the forefront how the heritage exists in defragmentation between the heritage of the residents and the nation. This understanding is important because the Indian heritage policies are based upon British heritage conservation policies, which largely perceive heritage as an entity frozen in time. In contrast, the Indian heritage is the site of living cultural practices and cultural continuity. The Malaprabha river valley houses many nationally protected heritage sites, with the three epi-centres being Aihole, Badami, and Pattadakal in Karnataka, India. This region houses heritage structures from megalithic culture (1200 BCE to 300 CE) until the 19th-century Marathas. Though the structures have existed for over a millennium, the valley's-built heritage is projected as the Early Chalukyan (6th to 8th centuries CE) heartland covering about two centuries due to the many structural temple clusters.

This paper discusses two temples types of the valley as the "gudi" (local name for village temple) versus the "Jakanachari gudi". The "gudi" is largely the functional and non-monumental temples of the valley. In contrast, the Jakkanachari gudi are "the temples of Pattadakal" and similar-looking temples which are monumental in scale and largely dysfunctional. This study highlights the differences between the two temples types (architecturally and plan), current use and heritage status, and how the "gudi" temple culture exists as an example of cultural continuity. The study observed that the village temples' plan largely followed a plan type of a few 8th centuries Early Chalukyan temples called hall type. The hall type plan is considered to be not fully adhering to the planning principles of temple design as per Ancient Indian scriptures. This information comes in light of the other temple plans of the Early Chalukyan period being considered the prototype of the temple architecture of the Deccan region. A few examples of hall type temples are Lad-Khan and Konti gudi. Understanding the binary between the two becomes important for an integrated heritage plan that includes all types of heritage without defragmentation.

Presentation Type: Communication

Unexplored Landscape around Sheikhpura Hills, Bihar, India

Elora Tribedy, School of Historical Studies, Nalanda University, India

Keywords: Networks, Hills, Reservoirs, Monastery, Sculptures, Atelier, Landscape

Abstract: The present paper elucidates the archaeological traces and modified landscape features of premodern period from an understudied area of Southern Bihar, India. The hilly area of Sheikhpura district is situated between two significant historical territories of Nalanda and Lakhisarai districts in Southern Bihar. Generalized as a 'corridor-zone', it has been hitherto presumed to be serving in the exchanges among neighboring 'dominantly studied' territories.

Three field seasons of explorations and examination of the landscape around the Sheikhpura hills (2019-20, 2020-21 and 2021-22) by present author, indicate complex growth of political and religious establishments in this area between 500/600 -1300 CE, in addition to vibrant ideological and material exchanges with other territories via the route which ran across Sheikhpura hills. The newly identified archaeological mounds, sculptural and epigraphic remains and hydrological features around Sheikhpura hills, bring into light careful consideration of ecology by past communities. The analysis of archaeological traces on hills, foothills, plains and area of drainage pan indicates a pattern and a possible evocation of a ritually charged landscape. The religious establishments and human settlements, gleaned through architectural members, sculptures and ceramics, echoes the unspoken actions and unheard emotions of multitudes who inhabited this landscape.

This paper also argues for the need of microregional landscape surveys of hitherto understudied territories in retrospect of generalized statements about people and past landscape usage in premodern South Asia.

Presentation Type: Communication

Urbanism, Fuzzy Boundaries and Archaeology of Lesser Known Sites: A Case Study of Champaner-Pavagadh; With Special Reference to 13th – 14th C.A.D

Avradeep Munshi, North-Eastern Hill University, India

Keywords: Champaner – Pavagadh, Heritage, Periphery, Medieval, Landscape, Urbanism

Abstract: The present research paper aims to understand the nature of urbanism in medieval India with special reference to the potential archaeological regions both from the core and periphery zones of historical cities. Our basic understanding of historical urbanism in the South Asian context is limited to the propensity of big heritage cities and their associated material cultures. Which generally invites an

elitist approach towards the understanding of urbanism, disregarding the very facts of the enormous contributions of the peripheral regions behind the successful sustainability of the urban core.

Therefore to address the above-mentioned theme of urbanism in the Indian context, the peripheral area of the Champaner Pavagadh (73°27' E - 73°36' E and 22°25' N - 22°32' N), (at present a UNESCO world heritage site) will be taken as a case study. A short-lived capital (1484 C.E – 1536 C.E) rose to power by utilizing constant political upsurges within the surrounding region of modern-day states of Gujarat, Rajasthan and Madhya Pradesh.

Based on earlier published and current exploratory datasets, in this paper, the author will try to envisage the concept and variability of urbanity by plotting the different categories of findings within a given landscape within and around the city. Further, this paper will also try to investigate how the fuzzy boundaries of contemporary medieval villages in combination with their existing material cultures can be posed as the potential zones that might interact with the main city to form a bigger picture of urbanism.

Presentation Type: Communication

Communities and Monuments, a Tale of Changed Settlement at Kalyan, Maharashtra, India

Gayatri R. Rede, Independent Researcher, India

Tanashree Redij, Amrita Darshanam (International Centre for Spiritual Studies), Amrita Vishwa Vidyapeetham, Bengaluru, India

Keywords: South Asia, Heritage Scape, Settlement Pattern, Port Town, Communities, Monuments

Abstract: Kalyan (19.24°N 73.13°E) is one of the significant ports on the Konkan coast, Maharashtra, India; that gained importance after the 14th century. Today Kalyan is taluka in the Thane district, which includes approximately 112 villages. Today it is an urban settlement having skyscrapers and mostly the migrated people are living there. Partly it has also become a commercial area. The history of Kalyan dates back to Satavahana and Post-Satavahana periods corroborated by the Epigraphic and foreign travel accounts which indicate that Kalyan was an important port and trade city during the time. The medieval period from the 14th to 17th centuries is also an important phase in the history of Kalyan, as it remained an important settlement during this period. The port was fortified during the 17th Century by the Matabar Khan, Aurangzeb's Subhedar. After 1860 the British took over this region from Peshwas. As a result of trade and the altering political powers, the city was always attracted by the different communities. Though the current geographical boundaries of the Kalyan city have extended beyond recognition due to urbanization, the 'Old City' can still be marked by pinpointing the location of

architectural remains of the medieval period. The religious architecture in the city is giving testimony to its changing past. People of different castes, creeds, and ideologies resided herein Kalyan as the result of political, industrial, and commercial turnover in the city. The altering of political powers, trade activity, and community-dwelling in the city of Kalyan has resulted in the amalgamation of the socio-political scenario of the city. Hence, the present research paper focuses on the medieval architecture of the city as a key to understand the changing settlement pattern of Kalyan over a period of time.

Presentation Type: Communication

Water: Creating Scapes, Creating Memories

Amulya Dixit, Amrita Darshanam (International Centre for Spiritual Studies), Amrita Vishwa Vidyapeetham, Amritapuri, India

Tanashree Redij, Amrita Darshanam (International Centre for Spiritual Studies), Amrita Vishwa Vidyapeetham, Bangalore, India

Keywords: Landscape archaeology, South Asia, Phenomenological landscape, Sacred scapes, Collective human memory

Abstract: One of the most important natural phenomena for human life has been water. If studied minutely, all the human settlements, from the earliest dwellings to the city-states, are essentially waterscapes as water fulfilled multiple needs of humans like diet, agriculture, cooking, cleanliness, travel, religion, defense and many more. Especially the evidence of moats around the fort cities from the 6th century BCE to Modern times plays a significant role in the defense strategy. Though the moats are artificially made landscapes, oftentimes it was seen that the humans made use of already existing water sources like the rivers to protect their dwellings.

The fort city of Mandla (22.5878124, 80.3696868) in the state of Madhya Pradesh is one such example where the river Narmada played a very important role in the settlement and the development of the fort-city. The fort-town of Mandla was the fifth and final capital of the Gond kings which was established in the 17th century CE. The Gond rulers were under constant attack from multiple enemies and hence decided to shift their capital to a more secure location.

In the town of Mandla, the river Narmada makes a meander thereby surrounding the city from three sides and making it a peninsula. The Gond rulers made use of this natural phenomenon and established their fort city right on the meander thereby providing enhanced protection to the city. As a result, the whole fort-town of Mandla flourished and developed with the natural course of the river Narmada.

The present research paper will confer on the key role played by the meander in the development of Mandla as a fort city and its influence on the collective human memory of local folks.

Presentation Type: Communication

Mapping the Transformation of Maritime Trade Centers of the Colonial Period in India

Ekta Gupta, Indian Institute of Technology - Gandhinagar, Gujarat, India

Ahana Ghosh, Indian Institute of Technology - Gandhinagar, Gujarat, India

Keywords: Colonial Period, Maritime Trade, Important trade centres, Remote Sensing, GIS,

Abstract: In the struggle for dominance over India's monopolistic maritime trade, European powers (viz. Portuguese, Dutch, British, Danish, and French) established defensive structures for the protection of their entrepôts and settlements. The maritime trading centres during the colonial period (16th century to early 20th century) had been a theatre of constant conflict among these powers and the native rulers. All of these antagonistic conflicts in the trading centers had left a pertinent impact on the landscape of the region leading to a metamorphosis of the landscape. However, it has been observed that some of these centres had been modified either to reduce their size in order to curtail the maintenance costs or to strengthen the structure for better protection. In some scenarios, there is a complete demolition that has erased almost all the visible traces of its existence. It has been observed that some of these centers continued to be important over the centuries. A few experienced transformations of their value and identity while others remained unchanged. The present study maps the physical transformation as well as the transformation of the meaning of the maritime scapes to its people through case studies of colonial maritime trade centers. Moreover, it unveils the phenomenology and the intensity of dissemination of these archaeological maritime scapes often questioning the temporality of these spaces due to constant combat within the microcosms. The current study applies remote sensing and GIS to trace these transformations and ground knowledge to interpret the changes in the value and meaning of the spaces within each microcosm. This study probes into the continuity and discontinuity in the functionality of these centres and open up several insights such as the progressive nature of certain trading centres and the regressive or inert nature of others. The study also resonates with the role of humans in shaping a particular space, particularly in the coastal region.

Presentation Type: Communication

Part 2. Echoes through the Scapes

Landscape and Gender: Undertaking Reconstruction, Deconstruction and Paving Future Genderscapes

Sharmistha Chatterjee, Amity Institute of Social Sciences, Amity University, Kolkata, India

Moumita Dey, Amity Institute of Social Sciences, Amity University, Kolkata, India

Keywords: Landscape, gender, genderscapes, gender equity, deconstruction

Abstract: The paper is about a Project on 'Landscape and Gender' which has been conceived in the form of an edited volume with 14 papers. The Project is transdisciplinary with its scope beyond the normative frameworks of disciplines with scholars from diverse fields of social sciences coming together to share their insights on Landscape and Gender. We have research contributions from history, sociology, geography, archaeology, and gender politics. This is the first attempt to relate the concepts of landscapes and gender in a developing country like India where we have more challenges and negotiations in comparison to the development strategies. Notwithstanding the fact that overarching influence of patriarchy has dominated Indian landscapes, the case studies significantly beget the activities, perceptions, and roles of different genders including males, females, and queer as an indispensable part of the progressive society. For the present paper we will focus and talk on four themes bridging the historical pasts with the contemporary present. We would highlight on reconstruction of gender roles in the historical periods followed by the regular contemporary landscapes from micro to macro modes of analyses, including the quotidian. The theme which follows is deconstruction of the landscapes bringing forth the gender roles and gendered perceptions from the diverse socio-cultural domains. The researchers have tried to focus on a number of spatio-temporal frameworks to bring forth the nuances of landscape-gender interplays. We will wrap up the paper by talking of the possibilities and the ways of activism and livelihood practices. This paves the path of the future genderscapes and taking these under consideration, it is possible to have new policies framed for gender equity and a desired exercise for the practitioners and policy makers to frame holistic development policies in India.

Presentation Type: Communication

Sacred Landscape of Moghalmari

Somreeta Majumdar, Kalyani Mahavidyalaya, India

Keywords: Landscape, Early medieval, Sectarian relationship, iconography, religions

Abstract: The landscape of Moghalmari was nestled by multiple sects of Buddhism, Saivism, Vaisnavism between 600 CE - 1200 CE. The inhabitants left the traces of their activities through archaeological, iconographical remains. This paper explores the pattern of their religious behavior leaving traces through archaeological, iconographical remains. Both of institutional and individual religious behavior was practiced by renouncer monks and householder religious teachers, and priests. They subsisted on the donated resources supplied by the laities living on agricultural and rural commercial products. The multi-religious landscape provided boost to the diverse economic activities of the riparian, rural landscape and established a inter-regional trading network in South and South East Asia.

Presentation Type: Communication

Understanding the Formation and Evolution of the Heritage-Scapes of Chinsurah in Hooghly District, West Bengal, India

Debajit Ghosh, Visva-Bharati University, Santiniketan, India

Keywords: heritage-scape, urbanscape, South Asia, public archaeology, Chinsurah, qualitative approach

Abstract: This paper attempts to exemplify the formation and evolution of the heritage-scapes of Chinsurah in Hooghly district, West Bengal, India. It tries to understand the dynamics of the relationship of the people with their heritage-scapes and how that relationship shapes the identity of the study area. It is an urbanscape located on the right bank of the river Hooghly, West Bengal, India. It secures a unique place in the heritage map of West Bengal because of its rich and diversified tangible and intangible heritage, having both the essence of colonial and indigenous flavors since the 16th Century. The present reconnaissance study investigated the role of the micro heritage scapes of Chinsurah in shaping its identity as a macro unit, through the implementation of research methods like archival research, observational approach and interviews with its people. This study unraveled how the people of Chinsurah have been continuously utilizing and specifically saying, shaping and re-shaping their immediate landscape within and around the heritage-scapes in order to meet their changing necessities since the past. This kind of qualitative study is pertinent to understand the context behind the constant changing dynamics of the relationship between humans and landscapes, which will

further portray the potentialities of heritage-scapes studies within the broader framework of the public archaeological approach.

Presentation Type: Communication

The Beats of Bengal: the Dhak Tradition and Its Changing Landscape

Hrishita Ghosh, Independent Researcher, India

Keywords: Dhak tradition, landscape archaeology, perspectives, ritual macroscales, musical microscales

Abstract: The research attempts to posit the idea of a musical instrument - the Dhak - as an embodied cultural experience that has changed from about the 1970's to 2020. As one of the many associations created and re-created during the autumnal Hindu festivities, the Dhak is a unique percussion instrument - a regional manifestation of the drum. As many tangible manifestations of the interconnections between the intangible spheres of heritage, rituals and music, its associations with the people are deep-rooted but ambiguous. Representative of a microscale in the expansive macroscale of rituals and music, the research shall entail the study of the players of the instruments residing in two specific villages, Khundanga of Bankura district and Kinnahar of Birbhum district; the receptive audience-participative or otherwise; and the researcher as well. This is to provide a wholesome idea of the experience from various perspectives and to connect it to the contextual landscape respectively. These contextual macroscales themselves shall be studied as a production of inter-related and palimpsestic microscales, of which four shall be exploited: homescales; trainscales; performance-scales and instrument-scales. Apart from an investigation into the functional associations of the instrument, the theoretical issues to be addressed include gaining perspective into the idea of "change" as perceived by specific cultural identities and contextualizing such change within an interconnected microcosm of mindscales and landscapes. Rather than ethnomusicology, it is an ethnoarchaeological attempt at understanding the contextualized idea of change, produced, and reproduced within a dynamic landscape.

Presentation Type: Communication

Negotiating the Space: Changing Landscape and Contemporary Hunter-Gatherers

Rakesh Kumar, National Institute of Advanced Studies, Bengaluru, India; The University of Trans-Disciplinary Health Science and Technology, Bengaluru, India

Keywords: Hunter-gatherers, subsistence, landscape and industrialization

Abstract: Hunting-gathering is considered the oldest subsistence strategy likely to be started with the Homo Erectus (~2 million years ago). Hunter-gatherers (H-Gs) of today are neither the same H-Gs of the past who have started the subsistence system, nor do they represent the linear evolutionary continuum of the past. However, the present H-Gs share some of the characteristics of their forefathers like nomadism and family-level foragers. Although the socio-cultural structure, behavioral pattern, eco-political exercise, and decision-making process are different and inconsistent from the past because of their continuous interaction with the settled community, exchanges of goods and ideas and adoption of technological development. Despite the appreciation for technology and industry-led development, the H-Gs of today are undergoing a tremendous amount of stress due to the change in the landscape. For H-Gs landscape is not only a source of nourishment but also constitutes of their knowledge system, beliefs, culture, and worldviews. The slightest change in the landscape due to deforestation or industrialization of forest or natural calamities has an adverse effect on their livelihood and practices (which are the threshold to collapse). The present study opted for an ethnographic method to perform a qualitative exploration among the selected H-Gs communities of Nilambur valley, Kerala namely Cholanaickan (C) and Kattunaickan (K) to understand the problem of space crunch due to changes in the landscape and its effects on the various dimensions of H-Gs livelihood.

Presentation Type: Communication

Investigating the Contemporary Artisan Working Space to Comprehend Archaeological Evidence of Workshop Working Space

S. Udayakumar, National Institute of Advanced Studies, Bengaluru, India

Keywords: Heritage, Workspace, Bronze casting, Artisan, archaeological sites and materials craft

Abstract: In India, there is a much-concentrated craft center which indicates the heritage and techniques of the past and it still following through generation to generation. As the whole concept of this research paper is to accommodate the artisan community, how they make use of living space and workspace together. As concern to workspace, the question raises how they divide the workspace of each

activity. In the case study of the bronze casting techniques method, we could see the different workspace for each working pattern. In an indoor working activity which includes making the wax model, chiseling of metal images and in outdoor workspace other activities like de-waxing the mould and casting will take place. This paper also includes the connectivity between indoor and outdoor craft activity which brings out the final product, so each craft has its workspace requirement according to the materials of craft and demand of the product in the national and international market. This paper also covers how the current craft workspace will help archaeologists to understand workspace which was excavated in a different cultural period in archaeological sites in India and how to approach the comparative analysis of current craft workspace and archaeological evidence of craft workspace.
Presentation Type: Communication

**Mahadev Koli and Their Shifting Cultivation (Rab):
Looking into the Traditional Knowledge Scope of an Indigenous
Community from an Ethnoarchaeological Perspective**

Tanoy Sengupta, Deccan College Post-graduate & Research Institute, Pune, India;
Indian Museum, Kolkata, India

Parupudi Vinnie Pratibha, Deccan College Post-graduate & Research Institution,
Pune, India

Keywords: Knowledge-scape, Indigenous Community, Shifting Cultivation, Ethnoarchaeological Perspective, South Asia, Chalcolithic

Abstract: The concept of “Knowledge-Scape” comprises of shared physical or intellectual spaces in which knowledge is communicated, collected, and eventually transformed into something that is performed or made, rather than simply possessed. Knowledge and skill encompass a wide range of activities, which can be observed and interpreted from an archaeological perspective and is socially relevant as well. Since traditional knowledge is considered an indispensable part of the ethnic community’s culture that validates their identity; the present research resonates with the conventional shifting cultivation (rab) method of the indigenous Mahadev Koli community, settled in the hill slopes and flatlands of the Sahyadri range, Maharashtra, by engaging their folklores and traditional knowledge system, which are associated with the utility and utilitarian aspects. In this context, the present research attempts to investigate the methods of rab cultivation, land rotation models, settlement and storage strategies, use of implements and rituals recited by the community. To explore the analogies presented above, this study focuses on the comprehensive documentation of the rab farming strategies, merged with an observational approach for understanding the dynamics of the local myths and the socio-religious aspects of the ethnic community. In addition, the research delves into

the greater cultural milieu of the indigenous communities to ascertain whether the present-day rab farming is a continuation of the past Chalcolithic traditions of the region or not. This research can be taken as a useful model for understanding the behavioral pattern and traditional knowledge system of the communities presently practicing shifting cultivation in the region.

Presentation Type: Communication

Why Memorial Matter Matters?

Neha Khetrapal, Jindal Institute of Behavioural Sciences, O. P. Jindal Global University, Haryana, India

Keywords: war memorials, senses, affect, India, embodied

Abstract: The rise of the material turn in social science has successfully placed material things—objects, spaces, buildings, and so on—at the focus of scholarly inquiry. The material turn has also helped to extend memory studies beyond the confines of laboratories. We have moved from defining memory as an internally located long and short-term archive, which facilitates remembering, to a description that entails everyday practices and as a multi-sensory phenomenon. With this contemporary definition, facilitated by the material turn, remembrances and recollections are cued by materiality. Thus, the mind is loaded into the senses, practices, built forms and cultural artefacts.

For researchers interested in recollections of socio-political pasts, war memorials deserve a special mention. Memorials and closely associated commemorative practices help objectify historical narratives and assist societies in recollecting their past. A question of interest is whether features of built memorials or specific architectural styles help anchor recollections and remembrances. And, whether there are constitutive elements in this social exercise that help translate the abstract messages associated with the built material forms into conversable forms.

By adopting an ethnographic approach and by examining Indian war memorials, the current paper identifies the senses and corporeal experience as integral constitutive elements in establishing connections between the past and the present or between the far and the near. The present investigation also helps identify unique architectural styles and memorial designs that contextualize the recollections of socio-political pasts in the Indian scenario wherein memorial visitors report recollected pasts, as infused with feelings of deep respect and melancholy. Furthermore, the unique memorial designs of the post-independent era spotlight supreme sacrifices and offer a material platform for remembrances that is uniquely regional in character.

Through this endeavor, the present study seeks to fulfil two separate objectives. First, it highlights the significance of adopting a sensory-based ethnographic approach as the linchpin for advancing memory studies within the material

landscape. Second, it elevates the status of Indian memorial designs as a promising field of study. And, aligns this line of enquiry with efforts that have so far been restricted to the European context.

Presentation Type: Communication

Strongholds (Forts and Fortalices) of Garhwal Central Himalaya, India and their Role in Changing the Identity of Medieval Landscape

Nagendra S. Rawat, Hemvati Nandan Bahuguna Garhwal University, Srinagar Garhwal, Uttarakhand, India

Vinod Nautiyal, Hemvati Nandan Bahuguna Garhwal University, Srinagar Garhwal, Uttarakhand, India

Keywords: Garhwal Himalaya, Forts, Landscape, Divinity, Identity, India

Abstract: The Garhwal Central Himalaya, in the state of Uttarakhand, India is dotted with a large number of the ruins of medieval strongholds (fortresses and fortalices) running into more than 150 in numbers which were supposedly built in a high mountainous cliff or slope during medieval period by local chieftains for the purpose of residence of noble class and as well as a watchtower respectively. The study of the authors has shown that the strongholds were networked in such a fashion to build a local and large defensive network in this mountainous landscape during the medieval period. However, in this study we report that besides the defensive nature of the architecture and functional aspect of the strongholds, these medieval structures which once were the seat of power of nobility/ royalty were not abandoned but rather transformed as temple during the course of time. This presentation also highlights that how this changing role of strongholds played a significant role in changing the identity of place and landscape 'from Defensive to Divine' or 'Royal to Ritual' over the centuries.

Presentation Type: Communication

Contextualizing Landscape and Archaeology of Spiti Valley, Himachal Pradesh, India

Ekta Singh, Shoolini University, India

Rakesh Chandra Bhatt, HNB Garhwal University, India

Nagendra Rawat, HNB Garhwal University, India

Keywords: Landscape, archaeology, Spiti valley, Trans-Himalaya

Abstract: The idea of the interrelationship between human and geographical landscape is a most widely discussed subject because people often try to associate the older known landscape with the new ones and often influence the perception of

the entire landscape. Knowingly or unknowingly, people tend to see a landscape through social eyes. Landscape archaeology exemplifies the purpose and rationality. Therefore, the present and past remain interwoven. This builds up all these forms over time and makes it an essential attribute of the landscape study, making all landscapes historical. The Spiti valley bears many important archaeological markers such as lithic tools, burials, petroglyphs, pictographs, and cupules which generally seem scattered over the landscape. Therefore, this paper aims to see all the archaeological and historical sites in relation to the landscape and try to draw a link between the landscape and the archaeological evidence found. This paper will also focus on how early settlers used this challenging terrain to survive and procure and use their landscape according to their needs.

Presentation Type: Communication

Journeying to Eternity: "Ghora-Galis" and Place-Making in the Indian Himalayas

Baisakhi Sengupta, Cotsen Institute of Archaeology, UCLA, USA

Keywords: Himalayan Archaeology, Landscape and Placemaking, Embodiment, Iconography

Abstract: Permeable regions in high altitude gradients such as the Himalayas, despite their extreme climatic conditions have witnessed extended contacts between cultures. These terrains have historically been defined by a complex network of pathways linking trade networks to people, goods and animals. Amidst rugged mountainous regions, the corridor connecting the subcontinent to Inner Asia has in the recent decades begun to be globally recognized as a niche for the flourishing of a specific ecology wherein humans parcel a distinct set of relations with the environment. On a global scale this has nurtured an understanding of adaptability, shifting perspectives from these mountainous regions as 'inaccessible' to highlighting the discrete richness of resources available to humans at height. For my doctoral project I record and document archaeological material in the under-studied Pir Panjal Valley of the Jammu Region in North India. The Pir Panjal Valley is a mountain range in the inner Himalayan region in a locality replete with sites locally known as 'ghora galis' or horse passes on ancient and medieval trade routes. My research in 2018 identified three archaeological sites in the region (Gool, Mahore, and Kutas), two of which had been studied by foreign scholars and one of which has been additionally reported by my colleagues working in the region. Each of these sites have evidence of hundreds of stylized and richly adorned stone horse and warrior sculptures along with other associated finds such as water caskets, reservoirs and pillar fragments clustered on mountain slopes. As artistic expressions of complex thoughts, beliefs and practices - the erection of these monumental sculptural pieces in the past may have been intended to create a cultural and sacred

landscape with multitudes of meaning for those who associated with them and others who experienced them. In this paper I will explore the concept of “ghora galis” as sacred spaces and locally remembered places preserving a peculiarly distinct cultural memory of warriors, gods and ancestors, frozen in time and material. The embodied persons and animals positioned on the hill slopes seem to be collectively journeying on a path to eternity. What does this unique material assemblage in the Himalayas tell us about cultural metaphors of identity, movement and historical placemaking?

Presentation Type: Communication



SESSION 05. THE PAST, PRESENT AND FUTURE OF EARTHWORKS: TOWARDS AN INTEGRATED APPROACH

Session Organizers:

Roy van Beek, Wageningen University, Netherlands

Mans Schepers, Groningen University, Netherlands

Jayur Madusudan Mehta, Florida State University, USA

Soetkin Vervust, Free University Brussels, Belgium

Elizabeth Chamberlain, Wageningen University, Netherlands

Keywords: earthworks, human-landscape interactions, interdisciplinary research, identity formation, adaptive reuse, heritage management

Session description:

In many parts of the world human-made earthen structures are omnipresent. Examples are dwelling mounds, ceremonial mounds, dikes, barrows, various types of bank systems and artificially raised fields. These earthworks contribute to landscape character and identity. People relate to them and the narratives attached to them. Moreover, as these monuments often reflect significant events or phases in the region, they provide invaluable sources to study – and form visible reminders of - how humans responded to past environmental challenges and opportunities and shaped the world in which they lived.

Yet, despite of their abundance, most earthwork types are under-explored from an academic point of view. Often, surprisingly little is known about their construction age, purpose, function, link to environmental processes and significance within the cultural landscape. Potential reasons for this research deficit are that some features are not easily available for research due to continued functioning (e.g. dikes) or monument status (e.g. mounds), or that they fall on the boundaries between scholarly disciplines of archaeology, historical geography and natural sciences. Sometimes earthworks are not even recognized as such, but mis-interpreted as natural features. Concerted, interdisciplinary research efforts are not only necessary for academic progress, but also to contribute to decision making with regard to protection, preservation, and adaptive re-use of these structures.

In this session, we aim to consider earthworks from a diversity of angles, and to discuss how to move forward in the future. We are open to any contribution on relevant current research and especially welcome contributions addressing the following themes:

1. The development and integration of innovative theoretical and methodological approaches in earthwork research;
2. The potential of earthworks as archives of past human-landscape interactions;
3. The role of earthworks in past and present identity formation;
4. Problems and potentials in earthwork-related heritage management and spatial planning.

With an Eye in the Sky and Feet on the Ground: Earthwork Survey, Technology and Tradition

Olaf Bayer, Historic England, UK

Dave Went, Historic England, UK

Keywords: Analytical earthwork survey, drones, hachure plans

Abstract: Over the last decade the ability to digitally capture, model and visualize landscapes and archaeological earthworks has moved forward with extreme rapidity. Advancing Lidar coverage (by national agencies in the UK) has been followed by improved photogrammetric applications which fall within the easy reach of the drone-using archaeologist, allowing for detailed digital topographic modelling of individual sites and discrete landscapes. Historic England's archaeological surveyors have been engaged with drone-acquired digital imagery since 2014 (Bedford and Went 2015), exploring ways by which new methodologies can combine with and enhance approaches to earthwork survey which form part of a long and celebrated British tradition (see Bowden and McOmish 2012). This paper will discuss thoughts and actions arising from this experience, which are leading towards the publication of best practice and professional guidance in England.

The key points are the primacy of archaeological interpretation over the creation of visual aids ('models'); the continued relevance of hachuring and similar means to express that interpretation; the importance of a clear audit trail to distinguish between primary (directly observed) earthwork depictions, those derived from aerial models but verified on the ground, and those entirely derived from secondary observation.

We will also discuss the continuing value of ground-based survey as a means of understanding sites more completely, both in terms of the scrutiny of actual evidence (as opposed to the desk-based study of a digital simulation of it), and the less tangible aspects linked to the shared human experience of a location. This last point explores the significance of the archaeologist working in the same physical location as those who occupied a location in the past. It considers the particular understanding of place that is gained by the type of protracted physical interaction with a landscape which is necessitated by analytical earthwork survey.

References: Bedford J. and Went D. 2015 'Using Drones for Field Survey', *Historic England Research* 1, 20-25; <https://historicengland.org.uk/images-books/publications/historic-england-research-1/>; Bowden M. & McOmish D. 2012 'A British Tradition? Mapping the Archaeological Landscape', *Landscapes* 12(2): pp. 20-40; <https://doi.org/10.1179/lan.2011.12.2.20>

Presentation Type: Communication

Unlocking the Histories of Ancient Field Systems using Landscape Archaeology with OSL Profiling and Dating

Soetkin Vervust, Vrije Universiteit Brussel, Belgium

Keywords: optically stimulated luminescence, field boundaries, historic landscape character

Abstract: Understanding how people have used landscapes in the past and how that has shaped their modern character, requires identifying ancient landscape features in the current landscape and discerning the chronological relationships between them. In many regions, boundary features - like earth banks, hedgebanks, lynchets and terraces - which divide the landscape into fields, provide some of its most characteristic elements. Such earthworks typically derive from long histories of landscape exploitation, and it is rarely clear when they were first created or how they developed over time. Some of the most used approaches for dating field boundaries – which include dating artefacts recovered from within the earthworks, dating through associated archaeological features, and direct dating of ecofacts and sediments using radiocarbon or optically stimulated luminescence (OSL) methods – can be problematic. Over the past decade, the development of portable OSL equipment has offered a potential solution, as it allows for luminescence-depth profiles to be generated for the entire stratigraphy of an earthwork in near real time during fieldwork. The insights this provides in its relative chronology inform the subsequent strategy for collecting larger OSL dating samples. Examining the luminescence behavior of a whole stratigraphic profile also means the dating samples are not isolated and sediment ages can be contextualized, which provides tighter control on an earthwork’s age and a better understanding of its depositional sequence. The potential of this methodology will be illustrated using different case studies, investigating medieval field boundaries in Northumberland (UK), as well as working prehistoric field systems in Cornwall (UK), and the remnants of early land reclamation through embankment in the Belgian coastal plain (<https://testerep-project.be/>). By combining the dating evidence with additional information from wider archaeological surveys, historic sources, earth sciences data and computational modelling, it becomes possible to create detailed histories of past land use and management strategies that go beyond the scale of the individual field boundary. This not only helps highlight the significance of the landscape heritage which surrounds us, but can also contribute ideas about sustainable landscape management in the future, as will be shown.

Presentation Type: Communication

Luminescence Dating Approaches for Plaggen Soils in the Netherlands

Jungyu Choi, Wageningen University, Netherlands

Roy van Beek, Wageningen University, Netherlands

Elizabeth Chamberlain, Wageningen University, Netherlands

Tony Reimann, University of Cologne, Germany

Harm Smeenge, Bosgroepen, Netherlands

Annika van Oorschot, Wageningen University, Netherlands

Jakob Wallinga, Wageningen University, Netherlands

Keywords: plaggen soils, luminescence dating, soil mixing

Abstract: Plaggen soils are elevated and mixed anthropogenic soils that are widespread in nutrient-poor sandy areas of North-West Europe, including the Netherlands, Belgium, northern Germany, and Denmark. The 'plaggen' is created by mixing sods with animal manure, resulting in a heavily mixed soil that aggrades over time often to a relief of >1 m. Despite being one of the major anthropogenic elements of the European Sand Belt, there is uncertainty in the times of initiation and accumulation rates of plaggen soils. This is mainly due to the inconsistency between different dating approaches, insufficient historical records, and problems obtaining in situ ages for mixed sediments. Most recently, several studies have dated plaggen soils using optically stimulated luminescence (OSL). OSL directly measures the time of last sunlight exposure of sand grains and is thereby a promising method for dating terraformed sediments and characterizing mixing in soils. Still, much work is needed to refine a luminescence approach that can discern both time and processes in soil formation.

In this study, we aim to determine the best luminescence approach to 'rate and date' plaggen soils through tests on plaggen and underlying natural deposits of the eastern Twente region, Netherlands. We compare the luminescence results from (1) multi-grain aliquots of quartz sand, and (2) feldspar sand measured at a single-grain level. The quartz luminescence signal is the most stable and readily zeroed making it desirable for dating, but only a proportion of quartz grains luminesce. By contrast, feldspar is typically less desirable for dating but more ubiquitously luminescent. This means that feldspar measurements can resolve ages on a single-grain level within a soil, thereby providing a means to quantify soil mixing. We find that comparing quartz and feldspar luminescence results reveals a discrepancy on the human-influenced plaggen layers, while underlying natural deposits provide more consistent results. This can be used to identify and interpret soil mixing induced by human activities. Our approach improves understanding of the temporality of plaggen soils and their original landscape setting and may be useful for constraining time in other earthworks of the Netherlands and elsewhere.

Presentation Type: Communication

Dating Earthworks with Luminescence Dating Techniques: The Medieval Ringfort of Den Burg

Kirsten de Nooijer, Wageningen University, Netherlands

Michiel Bartels, Archeologie West-Friesland, Netherlands

Roy van Beek, Wageningen University, Netherlands

Sander Gerritsen, Archeologie West-Friesland, Netherlands

Jakob Wallinga, Wageningen University, Netherlands

Keywords: ringfort, dating techniques, optically stimulated luminescence

Abstract: Earthworks, human-made earthen structures, hold information on the past. In the Netherlands earthworks are abundant, however placing them in time remains a challenge. Earthworks are poor in archaeological artefacts and often lack suitable organic material for radiocarbon dating. Therefore, alternative methods are needed to pinpoint the time of construction. Luminescence dating methods have proven promising, but challenges remain as not all grains might have been exposed to light at time of construction. Moreover, sediments close to the surface may be exposed to light after construction by post-depositional mixing. Here we investigate a bank and ditch fillings that are part of a ringfort in Den Burg on the island of Texel (northern Netherlands). Age estimates for the structures currently range from 7th - 14th century CE. The goals of the research are: 1) to determine which depositional context is most suitable for dating the earthwork; 2) to find which combination of luminescence dating methods provides robust ages; 3) to determine the age of the structure. Samples were obtained for luminescence dating from the bank and ditch infill. We apply quartz single-aliquot optically stimulated luminescence (OSL) dating, as well as feldspar single grain post-infrared infrared (pIRIR) luminescence dating. The addition of pIRIR provides insight in the luminescence distribution on a single grain level to identify the grain populations exposed to light during construction of the ringfort. Preliminary results show that the bank may have been constructed as early as the 8th century CE, while some of the ditch fillings date several centuries younger. We will present final results, provide guidelines for sampling earthworks, and discuss most suitable luminescence methods for dating earthworks.

Presentation Type: Communication

Cool! You found a Prehistoric Bank on Your LiDAR Map...Now What?

Stijn Arnoldussen, Groningen Institute of Archaeology, Netherlands

Keywords: prehistoric tenure, prehistoric field systems, Celtic fields, heritage management, LiDAR

Abstract: In a large zone of the Northwest-European coastal fringe at altitudes below 100 m above sea level, embanked field systems were common. These structures can be found in areas as distant as from Latvia to Ireland, and from Denmark to Belgium. Advances in the availability and quality of LiDAR imagery, has proven to be vital to the improved identification of such systems of prehistoric agricultural land allotment that relied on earth- and stone banks. Yet, all too often, this is where the excitement peaks and interpretation ends: a new site is added to a map of a heritage authority, and life goes on. If we insist on extracting information on the ways prehistoric tenure created and materialized in such landscapes, we need to go beyond the process of mapping alone. However, several properties of the dataset pose challenges: For example, how are we to deal with hundreds of later prehistoric field systems in the Netherlands? What tools and methodologies do we need to extract social information from prehistoric landforms? This paper will focus on routeways that allow to go beyond mere mapping of prehistoric field systems discuss methods that build social narratives for the past from lingering landforms in the present.

Presentation Type: Communication

Dwelling Mounds in the Netherlands. Anthropogenic Archives of Human-Landscape Interaction in Wetland Environments (500 BCE – 1900 CE)

Roy van Beek, Wageningen University, Netherlands

Harm Jan Pierik, Cultural Heritage Agency, Netherlands

Keywords: earthworks, dwelling mounds, human-landscape interaction, the Netherlands

Abstract: Dwelling mounds – defined here as anthropogenic earthen mounds, deliberately raised to be able to live in areas prone to flooding – are an extremely valuable information source for the investigation of past human-landscape interactions. This certainly applies to the Netherlands, a country of which almost a third is situated below sea level. Numerous dwelling mounds are found alongside the North Sea coasts. These monuments, that were constructed between the Iron Age and High Middle Ages, are investigated relatively well and internationally known for their (sometimes) excellent preservation conditions. However, far less known is

that dwelling mounds were also constructed in various other parts of the Netherlands, including the central Dutch river area, the IJssel delta and Western Frisia. Most of these sites are younger than the dwelling mounds along the North Sea coasts, and constructed in different environments. So far, national-scale overview studies are lacking. Such synthesizing research is not just important from a scientific perspective, but may also provide vital information for heritage management and adaptive reuse. In this paper we present the first overview map of dwelling mounds in the Netherlands, discuss the site variety and landscape settings in which dwelling mounds appear, and examine which information they provide on past human responses to environmental challenges.

Presentation Type: Communication

Pollen, Seeds, and Sods: Palaeobotanical Analyses from Sod Structures in the Dutch Wadden Sea Area

Mans Schepers, Groningen University - Centre for Landscape Studies, Netherlands
Arnoud Maurer, Groningen University - Groningen Institute of Archaeology, Netherlands

Daniël Postma, Archaeobuild, UK/ Netherlands

Keywords: sod building, salt marsh, wadden sea region, palaeobotany

Abstract: People living on the mainland coast and the islands in the Wadden Sea region, had to deal with a landscape that did not naturally offer timber in abundance. Brick building however, was not introduced to the region before the High Middle Ages. Thus, they partly relied on imported wood, driftwood, or re-used ship wood for the construction of various features. In addition to this, people used 'earth' to build various cultural elements. For large earthworks, such as dwelling mounds, this concerned more or less 'loose earth' or sods haphazardly thrown together. In cases where more stable engineering was required, sods were stacked on top of each other with great care. These features include dikes, houses, well linings, and quay walls.

These structures continue to stay in use for centuries even when brick building was introduced. Sod features have been carefully drawn, measured, and described in numerous reports. Field archaeologists were able to identify considerable differences in the size of the sods used, the way they are positioned next to and on top of each other, and their sedimentological composition. Until recently however, surprisingly little botanical analyses targeted these sods. In addition to the sedimentological composition, botanical analyses can shed light on their environmental origin.

Over the past few years, we have been able to study the botanical composition from sods throughout the area, with great variation in time and place. These studies show that sods were extracted from environmentally diverse environments indeed.

We will reflect upon the differences observed, and discuss how these differences can be explained. Elements of this discussion are time and space, but also functional preferences depending on the feature built. In most cases however, a complex interplay between all of these played a role in 'sod selection'.

Presentation Type: Communication

Icelandic Earthworks: Remnants of Human Ecodynamics

Pablo Barruezo-Vaquero, North Atlantic Biocultural Organisation, Spain and United Kingdom

Keywords: Iceland, earthworks, human ecodynamics, synthesis, landscape management

Abstract: Icelandic earthworks stand in the landscape as remnants of an "ancient past" for some people. Others do not even consider them remnants but, instead, view them as "natural" features from an exotic land. For their part, archaeologists and historians analyze and interpret them; yet, the number of studies on these features is scarce compared with other remains. If this was not enough, there is even less literature on their functionality or connecting them with other remains—although some notable exceptions exist. This scholarly landscape is problematic for various reasons. Firstly, Icelandic earthworks are remains from ancient boundary systems, which means they tell stories about past socio-economic processes deeply rooted in ecological dynamics—i.e., human ecodynamics. Secondly, and although there has been some research on the different functions of landscape boundaries, we need further studies which can unravel their functionalities with higher precision. Thirdly, and as a consequence of the two previous points, the study of Icelandic earthworks ought to be connected with the study of other archaeological features (e.g., farmsteads, shielings, etc.) in a synthetic fashion. This paper aims to continue research on Icelandic earthworks by theorizing on their importance from the basis of human ecodynamics and Historical Ecology. The presentation explores but does not expand on different boundaries functionalities; rather, it aims to use previous knowledge to frame these features within such theoretical underpinnings. The aim is thus to lay in a theoretical understanding of earthworks upon which to consider them as remnants of past human ecodynamics. This will additionally serve for pondering over the epistemological consequences of such a theorization.

Presentation Type: Communication

Reading the Surface, Terraces as Indicators for Human Resilience and Adaption: A Case Study from Petra, Jordan

Catreena Hamarneh, The German Protestant Institute of Archaeology, Hashemite Kingdom of Jordan

Keywords: Terraces, Petra, resilience, adaptation, multidisciplinary approach

Abstract: Petra, located in the south of Jordan, has a history of human settlement that spans several centuries from prehistory until now. The surrounding landscape is dotted with man-made terraces, constructed from local materials. These terraces show a large variety of forms and distribution patterns, allowing them to be used as markers of environmental change through time.

Petra lays on an arid climate with low rainfall (< 200ml y⁻¹). Morphologically, Petra does not enjoy good fertile soil to encourage agriculture, and geologically, it is dominated by sandstone outcrops, which are severely fractured creating valleys, gorges, and creeks.

These conditions placed humans in front of several challenges. On the one hand, humans needed to protect the little resources they had (water, soil), and on the other, they needed to prevent cataclysms of nature such as floods, landslides, over siltation among others. As the environmental conditions evolved, so did the human reaction. This was manifested in a variety of terrace forms that were constructed at certain locations within the landscape.

During the period of five years, a multi-disciplinary project was conducted at the Hreimeyyeh catchment area in Petra, Jordan. This rather small catchment area is characterized by extensive terracing conducted from around 4th century BCE until around 10th century CE. This longevity of human exploitation reflects of human interaction with concurrent conditions, resource availability, climatic fluctuation, and human needs.

The detailed examination of the terraces constructed allows reconstructing some of the prevailing conditions that dictated their construction and will try to prove the possibility of using these forms as indicators for similar conditions.

Presentation Type: Communication

Monuments through the Ages.

Planning the Creation of an Archaeological Landscape Biography of the Kreuttal Micro-Region and its Middle Neolithic Sites in Lower Austria

Doris Jetzinger, Department of Prehistory and Historical Archaeology, University of Vienna, Vienna, Austria

Roderick B. Salisbury, Department of Prehistory, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Keywords: Landscape biography, diachronic, remote sensing, geophysical prospection, Middle Neolithic circular enclosures

Abstract: One of the most noteworthy characteristics of landscapes is their apparent permanence. While landscapes do change, they do so at rates profoundly different from those of living organisms and human culture. Landscapes are passed on from one generation to the next, imbuing the land with a strong sense of historicity. Societies and their cultures are strongly influenced by the long-term impacts of previous interventions in the natural world, recent ones as well as events of the distant past. Comprehensive research into landscape histories requires a holistic approach that is both diachronic and spatially multi-scalar. Although such approaches have become a research standard in landscape studies across many archaeological fields, some research areas still show a notable absence of a landscape perspective, concentrating on site-centered and period-specific research instead.

One such research area is the study of the Middle Neolithic circular enclosures (“Kreisgrabenanlagen” or KGAs in German) in Central Europe. These monumental earthworks were in use for a relatively short period of time between 4850/4750 – 4650/4500 BC and consist of one to several near-circular, concentric ditches with possible additional concentric palisades on the inside. Their purpose is still unclear and remains a matter of scientific debate. Research on these monuments has accordingly been mainly occupied with determining their possible functions as well as studying construction and backfilling processes. However, there is an absence of work focusing on the KGAs within their surrounding landscape, the implications of their presence within the landscape, and their impact on landscape changes after their abandonment.

This paper introduces a project that aims to fill this research gap by examining the landscape history of the Kreuttal micro-region in Lower Austria and its two Middle Neolithic circular enclosures at Hornsburg. The main focus of the project is the identification of landscape formation processes and traces of human activity beyond the sites. Landscape biography, Historic Landscape Characterisation (HLC), and human ecodynamics (HE) are integrated in a conceptual framework for analysing, characterising, interpreting, and visualising data. These data consist of multiple large-scale prospection and remote sensing data sets, including modern

and historic aerial photographs, ALS data, historic maps, magnetometry data and fieldwalking survey data. Additionally, electromagnetic induction measurements and targeted corings will be performed to facilitate the identification of subsurface formation processes, depositional changes, and stratigraphic sequences. The project's objectives are the reconstruction of the micro-region's landscape history, landscape changes, and the processes by which they were informed. All results form part of the landscape biography, which will shed light on which processes govern the formation and evolution of a landscape as well as how people interact with their surroundings, and how they and their built environment influence the landscape over time and are influenced by it themselves. The project's results will provide first insights into the interactions between Middle Neolithic circular enclosures and their surrounding landscapes in time and space.

Presentation Type: Communication

The Axe and the Bullet. Eneolithic Settlements and First World War Fortifications on Moldova River Valley

Sorin Ignătescu, „Ștefan cel Mare University” Suceava, Romania

Keywords: Eneolithic, First World War, Moldova River Valley

Abstract: The valley of the Moldova River between Dumbrăvița (județul Suceava) and Cristești (județul Iași) follows a line oriented North-West – South-East. To the North-East it borders the Suceava Plateau, a typical structural geomorphological unit. On the edges of the plateau two archaeological types of sites can be found: Cucuteni settlements from phase A and First World War trenches, often in the same place. In fact, most of the Eneolithic settlements were discovered precisely due to the construction of the earthworks by the Romanian Army, in 1915 and 1916. They are separated by short distances, which allow good communication, using signals or sound.

This incredible coincidence encourages us to compare the two habitations, which could be the result of the same objective, five millennia apart. Although the eneolithic settlements seem to be longer lasting than the modern fortifications, we cannot ignore their military potential. Of course, the Romanian Army fortified the Moldova River valley in order to defend the North of the country from a possible invasion from the South or West. If the Cucuteni settlements had, at least partially, the same purpose, then we should ask who the enemy that they feared was and what kind of social structure stood behind this achievement.

Presentation Type: Communication

Motte Earthworks in the Landscape of Southern Poland: Current State of Research and Future Prospects

Cezary Namirski, The Historical Museum in Bielsko-Biała, Poland

Keywords: motte, medieval, earthwork, Poland

Abstract: The late medieval motte castles are one of the most common archaeological earthwork features of southern Poland - in Silesia alone there are some 400 identified (Lodowski 2001: 565, Nowakowski 2017), while new sites are still being discovered (Lewicki et al. 2020). Strongholds of this type, known from many areas of western Europe (especially France and the British Isles), were being built in Poland from the 13th century (Marciniak-Kajzer 2018), some of them were in use up till the 16th century (vast majority date to the 14th and 15th centuries). Many were fortified residences of local knights, while other structures of this type were built for the purpose of controlling important trade routes. Numerous motte sites survived in the landscape as earthworks, but their distribution and state of archaeological and historical studies vary in different parts of southern Poland. The aim of the communication is to present the current state of research on medieval motte sites in southern Poland, as well as to outline the major future prospects with particular focus on research relevant to landscape archaeology.

Presentation Type: Communication

Early Iron Age Circular Hillforts in Eastern Europe

Oleksandr Shelekhan, Institute of archaeology, National academy of sciences of Ukraine, Ukraine

Keywords: Eastern Europe, Early Iron Age, Scythian culture, hillfort, fortifications

Abstract: In the early – middle 7th c. BC indigenous post-Chornolis tribes who lived in the forest-steppe area of Eastern Europe were conquered by the Scythians. The horse riders impose their culture and their name on the locals. At the same time, the Northern Black Sea region appeared to be the far limit of the Greek colonisation. These processes had a huge impact on the local peoples' life. The appearance of the big circular hillforts was one of the markers of those shifts.

There are known four such monuments: Nemyriv (125 ha) in the Eastern Podolia, Rukhotyn (nearly 40 ha) in Northern Bucovina, Kulchytsi (near 55 ha) and Chotyniec hillfort (35 ha) in Galicia. While the plans of all other enclosures were strictly conducted by the surrounding landscape, the mentioned hillforts show repeated tradition. But I can't agree with the scholars who describe circular hillforts just as symbolic ones. Common methods of fortification and using natural uphill in defensive lines are the evidence against it.

Each of the named hillforts was the centre of a certain commune. But they had been placed in different conditions. The group of sites with Nemyriv in the centre occupied a plateau with grey forest soil, surrounded by steppe black soils. But the walls of Nemyriv itself enrolled part of the river valley, covering as diverse landscapes as possible. Rukhotyn and other Dniester keeps were erected on the steep slopes over the river canyons. Kulchytsi was placed at the Carpathian foothills near the Uzhok pass. And Chotyniec hillfort was erected on the smooth hill over the marshy valley.

The earliest site is Nemyriv evolved from the relatively small enclosure that now can be seen as the central keep. Greek pottery dated by the third quarter of the 7th - middle 6th c. BC was found here. Despite some part of the mass materials can be dated earlier than the imports, one can't date Nemyriv earlier than the middle 7th c. BC. Also, late 7th – early 6th c. BC amphorae were collected on the Chotyniec. Though the ¹⁴C dates ranged within the 7th – 5th c. BC, no archaeological materials later than middle 6th c. BC were found here, which points to the imperfection of radiocarbon dating for Iron Age sites.

Thus, the tradition of circular hillforts developed for quite a short extent and hadn't continued in the Middle Scythian period. It reflects western impulse during the Early Scythian culture expansion. But despite the similar vision on fortification methods, archaeological materials show that the Scythian component is more representative on the eastern monuments. For example, despite wide excavation, no artefacts decorated in the animal style were found on Chotyniec. At the same time, the substantial contribution of the local post-Vysock and post-Lusatian populations is seen in the western territories that reflect complicated ethnocultural mosaics in the region.

Presentation Type: Communication



SESSION 06. HOW DOES THE WATERSCAPE INFLUENCES, AFFECTS AND INFERS THE HUMAN COMMUNITY'S DEVELOPMENT, EVOLUTION, VULNERABILITIES, AND RESILIENCE OVER TIME?

Session Organizers:

Cătălin Lazăr, Division ArchaeoSciences, ICUB, University of Bucharest, Romania

Valentin Radu, Division ArchaeoSciences, ICUB, University of Bucharest; National Museum of Romanian History, Bucharest, Romania

Cornelis Stal, HOGENT University of Applied Sciences and Arts, Department of Built Environment, Ghent, Belgium

Laurent Carozza, UMR 5602, CNRS, - Géographie de l'Environnement , Maison de la Recherche de l'Université du Mirail 5, France

Keywords: Waterscape, Prehistory, History, Human Society, Anthropic Impact

Session description:

Investigations of the water in an archaeological context could be connected to natural water supply, hydrological conditions, and socio-cultural developments of human societies in the past is a real challenge for contemporary research. Unfortunately, the past human habitation was perceived as a terrestrial model for many years. Consequently, the archaeological/historical sites are viewed as located in a landscape, with waters as an essential source (for surviving, economy, communication, transport, protection, etc.). However, this terrestrial limitative view of the past may partly result from wetlands having substantially receded in today's landscape. Therefore, in order to understand the real valences of the waterscapes, we should examine the local aquatic environments from a broader perspective, especially as recent research in the field clearly shows that water does not separate – it connects humans, environments and landscape.

The “amphibious” networks developed in the past waterscapes result from a lively, diverse and constantly changing interplay between different actors (humans, animals, plants and other matters), factors (environmental conditions, accessibility, climatic modification, raw materials sources), and natural forces (gravity).

Our session deliberately focusses on hydrological aspects of the climate-culture-waterscape interaction topic, and we invite papers related to geoarchaeology, bioarchaeology, archaeometry, GIS, molecular analysis, and archaeology such as (but not limited to):

- The dynamics of the shores and coasts of the watercourses (river basin variability, sea-level variations, natural or anthropic impact on human lifestyle, etc.);
- Eco-hydrological aspects of ancient water availability and management (natural water supply, environmental carrying capacity, aquatic ecology, hydrological system variability, water strategies, etc.);
- Aquatic palaeoeconomical aspects (e.g. irrigation, water supply management, aquafauna and aquavegetation exploitation, seasonality, dietary impact, etc.);
- Aquatic architecture (harbours, channels, dwellings on pillars, bridges, dams, etc.);
- The hydrological hazards to societies (tsunamis, floods, dryness, erosion, etc.);
- Hydrological-cultural models (wetlands sites, water use in artefacts processing technology, aquatic traditions, myths, rituals, and beliefs).

Fish Remains from Archaeological Sites as Indicators of Sea-Level Variations. A Case Study for the Hamangia Culture, VIth-Vth Millennium BC, Romania

Valentin Radu, Division ArchaeoSciences, ICUB, University of Bucharest; National Museum of Romanian History, Bucharest, Romania

Valentina Voinea, National History and Archaeology Museum Constanța, Constanța, Romania

Adrian Bălășescu, Vasile Pârvan` Institute of Archaeology, Romanian Academy, Bucharest, Romania

Keywords: Hamangia Culture, Eneolithic, fish, sea-level variation, Black Sea, Dobrogea

Abstract: Archaeological researches realized in the past few years for several Hamangia sites, located in Dobrogea region (S-E Romania) such as Cheia, Techirghiol, Constanța, dated to the Early Eneolithic period (late 6th millennium - first half of the 5th millennium BC) have revealed bones remains from marine fish species: flatfish, sea bass, flathead mullet, gilt-head bream, Black Sea roach, sturgeons. During this timespan, the Black Sea level was rising due to marine transgression so that at the end of the 5th millennium BC the prehistoric coastal settlements were flooded and abandoned. Năvodari-La Ostrov and Taraschina settlements (Gumelnița-Kodjadermen-Karanovo VI) but primarily those from the Bulgarian coast testify this sea-level evolution. Moreover, the process was much faster for the Bulgarian coast due to the tectonic movements and a more pronounced sinking of the continental shelf.

The evolution of the coastline is not yet clearly established for this period. The geological and geomorphological studies provide us information related to a time of about a millennium. However, in terms of material culture and radiocarbon data, archaeological research can more accurately frame various events that influenced human communities at a resolution of about 100-200 years. Therefore, we correlate the ¹⁴C dates obtained for the different levels of Hamangia or Gumelnița sites with the list of fish species identified for each of them. Based on fish ecological requirements, we can outline some characteristics of the Black Sea coastline during the period between the end of the 6th millennium to the middle of the 5th millennium BC. Thus we notice that the increase of the Black Sea level has, consequently, led to the formation of the marine lagoon areas starting from south to north. Lake Techirghiol in the south was already connected to the sea in 4900 BC, while in the north in the area of the Lake Tașaul there was a mixed zone around 4300 BC with freshwater supplied by the Casimcea River and a marine lagoon.

This work was supported by a grant from the Romanian Ministry of Education and Research, CNCS-UEFISCDI, project number PN-III-P4-ID-PCE-2020-2369.

Presentation Type: Communication

**River Culture:
the Relations of the Chalcolithic Gumelnița Societies (4700-4000 BC) and
their Environment in the Lower Danube Area and its Delta**

Laurent Carozza, CNRS UMR 5602 Géode, France

Adrian Bălășescu, `Vasile Pârvan` Institute of Archaeology, Romanian Academy, Bucharest, Romania

Valentin Radu, Division ArchaeoSciences, ICUB, University of Bucharest; National Museum of Romanian History, Bucharest, Romania

Jean-Michel Carozza, Université La Rochelle, UFR de Lettres, Langues, Arts et Sciences Humaines, France

Mihaela Danu, "Alexandru Ioan Cuza" University of Iași, Faculty of Biology, Iași, Romania

Cristian Micu, ICEM, Tulcea, Romania

Marie Balasse, Laboratoire de Biogéochimie Isotopique, Université Pierre et Marie Curie, CNRS-INRA, UMR 7618, Paris, France

Albane Burens, Université de Toulouse le Mirail - CNRS, GEODE, UMR 5602, Maison de la Recherche, Toulouse, France

Constantin Haită, National Museum of Romanian History, Bucharest

Florian Mihail, ICEM, Tulcea, Romania

Keywords: Danube, culture, river, delta, Gumelnița, geography

Abstract: In Romania, the lower Danube and its delta constituted during the 5th millennium BC an intense zone of settlement by the Chalcolithic communities of the Gumelnița culture (4700-4000 BC). This territory, strongly marked by the ecosystems of the river, allowed the development of a production economy based on agriculture, pastoralism and the exploitation of resources from the vast wetlands of the river. However, behind the homogeneity of the façade of the cultural components (material and symbolic productions, forms of habitat and land use), a certain variability can be observed at a more local scale. The reasons for this variability are multiple, but the modalities of resource exploitation in a changing environment seem to constitute a major role in this causality. Indeed, environmental changes are observed around 4350 BC, and more particularly hydrogeomorphological changes within the vast wetlands. The eustatic changes in the Black Sea induced modifications within the wetland ecosystems. The purpose of our paper is to determine the temporalities of socio-environmental changes and to characterize the different adaptation strategies that the Chalcolithic communities were able to bring to a global forcing. We will be particularly interested in defining the state of natural resources, particularly fisheries, and in observing whether or not there are changes in practices. Another issue is to observe the nature and impact of

environmental changes in the alteration of socio-cultural trajectories. The acceleration of global changes challenges the ways in which societies process environmental information; the unpredictable and complex nature of these changes does not systematically allow culture to provide the knowledge and cognitive tools necessary to resolve crises, and places human groups in a vulnerable situation.

Presentation Type: Communication

Historical Land Use Changes and the Effects on Archaeological Site Preservation. Mostiștei Valley Case Study

Cristina Covătaru, Division ArchaeoSciences, ICUB, University of Bucharest, Romania

Cornelis Stal, HOGENT University of Applied Sciences and Arts, Department of Built Environment, Ghent, Belgium

Ionela Opreș, Division ArchaeoSciences, ICUB, University of Bucharest, Romania

Mihai Florea, National Museum of Romanian History, Bucharest, Romania

Cătălin Lazăr, Division ArchaeoSciences, ICUB, University of Bucharest, Romania

Keywords: Mostiștea Valley, landscape changes, GIS application, anthropic impact

Abstract: Through time, cultural heritage has unfortunately been under threat due to a variety of environmental and human-induced factors, which likely triggers various hazards. To date, factors like population growth, technological developments, economical optimization, and planned landscape development have massively affected the environment, also resulting in the damage or loss of cultural heritage.

This paper focuses on studying the human impact regarding the preservation of 319 archaeological sites that are part of a broad chronological frame, located within a 10 kilometers buffer area from Mostiștea River, situated in Călărași County, Southeastern Romania.

This is an interesting micro-region both in terms of discoveries and exploration of cultural heritage. Firstly, numerous archaeological sites have been identified since the second decade of the last century. Secondly, massive anthropic intervention took place in the last 50 years in this area, which inevitably led to the gradual degradation and destruction of the archaeological sites within it.

This endeavor is based on the analysis, at different scales and resolutions, of cartographic sources, alongside with land cover and land use data (LCLU), and old satellite images, covering a timespan of 230 years (1971-2018).

All sources have been acquired through open-source platforms or due to access to museum archives. As for cartographic material we rely on the Specht map (1791), Szathmári map (1864), Artillery Firing Plans (1950) and Topographic Map 1:25 k (1975-1987), combined with CORONA satellite images (1962) and CORINE LCLU inventories.

This combined effort has provided new data and supplemented the already known data regarding the archaeological sites which are under threat due to massive anthropogenic interventions. Key moments were observed on how man-made intervention led to the deterioration, destruction, or disappearance of several archaeological sites.

This work was supported by a grant from the Ministry of Research, Innovation, and Digitisation, CNCS - UEFISCDI, project number PN-III-P4-ID-PCE-2020-2369, within PNCIDI III. Cristina Covătaru thank the `Simion Mehedinți - Nature and Sustainable Development` Postgraduate Program, Faculty of Geography, University of Bucharest, Romania for the academic and financial support to her PhD.

Presentation Type: Communication

Human-Environmental Interaction and Spatial Networks in Eastern Sicily: Settlement System, Land Use and Hidrography throughout Prehistory under the Etna Volcano

Rodolfo Brancato, University of Naples Federico II - Department of Humanistic Studies, Italy

Claudio Sossio De Simone, University of Rome "Tor Vergata" - Department of History, Cultural Heritage, Education and Society, Italy

Keywords: Settlement Systems, Ancient Topography, Land/ Water use, Spatial Network, Prehistoric Sicily

Abstract: In the context of central-eastern Sicily, under the Etna volcano, lies the Plain of Catania which is the largest flat area on the island. The area is crossed by Simeto, Dittaino, Gornalunga and San Leonardo rivers, natural communication routes both in the North-South and East-West directions. In the Pleistocene period, the large plain area must have contained large marshy areas, while the current appearance of the plain, a large arable area, is the result of reclamation operations carried out in modern times.

The research stems from the desire to integrate the large amount of heterogeneous data (archaeological, topographical, archaeobotanical and climatic) available for the area into a GIS platform: this analysis will allow us to hypothesize the evolution of the environmental characteristics of the basin through the Pre- and Protohistory on the basis of the distribution of archaeological evidence brought to light from survey and excavation projects carried out in the area in the last decades. In addition, the research aims to demonstrate the role of the waters resources in the area to the early development of human society. Indeed, this approach seeks to investigate the relationships that exist between the geographic-geomorphological variables, the topographical characteristics (extension, elevation and exposure) of the pre-protolithic sites in the area (settlements, funerary areas) and local water

environments (i.e. alluvial plain, inland and coastal marshes, shoreline). This will make it possible to attempt the reconstruction of the environmental context within which human groups settled there lived and used the water and land system resources available between the Neolithic and the Early Iron Age.

The spatial analysis and the GIS management of archaeo-topographical data allow to proceed with statistical analyzes to correlate these variables with settlement and subsistence choices: through the combination of geomorphological, ethno-historical and archaeological variables a cost surface model to identify the best areas for grazing and agriculture in pre-prehistoric times, developed on the DTM (Digital Terrain Model) with 1 meter ground resolution deriving from LiDAR scanning available for the Sicilian territory will be carried out. Moreover, according with the rules of spatial network theories, a reconstruction of the environment of the plain will be proposed, with particular regard to the range of wetlands and the main routes, which will be built starting from Cost Surfaces Network Models in terms of energy expenditure and spatial turn, according to a well established landscape archaeology approach.

Presentation Type: Communication

In and Out or the Subtle Art of Managing Water in the Marshes in Bronze Age Southern Mesopotamia

Melania Zingarello, Sapienza - University of Rome, Italy

Davide Nadali, Sapienza - University of Rome, Italy

Keywords: Waterscape, Southern Mesopotamia, Bronze Age, water management, drainage systems

Abstract: Since Antiquity, Southern Iraq (the ancient Lower Mesopotamia) has been the scene of profound transformations of its water environment, mainly characterized by wetlands and affected by the proximity to the sea. The fluctuations of sea level and the gradual progradation of the Persian Gulf's shoreline over millennia strongly shaped the ecosystem in the region. Likewise, the relationship between human societies and natural environment has been deeply affected by the changes in the waterscape. However, starting as early as the 6th millennium BCE, in the balance of the interaction between environment and humans, the role played by the first one was no longer predominant, and the anthropic impact started being more and more significant.

This became especially apparent from the mid-3rd millennium BCE, when both the natural landscape and the urban landscape appear to be shaped by the Mesopotamian knowledge of hydraulic management. In the first case, textual evidence attests to the employ of a rich and specific terminology on irrigation including different types of canals and other devices for water control. In the case of

urban centres, the construction of complex ductwork systems for evacuating wastewater and rainwater from buildings proves a full mastery of water disposal.

This paper will focus on the latter case, showing in particular how the employ of specific installations in drainage systems attested in Central and Southern Mesopotamia – the vertical drainpipes – is strictly correlated to the deep knowledge of the seasonal dynamics of the waterscape. Indeed, the use of vertical drainpipes appears to not be limited to urban architecture. The case study of the site of Tell Zurghul (Dhi Qar, Iraq) seems to suggest that these installations could have played a role in regulating the seasonal increase of water in a marshy environment.

Presentation Type: Communication

**Waterscapes of Greek Colonization:
A Geoarchaeological Approach to Socio-Environmental Interaction and
Coastal Landscape Changes around Ancient Abdera (Thrace, GR.)**

Alfredo Mayoral, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Ana Ejarque, ISEM, Université Montpellier, CNRS, IRD, France

Arnau Garcia-Molsosa, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Mercourios Georgiadis, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Giannis Apostolou, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Vincent Gaertner, CNRS, UMR 5600, EVS-IRG & University of Lyon, France

Constantina Kallintzi, Eforia of Antiquities at Xanthi, Archaeological Museum of Avdira, Greece

Eurydice Kefalidou, National and Kapodistrian University of Athens, School of Philosophy, Department of History and Archaeology, Athens, Greece

Hèctor Orengo, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Josep María Palet, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain

Keywords: Geoarchaeology, Socio-Environmental Interaction, Paleogeography, Waterscapes, Coastal Thrace

Abstract: Mediterranean landscapes have been shaped by human societies since the prehistory, and coastal wetland landscapes -or coastal waterscapes- are certainly among the best examples of this complex history of long-term socio-environmental interaction. In the framework of TransLands project, which is focused on Greek colonial landscapes, we developed an integrated geoarchaeological approach in the

ancient city of Abdera, founded by phocaeen colonists in the VIIth c. BC in coastal Thrace. We combined remote sensing, archaeological data, geomorphological analysis, core extraction and ¹⁴C dating in order to reconstruct coastal dynamics and landscape changes in wet lowlands around the colony during the late Holocene. 19 borehole drillings distributed in 5 transects were subject to detailed sedimentological and litho-stratigraphic descriptions, and were dated by 32 radiocarbons. Results shown that the area was subject to major palaeogeographic and palaeoenvironmental changes between the Neolithic and the late Antiquity. The mid-Holocene sea-level rise caused a marked marine transgression c. 5000 cal BC, submerging several small coastal valleys. Beach-barrier systems with back-barrier lagoons developed thereafter, remaining relatively stable during millennia. The Klazomenian colonists founded Abdera in the hills dominating a large embayment at c. 650 cal BC. However from IVth c. BC accelerated coastal progradation, perhaps as a result of anthropogenic forcing, led to gradual silting of this bay. Sedimentary fluxes coming from the colony itself seem to have contributed significantly to silt its harbour area. The relocation of the city 1km southwards by the middle of this century has traditionally been interpreted as a consequence of the silting of its harbour facilities, however our results show that this process was at this time only incipient and the area was likely still navigable. This suggests that the causes of this displacement can be rather contemporary historical events such as the defeat against the Triballi or the onset of Macedonian rule. At the end of the Roman period lagoons were almost totally silted and had been replaced by shallow marshes, and the coastline was close to its present-day position. A high-energy marine event, likely a tsunami, devastated the coastal plain in the Vth c. AD and likely affected the city, although its decay had already started a century before. Further research in the area will include multi-proxy geoarchaeological and palaeoenvironmental analyses of selected sedimentary sequences, in order to improve our understanding of how ancient Abderitans modified and impacted their close environment, and how they city adapted to and co-evolved with changing waterscapes.

Presentation Type: Communication

The Cervia Project: Mediaeval Coastal Ecosystems and Salt Production in the Northern Adriatic Sea

Mila Bondi, DISCI - Bologna University, Italy

Michele Abballe, Department of Archeology, Ghent University, Belgium

Andrea Augenti, DISCI - Bologna University, Italy

Mila Bondi, DISCI - Bologna University, Italy

Marco Cavalazzi, DISCI - Bologna University, Italy

Celeste Fiorotto, Department of Cultures and Civilizations, Verona University, Italy

Keywords: Ravenna network, paleoenvironmental evolution, wetland, settlement patterns, salt production

Abstract: Cervia Vecchia is an abandoned medieval city located near the Adriatic coastline in northern Italy, around 20 km south of Ravenna. The city was relocated towards the end of the 17th and the beginning of the 18th century CE. The inhabitants moved into a new planned settlement positioned in a healthier location closer to the coast.

The site was associated with marine salt production at least since the 10th century CE, and probably even before that. This production relied on the presence of the numerous inland wetlands which have always characterised the territory in the past. Then, after the intense reclamation activity that interested the Modern period, which significantly transformed the land cover of the area, agriculture became the most relevant economic activity. It is undoubted that, over the course of the centuries, the interactions between the human presence and this peculiar waterscape have been sometimes mutual (such as the preservation of natural wetlands for exploitation), other times of contrast (intense land reclamation).

Also to better understand these interactions, the University of Bologna launched the Cervia Project in 2019, within the “Ravenna Landscapes” archaeological project. This project aims to investigate the Cervia Vecchia site and its surroundings and to i) reconstruct the paleoenvironmental evolution of the area over a large chronological span, from the Bronze Age to the Modern period; ii) define the relationship between local communities and the environmental factors, specifically focussing on the exploitation of natural resources (i.e. salt); iii) determine the economic and cultural relationship with the dominant centre (Ravenna); iv) specify the organisation of the urban and rural space and the water infrastructures created.

This communication aims to present the preliminary results of this project, which were obtained applying an integrated approach including several methodologies such as artefact surveys, archaeological excavations, extensive geophysics, geoarchaeological analysis, archaeobotanical investigations, and historical maps interpretation.

Presentation Type: Communication

The Boat and the Plough: Fish Harvesting and Processing Strategies in the Lower Mekong River Basin from Pre-History to the Angkor Era

Veronica Walker Vadillo, University of Helsinki, Finland

Keywords: maritime archaeology, deep pools, fishing, Mekong, fermented fish

Abstract: The location of pre-Angkorian archaeological sites in the main course of the Mekong River Basin between Kratie (Cambodia) and Champassak (Laos) has been attributed to local populations' attempts to control goods moving in and out of the hinterland based on Bronson's model of river hierarchies in Southeast Asia. These interpretations have placed an emphasis on trade, in addition to rice cultivation, as a marker for social complexity and wealth accumulation. In this presentation I will argue that the location of these sites can be linked to fish resources, and that social complexity can be similarly attributed to societal responses to fisheries management, adding to an increasing list of examples of convergence in cultural niche construction surrounding floodplain fishery in tropical river environments. In doing so, the essay reviews two data sets that are rarely used to discuss the selected archaeological material: regional fish ecosystems and traditional ecological knowledge of fishing practices among local communities. The study examines fish migration patterns, and explores traditional fishing practices connected to the systematic exploitation of the two main ecological niches linked to the reproductive life of fish –flood plains and deep pools. The location of these fishing grounds and the constraints that fishing resources impose on people is discussed in relation to archaeological data and livelihood activities related to fishing and fish processing. The discussion will then explore similar examples of flood plain fisheries management in the Amazon and Congo River Basins.

Presentation Type: Communication



SESSION 10. PHOTOGRAPHY AND LANDSCAPE ARCHAEOLOGY

Session Organizers:

Codrin Dinu Vasiliu, "Gh. Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch, Romania

George Bodi, Institute of Archaeology, Romanian Academy, Iasi Branch, Romania

Keywords: Landscape Archaeology, Photography, Videography, Digitization, Heritage, Techniques, Ethics

Session description:

Photography and videography are tools with a constantly increasing importance in archaeological research, and we are witnessing a continuously intensifying effort to conserve every aspect of the cultural heritage through digitization. These efforts are always doubled by the dissemination dimension, aiming at providing wide and equal access to these digital products. However, while a photograph, or a video, may be an important instrument for data collection, scientific research, or raising awareness towards heritage issues, it may also constitute a means to promote ideological agendas, and even falsify the archaeological practice. Therefore, in increasingly digital culture, the archaeologist, as well as the photographer or videographer, have to pay more attention to these expression mediums, and also to develop an epistemic, ethical, and pragmatic attitude towards these instruments. To this end, a discussion on the use of photo/video documentation of the archaeological heritage and its context has to also include, in addition to technological and methodological advances, reflections on the use of metadata and paradata as necessary prerequisites for the construction of a visual discourse that is not only scientifically correct, but also ethical, context-sensitive, and socially relevant.

Our session welcomes contributions tackling the complexity of the topic focused on, but not limited to, the following themes:

Photo/video documentation as an impartial witness of the archaeological heritage

Photo/video documentation as means to patrimonialize the archaeological landscapes

Photo/video documentation as cultural and/or political discourse

Photo/video documentation of archaeological landscapes between research instrument and aesthetic enjoyment

Epistemic Functions of Photography in Archaeology

Codrin Dinu Vasiliu, "Gh. Zane" Institute for Economic and Social Research, Romanian Academy, Iași Branch, Romania

Keywords: Photography, Archaeology, epistemic functions

Abstract: Photography, especially when it is used for scientific purposes, represents a documentary instrument as well as an interpretation tool. On the other side, it implies both an observational dimension and a creative one (aesthetic or/ and even artistic). These are the four possible limits for defining the degree of scientific accuracy in the case of photography. And within these very limits, we can bring into discussion the epistemic functions of scientific photography on the whole, and, particularly, of archaeological photography. Grounded on these four limits, the present communication focuses on the following epistemic functions of archaeological photography, namely the functions of data collection, observation, demonstration, archive, and heuristics.

Presentation Type: Communication

Modern Photography - The Missing Link Between the Public and the Archaeologists

Radu-Alexandru Brunchi, Arheoinvest Centre, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Vasile Cotiugă, Faculty of History, "Alexandru Ioan Cuza" University of Iași, Romania

Andrei Asăndulesei, Arheoinvest Centre, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Casandra Brașoveanu, Arheoinvest Centre, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Keywords: photogrammetry, aerial photographs, public archaeology, 3D models

Abstract: In the context of the incredible fast development of technology, if archaeologists won't find a way to connect with the public, the latter will find a way to move forward without them. The aim of our paper is to discuss how the aerial photography, along with all the techniques that derive from it, can help archaeologists to step in the digital era and better connect with the public. Using photogrammetry, as well as both oblique and vertical aerial photography, we are able to create very large orthorectified images and Digital Surface Models of the archaeological sites and the surrounding areas. These can help the archaeologists to present the scientific information in a manner easier to understand for the uninitiated, but interested, public. Also, we can create 3D models of the

archaeological discoveries, that are easily accessible on the internet. All of this information will be later integrated in a free online platform containing various information obtained through extensive field research. We will provide information about the archaeological sites, overlay different orthorectified images and figures, provide pictures and geophysical scans in order to better facilitate the access of the interested public to the archaeological information. Of course, the platform will also present interest for researchers as it will provide novel and accurate data that they can interrogate and work with. With the help of this portal we hope to bring together the archaeological community and better connect with the public.

Presentation Type: Communication

Stichpunkte

Carlos Didelet, IAP - Instituto de Arqueologia e Paleociências da Universidade Nova de Lisboa, Portugal

Keywords: Photography, Landscape Archaeology, Prehistory, Ritual, Neolithic

Abstract: From a concept of landscape analysis came the idea of creating a set of images with a thematic unit, through the capture of panoramic photographs. The landscape and some of its most striking elements, but also the feeling of escape, of sacralizing, of searching. How can we come as close as possible to past reality, the past and the irretrievable mentality without these influences to which we are all subject? There, the archaeologist must resort to the interdisciplinarity that today is essential to make a good interpretation of the material culture left by our ancestors and the cognitions involved in their creation. A method of interpreting the landscape is proposed, based on the use of panoramic photography of the places to be studied, as a means of understanding this same landscape. For this purpose, low-cost material will be used, which will allow for obtaining images of the landscape surrounding the monuments in question. Using instruments such as a camera to capture panoramic images, tripod with panoramic head, topographic map, compass to obtain azimuth. The use of drone to obtain aerial images in the perspective of complementation of the images obtained. After obtaining the images, the entire process of studying them will follow, complemented with data collected in the field and consultation of the bibliography.

Presentation Type: Communication

Archaeological and Historical Land Use along the Lower Danube Valley (Romania's Territory) – A Perspective from the DAeL Project

Mihai Florea, National History Museum of Romania, Romania

Călin Șuteu, Gigapixel Art SRL, Romania

Carmen Miu, National Road Infrastructure Company, Romania

Corina Borș, National History Museum of Romania, Romania

Keywords: landscape, aerial images, satellite images, VR

Abstract: A possible reconstitution of the Lower Danube Valley's landscape in different historical periods is based on various documentary, cartographic and imaging information, as well as on a series of interdisciplinary studies carried out on the basis of sedimentary, osteological analyses, etc. in archaeological sites, which have provided information on the evolution of the eco-system over time.

In order to define the landscape around the sites selected in the framework of the DAeL project (a selection focused on more than 20 sites from SW and SE Romania, the regions of Oltenia, Walachia and Dobrouja, spanning from Paleolithic to the Middle Ages), the analysis of satellite images and aerial photographs was carried out in GIS. This approach was done by comparing the sources at the level of changes determined by the development of a (human) community in a (certain) space. In the case of field research and reconnaissance, the archaeologist makes contact with archaeological artifacts and features and this information is the source to identify the areas of exploitation of clay, wood or the crafts those people have practiced.

The analysis of the aerial images and satellite images provides information that makes possible to understand the landscape in all its aspects: morphological, hydrological, geological, archaeological etc. Of particular importance are the satellite images provided by Sentinel 2 and the declassified images provided by the Corona satellite.

The relief and the watercourses are important resources that can be analyzed, through the important information they provide from a morphological point of view, as elements in the valorization of the landscape by man, as a source of food and as a habitat, from prehistory to the present.

The current landscape with its different uses can be visualized through by recently taken 360 panoramas that transpose the viewer through VR into the present environment. The information she / he receives helps her / him to understand the evolution of the landscape and how the human factor and nature have changed the landscape over time. Also, the 3D scans of various artifacts discovered on the selected archaeological sites provide direct access to how better observe and understand them. Sucu digitally created artifacts can be manipulated guided or freely in order for the archaeological objects to be viewed up close.

All these new digital "perspectives" were developed in the framework of the EU funded Danube's Archaeological e-Landscapes (DAeL) Project, for an innovative VR

exhibition named “Histories of the Past. Virtual Journey into Lost Landscapes”, organized at the National History Museum of Romania (Bucharest).

Presentation Type: Communication

Investigating the End of the Bronze Age through Photographs. Case Study: Jijia Catchment, NE Romania

Casandra Brașoveanu, Arheoinvest Centre, Institute of Interdisciplinary Research, “Alexandru Ioan Cuza” University of Iași, Romania

Keywords: aerial photographs, LiDAR, GIS methods, Late Bronze Age, NE Romania

Abstract: Romanian Late Bronze Age (LBA), although very rich in archaeological discoveries, still remains unknown and misunderstood, because the vast majority of archaeological research has consisted of conducting field research or small surveys. Most of the data known so-far were obtained by accident, in the context of the systematic research of settlements specific to other prehistoric periods.

During this chronological interval, the area located from the middle and upper Dniester, to the east of the Apuseni Mountains was occupied by Noua communities, belonging to Noua-Sabatinovka-Coslogeni cultural complex. The main characteristic of their settlements and the subject of the present study is represented by the so-called ashmounds, that appear as grey spots visible on the field. These features allow the visualization of LBA settlements using satellite images and aerial photographs. Also, the elevation of the structures in question (similar to small mounds) facilitates the investigation of the sites using LiDAR data. Thus, the aim of the present study is to highlight the spatial characteristics of the sites that present these features on the surface, using UAV surveys, satellite images and high-density LiDAR, in order to identify the relationship between Noua communities and the occupied environment. As a case study was selected the area known as Jijia river’s catchment, due to the high number of LBA archaeological sites that present ashmounds on the surface (nearly 200).

The photographic database has provided important insights regarding the characteristics of the ashmounds and the planimetry of the settlements. Also, by using GIS analysis and corroborating the results obtained with the data from the aerial photographs, I sought to establish the characteristics of the human-environment relationship, existing at the end of the Bronze Age in Jijia catchment.

Presentation Type: Communication



SESSION 11. LONG-TERM DYNAMICS OF HUMAN-ENVIRONMENT INTERACTION: THE CASE OF PREHISTORIC MULTI-LAYERED SETTLEMENTS

Session Organizers:

Marian Adrian Lie, Institute of Archaeology, Romanian Academy – Iași Branch, Romania

Alexandra Găvan, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Keywords: archaeology, tells, tell-settlements, neolithic, copper age, bronze age, environment, landscape, prehistory

Session description:

Prehistoric multi-layered settlements, formed as a result of long-time occupation spanning generations, have left an important mark on the past and present landscape. This is one of the reasons why they attracted scholarly attention for almost two centuries. At first, the excavation of these sites was seen as an excellent opportunity to acquire significant amounts of prehistoric artefacts meant to enrich the collections of local museums. Later on, multi-layered or tell sites came into focus because of their potential to make important contributions to typo-chronological series. Today's challenges of studying prehistoric tell settlements are more complex, as we try to understand how such sites came to be and function over time, and how the communities that built them were organised. An important step toward investigating this would be to understand how the communities inhabiting these sites connected with their local environment, what made them settle in particular places, what made them prosper and what made them leave.

Modern technology is becoming more integrated into archaeological practice and allows us to have a better grasp of details that were elusive a few decades ago. For instance, access to geomagnetic prospection has become progressively accessible and is having a crucial contribution to a variety of aspects regarding prehistoric multi-layered settlements and their surroundings. Our session proposes an analysis of how people living in prehistoric multi-layered (tell) settlements interacted with their surrounding environment, how they adapted to it and how they adapted it to

their needs. Are there patterns connecting cultural backgrounds to environmental settings? Or is this just a convenient archaeological construct?

We would like to address these questions, and other related topics, during this session. All contributions dealing with these subjects are welcome. The scope of our session spans chronologically from the Neolithic to the Bronze Age and has no geographic constraints in order to allow us to discuss and compare a wide range of examples of different human-environment interactions in the context of tell societies.

Neolithic Risk Management: Settlement Mounds, Ditches, and Human Ecodynamics on the Great Hungarian Plain

Roderick B. Salisbury, Department of Archaeology, Comenius University Bratislava, Slovakia

Gábor Bácsmegi, Munkácsy Mihály Museum, Hungary

Attila Gyucha, Department of Anthropology, University of Georgia, USA

Balázs Nagy, Department of Physical Geography, Eötvös Loránd University, Hungary

Keywords: Ecodynamics, palaeohydrology, Neolithic, Great Hungarian Plain

Abstract: There is a long history of excavations and investigations at Neolithic tell settlements on the Great Hungarian Plain. Nevertheless, the reasons for the establishment of nucleated settlement mounds remain a mystery. Common features of this region are ditched enclosures surrounding both well-known large settlements and smaller and lesser known tell-like mounds. These ditches have been interpreted as defensive, intended for flood control or animal management, used to segregate different parts of the population, or as instrumental in constructing social memory and community. Much like interpretations of the mounds themselves, these explanations lack strong material evidence.

In this paper, we consider Late Neolithic tell construction, including ditches, as a form of risk management, constructed to mitigate environmental changes. Evidence from over a decade of research in the low-lying Körös Region indicates that hydrological events (floods) were low-energy and regular (annual). These events were at least in part predictable and manageable, and might not have required any specific strategies other than settlement location on morphological ridges and islands. During the middle-to-late Neolithic transition, however, macroregional evidence suggests wetter conditions, with increasing precipitation. The mosaic of backswamps, oxbow lakes, and marshlands, such as the Kis sárret, would not have been able to continuously absorb increasing water inputs. Liveable or farmable land, including the flood-free lag surfaces, must have been slightly restricted or reduced, even though the riverine energy level remained low. Raising the surface of a settlement, and digging ditches around a settlement, would mitigate rising groundwater levels and spreading marshiness. The ditches, in particular, might have been dug for several reasons, but drainage is one advantage of having them. The process of tell construction, as an aspect of cultural resilience in human-environment relations, would have had other, social implications. Although we do not address these here, they are evident in the many narratives of Neolithic tell life.

Presentation Type: Communication

The Tell on the Plain: How the Interaction Between the Stratified Mound and the Single-Layer Settlement at Szegvár-Tűzköves Structured the Landscape

András Füzesi, Hungarian National Museum, Hungary

Gábor Mesterházy, Hungarian National Museum, Hungary

Kata Szilágyi, Christian-Albrechts-Universität zu Kiel, Germany

Máté Mervel, Eötvös Loránd University, Hungary

Eszter Bánffy, Deutsches Archäologisches Institut, Germany

Pál Raczky, Eötvös Loránd University, Hungary

Keywords: Great Hungarian Plain, Neolithic, spatial framework

Abstract: In the 1970s and the 1980s, research on the Neolithic tells in Hungary focused on stratigraphy as the main source of information on a local scale, and tells were regarded as the arenas of both quotidian and ritual activities. In the wake of further discoveries, as well as the many advances in archaeological sampling and evaluation methods during the past decades, the time seemed ripe for the complex investigation of the Hungarian Late Neolithic settlement network in order to unravel the social and ecological relations and factors determining the life of the period's communities. The goal of the research project launched in 2019 as a collaborative undertaking of the Institute of Archaeological Sciences of the Eötvös Loránd University (Budapest) and the Romano-Germanic Commission of the German Archaeological Institute (Frankfurt am Main) was the multidisciplinary investigation of well-known Neolithic tell settlements in the southern Hungarian Plain. We strove to present the "world" of the Neolithic tell cultures on the Hungarian Plain within a broader interpretative frame based on the investigations conducted at the site of Szegvár-Tűzköves.

In November 2020, an extensive magnetometer and experimental radar survey was carried out at the site, with unexpected results. The spatial framework of a settlement extending over nearly 32 ha was recorded, within which we identified structured units of burnt houses ringed by an enclosure system of multiple circular ditches. We could now also set the excavated features of the successive campaigns between 1950 and 1970 into the spatial context of the entire settlement. We tried to determine the locations of the trenches opened by the Koszta József Museum in Szentes and the Hungarian National Museum as well as of the excavated features. A series of pit silos built in the 1970s were cut into the site, destroying a significant part of it, whose archaeological documentation was begun in March 2022. The clearing and documentation of two 90-meter-long walls of the northernmost pit silo also yielded new insights. A high number of archaeological features were identified together with the associated finds. Soil samples were collected from several features filled with charcoal and ashes. A systematic field survey was also organised over a

2500- m2-large area, where the remains of few burnt houses were found. By reassessing old information and using newly acquired data, we can build up a detailed picture of the local Late Neolithic community and its landscape.

Presentation Type: Communication

Exploring Human-Environment Interaction at the Local Scale: The Bronze Age Tell from Toboliu (Western Romania)

Alexandra Găvan, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Marian Adrian Lie, Institute of Archaeology, Romanian Academy – Iași Branch, Romania

Tobias L. Kienlin, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Nadine Nolde, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Astrid Röpke, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Tanja Zerl, Institut für Ur- und Frühgeschichte, Universität zu Köln, Germany

Keywords: tell-settlements, Bronze Age, human-environment interaction

Abstract: In this presentation, we will discuss human-environment interaction in the Great Hungarian Plain at a local scale, focusing on the complex Bronze Age tell of Toboliu, western Romania. The site is located at the eastern margin of the Great Hungarian Plain, more specifically at the contact between the Crișul Repede floodplain in the north and the high plain of Miersig in the south. Today, a large part of the settlement area, whose average elevation lays around 102 masl, is used for arable farming. A seasonal stream, currently dry for most of the year, runs to the south of the settlement mound.

Recent work at Toboliu consisting of non-invasive investigations (surface surveys, aerial photography, core drillings and geophysical survey) and excavations conducted on both the tell and outer settlement has brought significant new insights into a range of topics such as the inner structure of the site, chronology, subsistence strategies, and economy. For this presentation, archaeological settlement data along with the first results of archaeobotanical, archaeozoological and geoarchaeological analyses will be collated in order to reconstruct the local environment of the site and how the landscape and its resources were used throughout the occupation history of this complex settlement. Faunal and macrobotanical assemblages from excavated contexts in the tell and outer settlement allow us to get an insight into the subsistence practices of the community in Toboliu, as well as into the surrounding landscape. Furthermore, the locally available soils will also be presented, with a focus on their quality for agriculture and food production. By using an interdisciplinary approach, this presentation aims at reconstructing the complex interaction between culture and environment at a Bronze Age tell settlement in the Hungarian Plain.

Presentation Type: Communication

Reconstructing Landscape Change at the Bronze Age Tell Site Toboliu (Romania)

Mirijam Zickel, Institute of Geography/ Archaeobotany Laboratory, Department of Prehistoric Archaeology, University of Cologne, Germany

Florian Steininger, Institute of Geography, University of Cologne, Germany

Dennis Handy, Institute of Geography, University of Cologne, Germany

Astrid Röpke, Archaeobotany Laboratory, Department of Prehistoric Archaeology, University of Cologne, Germany

Keywords: Eastern Pannonian Basin, pleistocene sediments, loess, wetland palaeoenvironment, extraction pits

Abstract: The interdisciplinary project 'Living together or apart? Unravelling the development, internal organization and social structure of a complex Bronze Age tell settlement at Toboliu, western Romania' (see Găvan et al. 2021) aims to analyse Bronze Age settlement activity at Toboliu, which is situated in the eastern part of the Pannonian Basin. Associated land use and landscape development are important key features, and therefore the main focus of the paleogeographic landscape reconstruction of the tell's surroundings. Following a Pleistocene braided river relief, we found an intricate loess palaeosol sequence formed by alternating loess accumulation and soil formation phases. Today's topography is strongly overprinted by current and past agricultural activity. This has a major influence on the preservation of the archaeological site, but also on the reconstructability of the Bronze Age environment. Overcoming this challenge implies a close interdisciplinary collaboration of archaeology and geosciences. Thus, an interdisciplinary core drilling campaign was undertaken in March 2022. For one, to identify well-preserved Bronze Age features which will be excavated during the project term. Further, to sample fossil soils and sediment sequences which allow insights into Holocene landscape genesis, and especially into the Bronze Age environmental conditions. In addition, information was gained on how the Bronze Age inhabitants used the past topography. The investigation of drainless hollows close to the tell implies that local soil horizons might have been exploited as construction material.

Presentation Type: Communication

The Continuity of Household Architectural Practices at the Bronze Age Tell Site of Borsodivánka, NE Hungary

Klára Pusztainé Fischl, Universiät Miskolc, Hungary

Tobias L. Kienlin, Institute of Archeology, Research Center for the Humanities, Eötvös Loránd Research Network, Hungary; University Cologne, Germany

Tamás Pusztai, Hungarian National Museum, Hungary

Keywords: Bronze Age, architecture, use of resources

Abstract: The presentation proposed will look into the continuity of household architectural practices at the Middle Bronze Age tell site of Borsodivánka in north-eastern Hungary and the use of various raw materials from the site's natural environment in the construction of subsequent building phases of Middle Bronze Age households. In a long-term perspective the continuity of raw material procurement for the architecture of a Bronze Age community in a specific ecosystem and landscape prone to frequent flooding in the Borsod plain will be discussed.

Presentation Type: Communication

Roşiori "La Sere" (Bihor County, Romania) Settlement in the Context of Bronze Age Tell Settlements in the Crişuri Basin

Gruia Fazecaş, Criş Country Museum, Romania

Marian Adrian Lie, Institute of Archaeology, Romanian Academy – Iaşi Branch, Romania

Keywords: Middle Bronze, Tell settlement, Habitat, Power centre

Abstract: The tell type settlement at Roşiori "La sere" (Bihor county, Romania) was archaeologically investigated fifty years ago, but the results of the research have poorly published. With the start of a research project ten years ago, that took into account the multilayered settlements of the Bronze Age in western Romania, interest in this settlement gained new momentum.

The settlement of Roşiori "La sere" is 22 km north of Oradea, on a terrace overlooking the low area of the Ier and Barcău rivers confluence. Six levels of dwelling have been identified belonging to the Middle Bronze Age, characterized in this space by Otomani style pottery. The level of deposits is slightly higher than one meter. The settlement is fortified by a defensive ditch that is almost 90 meters in diameter.

Such settlements are interpreted by most researchers as centers of power over smaller or larger hinterlands. Our intention is that depending on other such dwellings, belonging to the same period, to determine the area on which it exerts its influence. In this analysis, based on both the classic model proposed by C. Vita-Finzi

and E. Higgs but also mathematical models such as Thiessen polygon or heat intensity diagram, we intend to identify the secondary settlements that belonged to this center of power, the resources to which it had access and relationship with neighboring power centers.

Presentation Type: Communication

Before the Rise of the Late Bronze Age Mega Forts

Victor Sava, Complexul Muzeal Arad, Romania

Florin Gogâltan, Institutul de Arheologie și Istoria Artei, Cluj Napoca, Romania

Keywords: Lower Mureș Basin, Middle Bronze Age, Late Bronze Age, tradition, change

Abstract: The most representative Bronze Age settlements in the Lower Mures Basin are the Middle Bronze Age tells (MBA) and Late Bronze Age mega-forts (LBA). Recent research indicates that multi-layered settlements are formed after 2200 BC, being continuously inhabited until around 1500 BC. Their abandonment is not thought to be due to an internal or external cause with catastrophic consequences, but is the result of the reorientation of communities towards other subsistence strategies. The success of the new social, economic and political realities is leading to the erection of mega-forts, as A. Harding has inspiredly called them. They are large-scale fortifications enclosing areas ranging from 15 to over 1700 ha. The data available so far show that the heyday of mega-forts was between ca. 1450-1250 BC. While the multi-layered settlements of the MBA spread over a considerable area of the Carpathian Basin, the LBA mega-forts are concentrated only in the lowland area of the Lower Mures Basin.

From this perspective, the central area of the Lower Mures Basin, represented by the present county of Arad (7754 km²), becomes of utmost interest for understanding the transition from the habitation of a limited area of ca. 1 ha to another involving tens and hundreds of ha. For this purpose, all available information on the settlement system, burial finds, artefacts and economic activities of the MBA and the chronological phase after LBA I were collected and ordered. The aim was to identify similarities and differences by performing quantitative and qualitative analyses on the indicators already listed. The results of our approach show the existence of some elements of continuity between the MBA and the LBA I. These include the settlement system, some ceramic ornamental forms and motifs, metalwork, and aspects of funerary ritual. During LBA I, however, new elements also appear, such as the foundation of settlements in previously unexploited areas, the emergence of a new fashion in the decoration of artefacts leading to greater uniformity of material culture. Consequently, we can observe two major trajectories during LBA I, on the one hand one more related to the MBA world, and on the other hand one in which many new elements are present. This combination of tradition

and new developments eventually led to the formation of a new reality: the world of the LBA mega-forts.

Presentation Type: Communication

What is Old and What is New? Reconsidering Some Cucuteni Culture Sites from Botoşani Region-Romania

Adela Kovács, Botoşani County Museum, Romania

Carsten Mischka, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

Keywords: geomagnetic survey, surface estimation, old excavations, Botoşani

Abstract: This presentation is presenting the results of geomagnetic scans developed by the University Freidrich Alexander from Erlangen Nuremberg, in association with Botoşani County Museum. Several sites were already excavated in the 60's and 70's from the 20th century. The material culture from these sites are well known and published already. Some of the sites have benefited of a proper monograph publishing all the materials resulting from the extensive intrusive researches. Most of the sites have a thin layer coming from Sintana de Mureş-Cerneahov and Bronze Age layer. The most consistent traces are coming from the Cucuteni Culture. What we can see now, using the geomagnetic methods are actually changing all the information published so far. The extensive surveys made in the last few years have the purpose of researches under the ground level. The combined methods, using photogrammetry, topography, geomagnetic and aerial photography is now contributing for a much clearer estimation on the dwellings number, the spatial organisation of the settlements and the fortification systems. The most important results obtained so far is related to the demonstration that radial organisation of the settlements starts from Upper Prut valley region and then expands towards east, and the later developments of the sites determined the appearance of the so called „mega-sites” or „proto-cities”.

Presentation Type: Communication

Near or Far? Experimental Study on Clay Sources for Middle Bronze Age Pottery of the Eastern Carpathians

Ana Drob, "Alexandru Ioan Cuza" University, Interdisciplinary Research Institute, Department of Exact Sciences and Natural Sciences, Arheoinvest Research Center, Iași, Romania

Neculai Bolohan, "Alexandru Ioan Cuza" University, Faculty of History, Iași, Romania

Viorica Vasilache, "Alexandru Ioan Cuza" University, Interdisciplinary Research Institute, Department of Exact Sciences and Natural Sciences, Arheoinvest Research Center, Iași, Romania

Keywords: clay, experimental study, interdisciplinary techniques, Middle Bronze Age, Romania

Abstract: The archaeometric study of pottery from the Middle Bronze Age stronghold from Siliștea-Pe Cetățuie (Neamț County, Romania) highlighted the presence of a local kaolinitic clay, with a high iron content, which was used in pots manufacturing. The Siliștea-Pe Cetățuie settlement is naturally defended from three directions (N, E, W) by steep slopes, the defensive system being completed by an anthropic ditch (S), characteristics that generate difficulties concerning the plateau's accessibility. In this regard, the two communities documented in the settlement, Costișa and Monteoru, used a local clay, suggesting the existence of preferences regarding immediate and effortless access to resources.

Based on this information, we carried out an experimental study in order to identify the source of the clay raw material exploited by the two Bronze Age communities. Thus, a first source is represented by a ravine located at approximately 300 m West from the settlement, close to the base of the slope and the second source, which is on the inhabited plateau, is represented by the clay on the Eastern upper slope of the settlement.

In order to identify the source of the raw material we used more interdisciplinary methods of analysis, such as mineralogy, Scanning Electron Microscopy (SEM) and Energy-Dispersive X-Ray (EDX) Spectroscopy, Micro-Fourier Transform Infrared Spectroscopy (FTIR) and Thermogravimetry (TGA/DTA). The results of this experiment provided information on the behavior of the Middle Bronze Age communities that occupied areas East of the Carpathians, especially regarding the exploitation and use of the natural resources required for pottery manufacturing.

Presentation Type: Communication



SESSION 12. ROAMING THROUGH OPEN LANDSCAPES: LATE PLEISTOCENE HUNTER-GATHERER ADAPTATIONS IN CENTRAL AND EASTERN EUROPE

Session

Mircea Anghelinu, Faculty of Humanities, Valahia University Târgoviște, Romania
Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Austria

Daniel Vereș, Cluj-Napoca Institute of Speleology, Romanian Academy – Cluj-Napoca Branch, Romania

Cristina Cordoș, Institute of Archaeology Iași, Romanian Academy – Iași Branch, Romania

Organizers:

Keywords: Paleolithic, paleo-climate, Pleistocene landscapes, Central and Eastern Europe

Session description:

The Late Pleistocene has generally been characterized by a series of rapid warming and cooling, spanning centennial to millennial time scales. Recent advances in multi-proxy analytical approaches and reliable dating allowed for more accurate regional to global paleo-environmental models constraining the past rapid climate variability. Although there is a wide consensus that the climatic background played an important role in the spread of anatomically modern humans into Europe, as well as in subsequent cultural developments, a clear link between the archaeological data and global paleo-climatic scheme is, in many instances, less conspicuous. In this regard, the role of regional paleo-climate variability driving environmental changes is more and more brought into discussion as a key for understanding the distinct patterns which become visible by analyzing the information provided by archaeological sites, such as cultural and technological developments, resource management, mobility, and occupation patterns.

For the Late Pleistocene, potentially similar patterns have long been observed for Central and Eastern Europe, suggesting comparable developments. We therefore selected this region as the geographic focus of our session, and aim at bringing

together contributions which demonstrate how particular sites can be fitted into a wider framework. Our obvious intention is to explore, preferably from a diachronic perspective, the connection between changing landscapes and the transformations seen in the Upper Paleolithic hunter-gatherer record.

Archaeogis for the Digital Modeling of the Upper Paleolithic Sites in the Eastern Carpathians. Case Study: the Bistrița Basin

George Murătoareanu, Faculty of Humanities, Valahia University Târgoviște, Romania

Roxana Cuculici, Faculty of Geography, Bucharest University, Romania

Valentin Georgescu, Faculty of Humanities, Valahia University Târgoviște, Romania

Keywords: Archeogis, digital modelling, Bistrița Basin, Upper Paleolithic

Abstract: Archaeology is a complex science that can act effectively only by integrating information obtained from many other related fields amongst which natural sciences hold a central place. The recent technological developments, especially computer-aided applications allowed the integration of many natural sciences fields into archaeological routines. With the help of 3D imaging and modeling, digital visualization enabled new methods of analyzing and reconstructing historical landscapes, by capturing and displaying cartographic data. With the help of Archaeogis, we propose a digital reconstruction of the Upper Paleolithic sites in the Bistrița Basin (Eastern Carpathians). The major objective of the study is the collection and analysis of a series of hydrographic, geological, pedological, and imaging data, organized into a complex database. The data are subsequently correlated into geospatial analyses in order to identify possible locations of Upper Paleolithic archaeological sites, which can be further validated through subsequent field research. Finally, the study allows the building of an Archaeogis working methodology that can be applied for the entire area of the Eastern Carpathians.

Presentation Type: Communication

The Paleolithic Record of Bistricioara Lutărie III – Sedimentological and Chronological Investigations

Daniel Vereș, Cluj-Napoca Institute of Speleology, Romanian Academy – Cluj-Napoca Branch, Romania

Mircea Anghelinu, Faculty of Humanities, Valahia University Târgoviște, Romania

Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Austria

Ulrich Hambach, BayCEER & Chair of Geomorphology, University of Bayreuth, Germany

Christoph Schmidt, Institute of Earth Surface Dynamics, University of Lausanne, Switzerland

Frank Lehmkuhl, Department of Geography, RWTH Aachen University, Germany

Keywords: Eastern Carpathians, Upper Palaeolithic, Paleoclimate

Abstract: The Bistrița river valley in the Eastern Carpathians provides one of the densest networks of Upper Paleolithic sites in Romania. Detailed archaeological

research carried out during the last decades coupled with numerical dating allowed for a comprehensive understanding of the temporal span and characteristics of the Upper Paleolithic occupation in several spots along the valley. Here we discuss sedimentological and chronological data for Bistricioara Lutărie (BL) III, a site situated at the former confluence of Bistricioara and Bistrița rivers where a rich succession of archaeological material assigned to the Gravettian and Epigravettian technocomplexes is currently under investigation. Grain-size analyses indicate that sediments harboring the archaeological horizons are characterized mainly by fine grained aeolian material slightly impacted by colluvial and slope-wash activity, with several distinct sedimentological units as well as paleosol horizons that can be traced laterally. Sharp variability in rock magnetic proxies generally correspond to the succession of archaeological layers, and to a lesser extent to paleosol horizons indicating favored climatic periods. The archaeological layers are separated by intervals with low values in the magnetic proxies pointing to sterile layers and/or to cold and dry climatic periods. The magnetic enhancement seen in most archaeological layers reflects the alteration of the depositional environment through human input of ashes, small aggregates of burnt sediment and other residues. These proxies thus provide a clear view on a long record of human occupations at BL III during the Upper Paleolithic. Since information on site extent and formation was limited to the excavated areas, we applied test coring to assess a larger area. Results show that the loess and loess-like sediments are almost 8 m thick, potentially preserving a much denser stack of archaeological horizons as indicated by the presence of charcoals within the test cores. Luminescence dating on samples collected from both the profiles of the excavation trenches and test cores indicate that the loess and paleosol sequence at BL III extends over the last glacial cycle, starting at Marine Isotope Stage 6, with a well-resolved record over Marine Isotope Stage 3 and 2 when aeolian deposition predominated.

Presentation Type: Communication

Lithic Resource Management Demonstrates Gravettian Hunter-Gatherer Mobility at Krems-Wachtberg

Michael Brandl, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Marc Händel, Austrian Institute of Archaeology, Austrian Academy of Sciences, Vienna, Austria

Roswitha Thomas, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Christoph Hauzenberger, Department of Earth Sciences, University of Graz, Austria

Peter Filzmoser, Vienna University of Technology, Institute of Statistics and Mathematical Methods in Economics, Vienna, Austria

Maria M. Martinez, Amerind Foundation, Dragoon, Arizona, USA

Irene Petschko, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Thomas Einwögerer, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Keywords: petrographic and geochemical analyses, GIS-mapping, lithic resource management, seasonal mobility, Krems-Wachtberg

Abstract: The Gravettian site of Krems-Wachtberg in the Austrian Danube region received international attention by the discovery of two infant graves, one with a double burial of newborn monozygotic twins and the other with a single burial of a child that died at an age of ca. 3 months. The graves were found in the context of a well-preserved occupation layer rich in finds and with a number of evident domestic structures such as two hearths and several pits representing the short time span of a seasonal occupation in winter and/or early spring. The site also provides a large inventory of artefacts and archaeofaunal material. In total, the lithic assemblage comprises of over 44,000 individually recorded stone artefacts. Detailed lithic raw material studies by application of the multi-layered chert sourcing approach (MLA) combining petrographic (stereomicroscopic) analysis of each individual specimen and geochemical analyses using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) with subsequent statistical data treatment using compositional data analysis (CODA) of selected materials allow us to determine the provenance of the vast majority of the chipped stone artefacts. The combination of GIS-mapping of the obtained provenance information in tandem with technological studies applying transformation analysis reveals the particular resource management strategies of an Upper Palaeolithic society in the Middle Danube Region and provides indications for potential seasonal routes.

Presentation Type: Communication

Strangers in a Strange Land? Reassessing the High-Altitude Swiderian Site at Ceahlău-Scaune (NE Romania)

Mircea Anghelinu, Faculty of Humanities, Valahia University Târgoviște, Romania

Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Austria

Norbert Buchinger, Austrian Archaeological Institute, Austrian Academy of Sciences, Austria

Loredana Niță, Faculty of Humanities, Valahia University Târgoviște, Romania

Alexandru Ciornei, “Vasile Parvan” Institute of Archaeology, Romanian Academy, Romania

Daniel Vereș, Cluj-Napoca Institute of Speleology, Romanian Academy - Cluj-Napoca Branch, Romania

Christoph Schmidt, Institute of Earth Surface Dynamics, University of Lausanne, Switzerland

Ulrich Hambach, BayCEER & Chair of Geomorphology, University of Bayreuth, Germany

Tiberiu Sava, “Horia Hulubei” National Institute for Physics and Nuclear Engineering, Măgurele, Romania

Cristina Cordoș, Institute of Archaeology Iași, Romanian Academy – Iași Branch, Romania

Keywords: Late Paleolithic, Swiderian, Ceahlău, high-altitude site

Abstract: Across Europe, the climatically turbulent transition from Pleistocene to Holocene is archaeologically connected to the tanged point technocomplex (TPT), generally seen as representing comparable but distinct regional adaptations of local Late Paleolithic hunter-gatherers to the rapidly changing landscape and environment. In Central and Eastern Europe, the most widespread TPT phenomena is the Swiderian, generally attributed to highly mobile hunter-gatherers roaming the vast open spaces to the north and east of the Carpathian Mountains chain during the Pleistocene/Holocene interface. The Swiderian site of Ceahlău-Scaune in the Eastern Romanian Carpathians represents an exceptional occurrence, both in terms of altitude (1370 m) and latitude, as it is located unusually far south on the Swiderian map. Although explored archaeologically on a rather large scale since 1950's, the site long remained undated and failed entering the international archaeological literature.

Two brief field evaluations in 2019 and 2021, including a small scale but high-resolution excavation, complemented by paleoclimatic and chronometric sampling of the geological archive, lithic raw material study and techno-typological analyses allow taking a fresh look at this unique findspot. Despite the short and partially disturbed stratigraphic sequence and the lack of organic remains (except charcoal), the site is characterized by a rich lithic collection accumulated during several occupation episodes, as suggested by the new stratigraphic assessment and numerical chronology. While local raw materials represent the bulk of the lithic collection, some allogenous categories (Cretaceous flint, obsidian) also point to distant provisioning areas, towards Central and Eastern Europe, connecting Scaune to the rest of the Swiderian world.

Presentation Type: Communication

Home Sweet Home. Mapping of the Settlement Decisions in the Nenets' Landscape (Yamalo-Nenets Autonomous Region, Northwestern Siberia)

Sandra Sazelova, Institute of Archeology, Czech Academy of Sciences in Brno, Czech Republic

Martin Novak, Institute of Archeology, Czech Academy of Sciences in Brno, Czech Republic

Pavel A. Kosintsev, Institute of Ecology of Plants and Animals, Russian Academy of Sciences in Yekaterinburg, Russian Federation

Keywords: ethnoarcheology, settlement strategy, seasonality, hunter-gatherers, reindeer herders

Abstract: The ethnological analogies collected among recent hunter-gatherers and reindeer herders from the Arctic and sub-Arctic regions are being exploited since the beginning of Paleolithic research around the mid-19th century. The pros lie in its ability to recover past and static finding situations through the dynamic lens observed in recent social, economic, and symbolic activities (and especially those not leaving behind any archeological traces). The extreme variety in recent human social and economic adaptations fitting to most of the archeological hypothesis, and an absence of direct several-generation ancestral linkage to recent societies present important cons in this approach. Nevertheless, the ethnoarcheological research expects that recent sub-Arctic and Arctic environmental pressure shifts necessary human adaptations, behavior and motivations in social, economic-subsistence and ritual strategies, and material objects (e.g. clothes, dwelling shape, household, and hunting/herding artifacts, inner and outer settlement structure, landscape orientation) to such a degree, which offers a comparison between recent societies and last Glacial hunter-gatherers adapted to open and cold climate landscape of a mammoth steppe.

Thus, we can simultaneously document similarities, e.g. repeated usage of settlement placement, position of the central and dominant hearth in a dwelling; the circular or oval dwelling shape with the highest thermoregulation impact; number of expected inhabitants; winter hunting of furbearers and seasonal fur processing; as well as the differences, e.g. placement of the human burial outside the settlement and of course a usage of new types of raw material and nourishment resources. The complex ethnoarcheological research allows us to evaluate equally the past and recent societies and to increase our ability to discern and denude the smallest social, economic, and symbolic nuances; in our case a decision strategy, where to settle within the recent and Mid-Upper Paleolithic open landscape. In order to fill the above-mentioned gap we have collected series of ethnoarcheological data concerning the Nenets' settlement activities and their usage of natural barriers for moderation of animal behavior at the Jangana Pe micro-region in 2009 and 2012 and at the Yambutu lake micro-region in 2018. Although the reindeer herding prevails

in subsistence strategies of recent Nenets, their landscape orientation possessing rather aspects of hunters than animal herders, e.g. Komi, has been repeatedly stressed out. Finally, we believe that such a comparative model based on the recent model might definitely help us to cross our socio-cultural border by adding important piece into the puzzle of settlement decision making among the Mid-Upper Paleolithic hunter-gatherers in Moravia; and perhaps help us to understand its importance to our ancestors.

Acknowledgements: Our research is supported by Czech Science Foundation [grant no.: 20-26094S]. We thank to Nenets' families, J. Svoboda, V. Jankovská, M. Holub, colleagues from the Institute of Ecology of Plants and Animals, Russian Academy of Sciences in Yekaterinburg and Settlement Administration in Panaevsk at Yamalo- Nenets Autonomous Region for consultation and collaboration.

Presentation Type: Communication

Investigating Flint as Proxy for Diachronic Mobility Patterns in the Upper Palaeolithic of Northeast Romania

Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Michael Brandl, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Alexandru Ciornei, "Vasile Pârvan" Institute of Archaeology, Romanian Academy, Bucharest, Romania

Loredana Niță, Faculty of Humanities, Valahia University Târgoviște, Romania

Cristina Cordoș, Institute of Archaeology Iași, Romanian Academy – Iași Branch, Romania

Christoph Hauzenberger, Department of Earth Sciences, University of Graz, Austria

Peter Filzmoser, Vienna University of Technology, Institute of Statistics and Mathematical Methods in Economics, Vienna, Austria

Mircea Anghelinu, Faculty of Humanities, Valahia University Târgoviște, Romania

Keywords: chert sourcing, Prut flint, long-distance procurement, hunter-gatherer mobility, diachronic model

Abstract: The study of lithic raw materials provides geological and geographical information revealing relations between archaeological sites and source areas. Lithic resource management therefore represents a well-suited proxy for an assessment of mobility in hunter-gatherer societies. A rare opportunity for a high-resolution investigation of long-distance lithic raw material procurement throughout a long and dense sequence of short-term and seasonal hunter-gatherer occupations between 30-13 ka is given by the cluster of Upper Palaeolithic sites in the Ceahlău Basin of the eastern Carpathians in Romania.

Key site hereby is Bistricioara-Lutărie III which provides the highest resolution for the greater part of the occupation sequence, and thus main reference for the diachronic aspect. All lithic assemblages from the Ceahlău area show a strong component of Cretaceous flint; however, of varying portion and composition. The nearest source for flint is the Middle Prut area located about 150 km northeast, for which however detailed characterisation and geochemical data were hitherto not available.

We selected representative sample groups from stratigraphically controlled and numerically dated archaeological contexts covering the entire occupation sequence. Microscopic examinations suggest the use of at least five genetically different types of 'Prut flint'. A prospection for and collection of representative geological samples of flint from primary and secondary sources in the Middle Prut area was carried out in October 2021. Detailed lithic raw material studies of both the artefacts and the geological samples were conducted by application of the multi-layered chert sourcing approach (MLA) combining petrographic and geochemical analyses using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) with subsequent statistical data treatment using compositional data analysis (CODA).

The results contribute to creating a diachronic economy model for the use of flint by Upper Palaeolithic hunter-gatherer groups roaming the landscapes between the Ceahlău Basin and the Prut valley between 30-13 ka ago.

Presentation Type: Communication

Early Epigravettian Landscape and Resource Use East of the Carpathians

Mircea Anghelinu, Faculty of Humanities, Valahia University Târgoviște, Romania

Loredana Niță, Faculty of Humanities, Valahia University Târgoviște, Romania

Cristina Cordoș, Institute of Archaeology Iași, Romanian Academy - Iași Branch, Romania

Alexandru Ciornei, "Vasile Parvan" Institute of Archaeology, Romanian Academy, Bucharest, Romania

Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

George Murătoareanu, Faculty of Humanities, Valahia University Târgoviște, Romania

Keywords: Upper Paleolithic, Eastern Romania, Gravettian, Epigravettian, Late Glacial Maximum

Abstract: According to existing archaeological data, the area between the Eastern Carpathians and the Middle Dniester hosts several hundred open-air Upper Paleolithic findspots, the vast majority of which are related to the Gravettian and Epigravettian technocomplexes. Despite the disputed paleo-cultural taxonomy and an occasionally frail numerical chronology, this wide network point to a consistent and persistent human presence across the Late Glacial Maximum (LGM), making

the area highly suited for tracking major paleo-cultural trends and significant adaptive shifts. One such key transformation, conventionally framed as the emergence of the early Epigravettian, happened on vast stretches of land in Southern, Central and Eastern Europe beginning around 26-24 ka calBP. It brought about considerable changes in lithic and organic repertoires, habitation features, prey spectra, symbolic representations and even human anatomy, pointing to a drastic restructuring of the human biogeography and cultural networks during the LGM.

In the area to the east of the Carpathians, many of these transformations became particularly visible in the last two decades, thanks to high-resolution archaeological excavations and intensive chronometric efforts. However, many aspects connected to the emergence of the Epigravettian, such as the degree of continuity with the Gravettian as involved by the 'epi-' prefix, or the alleged 'impoverishment' of the material culture, remained poorly understood. Here we propose a brief assessment of these aspects by focusing on the key features of the early Epigravettian sites: paleoenvironmental contexts, landscape mapping, habitation features, mineral and biological resources used, lithic and organic industries. Many of these aspects single out the early Epigravettian east of the Carpathians as an innovative and flexible set of adaptive solutions, managing the challenges of the LGM in a manner considerably different from the previous Gravettian.

Presentation Type: Communication

Erratic Flint as Diachronic Proxy for Hunter-Gatherer Mobility Around the Last Glacial Maximum in the Austrian Danube Valley

Norbert Buchinger, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria; Institute of Prehistoric Archaeology, University of Cologne, Cologne, Germany

Michael Brandl, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Thomas Einwögerer, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Andreas Maier, Institute of Prehistoric Archaeology, University of Cologne, Cologne, Germany

Irene Petschko, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Marc Händel, Austrian Archaeological Institute, Austrian Academy of Sciences, Vienna, Austria

Keywords: Upper Palaeolithic, Lithic raw material provisioning, Erratic flint, Central European Danube region

Abstract: For a better understanding of Upper Palaeolithic hunter-gatherer societies, lithic raw material analyses are an essential component as they can contribute to a

broader insight into environmental, economic, and behavioural contexts and potentially provide indications on land-use patterns, subsistence strategies, and exchange networks.

Focusing on long-distance imports in form of erratic flint, this paper addresses provisioning strategies and technological patterns of selected Upper Palaeolithic find records within the Central European Danube region. By analysing assemblages from sites, such as Kammern-Grubgraben, Gösing-Setzergraben, and Krems-Wachtberg – findspots located in proximity to the Danube valley at a distance of more than 200 km to the closest source area for erratic flint in the north – it is possible to identify and contextualise both synchronous and diachronic variations in lithic resource management. As the portion of erratic flint in the inventories shows significant deviations, we address differences in supplying strategies and discuss various factors that can lead to shifts in raw material economy. While these are in part related to human adaptation to changing environmental settings over time, we additionally highlight aspects potentially influencing the intrinsic character of lithic assemblages, such as site function, duration of occupation events, and access to alternative raw materials.

In reference to the stated considerations adapted to the respective sites, we present models of raw material provisioning and contextualise the lithic inventories within a wider socio-economic and environmental framework.

Presentation Type: Communication



SESSION 13. MODELLING THE LANDSCAPE. FROM PREDICTIVITY TO POSTDICTIVITY

Session Organizers:

Agostino Sotgia, Sapienza - University of Rome, Italy; RUG - University of Groningen, Netherlands

Carlo Citter, University of Siena, Italy

Keywords: Modelling, Predictivity, Postdictivity, man-environment relationship

Session description:

Predictive models played a significant role in the last decades. They have been used in archaeology to manage the data set's complexity. However, researchers used these tools to reconstruct past scenarios too. The first attempts to shape predictive models in archaeology focused on settlement choices and were driven by the need of heritage management. Today the man-environment relationship seems the most profitable development to get new insights. The connectivity, the resource exploitation and the long *durée* fit well with an approach based on predictivity. Phenomenological experiments seem promising too. They point out at the perceived, rather than the physical landscapes and to the non-material heritage.

Artificial intelligence and remote sensing techniques provide new powerful tools, but they push to develop new theories as well. Tools cannot be used without a reflection on their own potential.

However, the whole set of approaches based on predictivity returns a certain degree of rigidity. Predictivity sounds like "unavoidable outcome" and this makes a large number of researchers skeptical. The data set still overcomes the paradigm.

The session we propose aims to go beyond this alternative toward postdictive models. Postdictivity is flexible, because it starts from observed data and produces simulated scenarios by mixing several human and environmental agents. The most fitting scenarios return the most likely set of agents involved. This allows us to profit of the large amount of data we already produced and, at the same time, to boost a serious theoretical and methodological discussion. To reconstruct the human behaviour over time is not less important than to reconstruct past landscapes. On the contrary, the former shaped the latter.

Reconstruction of Epipaleolithic Settlement Dynamic System in the Zagros Mountains using Eco-Cultural Niche Modeling and Gis

Anooshe Kafash, University of Tehran, Iran

Masoud Yousefi, University of Tehran, Iran

Elham Ghasidian, Stiftung Neanderthal Museum, Mettmann, Germany

Saman Heydari-Guran, Stiftung Neanderthal Museum, Mettmann, Germany

Keywords: Zagros Mountains, Epipalaeolithic settlement, Palaeoclimatic, topography variables

Abstract: The Epipaleolithic period is one of the influential periods in the process of human evolution since it is associated with the important shift from hunting and gathering procurement strategies to early sedentism. The Zagros mountains is located at western Iranian Plateau and the Mesopotamian lowlands. Despite this important location, Zagros remained less explored compared to the other region such as Levant concerning research on the settlement dynamic systems of late phases of Palaeolithic. In this study we used eco-cultural niche models to reconstruct the Epipaleolithic settlement patterns in the Zagros Mountains and determined the most influential factors in shaping Epipalaeolithic settlements in the high mountains landscape. We considered two General Circulation Models (GCM): The Community Climate System Model (CCSM4) and the Model for Interdisciplinary Research on Climate (MIROC) along with topographic variables (topographic heterogeneity and slope) in developing eco-cultural niche models. The models developed in this study performed well based on AUC values ($AUC \geq 0.85$). We identified the most suitable areas for the Epipaleolithic settlements in the Zagros Mountains and showed that climatic factors outperformed topographic variables in predicting the Epipaleolithic settlement in the mountains.

Presentation Type: Poster

Local Preference Driven Predictive Models for the Paleolithic Shelter Sites, Case Study Nawdarvan Valley, Kermanshah Region, West Central Zagros, Iran

Samran Asiabani, DiyarMehr Institute for Palaeolithic Research, Kermanshah, Iran

Sara Heydari, DiyarMehr Institute for Palaeolithic Research, Kermanshah, Iran; Faculty of Architecture and Urbanism, Tabriz Islamic Art University, Tabriz, Iran

Saman Heydari-Guran, DiyarMehr Institute for Palaeolithic Research, Kermanshah, Iran; Stiftung Neanderthal Museum, Mettmann, Germany

Keywords: Zagros, Palaeolithic periods, Zonal statistics, prediction model

Abstract: It is commonly accepted that highly diverse environments lead hominins to differentiate their preference for settlement selection; thus, constructing a model based on general hypothesis and detected from local intervening variables would be misleading. Considering this issue, the present study aims to propose a new method for predicting more accurate Paleolithic shelter sites based on the most preferred site of the Bawa Yawan shelter site in central Zagros, Nawdarwan Valley. The site has been systematically investigated from 2016 to 2021 and revealed long-lasting different hominins activities at least from 50 ka to the present day, representing one of the significant human spots in the entire Zagros Mountains. Proposed model uses zonal statistics for data gathering from digital elevation model (DEM), solar and slope analysis in order to construct a dataset and in second step using similarity search analysis to find Most Similar Zones (MSZ) to the candidate zone. The results of this analysis approve that the MSZ model is highly accurate (73.85%) with detected sites in previous field surveys. Therefore, the MSZ method is capable to be a reliable guide in field surveys and as well helps to hypothesize hominin preferences toward settlement selection in different zones for the entire Zagros Mountains and similar environments.

Presentation Type: Communication

Balancing between Biases and Interpretation. A Predictive Model of Prehistoric Scania, Sweden

Giacomo Bilotti, University of Kiel, CRC1266 Scales of Transformation, Germany

Keywords: Scania, Prehistory, Landscape, predictive modelling

Abstract: Southern Sweden, and especially the area around Malmö in SW Scania, is perhaps one of the most archaeologically investigated areas in the world. Our knowledge of the local prehistory has greatly increased in the past decades although it is also the product of centuries of agricultural practices, urban expansion and a relatively early (18th-19th C.) interest for prehistoric monuments (e.g. burial mounds and megaliths). However, despite the deluging amount of available information (over 50000 ancient sites recorded in Scania), their distribution is not homogeneous and archaeologists are restlessly trying to explain this pattern and its underlying causes. In general, two explanations are given, not necessarily exclusive: on one side it is possible that the distribution of data directly reflects past dynamics and past agency (more finds = more intense occupation). On the other hand, there is the (more than) concrete risk that our knowledge is heavily affected by post-depositional factors (infrastructure works, agricultural practices, erosion, flooding, sea level fluctuations, etc.). However, many of the currently available models are not aimed to quantify the impact of each of the two components on our data.

The study area is particularly suitable for a predictive model due to the large amount of modern excavations and the abundance of ancient monuments. In

particular, I will use two different datasets, both derived from the Swedish National Heritage database (Riksantikvarieämbetet): Stone Age settlements and Prehistoric monuments (mostly Neolithic and Bronze Age). I decided to analyse them separately because monuments (mounds, megaliths, cairns, stone cists) are usually highly visible in the landscape and did not require excavations in order to be discovered. Contrarily, prehistoric settlements were virtually unknown before the advent of modern surveys and excavations. Thus, they can give us different information and results in a predictive model but there is also the risk of interference or confounding when considered at once.

In this contribution I will develop a GIS and R based model in order to account and measure the impact of the processes in place on the different datasets, trying to disentangle the various components and recombine them into a new interpretative framework which could also be used as a starting point for further and more elaborate analysis (spatial statistics and simulations). In particular, I will show the relation between the presence and intensity of certain sites and modern land-use (urban and agricultural) and geomorphological variables already relevant in the past (elevation, distance from resources, soil, etc.).

I will do so in a reproducible way, relying on FOSS and open data only, in order to allow anyone interested to replicate the model, modify it for their own purposes and better stimulate a discussion.

Presentation Type: Poster

Landscape-Waterscape Relationship in Southern Tuscany during Upper Palaeolithic: a Predictive Approach from Legacy Data to Survey Planning?

Giovanna Pizziolo, Dipartimento di Scienze Storiche e dei Beni Culturali – Università di Siena, Italy

Keywords: Upper Palaeolithic, prehistoric landscape, legacy data, Southern Tuscany, coastal changes

Abstract: Since 30.000 years ago, during the Upper Palaeolithic Southern Tuscany (Italy) was strongly affected by geomorphological changes which dynamically transformed coastal areas. In particular during the Last Glacial Maximum the sea level got down to more than -100 mt and as a consequence the prehistoric coastland included the actual Tuscan archipelago, especially Elba and Pianosa Islands, assuming different settings during MIS 3 and MIS 2. In this scenario the prehistoric peopling process occurred according to different needs and criteria that we would like to further analyse.

This contribution discusses the possibility to investigate this varying prehistoric landscape-waterscape relationship adopting a predictive approach.

Beyond the simulation of coastal changes the study was based on the use of legacy data, taking into account the ones derived by surface artefact scatters collected decades ago by different teams

Legacy data, in this respect, may provide further evidence of the prehistoric peopling process if analysed through a predictive approach. In this scenario it is crucial to highlight areas which may preserve some relict features of the Palaeolithic landscape. These are analysed to explore the Upper Palaeolithic settlement strategies and to further investigate the relationship between inland and coastland sites in a diachronic perspective.

The work is in progress but the suggestions emerging from this elaboration provide new hints to plan further field survey activities.

Presentation Type: Communication

#TPAA project: the GIS Predictive Model in the Valli di Lanzo (Piedmont, Italy) for the Study of High Altitude Archaeological Sites

Sandro Caracausi, Università degli studi di Ferrara, Dipartimento di studi umanistici, Sezione di Scienze Preistoriche e Antropologiche; Associazione culturale 3P – Progetto Preistoria Piemonte, Italy

Gabriele L.F. Berruti, Università degli studi di Ferrara, Dipartimento di studi umanistici, Sezione di Scienze Preistoriche e Antropologiche; Associazione culturale 3P – Progetto Preistoria Piemonte, Italy

Sara Daffara, Università degli studi di Ferrara, Dipartimento di studi umanistici, Sezione di Scienze Preistoriche e Antropologiche; Associazione culturale 3P – Progetto Preistoria Piemonte, Italy

Eugenio Garoglio, Università del Piemonte Orientale, Dipartimento di studi umanistici, Italy

Marta Arzarello, Università degli studi di Ferrara, Dipartimento di studi umanistici, Sezione di Scienze Preistoriche e Antropologiche, Italy

Francesco Rubat Borel, Soprintendenza Archeologia Belle Arti e Paesaggio per le provincie di Alessandria, Asti, Cuneo, Torino, Italy

Keywords: Gis Predictive Model, Archeological Site, Western Alps, Lanzo Valley

Abstract: The present work concerns results obtained from the employment of a GIS predictive model for the identification of archaeological sites in Valli di Lanzo in Western Alps (Tourin, Piedmont). The Lanzo Valleys, an area of 583 km² composed of three large valleys (Val Grande, Val d'Ala and Val di Viù) and the archaeological contexts in the Lanzo Valleys result from occasional findings or consist of traces of rock art. This does not currently make it possible to hypothesise any reconstruction of the dynamics of frequentation and peopling of the Lanzo Valleys. Also, human population dynamics have a lot of archaeological-prehistoric data in the Eastern Alps while in Western Alps are very fragmented. The TPAA project (Traces Prehistoric

in the Alpine Environment) aims to research and valorise the archaeological heritage of the area.

The use of GIS software improves the processing of a huge quantity of data that allows spatial analysis and the management and development of field-work methodologies.

In this project, a GIS predictive model has been elaborated through the interpolation and interpretation of the different environmental and archaeological data available. GIS predictive model indicates with a probabilistic percentage the location of archaeological contexts. This methodology is an evolution of the one that has already been successfully employed in the Sessera Valley (Caracausi et al. 2018). Also, the predictive model maps identify the areas of the territory with optimal parameters for the presence of archaeological sites.

Between 2019 and 2020, data were collected on the known archaeological contexts in the Lanzo Valleys resulting from a field survey from the predictive GIS model developed for the area. In GIS Predictive model, criteria such as the geomorphology, distance to water resources, aspect, slope and the use of land were considered.

In this context, the TPAA Valli di Lanzo project was developed in collaboration with the Soprintendenza Archeologia Belle Arti e Paesaggio per la Città Metropolitana di Torino, the Cultural Association 3P-Progetto Preistoria Piemonte and the University of Ferrara, Department of Humanities, section of prehistoric and anthropological sciences.

Reference: Caracausi S., Berruti G.L.F., Daffara S., Bertè D., Rubat Borel F. (2018) - Use of a GIS predictive model for the identification of high altitude prehistoric human frequentations. Results of the Sessera valley project (Piedmont, Italy), *Quaternary International* 490: 10-20. doi:10.1016/j.quaint.2018.05.038.

Presentation Type: Communication

“Puglia’s Burning” Predictive Models and Social Complexity

Michele Pirro Leo, Università del Salento, Italy

Raffaele Rizzo, Università degli studi di Bari, Italy

Giovanna Francesca Spatola, Università del Salento, Italy

Keywords: settlement dynamics, social inequality, fortifications, catchment analysis

Abstract: The objective of this presentation is to analyze the settlement dynamics that develop in Apulia during the Middle Bronze Age. Throughout southern Italy, in phases 1 and 2 of the Middle Bronze Age (also known as the Early Middle Bronze Age) there is a proliferation in the number of settlements, which tend to occupy all ecological belts -from the coast to the plains to the hills and mountains - and to become increasingly stable. Between the end of the Middle Bronze Age 2 and the beginning of the Middle Bronze Age 3 there is an impressive series of

siege/destruction events and abandonment of settlements. The new settlements show instead a predilection for the coast or in a para littoral position.

Post-modern interpretations of the phenomenon tend to downplay social inequality and internal hierarchical organization among the concauses (Cazzella-Recchia 2021). If archaeology is political action (McGuire 2008), the need to restore social complexity to events will not turn up its nose.

In the detail of the case, southern Italy from the Middle Bronze Age onwards, - given the exposure to models, ideas and social forms coming from the Eastern Mediterranean - is characterized as an accelerator of the hierarchical process (Peroni 1969). Internal social competition, which is configured in local elites with stable social differentiation, is exacerbated by an environmental crisis that characterizes the entire Mediterranean in the Middle Bronze Age: a period of intense drought (Primavera et al. 2015). The environmental crisis may have catalyzed the struggle for access to and management of resources. The contemporary presence of monumental burials (Orlando 1995) contributes to return a tangible sign of an increasingly "anthropized" landscape. The settlements are equipped with powerful fortifications, for which it is assumed a function not only defensive, but also symbolic and self-representative of a "landscape of power" (Scarano 2017). The application of spatial models and analysis allows for the evaluation of different theories in relation to this phenomenon. The effectiveness of such models, however, depends on the data set available and the interpretation of the results obtained. For this reason, we will proceed to the use of different methodologies of investigation in order to reconstruct a picture as broad and complete as possible. On this basis, the probable area of influence of the various settlements will be determined.

Specifically, the application of visibility analysis allows to estimate the area of influence of the various settlements and the importance that anthropic works, such as walls and burials, had in the definition of the landscape. For these reasons, will also be hypothesized and reconstructed the main paths of connection infra-site.

The definition of the exploitation area of each settlement will be hypothesized based on catchment analysis referred to the travel times and costs of the various centers.

The hierarchy between the settlements will be reconstructed on the basis of the integration between visibility areas, exploitation areas and archaeological evidence, such as burials, imported materials and extension of the settlements.

The reconstructed model will not represent a definitive interpretative proposal, since it is based on partial data, but a first step in the research to calibrate the results of the application.

Presentation Type: Communication

Food, Distance and Power. Modeling a Multi-factor Proto-historic Landscape in the Po Plain

Laura Burigana, University of Padova, Italy

Keywords: Resource management, Agent-Based Modeling, Terramare collapse

Abstract: The paper illustrates the creation and integration of the environment as a multilevel landscape in AMPBV SIMULATOR, a spatial Agent-Based Model (ABM) developed in NetLogo programming language. The model was conceived with the aim of investigating, through a simulative approach, the events and the circumstances (both anthropic and environmental) that presumably led, between the end of the Late Bronze Age in the XII cent. C. and the beginning of the Final Bronze Age, the protohistoric communities of the southern Verona plain (known as the northern Terramare polity) from a climatic phase of maximum development and articulation to an anti-climatic phase of sudden collapse. The study context is an interesting application opportunity for an investigation through ABM, both because of the complexity of the case scenario, in which several interrelated actors and factors must have played an important role, and because of the availability of a number of geographical and archaeological data providing both a term of comparison and an excellent information base. The environment of an ABM is the "stage" in which activities are conducted, in which relationships between agents (or between agents and the environment itself) are intertwined, and in which, in essence, the life of artificial societies takes place. In AMPBV SIMULATOR space is an explicit component of the artificial system, where physical distances directly affect the individual settlements choices and behavior: the sites are, in fact, the main agent class in the model. Sites use or modify the environment in different ways, for this reason the virtual landscape is composed of multiple thematic levels, whose characteristics have been determined considering both archaeological and physiographic data derived from literature and remote sensing. Among the main themes modeled the food resources were primarily considered, focusing in particular on agricultural production: each spatial cell composing the digital landscape can produce greater or lesser food quantities according to several key parameters such as soil moisture, laborers or the cultivated cereal species. In addition to a productive landscape, a connective landscape was created by considering local characteristics such as terrain slope, forests or muddy soils, which must have conditioned movement choices and modes of communication significantly in ancient times. The AMPBV SIMULATOR universe also includes a landscape of power, depending in part on the settlements location and size, and in part on their local economy, which is visualized as a dynamic network of links. Such links, each one representing the economic relations between two agents, are updated positively or negatively basing on the of exchange processes outcome. With the development of an artificial environment and by modeling processes potentially critical for the fate of the

Terramare system, the hope is, on the one hand, to give such a complex study case a new mean of hystorical analysis and, on the other hand, to experiment Agent-Based Modeling and assess its potential as a methodology for archaeological investigation in the Po plain.

Presentation Type: Communication

A Predictive Model to Investigate the Agro-Pastoral Exploitation of Ancient Landscapes

Agostino Sotgia, Sapienza – University of Rome, Italy; RUG – University of Groningen, Netherlands

Keywords: Raster Model, Predictivity, Land Evaluation Techniques, man-environment relationship, GIS

Abstract: Thanks to the reconstruction of agricultural and pastoral land use of a territory, it is possible to obtain numerous information, both of an ecological nature, and about the populations who lived there. With the reconstruction of the agro-pastoral dimension of a community it is however possible to understand not only the aspects linked to the exploitation of a territory, the subsistence and demography of a given group, but also more generally the social organization itself. This is especially true for the pre-protohistoric period, in which the primary economy was in fact the basis of all forms of political power.

Through this particular “agro-economistic approach”, it is therefore possible to investigate in a more articulated way the ancient communities, the relationships between them and the historical phenomena that occurred to them.

With a series of tools inside a GIS System - capable to apply the FAO's land evaluation techniques - it has been possible to generate a raster model of the landscape with the degree of agro-pastoral suitability inside each cell. Thanks to this model it can be simulate the agro-pastoral exploitation of a territory, calculating the food production of each settlement, as well as the consequent demography maximum sustainable. At the same time, it is possible to verify - on a quantitative basis - the socio-political organization proposed by scholars for the communities or to suggest new ones. Thanks to the identification of sites specialized productions, villages capable of producing a 'surplus', or vice versa 'non-self-sufficient' settlements, it will be possible to articulate in detail these socio-political models, hypothesizing exchange networks or relationships (hierarchical or competitive) between the different sites. Through this approach, it is also possible to describe the historical events that occurred also from a demographic point of view, with a rough reconstruction of the population involved, further enriching the reconstructions proposed.

The paper presented intends to illustrate in detail the structure and functioning of the model developed, as well the different possible applications in archaeological contexts. The case study chosen, to show the direct application of this method, is

relating to the end of the first millennium BC in Southern Etruria at the time of the so-called "Protourban Turn". Through a reconstruction of landscape exploitation of the settlements, presented in the area between 1150 BC and 850 BC, an attempt will be made to describe – by the point of view of primary economy - the transition from village communities (organized among themselves in micro-systems, cantonal states, ...) in the proto-urban centres of Veio, Vulci, Tarquinia, Caere and Volsinii.

Presentation Type: Communication

Testing Least Cost Path on Field: Reflections on the Nuragic Landscapes of Central-Southern Sardinia (Italy)

Marco Cabras, University of Cagliari, Italy

Paolo Frongia, freelance geologist, Italy

Cristina Concu, University of Cagliari, Italy

Riccardo Cicilloni, University of Cagliari, Italy

Keywords: Least-Cost Path Analysis, Nuragic civilization, Sardinia, GIS, Landscape

Abstract: For about ten years this working group of the University of Cagliari (Italy) has been experimenting with techniques of spatial and visual perceptual analysis using GIS on the Nuragic landscapes (Middle and Late Bronze Age) of different areas of central-southern Sardinia. Over time, various field campaigns have been developed on the monumental manifestations produced, starting from the XVIII century BC until the beginning of the Iron Age, by the Nuragic communities; towers, fortresses, villages, tombs of giants and sacred wells suggest a marked attention to the display of a message of power, strength and monumentality on the part of the human group studied. An aspect often emphasized by these researches is the relationship of monuments with mobility and with the routes and strategic points of the territory, often verified through matches of different LCPAs that cross the territory by connecting different patterns of points. However, the real efficiency of the paths predicted by the GIS has never been directly tested on the ground. The paper presents the result of field analyzes by our group of archaeologists on the paths resulting from the GIS analysis in the Marmilla territories: travel times, energy expenditure and the real possibility of a path to actually cross a given territory are provided. This experimentation is absolutely plausible, as these are still little anthropized areas, which have not undergone significant geomorphological transformations over the centuries, with a marked conservatism of the main forms of the landscape. This contribution offers several points of reflection on the advantages, but also on the limits of this analytical approach. Working with the LCPAs is still to be explored, however it remains a valid tool, if an analysis unrelated to preconceptions and with a holistic evidence framework is carried out, for territorial research.

Presentation Type: Communication

Roman Land Use and its Impact on the Pannonian Landscape

András Bődócs, Eötvös Loránd University, Institute of Archaeological Sciences, Hungary

Keywords: Pannonia, centuriatio, land use model, roman landscape, irrigation

Abstract: The Roman colony of Savaria was the first founded town in Pannonia (colonia Claudia Savaria). Inscriptions attest the so-called deductio, the settlement of veterans. The first reconstruction of the centuriatio of Savaria was made by András Mócsy, who attempted to draw it using medium-scale topographic maps. Since his publication, no substantial archaeological attempt has been made in the last 40 years to verify his theory. In the last decade, research into the existence of the Savarian centuriatio has been pursued using GIS methods. Fortunately, we have found a correlation between the results of some archaeological excavations and the information of aerial archaeological phenomena, and we have managed to build a predictive model-network for the centuriatio. The new network is completely different from the previous reconstruction. We have collected hundreds of archival aerial photographs from the 1950s and 1980s, and we have also carried out test flights for aerial archaeological reconnaissance to verify the new theory.

The model has been continuously refined and validated by archaeological fieldwork and geophysical survey. The new reconstruction has led to new possibilities for interpreting the sites excavated in recent decades and the previously known Roman roads and aqueducts.

Another interesting correlation between the watercourses running through the former colonia and the Roman centuriatio was also detected: the impact of Roman agriculture on the landscape transformation that has survived to the present day. Our pilot project, launched this year, plans to verify these effects with multispectral drone surveys and geophysical measurements to show whether there were former streams along the presumed Roman channels that could provide evidence to support this hypothesis.

Presentation Type: Communication

The Roman Limes in Germania Inferior: A Gis Application for a Landscape Reconstruction

Vincenzo Ria, Università del Salento, Italy

Keywords: Roman Limes, Germania Inferior, Landscape Archaeology

Abstract: The Roman Empire at the height of its maximum expansion, reached during the II century AD, extended over the entire Mediterranean basin, occupying a large part of Europe, the Middle East and North Africa. The artificial and natural

borders that delimited it, together with the territories of the provinces located at the edge of the dominions of Rome, were part of the complex identified with the limes. The large territorial extension of the roman empire made it impossible to build a fortified border, along the entire perimeter, which would accurately mark a boundary between the dominions of Rome and the outside world. In some territories, such as Africa and Arabia characterized by large desert spaces, this limit was very fleeting while in other areas it was defined by natural barriers such as the course of large rivers, such as the Rhine, the Danube and part of the Euphrates. Only some parts of the limes without natural defences or more relevant from a strategic point of view were interested by the construction of fortifications. In the roman province of the Germania Inferior, that extended over a territory now corresponding to Holland and a part of western Germany, in an area of considerable strategic importance for Rome, the limes it develops along the course of the lower Rhine. The presence of the river, with its road and fortification, played a fundamental role that research on the ground has clarify. Thanks to the archaeological research it was possible to acquire a rich and articulated complex of archaeological evidence that made possible to identify the existence of a frontier civilization, which developed with homogeneous characteristics, even in the material culture, both inside and outside the limes. This evidence testifies how the idea of the existence of a dividing border between Roman civilization and the external ones is to be considered obsolete and does not correspond to a reality. So the limes is not configured as a permanent defensive barrier between the "Roman " and the "barbaric" world and cannot be considered as the result of a calculated political choice, rather it must be studied as the result of the fossilization of a line of contact between two or more conflicting forces. In this perspective the position of the castra along the limes primarily responds to defensive needs; but other factors, such as the presence of resources or the area of visibility, have determined the choice of the most advantageous positions. The application of GIS tools and spatial analysis makes it possible to have a tool to reconstruct the landscape of the ancient world, and to reconstruct these dynamics. The creation of complex rasters allows to recreate and classify various aspects of the territory, such as defensibility, agricultural capacity or travel costs. Using these techniques, the territory under analysis was assessed in relation to the position of the castra along the limes. Furthermore, analyses were carried out to reconstruct the main connection routes, starting from the known roman roads. Thanks to this database, an interpretative model is proposed that emphasizes and values the multiple aspects that have determined the distribution of Roman castra.

Presentation Type: Communication

Modelling of Wine Production Landscapes in the Lower Guadalquivir (Betic Province, Hispania). From the Study of Legacy Data to the Creation of Predictive Models

Pedro Trapero Fernández, University of Cádiz, Spain

Lázaro Lagóstena Barrios, University of Cádiz, Spain

Isabel Rondán Sevilla, University of Cádiz, Spain

Manuel Ruiz Barroso, University of Cádiz, Spain

Javier Catalán González, University of Cádiz, Spain

Enrique Aragón Nuñez, University of Almeria, Spain

José Antonio Ruiz Gil, University of Cádiz, Spain

Keywords: Roman viticulture, economic landscape, GIS, predictive model, Lower Guadalquivir

Abstract. Roman viticulture was one of the most important economic activities in the ancient world, due to the need for supply and the possibility of profit in a market economy. We know well the distribution and transformation technology, through studies of presses and ceramic containers for storing and transporting these products. But little is known about the production landscape. This is mainly due to the lack of specific sources in the literature, except for Roman agronomists and archaeology of perishable materials. The application of Geographic Information Systems makes it possible to interpolate some of the agronomic knowledge to current geography, allowing predictive models of areas with greater or lesser potential to host villa or even potteries or even a map of better agricultural soils for a vineyard. This paper presents the project currently underway to understand the unique area of the lower Guadalquivir, which we have been defending as the main wine producer in the Baetic region, through the review of legacy data and by articulating a series of predictive GIS analyses. We are currently checking the results of these analyses with surface and geophysical surveys, to reinvest this information in the model and improve it.

Presentation Type: Communication

Shaping Juridical Districts: A Postdictive Approach

Ylenia Paciotti, University of Siena, Italy

Carlo Citter, University of Siena, Italy

Keywords: Modelling, Predictivity, Postdiction, man-environment relationship, Geographic Information System

Abstract: How can we study the making of a medieval juridical space? Which were the agents that affected more? We try to answer to these questions thanks to a post-

dictive approach. We applied the Qgis algorithms to model the potential political space. We used several agents to get different outcomes. We tried both environmental and human agents to avoid the more deterministic side of this approach. We focused on the plain of Lucca in northern Tuscany to study the making and development of its bishopric. Then we turned to the southern side of this region to study the districts of two castles we have already excavated and whose territory we know quite well: Selvena and Casteldipietra. In this last example, we will apply a regressive procedure. We will start from 19th century communities boundaries to make hypotheses about the relationship with medieval districts. This procedure can be applied to any context where enough knowledge is available.

Presentation Type: Communication

GIS Analysis Application in Modelling Palaeohydrology of the Southwestern Banat (Serbia) during the Middle Ages

Irina Kajtez, Institute for the Protection of Cultural Monuments of Serbia, Republic of Serbia

Teodora Mladenović, Laboratory for Bioarchaeology, Department of Archaeology, Faculty of Philosophy, University of Belgrade, Republic of Serbia

Keywords: southwestern Banat, GIS analysis, Middle Ages, palaeoenvironment, palaeohydrography

Abstract: Since the natural environment is directly related to human activities, it is one of the important aspects of archaeological research. Morphology and characteristics of the terrain, layout of water surfaces, and watercourses are related to the potential of inhabiting an area, and the types of surrounding ecosystems. Therefore, it is important to have an insight into the dynamics of changes of geomorphology and hydrography in a certain area, when researching a specific period and area. The present-day landscape of the plain part of Banat differs significantly from the medieval one since extensive melioration works were carried out throughout the 19th century. These works included drying up a huge amount of water masses including lakes, ponds, and swamps, and "taming" wild watercourses, especially those whose springs were in the Carpathians, which enabled the formation of arable lands and making previously unsuitable areas habitable. Archaeological remains from southern Banat indicate that medieval settlements were built on elevated terrain (on loess plateaus or loess terraces), right next to watercourses and in between swampy areas. The distribution of water bodies was one of the important limiting factors for the formation of these settlements, and since it differs considerably from the present-day state, it is of great importance to have an insight into palaeohydrography of the area. The aim of this research is to propose a model of the potential distribution of water surfaces in Southwestern Banat during the Middle Ages. Modelling was done by GIS analyses using available data which

included historical maps, topographic, geologic and geomorphologic data. In addition, data obtained from historical sources, as well as zooarchaeological analyses, are combined to make a wider picture of the natural environment.

Presentation Type: Communication

Spatial Analysis in Northern Apulia: Case-studies in Gargano and Monti Dauni for Evaluation of Historical Landscape and Comparison between GIS Processing and Archaeological Data

Angelo Cardone, Università degli Studi di Bari, Italy

Keywords: Historic landscape, Capitanata, GIS, Landform classification, TWI

Abstract: The proposal comes from a current doctoral project about historical landscapes and settlements in the medieval, northern Apulia (University of Bari, Pasap-Med PhD course, XXXVI cycle; tutor prof. Volpe); it's focused on northern Daunian mountains and central Gargano. First aims is a georeferenced GIS-collection of historical and archaeological data available (excavations, historical cartography, toponymy, medieval written sources, etc.); this dataset is functional to carry out spatial analyzes for a diachronic interpretation of transformations/persistence of landscape structures. Spatial analyzes are also carried out to compare the results from 'traditional' sources and to create lines of research in areas where there is a lack of data prior to the late modern age.

The proposal aims to reflect on three contexts.

The first context concerns the ancient hydrography in the central Gargano; floodable areas have been reconstructed (TWI; flow accumulation) to analyse the potential extension of the lake of S.Egidio (near S.Giovanni Rotondo; written sources suggest an expansion of the lake in the 13th century), reclaimed in the 19th century, and the swamps near Candelaro river, in the foothills. Same processings has been carried out to reconstruct the ancient hidrographic situation in S.Marco in Lamis, now canceled (there were a watercourse originating from lamae, streams on the slope, and toponyms like Padula). This research provides new elements about the ancient landscape, the viability (routes leading to the sanctuary of Monte S. Angelo cross these areas), the locations of medieval casale and agricultural fields linked to the nearby S.Egidio monastery.

Second context concerns landform classification (slope, TPI) and reconstruction of the flooded areas between western Tavoliere and Dauni mountains; this research allow us to reflect on a postdictive control of diachronic settlement strategies. For instance, Neolithic villages occupy corridors corresponding to poorly raised terraces, while centuriated spaces (Ager Lucerinus) also extend into potentially floodable areas, as a consequence of the extensive hydrological arrangement carried out in the Roman age. So, new cropmarks of Neolithic villages have been identified

in areas characterised by similar morphology and the link between distribution of medieval casalia and hydrographic network emerges.

In the third case, cost-path and cost-surface analysis was carried out to study the paths between Sipontum-Manfredonia and Monte S. Angelo; the positioning of the water storage structures known in the pre-industrial age, of the few known archaeological sites (mainly early Christian necropolis) suggests a much wider network of routes and a complex landscape, not simply linked to pilgrimages. The useful results of the distance analysis are partially undermined by the highly irregular, mountainous morphology. Wieshied analysis and calculation of solar irradiation were carried out to evaluate advantageous location of sighting sites and agricultural / breeding centers. This makes it possible to select some sites for field survey (many hills have small elliptical reliefs, potential archaeological sites), as it is impossible to control effectively by remote sensing (prevalence of uncultivated or wooded spaces; few areas have of a detailed LiDAR DTM) and a extensive survey (a impervious, large territory has been analyzed; accesses are often not allowed by owners).

Presentation Type: Communication

GIS Analyzes and Demography of Late Medieval Nord Barese

Dicanio Giuseppe, Università del Salento, Italy

Keywords: Geographic Information System, man-environment relationship, demography, population density, Late Middle Age

Abstract: It is possible to distinguish two main methods for calculating the average number of people who lived in ancient times. First of all, there are analyzes based on estimated coefficients of population density that can be applied directly on the total extension of the settlement, on the minimum number of individuals living in one house or on the number of family members.

The great popularity of this type of approach is due to the presence of various coefficients with different corrective agents used, which generally derive from ethnographic studies conducted in the last century in the Near East. The main limitation of this methodology is represented by the methodological premise that the investigated context has similar population distribution parameters.

Secondly, however, it is possible to hypothesize the population of a given territory on the basis of the available resources and the average food needs of an individual.

The use of these analyzes requires the study and hypothetical estimate of some parameters, such as: the catchment area of a settlement (catchment analysis), the different uses of the land (such as the percentage of cultivated land, used for breeding or exploited in other forms) and indicative data on the average diet of the population. These prerequisites can be partially satisfied thanks to data acquired

with archaeobotanical and anthropological analyzes, while the use of GIS software allows the processing of spatial analyzes and raster files that express the agricultural potential of the soils.

Of course, the different methodologies can be used together to reconstruct the ancient settlement dynamics and the contemporary landscape with greater precision.

The major limitation is, however, constituted by the need to refer to parameters and coefficients that cannot be verified.

The goal of these investigations is to compare these analysis techniques in relation to the data known thanks to historical sources. For this reason, the area of the municipalities of "Nord Barese" (including Bisceglie, Bitonto, Corato, Giovinazzo, Molfetta, Ruvo, Terlizzi) was examined in relation to the "fuochi", the families, known between the XV and XVII centuries AD. These data were obtained from historical documentation sources, such as the "Liber Focorum Regni Neapolis".

On this basis, it is possible to hypothesize coefficients relating to the area in question starting from contemporary historical sources, reconstructing the catchment areas of the different communities in relation to the agricultural products necessary for a minimum diet. The data obtained also allows us to contextualize the known demographic trends in relation to the historical context and the production capacity of the land.

Presentation Type: Communication



SESSION 14. HIGH-RESOLUTION DIGITAL ELEVATION MODELS, GIS AND REMOTE SENSING IN SUPPORT OF LANDSCAPE ARCHAEOLOGY RECONSTRUCTION, DYNAMICS AND MANAGEMENT

Mihai Niculiță, Faculty of Geography and Geology, "Alexandru Ioan Cuza" University of Iași, Romania

Andrei Asăndulesei, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Bogdan Roșca, Geographic Research Center, Romanian Academy, Iași Branch, Romania

Keywords: Geomorphometry, Geoarchaeology, GIS, LiDAR, UAV, satellite imagery, aerial imagery, landscape archaeology

Session description:

Landscapes have spatial dimensions that require multiple scales processes and various resolutions of data to be considered when we want to understand the present-day landscape or reconstruct its previous instances. For recent past landscapes, the present-day topography of the landscape is basically the skeleton of the previous ones in the analysis study, and all the representations of topography and anthropo-scape are usable. This is why maps, DEMs, and remote sensing data are crucial for spatially filling the gaps of information from archaeological sites. For the ancient landscapes, although the present is not necessarily a backbone anymore, it could be used to gather data about similar settings. If modeling is used, this spatial information can be very useful, and still, the present landscapes can drive the modeling in a GIS environment. During the last years, the amount of data increased, driven by new satellites and new platforms like LiDAR and UAVs. Also, the computational methods diversified, including availability as open-source implementations, especially regarding visualization and modeling. We welcome the submission of abstracts for presentations of work from all fields of science that deal with the usage of maps, DEMs, GIS, and remote sensing for reconstruction, modeling or management of landscapes from different periods of the past or for the

understanding of the present-day landscape through its past dynamics. While new developments and methods or data are primarily of interest, also interesting case studies are welcomed. For better dissemination we also envisage a proposal for a special issue in the open access journal.

Testing SAR Imagery for Archaeological Mapping in Temperate Environments: Case Study of Ostia and Portus

Michele Abballe, National Research Council (CNR), Institute of Atmospheric Sciences and Climate (ISAC), Italy

Francesca Cigna, National Research Council (CNR), Institute of Atmospheric Sciences and Climate (ISAC), Italy

Deodato Tapete, Italian Space Agency (ASI), Italy

Keywords: Archaeology, Remote sensing, Satellite imagery, SAR, COSMO-SkyMed

Abstract: Remote sensing constitutes a standard tool for archaeological research from site to landscape level. In the beginning, most images were captured from aeroplanes, but in recent decades, a series of revolutions have boosted the opportunities to map archaeological traces. We refer, for instance, to the availability of more and more high-resolution satellite images, often offered for free by space agencies and private companies. However, most satellite data used for archaeological research are optical ones (i.e. RGB visible bands mostly), with only limited use of multispectral and Synthetic Aperture Radar (SAR) images. Especially the latter have remained a niche instrument, even though the earliest use of SAR to study paleo-landscapes dates back to the 1980s, and a rapidly increasing trend of applications has been recorded in the last two decades. Satellite SAR missions offer frequent revisit times, large historical datasets, basically immunity to weather conditions and potential ground penetration at larger wavelengths (e.g. L and P bands). However, archaeologists have often been refrained by the technical difficulties of data processing, thus limiting SAR data exploitation in our field. At the same time, the most successful applications come above all from ideal territories such as arid ones (e.g. the Middle East and North Africa), fueling the doubt about the effectiveness of SAR in other environmental contexts.

Within the Sino-European collaboration Programme Dragon-5, the SARchaeology project aims to overcome these limits by explicitly testing the mostly unexplored potential of SAR applications for archaeological prospection and heritage site protection. The area around Ostia and Portus, in the hinterland of Rome, has been selected as an ideal case to investigate archaeological landscapes in temperate environments, offering a wealth of well-known archaeological traces and natural evidence related to both the Tiber river and the prograding Tyrrhenian coast.

This paper aims to present the first results from this project, which wants to test the suitability of SAR remote sensing for investigating archaeological landscapes characterised by vegetation and grassland, mixed land cover and land use, and peculiar seasonal cycles. On the one hand, we tested the effectiveness of freely available medium-resolution SAR images from Sentinel-1 C-band and ALOS PALSAR L-band sensors to map prominent features, such as artificial canals and natural geological features. On the other hand, we launched a tailored monitoring

campaign to acquire high-resolution COSMO-SkyMed X-band images in SpotLight mode to detect crop marks relatable to sub-metre archaeological remains. A revision of the extensive previous research on the Ostia-Portus area, ranging from remote sensing observations, extensive geophysics, and targeted and random archaeological investigations, provides an excellent basis for assessing the effectiveness of SAR-based archaeological prospection in temperate environments. In particular, we want to define the best acquisition strategy in terms of both seasonality and technical parameters (e.g. imaging mode, polarisation, incidence angle), and the most suitable data processing and interpretation approach, to facilitate more widespread use of this powerful data for landscape archaeology.

Presentation Type: Communication

Above Ground and Underground - A Combined Perspective of the Archaeological Features from the Suusamyр Plateau, Kyrgyzstan

Adrian-Cristian Ardelean, National Museum of Banat, Timișoara, Romania

Adriana Sărășan, National Museum of Banat, Timișoara, Romania

Andrei Bălărie, National Museum of Banat, Timișoara, Romania

Kubatbek Tabaldiev, Kyrgyz-Turkish Manas University, Bishkek, Kyrgyzstan

Kunbolot Akmatov, Kyrgyz-Turkish Manas University, Bishkek, Kyrgyzstan

Keywords: Unmanned Aerial Vehicle, Digital Elevation Model, magnetic prospection, burial mounds, Suusamyр Plateau

Abstract: Located in the northern part of the Tian Shan Mountains, at a mean elevation of 2200 meters above sea level, the Suusamyр Plateau is home to a great number of archaeological sites. Here, hundreds of burial mounds are frozen in time as a silent expression of ancient times. Who built them and when? How many are they? These are questions still waiting for an answer because the Suusamyр Plateau is one of the least archaeologically investigated regions in Kyrgyzstan.

In the last decade, unmanned aerial vehicles (UAVs) have offered the possibility of fast acquisition of high-resolution images that facilitate the identification and automated detection of archaeological features and sites. Thus, using a DJI Phantom 4 Pro quadcopter, over 1500 ha (29 individual sites) were investigated within the Suusamyр Plateau, leading to the identification of over 600 burial mounds.

If we assume that the burial mounds form a sacred place, the answer to the following question is intrinsic to our study: are they independent features or are they part of a connected system? In order to answer this question, high precision magnetic investigations were performed on 2 archaeological sites. The magnetograms revealed a complex and diverse pattern of well-preserved peripheral structures located in the proximity of the biggest burials mounds. As the investigated sites appear to be typical for the Scythian Culture, the current approach provides a

combined perspective on the burial sites of the Scythian Culture that inhabited the high alpine environment of the northern Tian Shan Mountains.

Presentation Type: Communication

Remote Sensing Techniques for Identifying Site Structure Dynamics for Chalcolithic Cucuteni Culture from NE Romania

Andrei Asăndulesei, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Felix-Adrian Tencariu, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Radu Balaur, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Keywords: Remote sensing, LiDAR, Magnetometry, Cucuteni Culture, Site Structure

Abstract: Although the Cucuteni-Trypillia civilization enjoyed a very long and prolific history of research, we are still facing with two slightly uncomfortable facts: first, we are still far from understanding many related aspects regarding the particular behaviour of Cucuteni communities; second, some quasi-axiomatic assertions and interpretations, from older or newer writings, prove to have been wrong or questionable.

Without claiming to unequivocally solving or repairing previous interpretive inadequacies, the efforts of archaeologists from the Arheoinvest Research Centre (UAIC) have in recent years been focused towards enriching and nuanced knowledge of the habitat and material culture of the Eneolithic population from Moldavian Plateau.

Specifically, following an already well-defined and tested methodological workflow, effort was put into integration of non-invasive prospecting methods - LiDAR, aerial photography, magnetometry - with more consistent archaeological surveys or excavations, followed by processing and interpretation of archaeological materials, absolute dating and archaeometric analysis of the collected artifacts and ecofacts.

Case studies such as Isaiia-Balta Popii (Precucuteni), Ruginoasa-Dealul Ruginii, Războieni-Dealul Mare (Cucuteni A), Ripiceni-Holm, Cucuteni-Dâmbul Morii (Cucuteni A-B), Cucuteni-Cetățuie, Stroești-Pietrărie, Dumbrăvița-Tarlaua Iezer, Ripiceni-Popoaia, Drăgușeni-Cetățuia (Cucuteni B) increased the database of AMS radiocarbon dating (around 20 new data) of the Cucuteni culture, brought unique information about the internal spatial organization of sites and the typology of fortification systems.

Correspondingly, the archaeological materials discovered in the excavations conducted in some of the mentioned sites revealed, through a contextual analysis (involving the correlation of typological, technological, archaeometric and experimental studies), new valences of human behaviour in relation to the environment and artifacts produced and used by Cucuteni communities.

Presentation Type: Communication

Structural and Functional Analysis of a Purpuraria Workshop from the Archaeological Site and Landscape of Torregarcía (Almería) with Digital Restitution

Manuel Ruiz Barroso, Universidad de Cádiz, Spain

José Antonio Calvillo Ardila, Universidad de Cádiz, Spain

Isabel Rondán Sevilla, Universidad de Cádiz, Spain

María Juana López Medina, Universidad de Almería, Spain

Lázaro Lagóstena Barrios, Universidad de Cádiz, Spain

Keywords: LiDAR, Photogrammetry, digitization, purpuraria

Abstract: On the coast of Torregarcía, located in the municipality of Níjar (Almería), there is one of the best preserved archaeological sites dedicated to purpuraria in the Mediterranean. Since 2019, our research groups at the University of Cádiz and the University of Almería have been carrying out several research campaigns, using non-invasive techniques, in Torregarcía. The use of GPR, magnetometry, LiDAR, and others, have been essential tools for the study of this archaeological site, allowing a better comprehension of this productive area and its coastal landscape. To analyze the functionality and the structure of the site, a complete digital restitution of the site has been realized, combining two different techniques, LiDAR TLS (Terrestrial Laser Scanning), with a Leica BLK 360 laser scanner, and photogrammetry (aerial and terrestrial), in order to obtain a georeferenced model with a high level of accuracy. With this communication we present a complete study of this High Imperial purpuraria workshop and its surroundings, analyzing the different structures, its functionality and production process, mainly supported by the digital restitution technique.

Presentation Type: Communication

Tărtăria - Podu Tărtăriei Vest. Internal Spatial Organization and Ancient Hinterland of a Hallstatt Site from Central Transylvania, Romania

Corina-Ioana Borș, National History Museum of Romania, Romania

Andrei Asăndulesei, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Horățiu Cociș, County Museum of History and Art – Zalău, Romania

Felix-Adrian Tencariu, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Keywords: LIDAR; magnetometer survey; First Iron Age; bronze and iron objects hoards

Abstract: The prehistoric site Tărtăria - Podu Tărtăriei Vest, situated on Mureș river valley (Alba County, Central Transylvania, Romania), was discovered in 2012 during an extensive preventive archaeology project occasioned by the construction of the A1 motorway. Back then, an area of about 2 ha was completely investigated significant archaeological features and vestiges being discovered, providing major new data and finds for Middle Hallstatt period (9th -8th c. BC). The most important ones are two ditches (on the southern and eastern site's), two bronze hoards and a collective grave. Given the particular nature of the site, since 2016 was initiated a multi-annual archaeological research program, aiming both field excavations and non-invasive surveys (large-scale magnetometer measurements and aerial photography) for documenting the setting of the prehistoric site characterized by particular features. In 2021, a new complex range of non-intrusive investigations were undertaken: aerial photogrammetry for DSM generation, Graphic Target Imaging – detection, LiDAR scanning, as well as new geophysical measurements (ERT). Thus, were obtained highly accurate and complex sets of data, indicating new archaeological features on the northern part of the site (a ditch), but also outside the currently outlined Hallstatt period habitation.

Rather unusual as phasing these research stages, yet with significant sets of survey data, by analysing the results of the 2012 campaign in relation with the ones from 2016 – 2021 ones, by a comparative multidisciplinary approach is possible to have a better understanding of the features of this archaeological site and the surrounding landscape, a very representative one, providing also a very interesting case study on the benefits of archaeological prospection in undertaking development-led archaeological projects.

Presentation Type: Communication

Landmarks, Landscape Archaeology and Tumuli in the Târgu Frumos Area

Sergiu-Constantin Enea, "Ion Neculce" High School, Târgu Frumos, România
Dumitru Boghian, Faculty of History and Geography, "Ștefan cel Mare" University
of Suceava, Romania

Keywords: landmarks, Landscape Archaeology, tumuli, Târgu Frumos area, location patterns, chorological method, DEM

Abstract: Starting with the classical Eneolithic (end fifth millennium BC), in the general landscape from Eastern Carpathian area are distinctly observed the tumulary funeral constructions, singular and / or associated in necropolises, which were used, with different intensities and specificities, until the beginning of the second millennium of the Christian Era. These monuments, by their location and visibility in the landscape, indicate the existence of open forest-steppe spaces, with different degrees of anthropisation. Even if later some locations were covered by forest after their construction, these important geographical-spiritual landmarks were reused by the same or other communities, for burials, for main and secondary roads orientation, the delimitation of individual, community and supra-community properties (estates, localities, "countries"), the marking of topographic heights or for the construction of Second World War defence works, as shown by the various documentary and cartographic sources, especially medieval, modern and contemporary. Many of these monuments, which make up a moundscape, have been listed in the Târgu Frumos micro region, located approximately in the central area between the Carpathians and the Prut River, on the Middle Bahluiet course (Bahlui-Jijia-Prut Basins), in a contact region of the three sub-units of the Moldavian Tableland. Tumuli mapping and chorological and DEM multi-criteria analysis show a number of patterns of funerary mounds arrangement in rows and micro groups, on dominant locations of interfluves, along watercourses, in close connection with the Subboreal and Subatlantic landscapes of the micro region, and also allows for the assement of the degree of damage suffered. Also, the archeological diagnostic researches carried out in three "ridge tumuli" (Târgu Frumos-*Vest de Oraș/West of the City*, Crucea/Lungani-*Lutărie/Est de sat/Clay quarry/East of the village* and Lungani-*După Vie/After Vineyard*), confirmed the antiquity of such funerary constructions (Yamnaya culture, 33rd-27th Century BC), and the multigenerational and diachronic character of such necropolises (Yamnaya, Mnogovalikovaya, Sabatinovka, Sarmatians, Turanians). It also filled a series of gaps in the reconstruction of the protohistoric habitat of the area and contributed to the more precise definition of the place and role of these funerary monuments, in close connection with the other archaeological realities from the east, west and south of the Carpathians and with those from Ukraine, the Republic of Moldova, Bulgaria, Hungary.

Presentation Type: Communication

Modelling the Archaeological Landscape and Topography of Unguja Ukuu, Zanzibar

Tom Fitton, Department of Archaeology, University of York, United Kingdom

Stephanie Wynne-Jones, Department of Archaeology, University of York, United Kingdom

Keywords: UAV, GIS, Paleolandscape, Legacy data, Tanzania

Abstract: The aim of the Urban Ecology and Transitions of the Zanzibar Archipelago Project is to investigate resource use in urban settlements during a period of cultural change on the Swahili Coast of East Africa between the 7th-15th centuries CE. In this paper we discuss our methodology for constructing a phased model of landscape change and results from our analysis at the site of Unguja Ukuu, Zanzibar.

Unguja Ukuu is the earliest known proto-Swahili settlement on Zanzibar, and the location of the first major town and port of trade in the archipelago. The landscape of the site today represents a palimpsest of Iron Age, medieval, and modern settlements, historic coastal progradation and recent erosion, and encroaching mangroves, secondary woodland, bounded cultivation and open clearances. Identifying each of these vectors and their impact on the contextual archaeological record is therefore essential to interpreting the changing nature of urban ecologies and human-environmental relationships through the period of study.

Whilst satellite imagery and digital datasets for East Africa remain both rare and of limited value due to regional environmental conditions, we have achieved our aim through a combination of topographic, geophysical, and drone surveys with legacy datasets and remote sensing in GIS. This paper discusses both the problems and the value of careful integration, and presents an interpretative model of settlement development at the site based on our analysis.

Presentation Type: Communication

Multimodal Archaeology: Lidar, Multispectral and Geophysical Prospections at Vulci

Maurizio Forte, Duke University, USA

Keywords: LIDAR, multispectral, Etruscan, Vulci

Abstract: This contribution is aimed at discussing the importance of a multimodal approach in remote sensing archaeology. We define multimodal a combination of diachronic maps produced by different categories of sensors: LIDAR, multispectral, geoelectric and georadar. In particular we will discuss the intensive use of UAVs equipped with different sensors in combination with ground-based prospections.

The archaeological goal is the reconstruction of the Etruscan and Roman city of Vulci, one of the most important site in pre-Roman Italy.

Vulci (10th-3rd c. BCE), in the Province of Viterbo, Italy, was one of the largest and most important cities of ancient Etruria and one of the biggest cities in the 1st millennium BCE in the Italian peninsula. (Fig. 1) The habitation site is a highly stratified and mostly untouched urban context that includes, in the same urban area, Iron Age, Etruscan, Roman and Medieval settlements (Sgubini Moretti, 2005; 2008). It covered an area of circa 126 hectares and was part of the dodecapolis, the Etruscan federation of the most important cities of Etruria. The urban growth and planning of Vulci from the Orientalizing period (8th—7th cent. BCE) to the Romanization (3rd—1st cent. BCE) is mostly unknown. We presume it was a crucial period for the monumentalization of the tufa plateau of Vulci, but we still need to establish a definite chronological frame for the city-state, its organization of public and religious buildings, and its transformation into a Roman colony.

Presentation Type: Communication

GIS Project for the Analysis of the Geomorphic Analysis of the Prehistoric Occupation in the Casimcea River Basin

Constantin Haită, The Institute for Advanced Studies in Levant Culture and Civilization, Bucharest, Romania

Daniel Iosif, The Institute for Advanced Studies in Levant Culture and Civilization, Bucharest, Romania

Ștefan Marincea, The Institute for Advanced Studies in Levant Culture and Civilization, Bucharest, Romania

Keywords: GIS, Casimcea Valley, prehistory, geomorphology, geology

Abstract: The aims of the proposed GIS are the analysis of the spatial distribution of prehistoric sites and the characterization of geomorphological features of the immediate landscape of the settlements at different periods of occupation. The area of interest is the Casimcea Valley, one of the most important rivers in Dobrogea province, presenting an important diversity and density of occupation in prehistoric times.

This application is developed in QGIS software, a freeware application for visualization, editing, and analysis of geospatial data, as a vector spatial model. In this stage of the project, we integrated the topographic data at the 1:25000 scale and the geology of the area, at 1:200000 scale and 1:50000 data, where available. The detailed DEM obtained on the vector contours allowed the elaboration of geomorphology analyzes of relief, slope, and orientation of the slopes for each prehistoric site.

The inventory of prehistoric settlements was based on the national repertory (RAN) and completed with all the published data in specific publications. Most of

these points were checked in the field, and the precise position was recorded with a GPS.

Our first results at this stage show specific patterns for different periods of occupation and suggest a possible model of the most important changes in the man-environment relationships.

The geology of Dobrogea territory shows the image of the distribution of raw material sources, exemplified here for the study cases of the i) silicolites and ii) abrasive rocks, very important resources for different types of tools.

In the future, data on the paleo-environment evolution will be integrated into interactive modeling of the archaeological landscape, also considering the internal evolution and the timeline of each prehistoric period.

Presentation Type: Communication

Geophysical Surveys with Magnetometer in Bizkaia: A New Attempt at Methodological Systematisation for the Discovery of Iron Age Settlements

Jagoba Hidalgo-Masa, Universidad del País Vasco (UPV/ EHU), Spain

Jesús García Sánchez, Instituto de Arqueología de Merida (IAM/ CSIC), Spain

Keywords: Geophysical surveys, Basque Country, Biscay, Iron Age

Abstract: Biskaia is located in the extreme west of the Pyrenees in the Basque Country, a country with two large geo-environmental regions that are well differentiated by climate and orography. The northern or Atlantic zone, where Biscay is located, is defined by a very abrupt orography with steep valleys and mountains covered by a dense vegetation in which conventional remote sensing tools (LIDAR, orthophotos, etc.) obtain poorer results than in the Mediterranean region. In addition, intense forestry production has cut deep into the terrain, factors which may be responsible for the small number of Iron Age hillfort found.

However, the materiality that has survived to the present day could be identified as a faithful reflection of Iron Age societies and the problem could be contextualised in a poor demography incapable of generating a landscape with abundant settlements. We are inclined to assume that there is a bias generated by various factors, mentioned above, which have prevented or hindered an intensive survey of large areas of Bizkaia, resulting in a territory with a possible under-representation of sites in this and other chronologies. This bias is reflected in the fact that the majority of Iron Age sites in Bizkaia are located on hilltops with little vegetation, as in the case of Illuntzar in Narbaniz (Bizkaia), or in areas in which, although there is a dense vegetation cover, this is made up of low vegetation and is permeable for remote sensing tools such as LIDAR, as in the case of Malmasin (Arrigorriaga, Bizkaia).

However, how can this problem be solved? We believe that the answer lies in intensive ground truthing, by means of geophysical surveys with a magnetometer and small-scale deforestation work. This would make it possible to prospect the large gaps in the territory and thus be able to better characterise such a transcendental process as the development of Iron Age societies and their contact with the Roman Empire.

Presentation Type: Communication

Improving the Environment: Landscape Archaeology in the Medieval Fortresses from Moldavia

Carsten Mischka, "Friedrich-Alexander" University of Erlangen-Nürnberg – Institute of Pre- and Protohistory of Erlangen, Germany

Silviu-Constantin Ceaușu, Neamț National Museum Complex – History and Archaeology Museum of Piatra-Neamț, Romania

Mihai Niculiță, "Alexandru Ioan Cuza" University of Iași, Faculty of Geography and Geology, Romania

Constantin Preoteasa, Neamț National Museum Complex – Cucuteni International Research Centre – Cucuteni Eneolithic Art Museum of Piatra-Neamț, Romania

Keywords: landscape archaeology, medieval fortresses, magnetometry, GPR, LiDAR, UAV, GIS

Abstract: In recent years, as part of the collaboration project between the Neamț National Museum Complex, the "Friedrich-Alexander" University of Erlangen-Nürnberg and the Faculty of Geography and Geology, Alexandru Ioan Cuza University of Iasi, non-invasive interdisciplinary archaeological research (magnetometry, LiDAR, UAV, GIS) has been carried out on the Neamț Fortress in Târgu Neamț and the New Citadel of Roman from Gâdiniți, two of the most important fortifications of medieval Moldavia, from the XIV-XVIII centuries.

Both objectives were located in strategic places from a defensive point of view: the southwestern, steep slope of the Pleș Peak and the confluence of the Moldova and Siret Rivers, respectively. The results of our investigations provide important information on the complex anthropogenic fortification systems of the two cities, which largely capitalize on the advantages of the natural environment.

The New Citadel of Roman is located on the 5 m floodplain terrace of Siret River. The site is a meander island which was used as location of the fortification. The meander channel which is today 0.5 to 1 m incised from the island level was used as a natural protection trench.

Presentation Type: Communication

Remote Sensing for Hazard Evaluation of Arctic Cultural Landscapes and Cultural Heritage

Ionuț Cristi Nicu, Norwegian Institute for Cultural Heritage Research (NIKU), Norway

Lena Rubensdotter, Norwegian Geological Survey (NGU), Norway

Knut Stalsberg, Norwegian Geological Survey (NGU), Norway

Vibeke Vandrup Martens, Norwegian Institute for Cultural Heritage Research (NIKU), Norway

Anne Cathrine Flyen, Norwegian Institute for Cultural Heritage Research (NIKU), Norway

Keywords: remote sensing, Arctic, cultural heritage, drone mapping, archival images

Abstract: At a global level, cultural heritage sites and cultural landscapes are threatened by many natural hazards such as landslides, gully erosion, coastal erosion, etc. Over the last decades, the number of destructive events has increased exponentially, driven by the global climate change. While there is a growing evidence of studying climate change impacts on cultural heritage globally, little research has been conducted to explore climate change impacts on the Arctic cultural heritage and landscapes. With the technological advancement, research to understand the dynamics of climate-induced processes has become easier over the last years. However, many Arctic areas (e.g. Svalbard) remain poorly studied due to unavailability of more recent remote sensing data. To tackle this issue, field studies are needed (geomorphological and geological mapping), along with a large suite of measurements (total station surveys, the use of UAVs) of thermokarst processes (thaw slumps, thermo-erosion gullying, solifluction, coastal erosion). To this, adding the study of old cartographic material and archival images, we can have a better image of the dynamics of thermokarst processes affecting Arctic cultural heritage sites and landscapes. We perform the surveys in two different Arctic landscapes, where protected cultural heritage (former coal infrastructure and hunting huts) are in danger of being eroded by coastal erosion and river erosion, respectively. Besides these processes, a large suite of thermokarst processes were identified and mapped. It is concluded that over the last years, the erosion intensity has increased, leading to a fast and irreplaceable loss of Arctic cultural heritage.

Presentation Type: Communication

The Detection and Delineation of Tumuli from High-Resolution DEMs

Mihai Niculiță, Faculty of Geography and Geology, "Alexandru Ioan Cuza" University of Iași, Romania

Keywords: tumuli, kurgan, burial mounds, LiDAR, neural networks

Abstract: Convex features are characterizing many landforms and can be relatively easily identified using geomorphometric approaches. Despite this, the particularities of the landform development process and the evolution after the process cessation introduce slight changes of shape from the pure convex shape. Very often this includes the apparition of compound shapes, so besides the convex shape, a planar or a mixture of concave and convex shapes appears at the border of the landform.

I present the case of burial mounds whose shape particularities are influenced by construction technique and the erosional process of the later evolution of the landform. These particularities will influence mainly the precision of the convex part delineation, which is better for geometric convex form and worse for deformed convexities. In the same, the particularities will allow the usage of a machine-learning algorithm to learn these patterns and to be used to predict the presence of such features from the candidates in a certain area.

In the OBIA (Object-Based Image Analysis) literature there was clearly shown that objects (superpixels, segments) are better candidates for performing land-cover classifications. For DEMs, this should be also true as it was already shown in the literature. In multiscale situations, the object delineation might need a scalar approach, but in the case of specific "simple" shapes, the approach is straightforward. The limitations of object-based approaches are given by the over-or under-segmentation, so an assessment of these aspects is needed when using segments for classifications.

Burial mound detection on high-resolution data is a practical aspect of geomorphometry that has recently been the focus of various researchers.

Considering two of the best-rated approaches in the literature, one based on a pixel approach and the other based on an object approach, it was previously shown that the object-based approach performs better than the pixel approach, with the same algorithm (random forest).

Romanian burial mounds are of kurgan type, which appear from the middle Yenisei river to the middle Danube River, and they were constructed starting with the Eneolithic period (6th-5th millennia BP) and the Bronze Age to the Iron Age (3rd-2nd centuries BP) by various cultures: Sredny Stog, Usatovo, Jamnaya, Catacomb, Srubnaya, and Scythians. Two neighboring areas of the same size (sq km) were used to test the approach of classification with a multilayer perceptron (MLP). A high-resolution DEM resampled at 5 m resolution was used to delineate local convexity segments with watershed segmentation, and more than 80 geomorphometric

variables were used to train the MLP model which predicted 99% of the tumuli in the train and 100% in the test area.

The “goodie” of the object-based method is that it can even delineate the burial mounds. Although this was not necessarily targeted, the results are impressive. The results are limited by the use of local convexity and the degree of smoothing of the burial mounds due to erosion. Plowing even created a concave feature around the convex part. Once the concave parts are found the method could be extended to map also the concave features.

I have shown that the MLP can train models that detect convex burial mounds, with good generalization. Segmentation is a powerful tool that reduces the complexity of the task. The approach of segmentation followed by classification is the best in landform classification approaches. By adding the power of the ML & AI this workflow should be extended to include neighborhood information, to be able to classify compound shapes.

Presentation Type: Communication

The Archaeological Implications of the Geomorphological Interpretations of High-Resolution DEMs at Regional Scale

Mihai Niculiță, Faculty of Geography and Geology, “Alexandru Ioan Cuza” University of Iași, Romania

Keywords: quaternary geomorphology, high-resolution DEMs, landscape archaeology

Abstract: Northeastern Romania corresponds roughly to the Moldavian Plateau, a physiographic area extending beyond Romania's borders in the Republic of Moldova and Ukraine's neighboring countries. This area has unique geomorphological and geoarchaeological features that argue for the present study. The Moldavian Plateau is a hilly region of NE Romania characterized by a continuous and dense population from the neolithic times. Despite the dry climate, landslides, gullies, and fluvial erosion are widespread, with some hot spots that are related to archaeological features. These geomorphological processes have shaped landforms that were suitable for settlement localization, but at the same time, these processes are a factor in archaeological sites' hazards and risks of degradation.

In the context of the landscape archaeology and geoarchaeology of the Moldavian Plateau, the geomorphological evolution is very important because considering the extended habitation, there are important implications on the (i) initial archaeological site distribution influenced by the geomorphology, climate, natural resources, and societies, (ii) actual archaeological site preservation considering the erosion and deposition during the evolution of the study area, and (iii) future archaeological site preservation considering the intensity of the geomorphological processes in the near future, especially their exacerbation due to climate change influence.

I present the Lateglacial and Holocene geomorphological evolution of the study area considering the latest developments in geosciences and the implications on the distribution of archaeological sites and the geoarchaeological implications of past approaches and future endeavors.

Presentation Type: Communication

A Low-Cost, Easy-Way Workflow for Multi-Scale Archaeological Features Detection Combining LiDAR and Aerial Orthophotography

Antonio Jesús Ortiz-Villarejo, Universidad de Jaén, Spain

Luis M. Gutiérrez-Soler, Instituto Universitario de Investigación en Arqueología Ibérica, Universidad de Jaén, Spain

Keywords: structure from motion, DEM, LiDAR, UAV, GIS

Abstract: The difficulty of obtaining funding often places the continuity of research projects at risk, forcing researchers to resort to low-cost methodologies. Such methodologies sometimes require a high degree of technical knowledge which, in many cases, poses an insurmountable obstacle to the development of a project. This presentation shows a low-cost, easy-way methodology for diachronically analysing terrain in search of archaeological evidence on different scales (micro and semi-micro) in both already known and new archaeological sites through the analysis of orthophotographs taken with UAVs, the DEMs generated from them, and public LiDAR data. It allows researchers with small budgets but with a basic knowledge of GIS and photogrammetry to undertake some aspects of their project without necessarily having to call on the assistance or support of specialists. Thanks to this methodology, the researcher will be able to continue until they are able to obtain the funding that will enable them to take their research further, with specialists. This article presents the first conclusions obtained after applying the proposed methodology at the Giribaile (Vilches, Spain) archaeological site—a site of interest in its territory which possibly functioned as an advance defensive post for the town, a hypothesis based on the towers and numerous internal structures that have been identified.

Presentation Type: Communication

Understanding the Villa Di Tito and the Velino Valley within Central Italy by Creating Spatial Connections

Rebecca Payne, Saint Mary's University, Canada

Keywords: Roman villa, Spatial connections, GIS

Abstract: This research aims to compare Roman villas, in the lesser-known part of the Sabine Territory in central Italy. Using GIS, comparisons are made on surrounding landscapes and proximity to infrastructure, rural markets, and urban centers. This work is examined at two nested spatial scales. At the micro level, the Villa di Tito in modern community Castel Sant'Angelo in the Velino Valley is examined. This is 10km east of Rieti and about 80km northeast of Rome. The larger spatial unit is the Sabine territory and the archaeological sites within it. Chronologically this research focuses on Imperial Rome from the 1st century B.C.E to the 3rd century C.E.

Environmental and cultural datasets form the basis for this analysis. The environmental datasets that include slope, elevation, soil types, geology maps, rivers, lakes, and solar radiation. All these are contemporary while the cultural datasets are Roman roads, drove roads, and the sites are archaeological. There are two forms of analysis that aim to help create the connectivity of the Villa di Tito to the landscapes.

At a micro level, this analysis will examine the physical characteristics of the Villa di Tito and its immediate surroundings, such as soil types, geology, slope, aspect, and elevation, and calculate the distance of ancient roadways, drove roads and navigable waterways. This work will allow for the creation of a weighted overlay that will provide an insight on the agropastoral and economic potential, based in part on the historical evidence for rural economic activities written by authors such as Columella, Varro, Cato and Pliny the Elder. At the macro level the model will then be applied to other villa sites in the Sabine territory. This will identify archaeologically the characteristics of a particular settlement type (Roman Villas) and how the Villa di Tito fits into the overall rural settlement pattern within this part of Italy. It will also be used to identify potential commercial or economic networks to which the villa and other in the Sabine territory may have belonged to.

This research will contribute to our understanding of the economic potential of the Villa di Tito based on a range of important environment and historical factors. Most importantly, the use of spatial analysis mediated by GIS can be used to identify patterns in the location of such villa sites within the ancient Sabina.

Presentation Type: Communication

Landscape Archaeology in the Moldavian Subcarpathians: The Chalcolithic Habitation in Neamț Depression

Constantin Preoteasa, Neamț National Museum Complex - Cucuteni Culture International Research Centre - Cucuteni Eneolithic Art Museum Of Piatra-Neamț, Romania

Carsten Mischka, "Friedrich-Alexander" University of Erlangen-Nurnberg - Institute of Pre- and Protohistory of Erlangen, Germany

Doris Mischka, "Friedrich-Alexander" University of Erlangen-Nurnberg - Institute of Pre- and Protohistory Of Erlangen, Germany

Keywords: Cucuteni civilization, non-invasive surveys, geophysics, UAV, GIS

Abstract: In the period 2017-2022 (with interruptions), non-invasive interdisciplinary archaeological researches (geophysical surveys, aerial drone photography, digital terrain modelling) was carried out in 15 archaeological sites with Chalcolithic remains (grouped in one or more layers) belonging to the Precucuteni-Cucuteni cultural complex in the Neamț (Ozana-Topolița) Depression of the Moldavian Subcarpathians. To these are added three other archaeological sites with Cucuteni settlements in present-day forest areas, as well as salt spring sites, not investigated in this way yet, which complete the overall picture of the Chalcolithic habitat in the mentioned depression area. The results obtained on this occasion partially confirm information previously published in the literature and provide important (often surprising) data on the organization, arrangement and use of the inhabited space, as well as on the relationship between human communities and the natural environment. Features such as the inhabited landforms; the landscape of the area; the boundaries, shapes and sizes of settlements; the types, number and grouping of complexes within them; the current state of preservation of the remains (affected by both natural and anthropogenic factors) and the intensity of habitation have been largely highlighted. This preliminary information (which may be confirmed or refuted by future invasive interdisciplinary archaeological researches) also contributes to the sustainable protection of the tangible mobile cultural heritage of the Cucuteni human communities through a more effective management of the present landscape within this Subcarpathian depression.

Presentation Type: Communication

**Paleotopographic Reconstruction of the
Vetus Urbs of Italica (Seville, Spain):
Spatial Interpolation and Geoarchaeological Studies in Urban
Landscapes**

Maria-Esperanza Roldan-Munoz, University of Seville, Spain

Francisco Borja-Barrera, History, Geography and Anthropology department,
University of Huelva, Spain

Cesar Borja-Barrera, Physical Geography and Regional Geographic Analysis
department, University of Seville, Spain

Keywords: Italica, Paleotopography, Geoarchaeology, Topo to Raster

Abstract: Topography is a basic component of any event that occurs on the Earth surface and its evolution can help us to understand them better. In the reconstruction of past landscapes paleotopography plays a double role: as support and as result of natural and anthropic processes. In our study case, the Vetus Urbs of the ancient Roman city of Italica (Seville, Spain), this back-and-forward relationship has a special significance. This part of the city is consequence of several centuries of urban adaptations to an irregular and high-slope topography. Positive and negative adaptations (cuts, filling, levelling, construction of terraces, etc.), sometimes combined with natural processes, have resulted in the configuration of an authentic tell.

Thus, this work presents a proposal for the paleotopographic evolution of the Vetus Urbs of Italica from pre-occupational to Roman Imperial times. The methodology employed consists in the application of the Topo to Raster interpolation method to the altimetric information provided both by the archaeological excavations and the mechanical cores executed in the study area. This pure spatial analysis has been supported by a detailed geoarchaeological study of two cases, located at the top and at the side of the tell, specifically in the place known as San Antonio's hill (Northeast of the city). These studies have demonstrated its great thickness (over 5 meters), its almost exclusive composition by Roman materials, and the intense urban management of the hillsides.

Presentation Type: Communication

Implications of Geomorphometric Analysis and Soil Research in Preventive Archaeology. Case Study: Bacău City Detour Belt (NE Romania)

Bogdan Roșca, Geographic Research Center, Romanian Academy, Iași Branch, Romania
Radu Gabriel Pîrnău, Geographic Research Center, Romanian Academy, Iași Branch, Romania

Felix-Adrian Tencariu, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Andrei Asăndulesei, Arheoinvest Centre, Department for Exact Sciences and Natural Sciences, Institute of Interdisciplinary Research, "Alexandru Ioan Cuza" University of Iași, Romania

Lăcrămioara Istina, "Iulian Antonescu" Museum Complex Bacău, Romania

Keywords: geomorphometry, DEM, vertisol, soil truncation, preventive archaeology

Abstract: Major infrastructure development projects, in addition to economic benefits, also indirectly contribute to the enrichment of the national archaeological heritage due to preventive archaeological research that precedes such activities, which are mandatory by law. In recent years, the availability of high-quality spatial data from LIDARs and UAVs, together with the development of new tools and methods for soil survey in archaeological areas have led to an increased frequency of interdisciplinary approaches in archaeological research. The main purpose of this study is to highlight the importance of geomorphometric analysis of landforms and the implication of soil investigations in archaeological research carried out, in this case, on the route of the Bacău bypass which shall be integrated in the future A7 highway set to cross Moldova area from north to south. Our research has focused on explaining the origin of several unusual circular pits, revealed by archaeological diagnostic excavations, and originally interpreted as having an anthropic origin. In addition, several geomorphometry-specific methods, starting with the simplest, most commonly used to characterize the terrain (Relative Altitude, Slope, TWI, Surface Curvatures or Closed Depressions) and continuing with the more complex ones, which require many steps and parameters such as Black Top Hat (BTH) or Cartographic Depth-to-Water (DTW) index, were used to more precisely delineate the study area, to avoid unnecessary archaeological excavations. The results showed that the pits originated from the truncation of a large area related to a gilgai microrelief and covered by Vertisols through the artificial removal of the surface soil horizons. The lack of artefacts within these pits and the fact that although the pits are close to one another, but they never intersect are also strong arguments for their natural origin and provenience from truncated Vertisols. Also, by applying the geomorphometric analysis, using high resolution DEM, the area occupied by these

types of soils and implicitly that of the natural levee on which is the area of archaeological interest (rich in materials and artifacts) was identified and delineated more precisely, and by that, we successfully managed to reduce the area under investigation.

Presentation Type: Communication

Beyond the Record: The Use of Non-Invasive Methodologies for the Location and Study of Iron Age Settlements in La Rioja (Spain)

Andrea Solana-Muñoz, Institute of Heritage Sciences (Incipit), Spanish National Research Council (CSIC) / University of Jaén, Spain

Keywords: GIS, Landscape Archaeology, Iron Age, LiDAR, non-invasive methodologies

Abstract: Archaeological research on the Iron Age (8th - 2nd centuries BC) in the present-day territory of La Rioja (Spain) has been characterised by the fragmentation and scarcity of information, the lack of global projects for a comprehensive study of the period as well as the absence of studies that relate the sites to each other and to their surroundings. Moreover, the application of remote sensing and GIS tools has been rare to date, with only a few recent studies of Roman sites.

In view of this situation, I contend that an approach from the perspective of Landscape Archaeology and the use of non-invasive tools and methods, including LiDAR, historical aerial photography, satellite images, and Geographic Information Systems (GIS) is promising to produce a broad-scale temporal and spatial interpretation of the social dynamics of this period. The final objective is to understand the transformations in the forms of occupation, production, and social relations over time from an extensive territorial scale and a long-term temporal perspective.

For this session, I will present a first approach to such a project, that will constitute my future Ph.D. thesis. The work I will display at the conference will include showing how the use of non-invasive tools and methods, consisting of the application of LiDAR, historical aerial images, and satellite images, has been instrumental in the location of new Iron Age fortified sites (castros) and for better characterizing those that had been already catalogued. A comparison with similar sites already excavated south of the Iberian System (province of Soria) will allow proposing a probable chronological attribution, that will be verified with field surveys and the analysis of material culture found on the surface of the sites. Therefore, this paper will also show the results obtained from surveys in six of the new potential castros located using non-invasive methodologies.

Through the use of open-source data and software, this study will illustrate the potential that non-invasive methodologies and GIS have for the reconstruction and modelling of past landscapes in this particular region, as well as the importance of

Landscape Archaeology for the identification and interpretation of social and cultural patterns that are embedded in them.

Presentation Type: Communication

Regional-Scale Mapping of Archaeological Mounds in Southern Iraq with Cosmo-Skymed and Cartosat High-Resolution DEMs

Deodato Tapete, Italian Space Agency (ASI), Italy

Francesca Cigna, Institute of Atmospheric Sciences and Climate (ISAC), National Research Council (CNR), Italy

Keywords: digital elevation model, synthetic aperture radar, stereo-photogrammetry, tells, Iraq

Abstract: First studies showcasing the potential of satellite-derived digital elevation models (DEMs) to search for archaeological tells in Near and Middle Eastern archaeological landscapes date back to the early 2000s. Since then, free and open access global DEM datasets at medium resolution such as NASA's 90 m Shuttle Radar Topography Mission (SRTM) surface model have been increasingly exploited by archaeologists to map tells on a supra-regional scale, and thus analyse past settlement patterns. However, in the specialist literature there is little to no evidence that landscape archaeologists have investigated the improvements brought by higher resolution satellite-derived DEMs, as they were made available by space agencies. To understand how these datasets may support archaeological surveying, we test two high-resolution DEMs generated with (1) interferometric synthetic aperture radar (InSAR) and (2) stereo-photogrammetry (i.e. the two methods typically used for DEM generation), and assess their performance in comparison with openly distributed datasets (i.e. 30 m SRTM DEM and the Advanced Land Observing Satellite World 3D-30 m - AW3D30). We selected the 10 m posting InSAR-derived DEM generated from 3 m resolution StripMap HIMAGE mode images acquired by the Italian Space Agency's COSMO-SkyMed SAR constellation, and the 5 m posting stereoscopic Cartosat-1 Euro-Maps 3D DEM made available through ESA's Earthnet Third Party Missions programme and ad-hoc call for R&D applications. The demonstration was run at regional scale in the Governorate of Wasit in central Iraq, where the literature suggested a high density of sites, despite knowledge gaps about their location and spatial distribution. The enhanced observation capability of COSMO-SkyMed DEM was found advantageous to detect both well preserved and levelled or disturbed tells, standing out for more than 4 m from the surrounding landscape. The mapped tells were then compared and cross-validated with those detected using the Cartosat-1 dataset. Combined exploitation of the two DEMs allows improving the knowledge of type, distribution and condition of local archaeological deposits, also in the context of contemporary land use changes and threats for conservation. Archaeological heritage in Wasit is

currently at risk of vanishing due to natural erosion and weathering, encroachment of anthropogenic activities (e.g., ploughing, infrastructure projects, modern settlement and dam construction) and looting. DEM integration with Google Earth time-lapses (where available at suitable resolution), CORONA KH-4B tiles, 1950s Soviet maps and Copernicus Sentinel-2 multispectral imagery, enabled the identification of looting incidents and tells affected by anthropogenic disturbance (e.g., road and canal constructions or ploughing). While the results of our experiments contribute to the current vivid research on Iraqi archaeological heritage and its challenges for conservation, the developed methodology may stimulate further exploitation in archaeological landscapes with similar characteristics elsewhere, and the future development of semi-automated site and looting detection approaches.

Presentation Type: Communication

**Antiquities in Changing Rural Landscapes:
Using Satellite Imagery and GIS in the Regional Survey of
Northern Messenia, Greece**

Eleni Vallianatou, MSc University of the Peloponnese, Department of Archaeology, History and Cultural Resources Management, Greece

Eleni Zimi, University of the Peloponnese, Greece

George Malaperdas, University of the Peloponnese, Greece

Keywords: Satellite imagery, GIS, rural archaeology, Messenia, archaeological prospection

Abstract: Earth observation technologies are becoming more significant in cultural heritage management and protection. Identifying changes in urban and rural areas caused by natural phenomena, abandonment and low or-non-maintenance, contributes to a better understanding of the contemporary landscapes and prompts their protection from further damage. Residential locations, such as villages and their rural environs, frequently accommodate structures of archaeological interest. Even though these historical structures may be well-known to the local community, they get worn out and destroyed due to lack of use or adequate maintenance. Since the quality of satellite imagery and aerographic photography has vastly improved, high-resolution photographs are valuable for observing changes in the environment and the surroundings of inhabited sites. We can more effectively monitor the changes that occur in a larger research area with the help of GIS and the use of multilayer maps and data digitalization.

Northern Messenia, in the SW of the Peloponnese, is known for its rich mythological past and its fertile Stenyclarian plain, which was conquered by the Spartans in c. 735-715 BC. This paper aims to show the impact of agriculture and

natural phenomena on arable fields with antiquities in this region, exploring two case studies: a) a partly excavated late Roman bath complex with a mosaic floor, SE of the modern village of Polichni, b) the ruins of the Byzantine church of Hagios Athanasios, NW of the contemporary village of Stenyclaros. The DTM model regarding the aspect and slope analysis combined with satellite data demonstrated that both fields have a SE orientation. The field where the late Roman bath complex was found has a lower elevation and a high hydrological activity, making it an ideal place for agricultural activities. In the case of the field where the church of Hagios Athanasios is located, agricultural activities were not possible before the road construction in the 1990's and the irrigation of the land. Hence, for the past 20 years, these archaeological sites have been affected by different factors: the abandonment of the plot combined with the weather conditions partially destroyed the geotextile and exposed the mosaic floor to the weather elements, whereas natural vegetation and seasonal agriculture had a deteriorating impact on the ruins of the church of Hagios Athanasios.

Presentation Type: Communication

Developing High Resolution Topographic Models for the Middle and Upper Palaeolithic Hominin Settlements in Kermanshah Region

Masoud Yousefi, University of Tehran, Iran

Anooshe Kafash, University of Tehran, Iran

Elham Ghasidian, Stiftung Neanderthal Museum, Germany

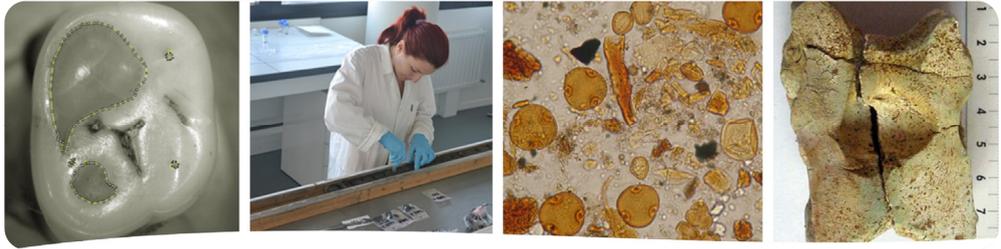
Saman Heydari-Guran, Stiftung Neanderthal Museum, Germany

Keywords: Paleodistribution, Maxent, niche modeling, Identity test, niche similarity

Abstract: Growing evidence shows that the coexistence and interbreeding of two hominin subspecies of *Homo sapiens neanderthalensis* and *Homo sapiens sapiens* took place several times in Western Eurasia. Therefore, the areas associated with Middle and Upper Paleolithic settlements may contribute to the possibility of these two subspecies meeting. In this study, we aim to develop two high resolution topographic niche models for the Middle and Upper Palaeolithic hominin settlements in the Kermanshah Region. We used maximum entropy approach and six topographic variables (aspect, slope, Topographic Position Index, footslope, peak (%) and valley (%)) based on Digital Elevation Model (DEM) to reconstruct two topographic models for these settlements. Then, we applied three identity tests metrics: the Schoener's D, Warren's I and Rank correlation in ENMTools 1.0.4 to compare topographical niche models of the two groups in both geographical and environmental spaces. The results approve that aspect was the most important determinant of the Middle and Upper Palaeolithic hominin settlement patterns in Kermanshah. Both groups preferred areas facing southeast. Three identity test metrics showed that the Middle and Upper Palaeolithic hominin settlement

topographic niches were not significantly different. We applied ecological niche modelling in studying the settlement pattern using high resolution topography data. Eventually, we found that the two groups have had topographically similar niches, presenting Kermanshah region as a high potential meeting area for two subspecies of Neanderthals and Homo sapiens.

Presentation Type: Poster



SESSION 15. BIOARCHAEOLOGY: EXPLORING THE INTERRELATIONSHIP OF HUMAN AND NATURAL SYSTEMS

Session Organizers:

Luminița Bejenaru, “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Iași, Romania

Mihaela Danu, “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Iași, Romania

Keywords: archaeozoology, archaeobotany, paleoanthropology

Session description:

Bioarchaeology reconstructs the past through the analyses of biological remains (i.e., human, animal and plant remains) recovered from archaeological sites, generating and integrating valuable data to understand the interrelationship of human and natural systems. This session aims to bring together interdisciplinary studies highlighting the importance of the bioarchaeological results for the landscape archaeology. Contributions may address a wide range of topics belonging to archaeozoology, archaeobotany, and paleoanthropology, all correlating biological data with aspects of ecological and cultural contexts (e.g., animal and plants used for food and other purposes, anthropic pressure on landscapes, human diet, health and lifestyle, economic life, ritual practices etc.). There are welcome current researches based on classical and new methods (e.g., analysis of ancient biomolecules and stable isotopes, dental wear, geometric morphometrics, palaeohistology, multivariate statistics), addressing questions regarding past societies and their interactions with the environment.

Resources of Animal Products in Medieval Moldova: The Case Study of Lăpușna Town

Luminița Bejenaru, “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Ludmila Bacumenco-Pîrnău, Institute of Archaeology, Romanian Academy - Iasi Branch, Romania

Ion Ursu, “Ion Creangă” State Pedagogical University of Chișinău, Republic of Moldova

Keywords: archaeozoology, domestic animals, wild mammals, fish

Abstract: This communication intends to present the results of the study of faunal remains collected during the archaeological campaigns of 2013 and 2014, from Lăpușna (Republic of Moldova), one of the important towns of Medieval Moldova. Archaeozoological data indicate that the main meat resource was provided by domestic species (the frequency of these remains exceeds 90% of the analysed sample), the most common of which are cattle (*Bos taurus*), sheep/goat (*Ovis aries/Capra hircus*) and pig (*Sus domesticus*). The diversity of animal resources was enhanced by hunting – for example of red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*), as well by fishing. Analysing the archaeozoological sample also in terms of the quality of products provided, different indicators were used, such as skeletal frequency and the selection of animals according to age and sex.

Presentation Type: Communication

The Human-Plant Relationship through Ritual Practices. Case Study: the Chalcolithic Site Isaiia, Eastern Romania

Casandra Brașoveanu, Arheoinvest Centre, Institute of Interdisciplinary Research, “Alexandru Ioan Cuza” University of Iași, Romania

Mihaela Aurelia Danu, “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Felix-Adrian Tencariu, Arheoinvest Centre, Institute of Interdisciplinary Research, „Alexandru Ioan Cuza” University of Iași, Romania

Diana Măriuca Vornicu, Institute of Archaeology, Romanian Academy - Iași Branch, Romania

Andrei Asăndulesei, Arheoinvest Centre, Institute of Interdisciplinary Research, “Alexandru Ioan Cuza” University of Iași, Romania

Claire Delhon, CNRS, CEPAM, UMR 7264, Université Côte d’Azur, Nice, France

Keywords: phytoliths, fertility cult, Chalcolithic, Eastern Romania

Abstract: The research of prehistoric periods, and not only, has gained important insights due to the development of the analysis of phytoliths, during the last

decades. On the Romanian territory, the Chalcolithic period has had a long history of research, but still benefits of a relatively small number of studies dedicated to archaeobotanical analysis. The latter are absolutely necessary when talking about the human-plant relationship, especially since the period in question offered large quantities of archaeobotanical material. Also, the specific beliefs of these communities, which are concentrated around the fertility cult, emphasize the role of palynological determinations.

We aim to present the archaeological context and palaeobotanical investigations of an important discovery made in the Chalcolithic settlement of Isaiia-Balta Popii, located in Eastern Romania. The dwelling excavated during 2015 and 2017 campaigns, brought to light an important finding, consisting of a medium sized ceramic vessel placed on the floor, near the western corner of the house. Inside the pot were deposited two objects made of burnt clay: an anthropomorphic figurine (with pregnancy depiction) and a small cone. Given the special character of the deposition, we collected several samples from the vessel and near it, in order to perform phytolith analysis; also, samples of bone found next to the vessel and from the nearby features were dated by AMS radiocarbon.

The results of palaeobotanical investigations, namely phytolith analysis, have proven that the plants in association with the small artefacts were cereals and mugwort. Both, but especially the latter, are known, besides their practical uses, as powerful symbols, used for ritualic/ magic purposes, throughout different historical periods. Thus, the palaeobotanical analysis augments the interpretation of the deposition as a result of ritual activities, related to fertility.

Presentation Type: Communication

**Animal Resources used in the Prehistoric Settlement of
Precucuteni Culture from Isaiia (Iași County, Romania):
Case Study of the Balta Popii Site, Pits no. 78 and 79**

Eliza-Ioana Crețu, "Alexandru Ioan Cuza" University of Iași, Faculty of Biology, Romania,

Felix-Adrian Tencariu, "Alexandru Ioan Cuza" University of Iași, Institute of Interdisciplinary Research, Department of Exact and Natural Sciences, Arheoinvest Centre, Romania

Andrei Asăndulesei, "Alexandru Ioan Cuza" University of Iași, Institute of Interdisciplinary Research, Department of Exact and Natural Sciences, Arheoinvest Centre, Romania

Luminița Bejenaru, Romanian Academy – Iași Branch, "Olga Necrasov" Centre for Anthropological Research, Romania

Keywords: archaeozoology, prehistory, Precucuteni culture, animal husbandry, hunting

Abstract: The current paper presents the study of a faunal sample, collected from two different pits (no. 78 and 79), discovered in the prehistoric site of Precucuteni culture (ca. 5000 - 4500 BC) at Isaiia-Balta Popii (Iași County, Romania), during the archaeological campaign of 2018. This study aims to contribute to the knowledge of the relationships between prehistoric human communities and the animal world, in terms of paleoeconomy and paleoenvironment. Within the archaeozoological samples that have been studied, various animal remains were identified to be associated with practices such as mollusc harvesting, fishing, hunting and animal husbandry, the latter one representing the main meat resource of the local economy. The frequency of identified domestic species (*Bos taurus*, *Ovis aries*/*Capra hircus*, *Sus domesticus* and *Canis familiaris*) is 40.68%, and of wild animals (*Cervus elaphus*, *Capreolus capreolus*, *Bos primigenius*, *Sus scrofa*, *Lepus europaeus*, *Ursus arctos* and *Emys orbicularis*) is 6.46%. The identified molluscs (*Cepeae* and *Unio*) represent 10.83% of the sample, and fish 6.97%. A significant percentage of faunal remains (35.04%), all belonging to mammals, were not identified up to species level, due to their excessive fragmentation.

Presentation Type: Communication

Historical and Anthropological Data from the Monastic Cemetery from Văratec Monastery (Neamț County)

Vasile Diaconu, Neamț National Museum Complex, Romania

Angela Simalcsik, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; Institute of Bioarchaeological and Ethnocultural Research (ICBE), Chișinău, Republic of Moldova; Cultural-Natural Reserve „Orheiul Vechi”, Butuceni, Republic of Moldova

Keywords: Văratec Monastery, funeral complexes, monastic behavior, anthropological study

Abstract: Archaeological research carried out recently at the Văratec Monastery, in Neamț County, has allowed the investigation of an important segment of the old cemetery of the monastic settlement. The monastery was founded in the second half of the 18th century, but during the next century it experienced an enhanced development, being built two more churches. According to local tradition, one of these churches was built over the old cemetery. This detail is argued by recent archaeological discoveries, which confirmed the existence of a funerary space that functioned for most of the 19th century.

In this regard, 72 funeral complexes were investigated, of which 43 were re-buried and 29 were buried, most of which were attributed to members of the monastic community, as shown by the specific funerary inventory (inscribed bricks).

The obtained archaeological informations are extremely valuable precisely because it provides a very complex picture of the funerary behaviour characteristic of the monastic environment.

To complete the historical information from the archaeological research, the entire osteological material was the subject of an anthropological study. It comes from at least 122 individuals, mostly adults, a few juveniles, very few children. Among adults, female individuals predominate. Numerous dental and bone pathologies were frequently reported in the Late Medieval and modern populations, as well as anomalies, epigenetic features and traumas.

From the category of dental diseases, we mention dental caries, antemortem tooth loss (frequently up to edentation, periodontitis), apical abscess and supragingival calculus.

The identified markers of physiological stress are porotic hyperostosis, cribra cranii, dental enamel hypoplasia, periosteal reactions, cribra femoris and undersized stature.

We mention some lytic lesions on the bones of the neurocranium (on the endocranial plate), probably benign neoplastic diseases. The same type of lesion, this time of infectious origin (*Treponema* sp.), was recorded on the postcranial and cranial bones of three individuals.

The most common osteopathies are those of the joints (intervertebral hernia, osteoarthritis, joint ankylosis, osteoporosis), which correlate very well with enthesopathic changes, present on all skeletal elements responsible for mobility - the bones of the belts and limbs.

Two cases of achondroplasia stand out from the category of anomalies with genetic determinism. Traumas are not very common, sometimes with post-traumatic complications. Most are produced in a "domestic" context, only a few reveals interpersonal violence.

Presentation Type: Poster

Palaeopathological Analysis of the Skeleton M38 of 16th Century, discovered at "Frumoasa" Monastery From Iași (Romania)

Vasilica-Monica Groza, Romanian Academy – Iași Branch, "Olga Necrasov" Center of Anthropological Research, Romania

Ozana-Maria Petraru, Romanian Academy – Iași Branch, "Olga Necrasov" Center of Anthropological Research, Romania; "Alexandru Ioan Cuza" University of Iași, Faculty of Biology, Romania

Mariana Popovici, Romanian Academy – Iași Branch, "Olga Necrasov" Center of Anthropological Research, Romania

Mădălin-Cornel Văleanu, "Moldova" National Museum Complex of Iași, History Museum of Moldova, Romania

Luminița Bejenaru, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Keywords: palaeopathology, image analysis, medieval human skeleton, Iași (Romania)

Abstract: In this study, the authors present the palaeopathological analysis of a skeleton of 16th century discovered at the “Frumoasa” Monastery from Iași (Iași County, Romania), during the preventive archaeological research in 2018-2019.

The skeleton named M38, belonging to a young male of about 25-30 years, was discovered in a partially disturbed tomb, with 14 gold coins of 16th century; it is incomplete, showing signs of old cracks in some bones (i.e., parietal, femur). The macroscopic and stereomicroscopic analyses were followed by imaging analysis (i.e. radiology and computed tomography).

The analysed skeleton shows an important pathological load dominated by the signs of Scheuermann's disease, mainly identified by the deformity of the thoracic vertebrae, which caused an excessive curvature in the dorsal region, with a visible deformity of the back in the shape of a hump. This condition usually occurs during the period of growth and development, before puberty, being more common in males. Although, the Scheuermann's disease is a common clinical finding in present, few cases have been reported in ancient skeletal remains. Therefore, the case describe in this work contributes to the palaeopathological knowledge of the medieval populations.

Other pathologies were identified on the same skeleton: spina bifida occulta at the level of the sacrum bone, multiple dental caries, dental calculus, and dental enamel hypoplasia. The identified enamel hypoplasia is of linear transversal type, on incisive, canine, and premolar teeth. Enamel hypoplasia is a developmental anomaly caused by perturbations of amelogenesis, representing a nonspecific indicator of health or/and nutritional status in human populations; it is a response of the human body to physiological stress. Enamel defects have been widely used by anthropologists for the investigation of growth disruptions in the past populations, as they are indicators of disturbances during child's developmental period.

This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P4-PCE-2021-1180, within PNCDI III

Presentation Type: Poster

Diet-Related Wear of the Mandibular M2 Molar: Comparison between Prehistory and 17th Century Dental Samples from North-Eastern Romania

Ozana-Maria Petraru, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania,

Mariana Popovici, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania

Vasilica-Monica Groza, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania

Luminița Bejenaru, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Keywords: dental wear, diet, human molar teeth, North-Eastern Romania

Abstract: Dental macrowear refers to the loss of dental hard tissues usually on the occlusal surfaces of teeth and it is not a result of dental pathologies or trauma. Visible to the naked eye, dental macrowear can be particularly useful for detecting information regarding diet and the physical properties of the consumed food - including preparation techniques, being influenced by the environment through the ingestion of grit. The aim of this study refers to the diachronic comparative assessment of dental wear of the human second molars (M2) from Prehistory (Chalcolithic and Bronze Age) and 17th century archaeological populations discovered in North-Eastern Romania. The degree of dental wear was evaluated by the semiquantitative scoring system (Scott's method for recording occlusal molar wear), quantitative assessment on dentine exposure (image analysis) followed by the statistical analysis. Spearman's test was used to analyze the correlations between the age and the percent of dentine exposure. Likely, the scoring system showed that a higher percentage of the analyzed mandibular molars are characterized by a highly advanced wear and it belongs to Prehistory. When the sex criterium was considered, the male molars were more worn-out compared to female ones, in both Prehistory and 17th century samples. Furthermore, the 17th century female molars are all (100%) characterized by a moderate wear while only 63.6% of the female molars from Prehistory belong to the same wear category. The percentage of dentine exposure (PDE%) showed similar results with the scoring system with increasing values along the age-ranges. Although, the results showed a pronounced dental wear in the Prehistory samples, no statistical difference was obtained when PDE was compared diachronically within each sex and age at death category. In the linear regression analysis, the age and the dentine exposure percent, as variables, are corelated in 52% for Prehistory and in the 50% for 17th century. Apart from age, there may be other

factors that can affect the loss of dental tissue, especially in archaeological populations, that could be also considered, including diet, food access and processing techniques, and ingestion of grit through food.

Presentation Type: Poster

Observations on Dental Phenotype in Archaeological Human Populations: Environmental Stress and the 2nd Upper Molar Morphology

Mariana Popovici, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania,

Ozana-Maria Petraru, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Vasilica-Monica Groza, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania

Luminița Bejenaru, Romanian Academy – Iași Branch, “Olga Necrasov” Center of Anthropological Research, Romania; “Alexandru Ioan Cuza” University of Iași, Faculty of Biology, Romania

Keywords: maxillary second molar, Geometric morphometrics, environmental stress, Prehistory, 17th century, North-Eastern Romania

Abstract: This study examines the variability and the role of environmental stress on dental phenotype in archaeological human populations dating from Prehistory (i.e., Chalcolithic ~5000-3800/3700 BCE, Bronze Age ~3500-2150/1150 BCE), and the Late Middle Ages (17th century) discovered in North-Eastern Romania.

The second maxillary (upper) molar (n=87) was used as phenotypic marker, while odontopathies (i.e., root remains, radicular cyst and dental enamel hypoplasia) and bone pathologies (i.e., porotic hyperostosis and cribra orbitalia) were used as variables for the influence of the environmental stress. Geometric Morphometric technique was applied in this research. The quantitative data were collected using a set of 32 landmarks located on the occlusal surface, highlighting the contour of the tooth and the shape of the cusps. The coordinate data were used to Generalized Procrustes Analysis, thus obtaining Procrustes coordinates and Centroid Size (CS).

CS did not show differences when the dental samples were compared by periods, sexes or individuals with or without pathologies. Also, when the shape of the maxillary second molar was evaluated, the Principal components analysis revealed that individuals tended to cluster together showing some phenotypic homogeneity. Instead, the Discriminant Analysis highlighted particularities of the molars, depending on the comparison criteria. Considering the variability of the buccal region and the points of intersection of the cusps at the central level of the molar occlusal surface, tooth distinct models were obtained for the archaeological

populations mentioned above (i.e., Chalcolithic, Bronze age, and Late Middle Ages). Moreover, it was highlighted an influence of stress factors on the shape of molars belonging to individuals with dental and bone pathologies. Within the group of individuals with pathologies, two patterns of variation were observed, which targeted hypocone and paracone cusps.

Our findings are new confirmations of the complexity of information that can be provided by the dental morphology, rising new questions related to the evolution of human populations, and their adaptation to environmental conditions.

Presentation Type: Communication

Seeds of Change: An Integrated Approach to Regionality and Peasant Autonomy in 1st Millennium CE Italy

Roberto Ragno, Università degli studi di Bari Aldo Moro, Italy

Keywords: Archaeobotany, Multivariate statistics, Agrarian economy, First millennium, Italy

Abstract: This paper focuses on long-term cereal farming practices of the Italian peninsula in the first millennium CE. I compare selected archaeobotanical samples from 148 contexts to assess variation at a macro-regional scale in mainland Italy (Northern, Central and Southern). The research uses non-parametric multivariate statistics and dimensionality reduction algorithms (NCA, NMDS) on presence/absence data to test, classify and visualize the emergence of regional patterns in the dataset. The preliminary results show that in the Roman and Late Roman phases (1st c. BCE–5th c. CE), the differences between Northern and Southern Italy are not statistically significant, meaning that the Italian cereal landscape did not vary greatly across the peninsula. Conversely, the samples tend to separate and become more diverse during the early medieval period (6th–10th c. CE). In Northern Italy, the loss of centralized power over the countryside led to the introduction of more resilient and short-cycled grains by the early medieval peasants—rye, einkorn, emmer, oats, and millets. This strategy was a way of minimizing the risk of food shortage caused by climatic, political, and social changes. In Southern Italy, the agricultural economy was instead still largely based on wheat and barley, with a far lower spread of minor cereals. Central Italy data is too scarce and unbalanced for the statistics to be significant. Overall, I argue that bioarchaeology shows that after the collapse of the Roman Empire northern peasants acquired more autonomy in selecting their crops and adopted new subsistence strategies, while southern farmers were more resistant to change.

Presentation Type: Communication

Medieval Settlements of Noviodunum and Enisala (Tulcea County, Romania): Archaeological and Archaeozoological Data

Margareta Simina Stanc, "Alexandru Ioan Cuza" University of Iași, Romania

Aurel Daniel Stănică, Eco-Museum Research Institute, Romania

Constantin Aurel Mototolea, National History and Archaeology Museum of Constanța, Romania

Luminița Bejenaru, "Alexandru Ioan Cuza" University of Iași, Romania

Keywords: northern Dobrogea, fortresses, wild and domestic animals

Abstract: Noviodunum archaeological complex is located on the right bank of the Danube River, on a promontory near the most important ford of the river in northern Dobrogea, at the point "the Old Pier" or Eski-Kale. By its geographical position, Noviodunum had an important strategic and economic role in the Roman, and Byzantine times, with the settlement ceasing here at the end of the 14th century and continuing on the territory of the actual Isaccea town. The 2014 preventive archaeological research in the sector "Land Border Police" identified an area of intense habitation (113 complexes), attributed to the Middle-Byzantine period (13th century). The archaeological complexes are represented by dwellings, pits, poles, pottery ovens, and also inhumation tombs. 3803 faunal remains have been collected, coming from molluscs (2), fish (565), reptiles (1), birds (311) and mammals (2924).

In 2014, an archaeological preventive research was carried out outside the Enisala Fortress archaeological site, in the project "Emphasizing the historical heritage - the Enisala Fortress, specific to the Sarichioi fishing area, Tulcea County". In the two researched surfaces (S1 and S2) a number of 13 pits were investigated (10 pits, and 3 pits respectively). In 13 residential complexes, a variety of materials were discovered – ceramic fragments, animal bones, fish scales, deer antlers, iron arrow tips, and different other artefacts (e.g. sewing needle, knife blade, iron sleeve, iron horseshoe). According to ceramic material, the investigated complexes are dated to the second half of the 15th century. Archaeozoological sample includes 685 remains: 49 of fish, 12 of birds and 624 of mammals.

The remains of domestic mammals predominate in the both assemblages (Noviodunum and Enisala), and the identified species are cattle (*Bos taurus*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus domesticus*), horse (*Equus caballus*), and dog (*Canis familiaris*). Cattle is dominant, followed by sheep/goat and pig.

Seven species of wild mammals have been identified, of which red deer (*Cervus elaphus*), wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), aurochs (*Bos primigenius*), and hare (*Lepus europaeus*) are present in both assemblages; wolf (*Canis lupus*) has been identified only at Noviodunum, and bear (*Ursus arctos*) only at Enisala. We notice the presence of forest wild species (i.e. red deer, wild boar, bear), as well as those of forest-edge and open field (i.e. roe deer, hare, aurochs).

Considering the location of fortresses and the relative small number of fish remains that has been identified in the samples, we consider that fishing is underestimated due to the method of collection by hand and not by sieving sediments.

This work was supported by a grant of Ministry of Education from Romania, CNCS-UEFISCDI, project number PN-III-P4-PCE2021-1180, within PNCDI III.

Presentation Type: Poster



SESSION 16. LANDSCAPES AS LIVING ARCHIVES: "MULTI-PROXY" APPROACHES TO PROFILING SOCIO-ECOLOGICAL CHANGES OVER TIME AND ACROSS SPACE

Session Organizers:

Ella Quante, Institute for Geosciences, Friedrich Schiller University Jena, Germany / Department of Archaeology, Max Planck Institute for Geoanthropology, Jena, Germany

Anna Pint, Institute of Geosciences, Friedrich Schiller University, Jena Germany

Federica Sulas, McDonald Institute for Archaeological Research, University of Cambridge, United Kingdom

Keywords: Multi-Proxy Approach, Geoarchaeology, Geology

Session description:

Landscapes are unique archives of human fingerprints and environmental processes. A long tradition of archaeological research has elucidated key developments of human landscapes, from the longevity of agricultural expansion in temperate regions to creative responses to serendipitous climate extremes in the Mediterranean basin, to mention but two important examples. As landscape archaeology deepens and widens knowledge of the past, so do the challenges of disentangling the complexities of the human-environment nexus: socio-ecological processes, actors, and impacts operate at multiple spatial and temporal scales; the importance of baseline and reference datasets to characterize natural versus anthropogenic conditions, processes, and outputs. Furthermore, most of the theories and practices of landscape archaeology have developed in and for temperate environments, making their applications to other biogeographic settings not straightforward. Methodological advances in the extraction and study of multiple proxies, from organic and inorganic sources to remotely sensed records and nano-scale markers, are expanding resolution and detail at an unprecedented level. However, these advances also introduce new challenges: which methods to integrate to investigate what and where. Recent applications combining geomorphological, geophysical, bio-geo- archaeological analyses have proven robust and effective in examining archives and deciphering landscapes' evolution under human influence.

To push research, we call for contributions that illustrate the potentials, challenges, and frontiers of multi-proxy methods and multi-scalar analysis in profiling human landscapes throughout time. Looking at landscapes as archives, specific topics to be addressed include (1) Baseline and reference data; (2) Context versus scale; and (3) Trends versus anomalies

Quaternary Landscape Evolution of Petra: Tectonics, Climate and Man

Nizar Abu-Jaber, German Jordanian University, Hashemite Kingdom of Jordan

Abdulla Al-Rawabdeh, Yarmouk University, Hashemite Kingdom of Jordan

Catreena Hamarneh, German Protestant Institute for Archaeology, Hashemite Kingdom of Jordan

Sahar Al Khasawneh, Yarmouk University, Hashemite Kingdom of Jordan

Keywords: Petra, Jordan, landscape, climate, geology

Abstract: The evolution of the Dead Sea rift system in the Wadi Araba area has led to the formation of horst-graben structures in the area of Petra, southern Jordan, on the eastern side since the Miocene. During the Quaternary, the pluvial climate allowed for the formation of freshwater lakes in these basins, filling them with pluvial and alluvial sediments. At the end of the Pleistocene the climate changed and tectonism caused a breach in the closed basin. Subsequent flooding, erosion and denudation shaped the landscape that is seen today. Throughout the Holocene, this dynamic process led to creating the steep slopes, soils, gorges and other features of the landscape. At the same time, these processes opened possibilities and presented challenges in the management of the area.

For example, the bedrock denudation in the Holocene exposed fresh, vertical sandstone cliffs that the Nabateans later carved into the iconic facades for which Petra is famous. The limestone slopes that overlook the ancient city were of critical importance because they provided spring water, agricultural spaces and strategic control of the area. At the same time, flash floods, debris flows and landslides were constant sources of threat to the inhabitants and visitors of the city as early as the Neolithic period. Beginning of the Iron Age, but especially in the Nabataean period, all of these elements dictated how the region evolved and how the peoples of the area managed that as clearly deduced from the settlement patterns uncovered today.

Presentation Type: Communication

A Multi-Scalar Approach to Land-Use History in Southern Romania

Emily Vella, Uppsala University, Sweden

Keywords: multi-proxy approach, data scarcity, land-use, Danube Delta, Romanian Plains

Abstract: Landscape approaches in archaeology can provide insight into the complex dynamics of past human-environment interactions. This research can be particularly valuable in the context of contemporary human-induced climate change. As our understanding of how our landscapes evolved increases, we can better understand how our current and future actions can influence our environments. One major caveat, however, is that change to human-environment

interactions is not static but dynamic across time and space and different patterns are visible at different spatial and temporal scales.

In this presentation, I will explore the land-use history of Southern Romania from the beginning of the Neolithic until the end of the Eneolithic across time and space. Land-use history is determined by numerous types of data, including material culture, faunal remains, and archaeological features. By using different temporal and spatial scales to explore archaeological and environmental datasets, different patterns can be observed at these different scales. Southern Romania is an interesting field lab to explore this topic because it contains three important landscape types: the Danube Delta, the Carpathian Mountains, and the Romanian Plains. This region presents important challenges to consider due to data scarcity, irregularity, interoperability and variety.

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement no. 813904.

Presentation Type: Communication

Early Anthropogenic Impacts on Landscapes and Natural Systems of Limagne Plain (FR.): A Multi-Proxy Geoarchaeological Approach

Alfredo Mayoral, Catalan Institute of Classical Archaeology. Landscape Archaeology Research Group (ICAC-GIAP), Tarragona, Spain; Université Clermont Auvergne, CNRS, GEOLAB, France

Salomé Granai, GéoArchÉon, Vigneulles-lès-Hattonchâtel, France; CNRS, Université Paris 1, UPEC. UMR8591. Laboratoire de Géographie Physique: environnements quaternaires et actuels, Meudon, France

Paul Ledger, Department of Archaeology, Memorial University of Newfoundland & Department of Geography, Memorial University of Newfoundland, Canada

Jean-Luc Peiry, Université Clermont Auvergne, France; CNRS, EDYTEM, France

Jean-François Berger, CNRS, UMR 5600, EVS-IRG, France; Université Lyon 2, Lyon, France

Anne-Lise Develle, UMR 5204 EDYTEM, Université Savoie Mont Blanc, CNRS, France

Emmanuelle Defive, Université Clermont Auvergne, CNRS, GEOLAB, France

Franck Vautier, Université Clermont Auvergne, CNRS, Maison des Sciences de l'Homme, France

Yannick Miras, CNRS, UMR7194, Histoire Naturelle de l'Homme Préhistorique, Département de Préhistoire, Muséum National d'Histoire Naturelle, Institut de Paléontologie Humaine, Paris, France

Keywords: Geoarchaeology, Palaeoenvironment, Anthropogenic impact, Limagne, Holocene

Abstract: The Limagne plain in central France is a small region with a well-known archaeological record and relatively abundant Holocene palaeoenvironmental

studies. However, fine interpretation of long-term socio-environmental interaction is still problematic due to the frequent lack of reliable radiocarbon frameworks, and to the pedological complexity of the apparently homogeneous Limagne dark soils. In order to address these challenges and characterize in detail the onset of human impacts on Limagne landscapes during the second half of the Holocene, a new multi-proxy and multi-scalar geoarchaeological and palaeoenvironmental approach has been developed since 2014. We implemented this integrated methodology in the archaeological site of Corent, located in a volcanic plateau of southern Limagne and occupied from the Neolithic to Roman times. We retrieved several sedimentary sequences from two wetlands in different but complementary geomorphological and archaeological contexts: a pond with a small basin in the plateau itself close to the site, and a depression with a larger watershed in the surrounding lowlands. We dated them by radiocarbon using carefully selected organic remains in order to allow the construction of robust high-resolution age-depth models. Multi-proxy geoarchaeological analyses (sedimentology, geochemistry, micromorphology) of these records were combined with malacological and palynological data. Soil micromorphology was crucial to interpret complex pedo-sedimentary processes and also very useful for multi-proxy dataset integration. Micro-scale analyses were completed with landscape-scale geomorphological and geoarchaeological prospections to allow spatial integration and interpretation. Results have allowed to characterize long-term socio-environmental dynamics in landscapes of southern Limagne, to identify threshold phases and to discuss the causality behind them. Between the Neolithic and the Middle Bronze Age, the signal of natural hydro-climatic fluctuations is clearly detected in sedimentary records, whereas human impacts on hydro-sedimentary systems and soils seem rather limited and spatially constrained. During the Late Bronze Age these impacts start to increase slowly, and reach a clear threshold in the 7th c. BCE in the Hallstatt period. These data indicate that anthropogenic forcing of soils and hydro-sedimentary systems in Limagne started much earlier than usually acknowledged. This threshold, followed by a gradual increase of impacts during La Tène and Roman periods, has also been detected recently in other Limagne areas such as the Sarliève palaeolake close to the Gergovie plateau. These findings will contribute to the ongoing debate around the precocious landscape-scale forcing of natural systems during the Early Iron age in Western Europe, and its potential connection with the emergence of first proto-urban phenomena in the same period.

Presentation Type: Communication

**Environment and Heritage as an Inseparable Binomial:
An Interdisciplinary Study of a Multi-Phase Site. The Peña Cortada
Aqueduct (Valencian Community, Spain)**

Juan José López Martínez, Consejo Superior de Investigaciones Científicas, Spain
Antonio Delgado Huertas, Consejo Superior de Investigaciones Científicas, Spain
Sabina Asins Velis, Consejo Superior de Investigaciones Científicas, Spain
María José Molina Donate, Consejo Superior de Investigaciones Científicas, Spain

Keywords: Landscape, Palaeoenvironmental, Peña Cortada aqueduct, Roman hydraulic engineering, Sedimentological samples

Abstract: The Peña Cortada aqueduct was (and is) one of the most important examples of ancient hydraulic engineering preserved in the Valencian Community (Spain). Built in Roman times, between the end of the 1st century AD and the beginning of the 2nd century AD, its creation meant a real transformation of the landscape, through the construction of vast kilometric canals, about 30 kilometres long, from the current village of Tuéjar to the ancient Domeño. Since its construction, excavated in the rock opencast, and subsequent abandonment, it has constituted a sediment trap for the soil that covers the hillside. The different climatic changes, including episodes of torrential rainfall, typical of the region, with periods of drought over the last millennia, make this aqueduct an example of "sedimentological traps". In this communication we present an interdisciplinary study based on the collection of sedimentological samples with the aim of establishing a diachronic evolution of the environmental variability of the area from the creation of this hydraulic structure to the present day. The analysis of the carbon balance in the soil by carbon isotopic tracing (¹²C, ¹³C, ¹⁴C), combined with the information on temperature and/or water types provided by $\delta^{18}\text{O}$, will allow to identify the role of climate and human activity in the evolution of the landscape.

Presentation Type: Communication

Living Landscapes in Ice Age Art

Bernie Taylor, Community Member, USA

Keywords: Prehistory, Geology, Geoarchaeology, Cave Paintings

Abstract: Upper Paleolithic Iberian cave art analyses have been focused on the identification of the depicted animals, dating, artistic styles and techniques, as well as hypotheses concerning the artists' states of mind. Little examination has been made of the depicted subjects' natural environments or if any terrestrial landscapes were projected onto cave walls. This might logically have been considered as natural landscapes, especially mountains, are featured in sacred traditions and myths

worldwide. The global observance of sacred mountains may indicate prehistoric roots. This study compared the details of previously published Upper Paleolithic images from caves in Northern Spain that are in the greater range of the Basque people with prominent natural landscapes observed outside of caves in the region. The findings demonstrate that Upper Paleolithic cave artists in Northern Spain found geological features outside of caves that were meaningful to them and then projected those terrestrial visualizations onto the walls of caves. The choice of cave panels by the Ice Age artists appears to have been determined by the initial identification of natural geological irregularities on the cave walls that had some visual similarities with the terrestrial landscapes. Those natural geological irregularities on the cave walls were then improved upon to be more closely representative of the terrestrial landscapes. In this presentation, five late Pleistocene art panels in four caves are shown to represent two mountain landscapes that are each pictorially associated with one animal species. The findings suggest that current Basque sacred traditions in Northern Spain for the depicted animals and reverence of living mountain landscapes may have been observed in the region before ancient times, as archived in the ethnographical, geoarchaeological and prehistoric archaeological records.

Presentation Type: Communication



SESSION 17. AFFECTIVE LANDSCAPE AND RATIONAL IDENTITIES: SENSORY APPROACHES IN LANDSCAPE ARCHAEOLOGY

Session Organizers:

Pamela Jordan, University of Amsterdam, Netherlands

Sara Mura, University of Amsterdam, Netherlands

Keywords: Landscape, senses, affective, experience, embodiment, conservation

Session description:

The approaches and interpretations applied in landscape archaeology were founded on the assumed primacy of visual means. For many generations of researchers, an ever-expanding variety of 2D images—maps, plans, (aerial) photography, drawings—have been considered the appropriate tools for critically examining the structures and cultural formation of landscapes. As a result, a landscape has been understood as something comprehensible when and as seen. However, the common understanding of ‘landscape’ has been broadened in the last few decades by multidisciplinary approaches combining traditional archaeological perspectives with more affective fields, from phenomenology to psychoacoustics and disability studies. Innovative sensory-based investigatory methods employ acoustic analysis, smell-scape and taste-scape studies, and kinesthetic research at varying scales, for example. These and many other approaches place individual human experience in the center, productively questioning the Cartesian or ocular-centric foundations of landscape archaeology and uncovering how the entire human sensorium has played a role in human-environment interrelationships. It is through the whole body that people shape and are shaped by the surrounding world, continuously recreating their knowledge, behavior, and social memory.

Studied either separately or through cross-modal interactions (such as the effects of synesthesia), affective research methods have identified undervalued sensuous qualities of material space and forms of place-making. Focusing on the affective qualities of a landscape reframes the possible values and meanings attributed by the original inhabitants, which may not be visibly accessible. Moreover, it opens the

space to consider how affective qualities may have informed the construction of landscapes during identified moments or across time periods. Through space and time, people have used elements such as visual alignments, olfactory cues carried by prevailing winds, and acoustic connection to organize landscapes.

Some of the most important challenges when approaching landscape archaeology through sensory experience is identifying its applied relevance in preservation, valorization and communication efforts. The goal of this session is to serve as both an introduction to the topic in its current theoretical contours as well as offering a discussion on practical applications in heritage and archaeological investigations. To bring such research forward, this session calls for contributions that present sensory-based research of the historic cultural landscape (both built and natural environments) from any period and geographical area. Research addressing affective approaches to landscape archaeological investigation, valorization, conservation, or interpretation are welcome. Pertinent questions to address may include:

-What has been the relationship between affective experience and place-making in a landscape?

-How were the senses relevant to the experience of the past? How can the sensory experience of a space today reflect and interpret the realities of the past?

-How do we approach the distinction between recursive and singular affective characterization of a landscape?

-How can a focus on the senses, particularly in a subject-oriented framing of a site, offer new paths in preservation, reconstruction, and interpretation of historic landscapes?

-How we can preserve affective aspects to better understand the rational landscape? Are distinctions necessary between public-facing and academic communication?

A Sense of Trauma. How Art affords Affective Engagement with a Landscape's Traumatic Past

Anja Novak, University of Amsterdam, Netherlands

Keywords: Affect, Contemporary art, Empathic vision, Heritage, Trauma

Abstract: Thinking of the Dutch landscape, trauma is not the first thing that comes to mind. Dutch landscapes are known for their combination of ingenious layout and pastoral outlook. Juicy meadows are intersected by a grid of canals and dikes that regulate water levels. Windmills bespeak the country's long standing history of hydraulic engineering and symbolize the Dutch's ability to turn difficult environmental circumstances into advantage. For centuries, the omnipresence of water has fostered a flow of goods that connects the Netherlands with the world. Yet the water has also served military purposes. From 1815 to 1945, a military defense line called The New Dutch Waterline (NDW) protected parts of the country against enemy attacks from the east. The NDW was a complex system of fortresses, water locks and inundation areas, which could be flooded to block the enemy's advance. 700 concrete group shelters are the last elements that were added to it. One of these shelters is the topic of this presentation.

Bunker 599 is situated near Culemborg at the foot of a dike and on the shore of an shallow lake. Built in 1939-40 and served as a group shelter during World War II. In 2013, the Amsterdam-based multidisciplinary studio RAAAF turned it into an artwork. This transformation included an aggressive act: the seemingly indestructible shelter was cut in two halves. The cut resulted in a corridor that can be reached from the dike by descending a flight of stairs. On the other side, the corridor takes visitors to a pier that extends into the shallow water of the inundation lake.

By cutting up the bunker, the artists have literally opened it up to the landscape: it invites visitors to explore the scenery and reflect on its military history. But the artwork does more than soliciting reflective thought. Drawing on Jill Bennetts concept of 'empathic vision', Teresa Brennan's thoughts on the transmission of affect, Alva Noë's enactive approach to art and perception, as well as Erik Rietveld's and Julian Kiverstein's work on affordances, I will argue that Bunker 599 affords an affective engagement with trauma. The artwork invites visitors to physically enter the bunker's interior and feel what it is like to seek shelter. Yet due to the shelter's broken shell, a sense of protection is induced and denied at the same. Moreover, the 'scars' left on the walls by the bandsaw convey a physical sense of injury. By means of its physical shape and the sensorial experiences it offers, the artwork invites visitors to empathize with its fate.

References: Bennett, Jill. *Empathic Vision. Affect, Trauma, and Contemporary Art*. Stanford, CA: Stanford University Press, 2005; Brennan, Teresa. *The Transmission of Affect*, Ithaca/London: Cornell University Press, 2004; Noë, Alva. *Strange Tools. Art and Human Nature*. New York: Hill and Wang, 2015; Rietveld,

Erik and Julian Kieferstein, "A Rich Landscape of Affordances." *Ecological Psychology* 26, 325-352. DOI 10.1080/10407413.958035.

Presentation Type: Communication

More than Meets the Eye – Multisensory Research and Outreach in a Landscape Museum

Poul Baltzer Heide, Øhavsmuseet, Denmark

Keywords: Sensory psychology, exhibitions, sense of place, sensory archaeology

Abstract: In this presentation I would like to share and discuss our experiences from the development phase and first open year at the landscape museum 'Øhavsmuseet' in Denmark. The museum is based on multisensory approaches, and I would like to use the opportunity to explore how this particular approach can be used to not only explore new aspects of known monuments and phenomena, but also how it allows museums to bring research and outreach close together.

Our landscape museum is specialized in research into and dissemination of the history and development of cultural landscapes, empirically focusing on northern Europe/southern Scandinavia. Our main objective is to make the cultural landscape known and relevant to public, enabling modern citizens to make the cultural landscape a part of their own identity. An important step in this process is what is often referred to as 'reading' the landscape, but before that can happen, the modern citizen need to actually get out into the landscape, and start to recognize the traces of the past. To facilitate that, we have made a disseminative framework for establishing an emotional connection between people and place.

In the exhibition 'Discover Yourself', our team of archaeologist, historians and ethnologists have collaborated with neuro, sensory and environmental psychologists and anthropologists to explore and present a different approach to five distinct cultural landscapes: hills and grave mounds, bogs and sacrifices, (dark) forests, the sea and green spaces. The collaboration has been mutually beneficial in that the cultural historians have gained a new theoretical framework for our interpretations, and the psychologists have been able to add a level of universality across time, that they normally don't have access to.

The exhibition plays heavily on sensory inputs via scent, sound, bodily movement and texture, combined with strong narratives and small challenges to allow the guest to start generating a sense of place while in the exhibition. With these sensations literally intact in the body, we can expose the guest to our research questions and results: How the comfort of an elevated position in a rich environment adds to the rationale behind the construction of thousands of megalithic tombs. Or the relationship between the complex sensorium of a bog and the use for offerings, the ways our ancestors coped with the ambivalent fear of the dark and the sea, and

the constant yearning for a least a little bit of greenery in our lives over the last two Millennia.

The feedback from both colleagues and the public so far suggests that the multisensory approach holds a considerable potential for otherwise hard-to-approach concepts like sense of place and individuality, that translates very well into both interpretation and cultural heritage management.

Presentation Type: Communication

Community Values and Affective Approaches to Archaeological Landscapes in the Lincolnshire Wolds

Jonathan Last, Historic England, United Kingdom

Steven Willis, University of Kent, United Kingdom

Keywords: landscape, archaeology, place, values, public

Abstract: Landscape archaeology has long been open to the development of affective, sensory and experiential approaches but these have usually been framed in academic, phenomenological terms (e.g. Tilley's 'A Phenomenology of Landscape'). However, there is potentially much to be learned from understanding the various ways that present-day communities value the affective and sensory qualities of landscapes in which they live, work and travel. Not only can the informal responses of today's inhabitants and visitors help us think differently about the ways that places and landscapes might have been perceived and valued in earlier periods, they also offer potential means of engaging wider audiences with the less visible or more temporally remote aspects of the archaeological past, through the shared experience of place. Drawing on some initial work in the Lincolnshire Wolds by a research network funded through the UKRI Landscape Decisions Programme, this paper outlines a possible approach to making connections between community values, the historic landscape and archaeological heritage that could benefit both public engagement and professional interpretation.

Presentation Type: Communication

Capturing Urban Memory with Sentient Data, Counter Mapping and Digital Methods

Simeona Petkova, Amsterdam University of Applied Science, Amsterdam School of International Business, Netherlands

Radmila Radojevic, Utrecht University of Applied Science, Netherlands

Nuria Arbones-Aran, Amsterdam University of Applied Science, Amsterdam School of International Business, Netherlands

Keywords: urban memory, dynamic-mapping, digital methods, archival practices, sentient data

Abstract: This paper puts forward a conceptual proposition that ties the discourses on ‘urban memory’ (Stillman and Johanson, 2009; Ringas, Christopoulou, Stefanidakis., 2011; Loughran, Fine & Hunter, 2015), sensory ethnography (Pink 2017), and counter-mapping (Crampton and Krygier 2018;) with digital methods (Rogers, Sánchez-Querubín, and Kil, 2015). As an ‘interventionist’ approach, we understand co-producing counter (dynamic) maps with local stakeholders (actors), coupled with sensory and sentient data as a way of capturing the memory of urban peripheral landscapes (through intervention and participation) and thus creating archival knowledge.

Urban memory is often understood as a form of collective memory that is constituted by individual experiences within the place itself and through its history and social environment (Ringas et al., 2011). With rapid changes in digital technologies, digital and material have become “inseparable and entangled in environments people move and navigate their lives through” (Pink and Fors, 2017). Memories are “evoked with material engagement with devices” which “opens up a field of sensory and affective engagement” research (ibid). While Pink and Fors propose to follow such engagement in a mundane and everyday setting, seen as a non-representational, phenomenological approach, we put forward a mixed methods approach that connects sensory and sentient data (as agents) with the larger environmental context.

Urban areas are often conceptualized as sites of ‘creative destruction’, in between stability and change, space (that can be developed) and place (that is lived in), often subjected to planning, regulation, and economic forces (Batty, 2007). This is especially true for urban areas that are located outside of the ‘center’ or in the cities’ periphery. These areas have experienced an endless cycle of deconstruction and reconstruction often witnessed and captured by local inhabitants, creatives, and activists. Currently, many of the peripheral areas are emancipating, bringing forward and openly communicating their complexities, values, and engaging various stakeholders in their regeneration efforts (which happens in a broader context of many European cities repositioning themselves in more polycentric and polyphonic ways, (Scott, 2015).

To be able to capture the memory of ever-changing, 'built a new' urban places, we put forward counter (dynamic) mapping using digital methods as complemented with sensory and sentient data generated through interactions with digital technologies. Building on Crampton's notion of maps (Crampton and Krygier, 2018), cartography is understood as existence (becoming) rather than essence (fixed ontology). Maps are therefore taken not as 'objects', but as performative practices. Digital methods, on the other hand, enable us to understand dynamic place-making, through 'tracing' the stakeholders (actors) and their relations overtime to capture the ways the urban environment gets performed.

To clarify with an example, in Spinoza Imaginaries Lab & Cafe situated in Amsterdam Southeast we have been capturing the ever changing urban environment in partnership with local stakeholders (actors), mapping their evolving relationships (and grouping) using the IssueCrawler and sentient data co-gathered by researchers and students, with the clear understanding that to be able to capture a place, it is important to map the vernacular knowledge of that place (imaginaries, including art, movies, unrealized plans and initiatives, etc.). We propose this mixed methods approach as an epistemological practice geared towards archiving the dynamic state of urban peripheral landscapes.

References: Batty, M. (2007). The creative destruction of cities. *Environment and Planning B: Planning and Design*, 34 (1), 2-5; Crampton, J. W., & Krygier, J. (2018). An introduction to critical cartography. *ACME: An International E-journal for Critical Geographies*. 4 (1), 11-33; Loughran, K., Fine, G. A., & Hunter, M. A. (2015). Urban spaces, city cultures, and collective memories. In *Routledge International Handbook of Memory Studies* (pp. 215-226). Routledge; Pink, S., & Fors, V. (2017). Self-tracking and mobile media: New digital materialities. *Mobile Media & Communication*, 5 (3), 219-238; Ringas, D., Christopoulou, E., & Stefanidakis, M. (2011). Urban memory in space and time. In *Handbook of research on technologies and cultural heritage: applications and environments* (pp. 325-340). IGI Global; Rogers, R., Sánchez-Querubín, N., & Kil, A. (2015). Issue mapping for an aging Europe. Amsterdam University Press; Scott, J., I. (2015). 'Creative Cities: Conceptual Issues and Policy Questions', *Journal Of Urban Affairs*, 28(1),1-7.

Presentation Type: Communication

Synaesthetic Landscapes: Searching for the Missing Senses

Tânia Manuel Casimiro, HTC CFE NOVA University of Lisbon, Portugal

Joel Santos, NOVA University of Lisbon, Portugal

Inês Castro, NOVA University of Lisbon, Portugal

Keywords: Palace, architecture, feelings, senses, 18th century

Abstract: In 1781 a book discussing the relationship between cats and dogs was published in Lisbon. Among the illustrations, there is a representation of a palace,

more precisely the Marquis of Ponte de Lima palace in Mafra, Portugal. This illustration reveals how this space was lived and felt not only by the observer but also by all the human and non-human agents that circulated and existed in this space. The palace still exists, it is a public building, and 241 years later we, as archaeologists and just people interested in past lives, visited the palace. We observed its architecture, touched its walls, and heard how sound would propagate, trying to use our senses to feel the space. A few things have changed inside the building and its surroundings in more than two centuries but the building, the way it stands close to a small church and the wall that surrounded it are still in their original place. After the visit, we sat down and discussed how the three of us perceived the place. We then got back to the late 18th-century representation and debated how this site could be felt then and we felt it now. We do not have some of the crucial elements that would make that space be understood differently. No fire was crackling in the kitchen, no pot stew was emanating its scent to open up our appetite, and no children were running and giggling up the stairs, however, the combination of this representation, where we can see affects and relations, with our own bodily experiences inside the building may help in understanding how people felt the place in the past. Our aim is to debate if we can use past representations of still existing spaces to understand how people (and in this particular case also animals) affectively reacted to different environments and how these representations influence the way we engage with such spaces.

Presentation Type: Communication

Man and the Perception of the Roman Cityscapes.

The Case Study of the Sacred Area of Largo Argentina (Rome, Italy)

Olimpia Proietti, Scuola di Specializzazione in Beni Archeologici, Università degli studi di Napoli Federico II, Italy

Keywords: Rome, Campo Marzio, Ancient Architecture, Sensory Archaeology, Ancient Topography

Abstract: Research's aim is the recomposition of the architectural space of the Sacred Area of Largo Argentina, located in Campo Marzio, in Rome. Starting from the legacy data review, the attempt is to interrogate the archaeological data in the light of perceptual parameters. The focus is to shed light on proposals of cognitive dynamics to underline the synchronic and diachronic relationship between man, architecture and landscape in order to understand one of the most ancient and most complex urban context in Rome.

Recently, attention has increased on the dialectic between man and space, both natural and anthropic. This relationship determines functional inputs for questions and useful answers to make a context intelligible and not just a mere catalogue of *disiecta membra*. The study of the Sacred Area of Largo Argentina offers a unique

opportunity in this direction: it allows to follow the architectural development and urban planning of a context for a long period of time; it provides numerous ideas for the study of the transformation of such an important space in the city. An attempt was therefore made to promote the point of view of man as a preferential element of the narration about the evolution of an ancient context with the final goal to let the beneficiary involved into the monument in function and not just a passive observer of the ruined monument.

The research is linked to the most pressing question regarding the valorisation of a building which is indissolubly connected to the actual perception of something that appears as unfinished and, therefore, distant in time and space. The problem of making "public" the archeology is not only when it comes to the musealization: making it intelligible is a purpose that the scholar must necessarily pursue starting from the theoretical study and publication of the context itself. Assuming that a strictly scientific approach is fundamental to any archaeological product and considering the valorisation a process that consists of different levels and passages, in the present work, a propaedeutic study to the fruition of an ancient context, is proposed.

Presentation Type: Poster

Egyptian Trade, Deities and Experiences. An Approach to the Diachronic Urban Cultural Landscape of Thessalonica

Dafni Maikidou-Poutrino, Aristotle University of Thessaloniki, Greece

Keywords: Thessalonica, landscape, religious experience, Isiac deities, Egyptian merchants

Abstract: In this paper, I focus on the creation of the maritime, cultural, and sacred landscape of Thessalonica due to its interaction with Egyptian cultural, religious, trading, and economic elements. I follow the structure and use of this urban environment diachronically, from the first archaeological evidence in the Thermaic gulf until today. It is a research based on archaeological evidence (excavations, study of material evidence, archaeological theories of Lived Ancient Religion, emotions, sensory-based approaches, and interconnectedness), putting at the center of attention the agents that lived, moved, and interacted within this cultural landscape. I then ask how the locals perceive all the above today and how this past is shared with travellers that wish to visit the Egyptian-related area of the city that gradually became part of the city's cultural heritage.

The presence of the Egyptians in the Thermaic gulf as a result of commercial activities has been attested since the Archaic times. Material culture found in the 6th century BCE necropolis of Sindos and Thermi reflects this economic and cultural interaction. The religious interaction started from the 3rd century BCE onwards, welcoming the Isiac deities to the newly founded city of Thessalonica. Here I focus

on how this Egyptian presence in the Thermaic gulf and especially in the sanctuary of the Isiac deities in Thessalonica – located near the port and in the so-called sacred area of the city – played a role in the creation of a landscape where Egyptian elements were incorporated into the local traditions. Additionally, I explore how such a formation of the surrounding environment culturally affected the social actors that engaged with this formation through colors, smells, processions, and objects that activated the senses and emotions.

Through the centuries and after the cult was abandoned, the memory of the Egyptians in the area remained, reflected in street names or names of public and private buildings. Reaching today, in this paper, I aim to show how knowledge on that subject is used, how this memory survived in the landscape of the modern city, and how people (either citizens or visitors that want to engage with the past) remember and visualize formations of this landscape. In order to achieve that, they use a variety of different means of communication and experiences: narration, songs, photos, taste, and performances aiming to recreate knowledge, behavior, and social memory. Therefore, I conclude by trying to understand to what extent today's sensory experiences reflect the reality of the past or whether they lead to our own reconstruction and perception of that past.

Presentation Type: Communication

The View from Rockshelters: Finding the Intangible in Landscapes

Carole Lynn Nash, School of Integrated Sciences, James Madison University, USA

Keywords: rockshelter, viewshed, Native American, Appalachian Mountains

Abstract: In the U.S., archaeologists are trained to recognize the value of research in archaeological archives, both as a requirement of compliance archaeology and an expected component of basic scholarship. Archives open conversations between past and present archaeologists and establish a context for the evolution of method and interpretation. The re-framing of empirical observations held in archive, using the tools of landscape archaeology and especially the multi-scalar approach, shifts the archival focus from specific sites to larger regions and and longer-term cultural patterns.

In this instance, the settlement archaeology research archive for the Central Appalachian Mountains includes the description of clusters of multi-component Native American floodplain sites located in direct proximity to multi-component, low elevation rockshelters. The integration of archives, field work, and geospatial technologies allows archaeologists to scale analysis differently. The floodplain sites are found to be within the line-of-sight of the rockshelters, each of which is oriented to a different sub-valley. During the Middle-Late Woodland periods (2500-500 B.C.E.) the shelters may have marked micro-buffer zones between communities with different geographic orientations and cultural networks. The nexus between site and

rockshelter, which had origins in the Archaic period thousands of years prior, became more prominent during the Middle and Late Woodland periods, when a more densely settled landscape gave rise to villages that were occupied at the onset of the European incursion.

The presence of multiple hearths, carbonized nutshell, and ceramics in the rockshelters support the interpretation of gendered spaces associated with women's task groups whose daily activities focused on mast harvest. The recovery of steatite pendants and vessel lugs, pottery, and smoking pipes indicate specialized activities in the enclosed locations. When joined under the landscape archaeology umbrella, these different lines of evidence form an image of rockshelters as fixed-in-place, long-term anchors for the creation and maintenance of Indigenous community identity, organized around the practices of women. The place memory associated with such sites, described in ethnographic literature as 'wombs,' may have reinforced ties to ancestral landscapes.

Presentation Type: Communication

Eighteenth Century Ottoman Fountains and Embodied Experience

Regatu Asefa, Carleton University, Canada

Keywords: Ottoman, Fountains, Phenomenology, Floral Imagery, Embodiment

Abstract: This paper explores the phenomenological and embodied experiences of two eighteenth century Ottoman fountains: Mahmud I's 1732 fountain at Tophane and Abdülhamid I's 1781-82 fountain at Emirgan. In her book, *The City's Pleasure: Istanbul in the Eighteenth Century*, Shirine Hamadeh positions fountains as centres of social activities – sites of pleasure that contributed to the rise in social and public experiences of eighteenth century Ottoman life. In building off Hamadeh's analysis of eighteenth century Ottoman fountains, this essay examines the embodied phenomenological experiences these sites encouraged. Through Maurice Merleau-Ponty's and Juhani Pallasmaa's theories of phenomenology, floral and natural imagery are examined to explore the embodied experiences of the two eighteenth century meydan – or freestanding – fountains. This study relies on travel journals and contemporary Ottoman poetry to elucidate some of the phenomenological experiences encountered at these two public fountains. Antoine Laurent Castellan's and Julie Pardoe's writings offer insights into the experiential dimension of the two fountains while eighteenth century poets including Nevres, Nedim, and Nahifi reveal the multisensory elements such as taste and smell. How did the floral and natural imagery of Mahmud's and Abdülhamid's fountains encourage embodied experiences? These two meydan fountains ultimately concretized existential space for eighteenth and early nineteenth century visitors. This paper aims to expand upon Hamadeh's analysis and offer further study of past embodied experiences,

developing further history's understanding of the relationship between body and built environment.

Presentation Type: Communication

Neuroscapes and Etruscan Ruins: The Case of Vulci

Maurizio Forte, Duke University, USA

Keywords: neuroscapes, spatial embodiment, VR, EEG, Vulci

Abstract: What does it mean to look at an archaeological landscape? The answers suggested by aesthetics and cognitive science have diverged. For many years aesthetics and cognitive science shared a similar attitude towards vision when accounting for the perceptual representation of the world and the ensuing aesthetic experience. Both approaches endorsed a sort of 'visual imperialism', conceiving vision as the mere outcome of the so-called 'visual brain', while neglecting the multimodal nature of vision. However, neuroscientific evidence on the relationship between the motor system, the body and the perception of space, objects and the actions of others, showed that such notion of vision doesn't hold anymore. Observing the world is more complex than the mere activation of the visual brain. Vision is multimodal: it encompasses the activation of motor, somatosensory and emotion-related brain networks.

This project focuses on the analysis of the cognitive impact in the observation and contemplation of landscape's ruins by combining methods of eye-tracking and EEG (electroencephalogram) in virtual reality systems and in the real world. We hope to connect cognitive activities in the processing of visual content to identify how previous knowledge and skills can amplify the perception of the visual stimulus.

The case study will be the Etruscan and Roman city of Vulci: its archaeological landscape, monumental tombs, temples, sanctuaries, and buildings of different periods have been represented by maps, drawings, digital models, 3D reconstructions and prints from the 19th century to the present. Moreover, the archaeological site has been investigated by Duke University (PI Maurizio Forte) since 2016, and new "ruins" and archaeological intact layers are digitally documented by maps and 3D photogrammetry.

The perception of Etruscan ruins is particularly challenging because of the complexity of the landscape but also because of the lack of extensive archaeological excavations in urban areas. It is challenging for the contemporary observer to visually imagine and reconstruct the urban setting based on very few scattered ruins. On the other hand, these very ruins have long served to reconnect living societies with lost living spaces in space and time.

Presentation Type: Communication

**Dancing with Cicadas:
Aural Perception at the Tomba Di Caronte in Cerveteri**

Jacqueline K. Ortoleva, University of Birmingham, United Kingdom

Keywords: Etruria, archaeoacoustics, sensory, landscape, funerary

Abstract: Our understanding of sixth-fourth century BCE Etruscan rock-cut tombs has often been guided by typologies involving architectural structures and/or sociocultural perspectives. For example, multi versus single chambered structures are presented in genealogical terms, whilst the exterior grandiosity of rock cut tombs is situated as a material rendering of status. The functionality of the tomb's striking landscape has rarely played a role in such studies, particularly as related to human sensory experience. This is especially clear with respect to the rock-cut Etruscan necropolis, the Necropoli Rupestre di Greppe Sant'Angelo in Cerveteri, Italy. One tomb at this site, the 4th century BCE Tomba di Caronte, is not only distinctive for its large exterior courtyard but also its unique setting overlooking the surrounding lowlands. Native cicadas cover the site during the summer season to dance among the surrounding flora and their aural symphony is transformed via material and environmental conditions.

This paper draws on fieldwork data recently collected at the Tomba di Caronte together with acoustic modelling techniques to explore sensory experience involving sound and visuals. Sonic and visual clues are considered in tandem with the tomb's unique landscape setting to clarify bodily movement at the tomb space. Ultimately, the tomb space is recontextualised as a place of enactive cognitive exchange shaped by its landscape and the possibilities, and limitations, of human sensory experience.

Presentation Type: Communication



SESSION 19. REFLECTIONS ON THE NEW MODELS OF ECONOMIC EXPLOITATION OF THE TERRITORY AND THEIR IMPACT ON LANDSCAPES, AND PROPOSALS OF MANAGEMENT FROM AN ARCHAEOLOGICAL PERSPECTIVE

Session Organizers:

Rebeca Blanco-Rotea, Landscape, Heritage and Territory Laboratory, University of Minho, Portugal

Teresa Nieto Freire, Delegation of Culture, Government of Galicia, Spain

Silvia Maciel, Independent researcher, Portugal

Carlos Amoedo, University of A Coruña, Spain

David Barreiro Martínez, Institute of Heritage Sciences –Incipit, Spanish National Research Council –CSIC, Spain

Keywords: Landscape transformation, Sustainable development, Landscape protection, Legislation, Sustainable management

Session description:

Since the European Landscape Convention and its ratification by the Member States of the Council of Europe, landscapes are recognised as a key element in our societies, as a document of the past, as a place where socio-economic and environmental actions take place in the present, and as a key tool for the future as the place where we live. For this reason, landscape policies must establish strategies and guidelines that allow for the adoption of measures for the protection, management and planning of landscapes from a sustainable development perspective.

However, despite the fact that more and more member states are drawing up regulations for the protection and management of landscapes, the volume of new models of land use is leading to an accelerated transformation of landscapes that entails the destruction of the cultural information they contain and of their heritage values, as well as a deterioration in the quality of landscapes caused by an extractive and predatory model of land use that does not take into account the agreements of the European Landscape Convention.

This phenomenon is particularly intense on the Iberian Peninsula, where, moreover, in some communities it is being strongly contested by society. Precisely these models of landscape management must include an environmental impact assessment, which in turn includes an archaeological assessment, which identifies the elements of the past that form part of the territory to be intervened, characterises these landscapes and prevents their destruction, but different modifications in the regulations are preventing this from happening.

In this session we intend to reflect on all these aspects taking into account the following topics:

- New models of exploitation of the territory and their impact on cultural landscapes, generating new landscapes that, among other things, entail the rupture of the connectivity of the territory and its landscape integrity: exploitation of fast-growing species, new generation wind farms, mining operations, estuary drainage, new agricultural practices....

- Legislative and conceptual changes that directly affect the protection and safeguarding of archaeological heritage and landscapes.

- Changes in environmental impact assessment models that include archaeological impact assessment.

- Analysis of different models of archaeological management of cultural landscapes that address this issue.

- Proposals for a more inclusive, sensitive, integrated and sustainable management of cultural landscapes.

The final objective of this session would be to carry out a comparative analysis of this situation in different European contexts, to review different management models that have addressed this problem in order to outline a proposal that guarantees the maintenance of cultural landscapes and the archaeological heritage that forms part of them, harmonising with the transformations generated by socio-economic and environmental processes.

On Archaeology, Ethics, and the Rural World

George Bodi, Institute of Archaeology, Romanian Academy, Iași Branch, Romania
Felix-Adrian Tencariu, “Alexandru Ioan Cuza” University of Iași, Institute of Interdisciplinary Research, Department of Exact and Natural Sciences, Arheoinvest Centre, Romania

Keywords: archaeology, heritage, ethics, rural, sustainability, durability

Abstract: Archaeology cannot be conceived without the rural world. Most of the (landscape) archaeological research takes place outside urban perimeters, and village communities constitute a second home for archaeologists. And yet, in their concerns there is little preoccupation for the impact that their work has on those who host and often support them. In this communication we will try to explain, at least in part, the reasons for this insensitivity, starting from the examination of the foundations on which the practice of archaeology is built (both legislative and epistemological), and how these connect, or not, to its social, cultural, and economic contexts. We will also have a look at the issues facing rural communities (with a focus on Romania) and present a critical analysis of the current initiatives aimed at their development, and highlighting their shortcomings both from ethical and socio-economic points of view, with special attention paid to the encouragement of tourism and traditional crafts as important development factors. We will further explore how the concepts of systemic heritage and territorialism (in the sense of Maurizio Carta and Alberto Magnaghi’s thought) could help archaeology make the first steps into becoming a relevant actor in the shaping of the current rural world, contribute to increasing its resilience, and to the development of sustainable growth.

Presentation Type: Communication

Cultural Landscape, Social Space and Landscape Archaeology on the Middle Course of the Morava River (First Millennium AD, Slovak and Czech Republic)

Marek Hladík, Czech Academy of Sciences, Institute of Archaeology, Brno, Czech Republic

Katarína Hladíková, Department of Archaeology at the Comenius University in Bratislava, Slovak Republic

Tibor Lieskovský, Department of Theoretical Geodesy and Geoinformatics Faculty of Civil Engineering, Slovak University of Technology in Bratislava, Slovak Republic

Alexandra Bucha Rášová, The Monuments Board of the Slovak Republic, Slovak Republic

Erika Makarová, The Monuments Board of The Slovak Republic, Slovak Republic

Marian Mazuch, Czech Academy of Sciences, Institute of Archaeology, Brno, Czech Republic

Martin Neumann, Cultural Landscape Research Institute, Slovak Republic

Peter Grznár, The Monuments Board of the Slovak Republic, Slovak Republic

Peter Bisták, The Monuments Board of the Slovak Republic, Slovak Republic

Keywords: Non-destructive research, Models of spatial patterns, Landscape protection legislation; Early Middle Ages

Abstract: A large number of historical structures have been preserved in the cultural landscape on the middle course of the Morava river, which lies on the border of Slovakia and the Czech Republic. They are a testament to the dynamic development of the region in the first millennium AD. The first millennium was characterised by frequent changes in settling populations (Germans, Avars, Slavs) in the studied region. These populations created distinctive historical structures in the country (fortified settlements, settlements, flat burial grounds, mounds). The resulting landscape palimpsest offers a wide range of possibilities for the research of settlement dynamics in the first millennium AD. These historical landscape elements can be detected and examined using modern interdisciplinary methods (spatial and landscape archaeology, historical geography, GIS, LiDAR, geophysics, multispectral imaging).

However, this space is currently exploited by intensive economic activities, which have a major impact on the cultural landscape (extensive forestry characterised by blanket felling with subsequent stumping and levelling of the cleared areas, efforts to build large logistics centres). These activities have been destroying cultural information for decades and jeopardise landscape integrity.

Presentation Type: Communication

Cultural Landscape and Preventive Archaeology in Albania: The Cultural Heritage Law of 2018 and the Impact of Legislation in the Management of Archaeological Resources

Ols Lafe, Center for the Development of Ancient and Medieval Albanian Heritage, Universiteti "Aleksandër Moisiu" Durrës, Albania

Keywords: Albania, contract archaeology, preventive archaeology, rescue archaeology, heritage law

Abstract. Legal approach

In 2008, following the example of the French INRAP, we witnessed the creation of the Archaeological Service Agency (ASHA). It came at the right time, undertaking the difficult task of managing rescue excavations across the country, at a time of extensive development and changes in the landscape. It soon managed to balance the institutional vacuum, and became the place where even the National Council for Territory Regulation would rely on for its final decision-making when the protection of archaeology was at the stake. Only in the first year of operation of ASHA, over 234 hectares of land were subject of control by the agency, indicating that the workload would increase as it actually did in the coming years. For the first time in 2008 the than National Council of Archaeology approved the regulation for issuing permits to archaeologists and a year later started granting the first licenses. Up to February 2022, 6 company licenses and 28 individual ones have been approved.

Current situation

Unfortunately, with the New Heritage Law approved by the Albanian parliament in 2018, this institution, was abolished, and turned into a mere directorate within the Ministry of Culture, damaging over 10 years of experience and success.

Every year in Albania large surfaces are subject to excavation from infrastructural development projects. Such works may potentially damage (and do damage) archeological remains. One example of the largest ever in our modern history of archaeological intervention ahead of an infrastructural project was the Trans Adriatic Pipeline – TAP, whose more than 200km of excavation inside Albania, yielded amazing and not known before archaeological sites, serving also as a large field school for several generations of Albanian students and archaeologists and implementing the most up-to-date methodologies in the field.

The National Council for Tangible Cultural Heritage (NCTCH) has approved the regulations and standards of conducting archaeology which set the rules of how to conduct operate in the field. When any developer aims at exploring a given area, the Cultural Heritage Law provides the requirement for the developer to fully pay for the research, excavation and publication of finds. The NCTCH reviews the request of the developer and drafts the specific requirements for that area (type of investigation, methodology, ways of recording the material, storage permission,

etc). The developer can choose to conduct the work by selecting a company or individual which may be willing to do the work.

The new aspect of the current legislation on the other hand is the inclusion for the first time of provisions regarding cultural landscape assets (chapter 4 of the law). Such new approach is deemed positive but its impact remains to be verified.

What lies ahead?

The numbers of licenses are expected to shift greatly in light of a new council of minister's decision, which further defines the criteria for archaeologists who may want to embark on contract research. Given the continuous increasing amount of construction in the country, it is expected that the number of licensed archaeologists will be higher, thus putting more pressure on the government structures to oversee their methods and control the territory. Will this approach and the inclusion of cultural landscape assets regulation in the law, protect the archaeological resources? Time and facts will demonstrate it, as preventive archaeology travels through uncharted territory.

Presentation Type: Communication

The Role of Archaeological Research in the Conservation of Historic Landscapes. A Reflection from Case Studies of the Ligurian Apennines (Italy)

Alessandro Panetta, Università di Genova, Italy

Anna Maria Stagno, Università di Genova, Italy

Caterina Piu, Università di Genova, Italy

Rebekka Dossche Università di Genova, Italy

Enrico Croce Università di Genova, Italy

Keywords: Historic Landscapes, Living Heritage, Historical Practices

Abstract: The idea that the conservation of historic landscapes cannot be conceived in a 'monumental' perspective, as is traditionally the case for archaeological sites, has become increasingly popular in recent years in Italy among those interested in the protection of these areas.

The importance of the historical practices that have contributed in the past, and still contribute today in some cases, to shaping the landscape is increasingly recognised as a more convincing answer in this sense than forms of integral protection of the 'forms' of the landscape, which often generates an abandonment of these areas and their marginalisation and degradation.

Archaeological research, in an interdisciplinary perspective that integrates sources from other disciplines such as historiography, historical ecology and environmental archaeology, can contribute to the reconstruction of the management practices of environmental resources that historically contributed to generating and

maintaining the landscapes that we wish to conserve today.

In this paper, through the analysis of some case studies related to the Ligurian Apennines (NW Italy) concerning the project "IRIS - Inspiring Rural Heritage (Jpi-CH) we intend to reflect on what can be the concrete ways in which archaeological research can cont

Presentation Type: Communication

**Photovoltaic Landscape vs. Heritage Landscape. The GPR Contribution
to the Tumulus of the Cañada de Ruiz Sánchez Revision
(Carmona, Andalusia, Spain)**

José-Antonio Ruiz Gil, Universidad de Cádiz. IVAGRO. Laboratorio de Historia, Spain

Javier Catalán González, Universidad de Cádiz. IVAGRO. Laboratorio de Historia, Spain

Isabel Rondán Sevilla, Universidad de Cádiz. IVAGRO. Laboratorio de Historia, Spain

Enrique Aragón Núñez, Universidad de Almería, Spain

Keywords: GPR, Tartesian Tumulus, Landscape Archaeology, Heritage protection

Abstract: Due to the current energy transition, the construction of electricity production plants is proliferating, especially in the south of Spain. This important modification of the landscape has to coexist with the conservation of monuments. In the valley of the Guadalquivir river, in the territory of Carmona, near Seville, prior to the construction of a 40 MW photovoltaic solar plant, geophysical surveys have been carried out to safeguard the Tumulus de la Cañada de Ruiz Sánchez. It is an artificial earthwork, or tumulus, that covers the cremation and the grave in which the cremation took place, or ustrinum. This burial mound is located on a fluvial terrace of the Corbones River. It was excavated in 1895 by George Bonsor, who revealed a material culture based on an iron pin with bronze balls on the ends, a copper brazier, a bronze trefoil jug, iron arrowheads and spearheads, dating the burial to the 7th century BC.

The Tumulus de la Cañada de Ruiz Sánchez, evaluated at around 10,000 m², is generically protected by the Spanish Historical Heritage Law (16/1985), but not specifically as an Good of Cultural Interest (GCI). To avoid an 'boundary' effect on the protected limits and new construction, geophysical prospecting work has been carried out with an IDS Stream X georadar. It has been carried out with an exploration depth of 80 ns, with 512 samples per scan (@512 Sample/Scan), average propagation speed of 10 cm/ns and with a GPS+PPS positioning system. Positioning files are exported from the GPS receiver to the control unit in NMEA format, taken every 0.2 sec (5 Hz).

The result has been the exact delimitation and georeferencing for protection as a prehistoric archaeological GCI of landscape character.

Presentation Type: Communication

Exploring Inclusive Practices for Preserving Archaeological Remains in a Traditional Landscape, Naxos Island, Cyclades

Irini Legaki, Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Cyclades, Greece

Anna Tsoupra, 2 HERCULES Laboratory, University of Évora, Portugal

Amalia Siatou, Revive-Art.Works, Greece

Mavroeidis Mavroeidopoulos, Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Cyclades, Greece

Demitrios Kormaniatis, Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Cyclades, Greece

Ioannis P. Staikopoulos, Hellenic Ministry of Culture and Sports, Ephorate of Antiquities of Cyclades, Greece

Keywords: inclusive practices, archaeological remains preservation, traditional landscape, Naxos island, Cyclades

Abstract: Naxos, one of the most famous Greek Cycladic islands, proves to be a representative case-study for a “Landscape Archaeology” analysis due to its continuous habitation from the Palaeolithic to the current era and, consequently, due to the numerous archaeological remains embedded in its natural environment. The modern development of the island has led to the need of a management plan with respect to its cultural and archaeological significance. In this view, the Greek Ministry of Culture and Sports via its local archaeological agency, i.e the Ephorate of Antiquities of Cyclades (EFAKYK) is adapting, when feasible, an approach that includes building construction with simultaneous protection and presentation of the archaeological remains in-situ. One of the first examples worldwide is the on-site Museum in Metropolis Square in Naxos town, created in the 90’s by EFAKYK in collaboration with the municipality of Naxos.

The case study, presented here, refers to the second on-site Museum on Naxos that is now under construction. It is located in the seashore of Grotta, few metres away from the aforementioned Metropolis Square, in small distance and opposite the Archaic temple of Apollo on Palatia islet. The project relies on the recent rescue excavation in Georgios Vasalakis plot for the construction of a modern touristic compound. The excavation revealed significant archaeological features from the Early Bronze Age to the Roman period. The most well preserved (primarily early Late Bronze Age and Mycenaean) remains have been restored in order to constitute an open-air museum accessible to the public. This co-existence of the ancient remains with the modern Vasalakis building, integrated in a sustainable way, aims to sensitise the citizens and tourists for the history and archaeology of the island.

Presentation Type: Poster



SESSION 20. WATERSCAPE ARCHAEOLOGY: MULTI-SCALAR HUMAN – ENVIRONMENT INTERACTIONS IN COASTAL LAGOONS

Session Organizers:

Alexandra Bivolaru, Ca'Foscari University, Italy

Daniela Cottica, Ca'Foscari University, Italy

Christophe Morhange, Aix Marseille University, EPHE-PSL-AOROC, France

Keywords: geoarchaeology, coastal lagoons, paleo-environmental reconstruction, multi-proxy, Holocene, Anthropocene

Session description:

The waterscape approach stems from a political ecology tradition that considers society and environment continually interwoven, resulting in hybrid socio-natures (Karpouzoglou 2017). The term waterscape, coined after Appadurai (1996), is now extensively used in studies dealing with territoriality, location, and place-making (McPhillips et al., 2020). Swyngedouw (2004) defines the waterscape as a “liminal landscape”: always transitory, dynamic, transgressive. Coastal lagoons can be seen as a “liminal landscape”: borderlands that lie between maritime and terrestrial zones, where social aggregations and environmental formations entangled. Since Prehistory, coastal lagoons provided numerous ecological potentialities for societal development. Situated at the intersection of fluvial and maritime domains, the lagoons are an ecological niche that allow the exploitation of aquatic resources, salt and reeds production, pasture for cattle, etc. (Parain, 1936; Fantasia, 1999; Marzano, 2013). In addition, lagoons serve as a communication hub for maritime, terrestrial, and fluvial networks. A lagoon is also a naturally protected environment at base level, making it an appealing setting for port activities (Morhange et al., 2015, 2017; Vittori et al., 2015; Fontana et al., 2017; Giaime et al., 2019). Considering the natural potentialities of lagoons, the purpose of this session is to examine through various study cases the relative role of natural and anthropogenic forcing agents in the shaping of the human-ecosystem's entanglement in coastal areas. To explain substantial changes in material culture, archaeological studies and text-based

narratives have frequently stressed the role of commerce, power interactions, settlement hierarchy, and colonization movements. We shall now ask at which extent conventional approaches have underestimated the environmental transformations of coastal areas in the dynamics of social aggregations.

This session calls for contributions that looks into the relationship between humans and coastal lagoons over time. Interdisciplinary contributions are encouraged, bringing together works from archaeology, anthropology, history, geography, geology, hydrology, etc., in a diachronic perspective.

The session aims to focus on:

- (i). paleo-environmental reconstruction and geoarchaeology of coastal lagoons and wetlands;
- (ii). lagoons' natural constraints and potentialities on the socio-economical evolution of societies;
- (iii). social vulnerability-adaptability-resilience in coastal lagoons;
- (iv). Holocene-Anthropocene transition in coastal lagoons. Overall, the goal is to bring together a variety of projects that address the question of how technology, environment, society, and ideas have shaped modern landscapes.

6000 Years of Human-Environment Interactions in Wetlands of the Western Netherlands

Harm Jan Pierik, Ministry of Education, Culture and Science, Cultural Heritage Agency, Amersfoort, Netherlands

Jelle Moree, Wageningen University and Research, Wageningen, Netherlands

Rowin van Lanen, Ministry of Education, Culture and Science, Cultural Heritage Agency, Amersfoort, Netherlands

Jaap Evert Abrahamse, Ministry of Education, Culture and Science, Cultural Heritage Agency, Amersfoort, Netherlands

Menne Kosian, Ministry of Education, Culture and Science, Cultural Heritage Agency, Amersfoort, Netherlands

Keywords: wetlands, historical water-management systems, human-environment interactions

Abstract: In this contribution we explore the phases of landscape change along the Old Rhine river in the peatland coastal area of the western Netherlands. This is one of the oldest and best preserved large-scale peatland reclamation landscapes worldwide, which is currently under threat of peatland subsidence, urban developments and sea-level rise. The study area has a rich geological and geoarchaeological history that shows changing landscapes and human adaptation over of the past millennia. By combining new palaeo-environmental reconstructions, (geo)archaeological data, and historical GIS analyses, we show how human-environment interactions formed this landscape and how people have adapted to environmental changes in this dynamic landscape.

Before medieval reclamation, the study area was a vast and mainly inaccessible swamp, crossed by the river Rhine and several smaller local creeks. Around 3500 BC (Middle Neolithic), the swamp rapidly transformed from a tidal lagoon into an extensive brackish reed wetland. In this mainly inaccessible landscape, small creeks with natural levees developed close to the river Rhine that provided possibilities for habitation and first agricultural practices in this part of the Netherlands. Over the following centuries the reed swamp became more fresh. Around 2500 BC, it gradually turned into a wood swamp under nutrient-rich fluvial water supply. This ecosystem change triggered the formation of larger and longer creeks that drained the peatlands, which strongly enhanced habitation and navigation possibilities.

Active sedimentation of these creeks stopped around 1000 BC, related to progressive closure of the river mouth of the Rhine. A decent portion of the habitable creek levees subsequently became overgrown by peat, although many creeks channels possibly remained open for navigation. In this landscape the Roman limes was constructed in the first century CE, positioned on the higher alluvial ridge of the Old Rhine, running as a large accessible corridor through this swamp. Engineering works were built (roads, castella, dams, canals), most of them strongly

related to the natural landscape elements in the area. Smaller creeks still drained the surrounding peat swamps, connecting to other sea inlets and ports along the coast.

Peat growth and sedimentation essentially stopped after medieval reclamation. The peat was drained by extensive network of man-made waterways. Some natural water routes became incorporated into this water network, and are still visible in the modern landscape. The creeks became important for water routing pathways and transport routes. They also played a role in city development and occasionally formed the political boundaries of the water boards.

This wetland area is a good example of how coastal-river processes and wetland ecosystems shaped the existing natural structures in the cultural landscape, despite increasing human influence over time. It furthermore shows what land-use strategies were applied in changing wetlands over the course of millennia.

Presentation Type: Communication

First Evidence for the Socio-Economical Interdependency of Coast and Hinterland Based on the Discovery of New Prehistoric Sites on the Persian Gulf's Northern Coasts

Elnaz Rashidian, Department of Archaeology, University of Konstanz, Germany

Abbas Moghaddam, Department of Prehistory, Iranian Center for Archaeological Research, Iran

Keywords: Persian Gulf, Chalcolithic, seasonal wetlands, human-coast interaction, Anthropocene

Abstract: We present our data on a recently discovered site on the Persian Gulf's northern coast and explore its implications regarding the prehistoric humans' interaction with the Persian Gulf's past waterscapes.

The Persian Gulf is a geologically young body of water in southwest Asia that emerged at the beginning of the Holocene era. The coasts were considered unstable and uninhabitable in Prehistory, due to their dynamic evolution throughout the Early to Mid-Holocene.

However, recent studies have proved this assumption oversimplistic. Systematic archaeological surveys and interdisciplinary investigations at the southern coasts identified prehistoric sites directly at the coasts with a stable human dependency on the sea resources.

The recent discovery of a Chalcolithic mound site on the Persian Gulf's northern coast has changed the narrative and indicated a similarly rich prehistoric period on the northern coasts. Following its discovery, the site was investigated interdisciplinary.

The site of Tahmachi, with its remaining two mounds containing more than 10 m of cultural deposits from the fifth millennium BCE, currently lies on the flat plain of Liravi, about 5 km to the Persian Gulf's current shores. Tahmachi itself seems to be

bordered by a coastal lagoon and seasonal wetland in Prehistory, based on our geoarchaeological analysis. A considerable number of shellfish and other marine remains existed within the cultural deposits. A mountain range separates this coastal plain from the intermountainous Zohreh valley, about 20 km toward the hinterland, whereas a chalcolithic settlement cluster around the prominent site of Chega Sofla is known.

While the material culture of Chega Sofla was found in Tahmachi, remains of shellfish and other marine resources were found during the recent excavation of Chega Sofla. Therefore, we suggest that these two sites were in close contact and probably exchanged their specific products during the fifth millennium BCE. Further excavation on both sites shall yield more evidence on this.

Based on this case study, we present our idea of a previously unknown settlement type on the Persian Gulf's coasts with specialized resource exploitation and direct dependency on its coastal lagoons and seasonal wetlands. We explore the probable extent of these settlements' interaction with their waterscape as well as their anthropogenic footprint. Furthermore, we elaborate on our idea of these coast sites' interdependency with their better-known hinterland sites in Prehistory.

Tahmachi is the first coast site on the Persian Gulf's northern shores, where a direct human-coast interaction and exchange with sites in the hinterland can be explored archaeologically, while such case studies are known around the Mediterranean.

Presentation Type: Communication

Waterlandscape of the Earthen Mound Builders (Cerriteiros) of Patos Lagoon, Southern Brazil

Rafael Guedes Milheira, Federal University of Pelotas, Brazil

Keywords: Archaeology, Earthen mounds, waterlandscape, indigenous, cerritos

Abstract: This work shows a GIS-based analysis for understanding the mobility and visibility system of the Pre-Columbian earthen mound-builders (cerriteiros) of Patos and Mirim lagoons, located in southern Brazil, during the late Holocene. A geospatial model of mobility, visibility, and centrality was developed using the least-cost path, network analysis, and viewshed methodologies. The degree of traffic and the settlement centrality allowed the interpretation of movement patterns and the connectivity of people in the coastal aquatic environment. The comparison between the terrestrial and aquatic models of mobility illustrates the permeability of the landscape suggesting the higher efficiency of movement via canoe in some environments as opposed to a purely walking-based model as well as the visibility model informed about the visual control over the aquatic resources in the estuary of the lagoon. Considering the GIS modelling and the archaeological and ethnohistorical data, we suggest that settlement and mobility patterns in some parts of the coastal plains were driven by the water-heavy landscape and the settlement

positioning acted as mechanism of ordering the landscape. According the zooarchaeological and isotopic data, the aquatic resources, as the estuary fishes, also played a major role in the organization of the Pre-Columbian settlements, which allow to think the earthen mound builders as fishers whom controlled the water landscapes over centuries until the European colonization. Our data also suggests that the Pre-Columbian aquatic scenario was managed in a sustainable way by the indigenous groups, which currently has been overexploited by industrial fisheries, showing that the estuary lagoon is near to the limit of its resiliency denoted by the lack production of fishes, the shift in their sizes and their estuarine location.

Presentation Type: Communication

Coastal Lagoons, Shifting Environments, and Control of Natural Resources

Annalisa Marzano, Università di Bologna, Italy

Keywords: Coastal lagoons, Roman fishing, Histria, Ephesus, control of natural resources

Abstract: In this paper I will discuss the natural resources offered by, and the exploitation of, coastal lagoons, particularly in respect to large- and medium-scale fishing and connected fish-processing activity by salting. By looking at these categories it will be possible to address key issues such as what factors governed the allocation of natural resources, who had access to capital, in what form, and how they dealt with it. The different legal status, from the point of view of property law, of the sea versus internal bodies of water such as lagoons, will offer the opportunity to investigate the degree to which municipalities, sanctuaries, and wealthy landowners tried to dominate and control exploitations rights to these bodies of water. The case studies I will discuss to illustrate this point will be the disputes involving sanctuaries and/or municipalities against the Roman publicani, such as the dispute about the Selinusia lagoon in Ephesus (Strabo 14.1.26) and the southern branch of the Danube near Histria (I. Histriae 67-68).

My previous research work has suggested that business partnerships were important in large-scale fishing activities because they allowed individuals to pool financial and labour resources, since the capital goods needed (boats; large fishing nets; weirs, etc.) were costly.

The underlying research hypothesis shaping this paper is that wealthy landowners, social elites, and collective entities such as sanctuaries situated in favourable geographic locations tried at all costs to secure the exploitation of these natural resources, aided by the fact that they had at their disposal the needed capital. Voluntary collectives were the only other way in which people of more modest means could enter this game; however, links and connections with the political and social elites must have been crucial in establishing proper supply and distribution

networks and in securing protection in the case of disputes and upholding specific rights when challenged.

Presentation Type: Communication

The Evolving Landscapes of the Lagoon of Venice (Italy): Geomorphology, Settlements and Infrastructures in Antiquity

Paolo Mozzi, Department of Geosciences, University of Padova, Italy

Carlo Beltrame, Department of Humanities, Ca' Foscari University Venice, Italy

Sandra Primon, free-lance geologist, Venice, Italy

Stefano Medas, Department of Cultural Heritage, University of Bologna and Department of Humanities, Ca' Foscari University Venice, Italy

Keywords: coastal geomorphology, relative sea level, Adriatic Sea, wet site archaeology, underwater archaeology

Abstract: The natural dynamics of formation and transformation of lagoons depend on the balance between the development of barrier islands, the fluvial and tidal sedimentary input to the lagoon basin, and the local trends of relative sea level (RSL). The evolution of the lagoon of Venice, among the largest in the Mediterranean, is paradigmatic in this sense, as it encompasses all three forcing factors. Its formation started about 7 kyr ago, thanks to the development of extensive barrier islands fed by longshore currents. These latter have been receiving abundant sediments from the mouth of major Alpine rivers, such as the Po, Adige, Brenta and Piave rivers, that debouch in the northwestern sector of the Adriatic Sea. Nevertheless, only in few moments these rivers directly debouched in the lagoon itself, thus reducing its silting up and allowing its preservation. The existence of an extensive lagoon was further allowed by continuous RSL rise largely driven by geological land subsidence all along the upper Holocene. An estimate of the average rate of RSL rise in the central and northern lagoon of Venice over the last millennia, based on geological and archaeological data, is around 1.2 - 1.3 mm/yr.

The human settling and exploitation of the lagoon of Venice therefore took place in an extremely dynamic geomorphological and environmental context. To fully understand the processes of formation and preservation of lagoon archaeological sites since antiquity, and to try to define the territorial dynamics underlying their distribution and function, it is necessary to reconstruct the changing structure of the physical landscape. In this contribution, we outline the geomorphological and paleoenvironmental evolution of the lagoon over the last millennia, in terms of coastline modifications, rearrangements of the tidal network, RSL rise, migration of river mouths. We further discuss their geoarchaeological significance in relation to main known settlements and infrastructures dating to the Roman period, as well as to the preliminary results of ongoing investigations (coring, surface and underwater archaeological surveys, geophysical surveys) at the Roman sites of Altinum, Scanello (Burano), Lio Piccolo, and Canale San Felice. A reappraisal of legacy data from previous underwater is also relative to the Ca' Ballarin site (Canale San Felice) and Sant'Erasmus mudflats and sandbanks.

Presentation Type: Communication

Vegetal Landscape in the Venetian Lagoon

Silvia Marvelli, Laboratory of Palynology and Archaeobotany, Centro Agricoltura Ambiente “Giorgio Nicoli”, Bologna, Italy

Veronica Rossi, Department of Biological, Geological and Environmental Sciences, University of Bologna, Italy

Marco Marchesini, Department of Humanities, University of Ferrara, Italy

Keywords: Vegetal landscape, Venetian lagoon, palynological data

Abstract: In the Venetian lagoon, at the beginning of the Sub-Atlantic, there is a decline in the tree cover which amounts to 60%; the *Querceto* dominates, which exceeds 20%. The presence of tree hygrophytes and herbaceous hygro/hydro/helophytes is significant. The certification of halophytic plants is considerable. Anthropogenic species, in particular cereals, are also discreetly represented.

With the affirmation of the Venetian civilization, on the mainland the vegetational landscape changes considerably and the palynological data, contextualized within the stratigraphic and paleoenvironmental framework, reconstructed through the integration of sedimentological and meiofauna data (benthic foraminifera and ostracods), allows to identify the main dynamics of the past. The surveys carried out in the Maerne area testify to a sharp decline in the tree cover (15%) of both deciduous and coniferous deciduous trees. Wetlands remain fairly extensive (10%). Widespread are the attestations cultivation of cereals (6%) and areas destined for grass/pasture (43%) of livestock.

In the lagoon, on the other hand, there is a considerable amount of trees, in particular at Lio Piccolo (site of Cà Ballarin), where they exceeds 70%; on the shores of the lagoon there is a dense mesophilic oak wood with Oaks/*quercus* (*Q. robur*, *Q. cerris*, *Q. petraea*), Hornbeam (*Carpinus betulus*, *Ostrya carpinifolia*-*Carpinus orientalis*), Ash trees (*Fraxinus excelsior*, *Fraxinus ornus*), Lime trees (*Tilia cordata*, *Tilia platyphyllos*), Elm/*Ulmus* accompanied by various shrubs such as Dogwood/*Cornus mas*, Sanguinello/*Cornus sanguinea* and Hazel. Extended are the Alders (*Alnus glutinosa* and *A. incana*) with values higher than 20%; the presence of herbaceous hygro/hydro/helophytes is modest. The contribution of plants in a brackish environment is limited. The anthropogenic component is modest, with scarce evidence of cereals, hemp/*Cannabis sativa* and fruit plants.

The arrival of the Romans, first on the mainland then in the lagoon, determines a radical transformation of the territory, favored by a progressive improvement of the climate. The new vegetation structure is characterized by the felling of the forest, the reclamation of wetlands and a strong increase in anthropic activities with a strong boost from agriculture. In the northern lagoon, in Cà Ballarin, the construction of the landing station and the relative Venetian-style well in the II-III century. A.D. determines the cutting of the forest. Forest coverage drops to 25%. In the area surrounding the well there are documented marshy meadows and

numerous ponds rich in sedges/*Carex*, rush/*Juncus*, common reed/*Phragmites australis*, duckweed/*Myriophyllum spicatum*, duckweed/*Lemna*, common water lily/*Ninfea alba* and various cutlery/*Sparganium*. Cultivated/cultivable plants reach 20%, especially due to the increase in cereals (barley, wheat, rye/*Secale cereale* and spelled/*Triticum spelta*). There are also numerous other finds including hemp and fruit plants (Walnut, Olive, Plum, Cherry).

Overall, in this phase there is a climatic improvement also documented by historical sources: in the agricultural treaty of the Saserna (II-I century BC) it is said that in northern Italy the changed climatic environmental conditions allowed the growth of some species of Grapevine and Olive Tree thanks to a warmer and milder climate.

Presentation Type: Communication

**Multidisciplinary Study of Continuous Core Drilling in the
Archaeological Site of the Roman Aquileia Fluvial Harbor:
Facies Analysis and Reconstruction of the Stratigraphic-Depositional
Architecture in Relation to the Development Phases of the Harbor**

Amedeo Martella, Department of Earth Science, Pisa University, Italy

Giovanni Sarti, Department of Earth Science, Pisa University, Italy

Duccio Bertoni, Department of Earth Science, Pisa University, Italy

Daniela Cottica, Ca'Foscari University, Italy

Cristhophe Morhange, Aix Marseille University, France

Alexandra Bivolaru, Aix Marseille University, France

Keywords: Roman fluvial harbour, Core analyses, Stratigraphic correlation, Paleo-environmental reconstruction, Geo-archeology

Abstract: We reconstruct the geoarchaeological history of the roman Aquileia (UD) harbor through a multidisciplinary study of two continuous cores (23.7 m and 17 m of depth respectively) located in the UNESCO archeological site of ancient harbor dock, that represent one of the best preserved ancient harbor in the world. Based on the integration between facies analysis and archeological findings we recognized three main phases related to the activity of the harbor: i) a pre-harbor phase, characterized by three different lithofacies: from the bottom to the top we recognized the succession of a mud-silt sequence with the presence of a peat level, a sandy fluvial channel deposit and a gravelly high-energy fluvial channel; ii) a syn-harbor phase within a more sandy and less energetic channel; and iii) a post-harbor phase when the harbor activities eventually stopped, approximately before the conquest and semi-destruction of the city by Attila in 452 AD.

The pre-harbor phase recognized in both the cores shows the amalgamation of at least three gravelly fluvial channel systems organized in fining upward sequences,

whose age spans from the protostoric period to the II century BC. The syn-harbor phase is well age-constrained between the II century BC and III / IV century AD by the archaeological roman remains found within the gravel and sand of the harbor channel. The sudden transition to the post-harbor phase is identified by an anthropogenic fill deposit constituted by different archeological remains (produced from the III to V century AD), generally devoid of sandy matrix, interpreted as an attempt to reclaim the area. In fact, this phase is related to the definitive deactivation of the Natiso cum Turro paleo-fluvial system, that was followed by the subsequent swamping of the surrounding area from the V century AD to 1770 AD. This succession of events led to the present geomorphological configuration, that was strongly influenced by human activity in the last centuries.

We also reconstructed the stratigraphic - depositional architecture of the sub-soil of the territory of Aquileia by using all the data deriving from past core analysis found in the literature, which have been re-analyzed and re-interpreted based on the new findings. The facies analysis of all the available cores allows us to complete an accurate reconstruction of several graphic panels of stratigraphic correlation, which highlight the paleo-environmental variations over time, with particular attention to the paleo-hydrographic evolution of this area in the last 29 ka, from the MIS 2 to present.

Presentation Type: Communication

Diachronic Human-Wetland Interactions on the Salpi Lagoon (Apulia, Italy): From the Pre-Roman Daunian Period to the Middle Ages

Girolamo Fiorentino, Università del Salento, Italy

Roberto Goffredo, Università di Foggia, Italy

Ilaria Mazzini, Consiglio Nazionale Delle Ricerche –Roma, Italy

Darian Marie Totten, McGill University, United Kingdom

Keywords: lagoon, paleoenvironment, *longue durée*, Apulia

Abstract: The coastal plain of Northern Apulia, in Southern Italy, has long been defined by the presence of an extensive lagoon. Its diachronic evolution has been affected by climatic changes, sea level fluctuations, river floods and adaptation, containment, and exploitation strategies led by local communities over centuries. At the beginning of the 20th century, the growing demand for cultivable land and the progressive degeneration of the area's healthfulness pushed the Italian State to reclaim most of the coastal wetlands and lakes of Gulf of Manfredonia. Alluvial deposits obliterated almost every trace of the ancient morphology of the shoreline, saving only two derivations of the original coastal lagoon: the Frattarolo Marsh, near Manfredonia, and a part of the Salpi Lagoon which was transformed into saltpans that are highly productive.

The proposed paper presents the initial findings of a multidisciplinary research program in the area of the Salpi Lagoon since 2013, to write the long-term history of

this radically transformed wetland alongside the three urban centers that grew up in it between the Iron and early Modern Age: the pre-Roman settlement of Salpia Vetus, the Roman town of Salapia, and the Medieval town of Salpi. Our landscape and paleoenvironmental data, when evaluated alongside the archaeological evidence, has aided in revising the negative picture provided by the ancient sources. In this ever-changing landscape, we track the long-term histories of these settlements that both benefitted and suffered due to the complex intersection of land and water.

The history of Salapia Vetus demonstrates a pronounced transformation in the settlement sited on an inland lake that brought the benefit of ample fishing to the community. What has emerged from the paleoenvironmental investigations is that, in the 5th/4th c. BCE, more radical changes were brought about: the active burning of forest cover to create large tracts of arable farmland, perhaps to sustain a growing urban population when paired with aquatic resources. But it was not to last: the freshwater became increasingly stagnant, if not malarial, leading to the transferral of the town's inhabitants to Roman Salapia, a narrative recounted by Vitruvius, and whose chronology has been confirmed by our excavations to the 1st c. BCE. Thus, the human-marsh relationship began again, this time situated on the salty Salpi lagoon. The town's relationship to the lagoon is still coming into focus, but salt production was likely central. Sometime in the 4th c. CE, notable continental sedimentation deposits indicate either increasing erosion of inland agricultural soils, or the slackening of earlier strategies to manage such deposits, that would have slowly transformed the shape and aquatic health of the lagoon in the long term. By the early 6th c. CE, the town had become a village that persisted to the 8th c., which was then abandoned. Despite a caesura dated to the 9th and 10th centuries, a new town was founded in the 11th c. that would become a medieval castrum, intent on exploiting salt resources, among others, and likely elevated not only for defence, but also for the intermittent flooding of the lagoon.

Presentation Type: Communication

Liminal Historical Landscapes in Southern Tuscany: The Erc Neumed Project, a Multidisciplinary Approach for a New Narrative

Luisa Dallai, Università di Sena, Italy

Giulio Poggi, Università di Siena, Italy

Vanessa Volpi, Università di Siena, Italy

Keywords: Coastal lagoons, Southern Tuscany, Multidisciplinarity, Medieval landscapes

Abstract: The coastal territory of southern Tuscany framed by the Pecora and Cornia rivers, the reliefs of Colline Metallifere and the gulf of Follonica (Grosseto and

Livorno provinces), has been for many years at the centre of archaeological research projects undertaken by the University of Siena, aimed at reconstructing diachronic settlement patterns and political-economic dynamics (DALLAI 2016).

Along the coast of this Tyrrhenian stretch, salted lagoons, nowadays completely reclaimed, have been for centuries the core of a very articulated economy; despite having been the subject of a relevant number of studies, their extension and transformation have been investigated mainly through the combined analysis of the archaeological record and historical cartography, with a very limited multidisciplinary approach.

Between 2015 and 2020 this territorial sample has become the core of an ERC Advanced project based at the University of Siena, named nEU-Med: "Origins of a new economic union (7th-12th centuries): resources, landscapes and political strategies in a Mediterranean region" (p.i. prof. R. Hodges; <https://www.neu-med.unisi.it/en>). The project aimed at reconstructing diachronic environmental changes (natural and anthropogenic), using them as 'litmus paper' in order to read the dynamics of environmental management and political control over the economical resources of the region (BIANCHI, HODGES 2018; BIANCHI, HODGES 2020).

Thanks to the multidisciplinary approach carried out within the nEU-Med project, many new historical-archaeological and environmental data have been acquired; these allow to better detail the different features of the landscape, regarding in particular the presence and variations in wetlands (PIERUCCINI et al. 2021). The investigations have combined traditional archaeological survey and remote sensing techniques with on-site geochemical analysis (pXRF), coring, archaeobotany, chemical and geoarchaeological analysis, providing absolute chronologies (C14 dates) to which to anchor the long-term landscape transformations. The multidisciplinary approach has detailed the interaction between man and environment with a high spatial resolution, with regard to the main landscape transformations and major land reclamation occurred over time, finally providing a new diachronic reconstruction of the historical coastal landscape in this mid-Tyrrhenian stretch.

References: Dallai L., 2016, *Paesaggio e risorse: il monastero di San Quirico di Populonia, la pianura ed il promontorio di Piombino*, in G. Bianchi, S. Gelichi (a cura di), *Un monastero sul mare. Ricerche a San Quirico di Populonia (Piombino, LI) / A Monastery by the Sea. Archaeological Research at San Quirico di Populonia (Piombino, LI)*, Firenze, pp. 89-108; Bianchi G., Hodges R. (eds), 2018, *Origins of a new economic union (7th-12th centuries). Preliminary results of the nEU-Med project: October 2015-March 2017*, Firenze; Bianchi G., Hodges R. (eds), 2020, *The nEU-Med project. Vetricella, an early medieval royal property on Tuscany's Mediterranean*, Firenze; Pieruccini et al. 2021= Pieruccini P., Susini D., Buonincontri M. P., Bianchi G., Hodges R., Lubritto C., DiPasquale G., Late Holocene human-induced environmental changes in Calcareous Tufa environments in Mediterranean valleys (Pecora river, Southern Tuscany, Italy), *Geomorphology*, 383, pp. 1-23.

Presentation Type: Communication

Reverse Engineered Sabkha Salt Production in Endorheic Basins as the Basic Technology of the Qanat, [Kariz, Aflaj, Foggara, Gallerias] has led to Erroneous Arable Furrow Agricultural Irrigation

David Bloch, Salt Archive M. R. Bloch, Israel

Keywords: Salt, Sabkha, irrigation, leaching, waste

Abstract. More than 150,000 thousand GALLERIAS, QANAT, KAREZ AFLAJ FOGGARA sweet water distribution systems including more than 200,000 kilometers of tunnels still exist in the Middle East, Central Asia and Mediterranean basins. The Islamic [Shiia Jafari] agricultural revolution reorganized the management control of these water sources and gave the Ottoman regime and its client trading partner Byzantium, the ultimate spice of the Silk Road, Common salt.. It is proposed that the engineering for the original ancient Qanat design was to direct water to arid zone SABKHA basins in order to irrigate and dissolve salt deposits of endorheic alluvial basins by leaching, then recrystallizing and precipitating the salts as pure salt crust during the hot desert seasons. With today's ubiquitous salt supplies, Qanat tunnels are used now only for desalinating and irrigating domestic and local agricultural soils while erroneously misusing and wasting 90% of the available water. The engineering and construction of these ancient systems involved an extremely heavy investment, in extreme desert conditions. The human cost of building the tunnels and boreholes could only have been justified by the priceless value of the salt products resulting from the irrigation and flooding mechanisms to produce huge quantities of commercial salts and only minimal aquaponic and hydroponic products for local consumption.

Presentation Type: Communication

Looking for the Watermarks.

Assessment and Evaluation of the Impact of Roman Hydraulic Infrastructure on Coastal Paleo-Lagoon Context. The Archaeological Site of Laguna Seca (Cadiz, Spain) through a Non-Invasive Methodology

Lazaro Lagostena Barrios, Universidad de Cádiz, Spain

Enrique Aragón Núñez, Universidad de Almería, Spain

Isabel Rondán Sevilla, Universidad de Cádiz, Spain

Keywords: Photogrammetry, Lidar, Paleo-landscape, anthropogenic geomorphological, roman archaeology

Abstract: The successful management of the resources of the vast territory occupied by the Roman Empire was primarily due to the optimisation of infrastructures. More specifically, the infrastructures dedicated to water management have always been

fundamental for the birth and development of both urban and rural settlements. Furthermore, the impact produced by this type of infrastructure on a landscape as fragile as the coastal or marshland landscape has rarely been evaluated. The footprint left by anthropogenic geomorphological remodelling of landscapes is challenging to detect throughout history. However, new non-invasive methods can bring some light to these transformations resulting from human activities on the environment to adapt it to their needs. This paper presents the results of the study of the area known as "Laguna Seca" (Cadiz, Spain) using detailed three-dimensional reconstructions of the surface structure of the landscape using LiDAR and photogrammetry. The territory under study is a space with multiple archaeological entities and connected with heavy infrastructure (e.g. aqueduct, water pipes, canalisation and large production areas) that seem to be related to a process of drainage and land drainage for productive purposes that must have occurred in Baetica in the same way as in other well-known territorial contexts of the empire.

Presentation Type: Communication

On the Banks of the Ancient Ligustinus (Southern Spain). Historical Settlement on the Past, Present, and Future of a Riparian Landscape

Maria del Mar Castro Garcia, University of Cadiz, Spain

Keywords: lacus Ligustinus, riparian landscape, remote sensing, emptyscape, waterscape, Guadalquivir River

Abstract: Preliminary results from the LiguSTAR MSCA Project are presented on behalf of a better understanding of the historical settlement on the banks of a great fluvial-maritime wetland, the ancient lacus Ligustinus, located at the mouth of the Guadalquivir River (Southern Spain). During the Holocene, geomorphological changes have been occurring in this waterscape. Nowadays, it is totally transformed. Initiatives to recover its environmental and cultural values are starting to be implemented, but they need the support of thoroughly planned multidisciplinary research. The LiguSTAR Project dealt with the historical part of this required research. The geomorphological process involved consequences for the human interaction with the riparian environment. In this respect, the ancient configuration of the settlement on the banks of the lacus Ligustinus is being examined from a diachronic approach. To focus this general aim, a selected study area in the surroundings of the ancient city of Ebora has been surveyed, particularly regarding evidence from Protohistoric times to Medieval ages. Special attention is paid to the Roman patterns of settlement. To achieve this research, different non-invasive archaeological techniques have been applied, such as geophysics, magnetic survey, and UAV applications. Also, we are analyzing the antropologic record and other

types of evidence that have been brought to light because of new and more aggressive procedures of land exploitation. The ongoing LiguSTAR research line undertakes the study of archaeological sites, as well as the so-called “emptyscape” between them, in order to explain the historical settlement as a result of the particular human-environment interactions on the banks of the lacus Ligustinus. The understanding of these relationships could be highly relevant to planning a new and more sustainable model of territorial management for this region.

Presentation Type: Communication

Natural and Human made Harbors in the Port City of Denia (Spanish Mediterranean)

Sophia O'Flaherty-Lopez, Alicante University, Spain

Jose Enrique Tent Manclus, Alicante University, Spain

Cesar Bordehore, Alicante University, Spain

Keywords: Ancient harbors, coastline dynamics, Denia, Mediterranean

Abstract: Denia is a small port city in the province of Alicante (Spain), which mostly dedicates itself to the transport of people and supplies to the Balearic Islands. Today's harbor was man made at the early 20th century because of the need to protect their sailboats from bad weather. This port city has a history of almost 3000 years but unlike now, two natural lagoons were used as harbors instead. 6000 years ago, when sea level stopped rising after the last glacial period, 2 estuaries to the north and south of a 70-meter hill developed. The combination between both estuaries and the hill, made Denia well known and be considered the most important Spanish Mediterranean coast port city during sailboat times, before the trade with the Americas started. The hill offered good sighting, and the estuaries were windward to San Antonio's cape, which separates the Valencia and Alicante bays. Both estuaries were used as natural harbors. The northern one, El Raset, was used during the ancient Iberian-Roman times and became silted in Muslim times, who then used the southern one, La Caldera. Denia was founded on the hill by the early Phoenicians Massaliots, then, Romans preferred using the northern slope and the El Raset harbor to found Dianum. Then in Visigoth times, the village and the northern harbor were close to being abandoned. The Muslim conqueror of Iberia founded the city of Daniyya to the southwest of the hill and used the southern harbor instead, La Caldera, becoming an important maritime military base for the Muslim caliphate fleet. Later on, La Caldera port would be better known for its morish pirates and corsairs for 500 years on, ruling all the western Mediterranean. The Aragonese Christian Kingdom took over Daniyya in 1244, changing its name to Denia. The port continued to be an important military and commercial base, but La Caldera was slowly silting. Its last major event was the Muslim expulsion by the Aragonese Kingdom in 1609, when 40.000 people were forced to abandon their homeland

boarding in Denia, to be taken to the north of Africa, in only two months. The castle at the top of the hill, symbol and protection of Denia's settlement, was destroyed in 1708 during the Spanish Succession War, and most of its debris filled La Caldera's harbor. By then, Denia's harbor was only a wood pier using a rowing boat to load and unload bigger ships. As no harbor protected the ships, plenty of shipwrecks started to happen, and commercial traffic had to be strongly descaled. In the early 20th century the new human made harbor was built, and maritime traffic got restored easily, as Denia offers the shortest maritime connection with the Balearic Islands. Nowadays, there is no evidence of these estuaries on land, and the studies about these lagoons is very scarce. The city's train tracks go through the old La Caldera, and what used to be the roman El Raset is now built up with high building blocks.

Presentation Type: Poster

The 7th edition of the Landscape Archaeology Conference is the first edition to be organized in Eastern Europe. Starting from this realisation and the fact that landscape archaeology is a discipline that naturally glides through dogmatic disciplinary boundaries, we have decided that the word that would best describe it would be togetherness. Around this word we have gathered other seven that define the six main themes of the conference:

The first is *Responsibility* as it relates to our duty of paying attention not only to our immediate moment of existence but also to the identification and assessment of anthropic pressure on both built and natural landscapes.

The second is *Defragmentation*. This theme is an invitation to explore the different ways in which various thought traditions mold the way we think about humans, time, and landscapes.

Integration defines the third theme and it shifts the focus towards contributions exploring the interrelationship of human and natural systems.

The fourth word is *Sensitivity*. This theme forgoes rationality and is an opportunity to look at landscapes as affective rather than rational constructs.

Explanation and Understanding, our fifth theme, constitutes an opportunity to examine landscapes starting from quantifiable attributes to cultural constructs.

The final theme is defined by *Cooperation*. As Landscape Archaeology defies disciplinary boundaries, it poses unique challenges. Therefore, this theme welcomes contributions that focus on theoretical and technological multi-disciplinary approaches to the reconstruction of past landscapes.

ISBN online: 978-606-714-716-2

www.editura.uaic.ro