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Zagreb, 2026

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14TH

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The scientific conference *Methodology and Archaeometry* is being organised by the Department of Archaeology, Faculty of Humanities and Social Sciences, since 2013. The goal of the conference is to entice interdisciplinarity, critical thinking, new insights and approaches as well as new theoretical frameworks in contemporary archaeological science. Coverage of a wide spectrum of themes and scientific disciplines has resulted in papers and discussions that promote scientific issues in the fields of methodology, documentation and interpretation of archaeological data.

The interdisciplinary character of the conference brings together archaeologists and researchers from other scientific disciplines with whom archaeologists collaborate closely, and who, through their work, projects and ideas, promote new insights about the interpretation of human life in the past.

Section Methodology

Obtaining and collecting data is an essential part of the archaeological research process. How we collect and interpret data defines the validity of our interpretation. We use different techniques, approaches and tools which help us to reconstruct the past processes and to give more objective and comprehensive picture of the past. Contemporary interpretation tools alleviate and speed the data collection and also provide us with countless possibilities of interpretation, protection and presentation of archaeological sites and the landscapes encompassing them.

Section Archaeometry

Given the limited information that can be obtained from archaeological excavations and the classification of archaeological material, cooperation with other scientific disciplines is essential if we are to learn as much as possible about how people lived in the past. Contemporary archaeology is a highly heterogeneous discipline, encompassing research groups focused on different periods, regions, theoretical frameworks and methodological approaches. Beyond describing the mechanical and physical properties of a particular artefact or material, archaeometric analyses allow us to address questions about the social and cultural lives of the people who made, used, exchanged and discarded these objects. Cooperation with the natural sciences answers many questions, but it also requires particular care in selecting the scientific analysis best suited to a given archaeological problem. Equally, it calls for continuous collaboration between the specialist and the archaeologist, from sample collection to final interpretation.

SCIENTIFIC COMMITTEE

Ina Miloglav
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Geology and Petroleum Engineering, University of Zagreb, Croatia

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UCL Institute of Archaeology, London, United Kingdom

PROGRAMME

14TH

PROGRAMME

Thursday, 26 November

9:00 – 9:10
Conference opening

Key-note lecture:
Chair: Ina Miloglav

9:10 -9:55
Carlos G. Santiago-Marrero
Reconstructing Human–Plant Interactions at the Microscale: Microbotanical Perspectives on Plant Use and Foodways in Past Societies

10:00 – 10:20
Coffee break

Session 1
Chair: Miroslav Vuković

10:20 – 10:35
Žiga Kokalj & Luka Škerjanec
Cross-border airborne laser scanning data

10:40 – 10:55
Sara Popović & Marko Rukavina
Redrawing the Roman Landscape: New Centuriations and New Questions from National and Transnational ALS Datasets

11:00 – 11:15
Siniša Pamić, Luka Bariša & Tomislav Zojčeski
Reading the Roman Landscape: LiDAR, Surface Traces, and Archaeological Excavations of Centuriation at Barbariga

11:20 – 11:35
Jerko Luka Gašpar
New insights into the study of Roman land division in Istria, Croatia, acquired through remote sensing analysis

11:40 – 11:55
Jelena Lapić
From Legionary Territory to Colonial Land Division: Reconstructing the Roman Landscape between Tilurium and Aequum

12:00 – 12:20
Coffee break

Session 2
Chair: Predrag Novaković

12:20 – 12:35
Predrag Đerković
Methodological challenges in GIS-based predictive modelling - Identifying 6th century hillforts in the central Balkans

12:40 – 12:55
Álvaro Corrales Álvarez
Advancing Open Science in Archaeological Documentation: Open-Source Tools, Repositories and Reproducible Workflows for Preventive Conservation in Roman Baetica

13:00 – 13:15
Gregor Pobežin & Zrinka Mileusnić
Stone to Digital: AI-assisted Workflow for Epidoc - the Case of Medieval and Early Modern Inscriptions

13:20 – 13:35
Slađana Nešković
The Replica as a Record of Process. Documenting Decisions in the 3D Digitisation and Additive Manufacturing of Archaeological Objects

13:40 – 13:55
Abreha Kiros
Reconstructing Environmental Change at Aksum: A Longitudinal Archaeological and Photogrammetric Assessment of Monumental Landscapes

14:00 – 15:00
Lunch break

Session 3
Chair: Andreja Kudelić

15:00 – 15:15
Beáta Barbocz
Quantitative Analysis of the Pottery from the Bandu Cemetery (Mureș County, Romania)

15:20 – 15:35
Florica Matau, Vasile Diaconu, Mitica Pintilei, Ovidiu Chiscan, Ana-Lavinia Vasiliu & Elena-Laura Ursu
Technologies of Tradition: Archaeometric Investigations into Cucuteni Pottery Technology at Răucești-Dealul Munteni (Neamț County, Eastern Romania)

15:40 – 15:55
Jasna Vuković
Beyond Simple Modelling: Reconstructing the Manufacturing Procedures of Vinča Anthropomorphic Figurines from Pavlovac-Čukar, Southern Serbia

16:00 – 16:15
Zrinka Mileusnić & Katarina Katja Predovnik
FIAT LUXUS. An integrated archaeological and archaeometric framework for the research of "Loka Painted Ware"

16:20 – 16:35
Mario Novak, Slavica Filipović, Petra Grizelj, Željka Bedić & Mario Carić
The Last Meal of a Roman Soldier: Dietary Signatures in a Third-Century Roman Mass Grave from Mursa

16:40 – 16:50
Coffee break

Session 4
Poster presentations

16:50 – 17:30
Zvonka Janežič & Jure Tičar
Reassessing the Archaeological Potential of Slovenian Karst Caves through Systematic Non-Invasive Surveys

Luka Škerjanec, Nejc Čož & Žiga Kokalj
Morphometric and Spatial Analysis of Prehistoric Burial Mounds in Eastern Herzegovina

Franka Ovčarić, Luka Drahotusky-Bruketa, Janja Mavrović Mokos
Seeing Is Believing: Applying Remote Sensing to Archaeological Surveys. A Case Study from Medvednica Mountain, Croatia

Sayem Ahmed
Revealing Hidden Landscapes: Artificial Intelligence and Satellite Remote Sensing for Archaeological Reconstruction in the Bengal Delta

Ružica Savić
Spatial Proximity and Technological Similarity: Building Practices at the Late Neolithic Settlement of Drenovac near Paraćin, Serbia

Tena Karavidović, Tomislav Brenko, Sibila Borojević Šoštarić & Tajana Sekelj Ivančan
Geoarchaeological Approaches to Identifying Iron Production Landscapes: Linking Production Sites and Potential Bog Iron Ore Sources in Altered Environments

Andreja Kudelić, Natali Neral, Filomena Sirovica, Zoran Čučković, Dinko Tresić Pavičić, Martina Čelhar, Mia Marijan, Marta Mileusnić & Iris Biškupić Bašić
Mapping Technological Knowledge through Pottery: The PotNet Research Project

Sarah Hinkel & Agnese Benzonelli
Secrets on the Surface: A Characterization of Late Bronze Age and Early Iron Age Wares from the Vedi River Valley Using Non-Destructive Techniques

Kristina Horvat Oštrić, Maria Letizia Amadori & Jgor Arduini
Archaeometry of pottery from the Neolithic site of Graduša – Lokve

Maciej Dębiec, Anna Rauba-Bukowska, Vasile Diaconu, Katarzyna Drabik, Ewa Rydzewska & Anna Przelaskowska
Archaeometric Investigations of Precucuteni Figurines from Romania: Technology and Production

Ramona-Crina Suciu, Mioara Zagrai, Ionuț Marian, Alexandru Turza, Aurel Rustoiu, Florin Popa, Senica Țurcanu & Călin Gheorghe Dan Neamțu
A multi-method approach to study miniature ceramic vessels from area of the Cucuteni - Trypillia culture

Natali Neral, Andreja Kudelić & Domagoj Mudronja
When the Method Meets the Laboratory: Implementing SEM-EDS Analysis of Archaeological Ceramics in Croatia

Petar Minkov, Denitsa Sandeva, Veseleina Dimitrova, Marina Kalpachka & Stanislava Todorova
Like Gold, Like Platinum: An Interdisciplinary investigation about gold and silver earrings from grave context from V century BC in Northeastern Bulgaria

Natali Neral, Ana Konestra, Małgorzata Zaremba & Agnese Kukela
Archaeometric Characterization of Mortar and Plaster from Late Antique sites along the eastern Adriatic coast (Croatia)

Koraljka Bakrač, Ankica Oros Sršen, Jan Hinkelman, Ivona Baniček, Tomislav Kurečić & Vibor Novak
Charcoal Evidence of Bronze Age Pastoral Practices at Spila nad Procjepom, Mljet

Jelena Jovanović, Tamara Blagojević, Camille de Becdelièvre, Maja Kokanović, Mario Novak, Maja Krznarić Škrivanko, Dragana Rajković, Lidija Balj, Andrej Starović, Dragan Milanović, Darko Radmanović, Guy Andre, Sara Bernardini, Federico Lugli & Gwenaëlle Goude
Stable isotope analyses and settlement archaeology approach indicate high variability in dietary and settlement patterns of the Neolithic communities in the Southern Carpathian Basin between the 7th and 5th millennium cal. BC

Zheni Vasileva & Elena Vasileva
Radiocarbon Dating and Cremation Practices at the 3rd Millennium BC Cemetery of Tarnayne, Northwestern Bulgaria

Ante Lozina
Tracing the Sacred: Historical Mobility and the Material Cultural Heritage of Saints' Relics in Croatia

Lovro Vragolović
The Barice-Gređani Group in Eastern Slavonia: Illuminating the Strizivojna-Šimenica Site in the Late Bronze Age Through New Discoveries

Friday, 27 November

Session 5

Chair: Jacqueline Balen

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Rodica-Mariana Ion
Roman Building Technologies across Moesia Inferior and Dacia: A Multi-Analytical Archaeometric Investigation of Raw Materials and Construction Practices

10:20 – 10:35
Alina Mosiu & Rodica-Mariana Ion
A Multi-Analytical Approach to HAp-Modified Lime Mortars: Linking Microstructure, Composition and Performance for Heritage Applications

10:40 – 10:55
Zrinka Mileusnić & Neža Čebron Lipovec
From archaeological park to heritage living lab: co-creation, teaching and sustainable management at San Simon's Bay, Slovenia

11:00 – 11:15
Annita Antoniadou
Beyond the Monument: How Archaeological Science Literacy Shapes Public Heritage Stewardship — A Case Study from Cyprus

11:20-11:40
Coffee break

Session 6

Chair: Nikola Vukosavljević

11:40 – 11:55
Noemí Cubas Martin & Joe Wallace Walser
From Soil to Spectrum: Experimental Burial, Cleaning Protocols and FORS Interpretation of Dyed Icelandic Wool

12:00 – 12:15
Marko Banda & Ina Miloglav
Sunset Stones: Lithics, technological organization and everyday activities at the Late Copper Age site of Prisunjača (Eastern Croatia)

12:20 – 12:35
Nikolina Belošević
Tracing Stone and Sculpture: New Insights into Early Medieval Sculpture of the island of Krk

12:40 – 12:55
Boris Rozić Vašiček
Network Analysis of Mousterian Sites in Bosnia and Herzegovina

13:00 – 14:00
Lunch break

Session 7
Chair: Petra Nikšić

14:00 – 14:15
Laura Sisto, Giulia Tagliabue, Michele Boracchi, Domenico Di Candia, Ciara O'Brien Butler, Richard Madgwick, Cristina Cattaneo & Lucie Natividad Jeannine Biehler-Gomez
Less is More: An integrated analytical approach to osteological material in the DOMINA Project

14:20 – 14:35
Barbara Kriletić
Amelogenin - small sample, big answer

14:40 – 14:55
Aleksandra Grzegorska & Rafał Fetner
No worms plenty of fish: Rethinking the "absence of evidence" in paleoparasitology through isotopic analysis, a case study of two Polish towns: Chełm and Puck

15:00 – 15:15
Abdul Adil Paray
AMS Radiocarbon Dating of Neolithic Sites in the Kashmir Valley, India: A Case Study in Minimally Invasive Sampling Strategies

15:20 – 15:40
Coffee break

Session 8
Chair: Marko Banda

15:40 – 15:55
Ivana Dimitrijević, Jelena Bulatović, Selena Vitezović & Ina Miloglav
Animals as Sources of Food and Raw Materials: Subsistence and Tool Production at the Late Copper Age Site of Prisunjača–Ciganica (Eastern Croatia)

16:00 – 16:15
Aivaras Jefanovas
Beyond Subsistence: Interpreting Seal Remains from Subneolithic Šventoji, Western Lithuania

16:20 – 16:35
Đurđa Obradović & Dragana Filipović
Measuring Charred Seeds: Insights into the Late Neolithic Use of Flax in Serbia

16:40 – 16:55
Saša Kovačević
The Individual and the Collective: Methodological Approaches to Iron Age Identities in Eastern Varaždin County

ORAL PRESENTATIONS & POSTERS
ABSTRACTS

14TH

ORAL PRESENTATIONS

Carlos G. Santiago-Marrero

Department of Humanities, Universitat Pompeu Fabra, Barcelona, Spain

Reconstructing Human–Plant Interactions at the Microscale: Microbotanical Perspectives on Plant Use and Foodways in Past Societies

Archaeobotany has contributed greatly to our understanding of human–plant interactions and plant foodways in past societies. Yet the preservation of plant remains in the archaeological record is shaped by the properties of plant materials, processing practices, and depositional conditions, creating biases that can obscure important dimensions of past diets and plant uses. These limitations raise a central methodological question: how can we investigate plant processing and plant foodways when macrobotanical evidence is scarce or absent? At the microscale, artefacts and surfaces associated with plant processing, food preparation, and consumption can retain microscopic residues that offer evidence of these activities. This is the case for plant microremains such as phytoliths and starch grains, which have become valuable sources of evidence for investigating plant-use practices even when no plant remains are visible to the naked eye. This keynote lecture examines the methodological principles, interpretative potential, advantages and limitations of microbotanical approaches to investigate past plant use and foodways. Drawing on selected archaeological case studies from Neolithic Southwest Asia, it explores how integrating microbotanical evidence with archaeological data and multidisciplinary frameworks can reveal overlooked dimensions of plant exploitation, foodways, and household activities in early sedentary communities. In doing so, it demonstrates how evidence preserved at the microscale can reshape broader narratives of human–plant relationships and everyday life in past societies.

Žiga Kokalj & Luka Škerjanec

Research Centre of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia

Cross-border airborne laser scanning data

In this paper, we discuss four types of boundaries. The first is the boundary of visibility, which airborne laser scanning (ALS, lidar) has already shifted considerably: archaeological features can now be detected even in forested, impassable and remote environments. The second is the geographical boundary. Lidar data acquisition is most often constrained by modern administrative boundaries, making it difficult to study historically connected landscapes. The third is the boundary of interoperability. National or regional ALS datasets differ in terms of their characteristics and acquisition times, derived elevation models, file formats, licenses, and access methods and restrictions. The nominal openness of data therefore does not necessarily translate into cross-border usability. The fourth is the boundary of accessibility. Open data are not necessarily easy to obtain, and accessible data are not necessarily ready for practical use. A published point cloud may still mean terabytes of data, demanding and time-consuming processing, as well as specialised expertise, software, and hardware. For many archaeological tasks, high-quality elevation models and analytical visualisations, ready for interpretation, are therefore often more valuable.

We address these boundaries by combining lidar data of Croatia, Friuli-Venezia Giulia, Italy, and Slovenia. CFVGS-CVAT is a 0.5 m resolution visualisation of a digital feature model (DFM) showing the terrain morphology and buildings. Archaeologists and others interested in terrain morphology and surface features can use it freely, easily, and comparably, without additional data processing. The Combined Visualisation for Archaeological Topography (CVAT) blends hillshade, slope, positive openness, and sky-view factor, computed with varied predefined settings, into a single image. It is therefore especially well-suited to interpreting microtopography in lidar-derived elevation models. CVAT enhances the visibility of features that differ in scale, height, orientation, and form, across terrain ranging from very flat to very steep.

Sara Popović[1] & Marko Rukavina[2]

[1] ArheoProjekt, Zagreb, Croatia

[2] Faculty of Architecture, University of Zagreb, Croatia

Redrawing the Roman Landscape: New Centuriations and New Questions from National and Transnational ALS Datasets

The availability of national and transnational airborne laser scanning (ALS) datasets is changing the scale at which Roman centuriation can be studied. Instead of reconstructing individual land divisions from fragmented local evidence, continuous regional coverage makes it possible to examine their extent, spatial relationships and physical materialisation across much larger landscapes.

This study presents newly identified Roman centuriations in Istria, Dalmatia and the Zagreb region, together with substantial revisions to the extent of already known land divisions. Together, these results redraw the known geography of Roman centuriation and challenge established assumptions about the relationship between centuriation, territory and administrative status. Centuriation is now documented in areas where it had previously been considered unlikely. Some neighbouring land divisions are separated by substantial gaps, while others meet directly without any gap at all. And within individual systems, the physical materialisation of the land division can vary considerably.

These results invite a reconsideration of the relationship between centuriation, territorial organisation, legal status, local communities and settlement. ALS does not by itself resolve these historical questions, but provides a new spatial framework in which they can be approached together with other archaeological and epigraphic evidence.

Siniša Pamić[1], Luka Bariša[1] & Tomislav Zojčeski[2]

[1] Croatian Conservation Institute, Svetvinčenat, Croatia

[2] Ruina d.o.o., Šibenik, Croatia

Reading the Roman Landscape: LiDAR, Surface Traces, and Archaeological Excavations of Centuriation at Barbariga

Roman centuriation was one of the principal ways in which the Romans organized and divided the landscape. Traces of this system often survived long after the original land division had disappeared, and Roman centuriation in Istria was recognized as early as the 19th century. In the Barbariga area, previous research established the basic pattern of the centuriation network, while recent LiDAR analysis has enabled a reassessment of the landscape and a more detailed investigation of its surviving traces.

This paper presents the results of recent archaeological investigations combining LiDAR analysis, digital terrain models, field survey, surface evidence, and archaeological excavation. Analysis of LiDAR data revealed a number of linear features and other elements corresponding to the previously known centuriation network. Following field clearance, some of these features became visible as regular lines of collapsed stone. Selected sections were subsequently investigated through archaeological test trenches in 2025 and 2026 to assess the preservation and nature of the identified structures. The excavations confirmed that some of these features represent the remains of Roman walls associated with the centuriation system. The investigated structures include walls forming major boundaries of the land division, as well as structures related to the internal division of the centuriae. In one area, walls associated with a route leading towards a Roman olive-oil mill were also investigated, providing new evidence for the relationship between the cadastral network, communication routes, and rural production.

The Barbariga investigations show that traces identified through landscape analysis can be tested archaeologically and, in some cases, linked directly to preserved Roman structures. The combination of LiDAR, field evidence, and excavation has therefore provided a more detailed picture of how the Roman rural landscape in this part of Istria was laid out, used, and maintained.

Jerko Luka Gašpar

Department of Barbaricum and Roman Provincial Archaeology, Faculty of Archaeology,
University of Warsaw, Poland

New insights into the study of Roman land division in Istria, Croatia, acquired through remote sensing analysis

Research on Roman land division on the Istrian peninsula has a long history. P. Kandler first recognized centuriation in Istria in the mid-19th century based on contemporary cartographic sources. B. Schiavuzzi later expanded his work using similar methods. Their work focused

on the peninsula's south, i.e., the colonial ager of Pola. The next significant breakthrough occurred in the post-war period with the appearance of aerial photography. These photographs taken by the RAF and JNA provided the basis for studies by M. Suić (1955), J. Bradford (1957), and R. Chevallier (1961), which contributed to a better understanding of the centuriation grids as well as to assessing their orientation and modular size. It was established during this period that the ager of Parentium was centuriated and that its grid shared the same modular size and orientation as that of Pola, raising questions of potential connection between the two grids. In contemporary times, great advances were made by subsequent authors who employed a wide range of digital tools such as satellite imagery, digitized cadastres, and sporadic LiDAR analyses, typically limited by the extent of the dataset.

At the current moment, new LiDAR data published by DGU in 2024 allow us to complement previous research with new insights. A detailed analysis of DEM derived from the LiDAR survey has brought to light many new and interesting features. Some of them fill the gaps within the known centuriation grid, but several features indicate that it extended farther than previously presumed, possibly redefining the borders of the agri within territoria of Pola and Parentium. Furthermore, evidence of a previously unknown grid, preliminarily identified as remnants of Roman land division located in eastern Istria, has been detected.

Jelena Lapić

Department of Archaeology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia

From Legionary Territory to Colonial Land Division: Reconstructing the Roman Landscape between Tilurium and Aequum

Established in the early 1st century AD, Tilurium housed Legio VII, as well as a detachment of Legio XI and auxiliary units. Veterans of Legio VII settled around Tilurium even before the legion's redeployment to Moesia in the second half of the 1st century. Following the Scribonian revolt, veterans were also settled in Aequum, founded by Emperor Claudius after AD 45 through a land grant discharge.

This study examines whether spatially coherent patterns can be discerned in the wider landscapes of Tilurium and Aequum and evaluates their potential significance for reconstructing systematic land division. LiDAR-derived digital terrain models underpin GIS-based identification and mapping of potential landscape features, initially without chronological or functional attribution. Their morphology, orientation, continuity, distribution and spatial relationships are assessed in relation to topography, hydrography, subsequent land use and differential preservation to evaluate whether apparent regularities reflect deliberate organization or other processes.

Where spatial evidence warrants further investigation, recurring distances are subjected to metrological testing, including possible correspondences with Roman surveying units and comparisons with alternative spatial configurations, rather than the imposition of predefined cadastral grids. The two areas are examined independently before comparative analysis considers whether any substantiated arrangements suggest shared organizational principles, distinct territorial systems, interaction or reorganization.

Separating feature identification, assessment of spatial coherence and historical attribution into distinct analytical stages provides a critical framework for evaluating the potential and limitations of LiDAR-based landscape reconstruction, particularly when inferring chronology, function and territorial boundaries. This approach provides a basis for examining hypotheses concerning colonial land division, the prata legionis and possible relationships between military and colonial territorial organization.

Predrag Đerković

Department of Archaeology, Faculty of Philosophy, University of Belgrade, Serbia

Methodological challenges in GIS-based predictive modelling - Identifying 6th century hillforts in the central Balkans

Steep and rugged mountainous regions in the central Balkans were widely occupied during the 6th century, following Justinian's efforts to restore the Empire under the banner of "renovatio imperii". Yet, our knowledge about the number and spatial distribution of early Byzantine hillforts in the Balkans remains limited and regionally uneven. This is precisely where archaeological predictive modelling can make a significant contribution, offering a wide range of tools for identifying areas with a higher probability of containing previously undocumented archaeological sites. However, applying quantitative and spatial methods to hillforts raises numerous methodological and epistemological questions about the selection of environmental variables, data quality, sampling bias, and the interpretation of model outputs.

This research is conducted in order to develop a precise GIS-based predictive model for identifying previously unknown early Byzantine hillforts. Drawing on a regional database of more than 1,000 documented fortifications, it assesses the possibilities and limitations of using spatial and environmental data to investigate patterns in hillfort distribution. Particular attention is given to uneven archaeological evidence, chronological uncertainty, and differences in the intensity and the nature of archaeological research across contemporary political and administrative boundaries.

The study examines how research design, data selection, and analytical decisions influence the model and the conclusions that can be drawn from it. While doing so, it also considers how data uncertainty can be incorporated into the modelling process within a GIS environment and how predictive outputs should be evaluated. By addressing these issues, the paper aims to contribute to a broader discussion about the reliability of predictive modelling and quantitative approaches in archaeology.

Álvaro Corrales Álvarez

Department of Prehistory and Archaeology, Faculty of Geography and History, University of Seville, Spain

Advancing Open Science in Archaeological Documentation: Open-Source Tools, Repositories and Reproducible Workflows for Preventive Conservation in Roman Baetica

Open Science is transforming archaeological documentation by promoting transparency, reproducibility and long-term data reuse. The SEVILLACCESS project develops a reproducible workflow for the preventive conservation of Roman heritage in Baetica, focusing on Hispalis (Seville) and Munigua, located in the municipality of Villanueva del Río y Minas. It combines non-invasive 3D documentation, open-source tools such as QGIS, trusted scientific repositories and sustainable data management practices.

The workflow is structured around four interconnected stages: information gathering, evaluation, intervention and projection. Archaeological and architectural data are integrated into a WebGIS built with open-source software, supporting spatial analysis, interoperability and long-term management. Terrestrial laser scanning and georeferencing produce 3D models that serve not as ends in themselves, but as components of a broader strategy for transparent, accessible and reusable research.

Depositing data in trusted repositories such as Zenodo and managing them according to FAIR principles facilitate validation, replication and reuse by researchers, heritage managers and other stakeholders. The project also fosters inclusive public engagement through openly accessible digital resources, including WebGIS applications, point-cloud models and immersive 360° virtual tour experiences designed for diverse audiences, including people with specific accessibility needs.

By shifting emphasis from data acquisition to reproducible and accessible research practices, SEVILLACCESS demonstrates how open-source tools, trusted repositories and FAIR data strategies can strengthen preventive conservation. This transferable framework integrates scientific rigour, sustainable data management, long-term preservation and wider access to Roman archaeological heritage.

Gregor Pobežin[1] & Zrinka Mileusnić[2]

[1] Department of History, Faculty of Humanities, University of Primorska, Koper, Slovenia

[2] Department of Archaeology and Heritage, Faculty of Humanities, University of Primorska, Koper, Slovenia

Stone to Digital: AI-assisted Workflow for Epidoc - the Case of Medieval and Early Modern Inscriptions

Medieval and early modern inscriptions constitute a rich yet underexplored historical source, which seems to be the case in most of Europe. Making this material accessible and reusable requires not only documentation and scholarly interpretation but also structured digital representations based on established standards.

This paper presents a methodological case study developed within the AID HCH project (https://aidhch.com/), exploring AI-assisted workflows for transforming epigraphic transcriptions and descriptions into structured data using EpiDoc/TEI XML. The proposed workflow focuses on semi-automated encoding based on a predefined EpiDoc template. Using transcriptions and accompanying descriptive metadata, AI tools identify relevant textual and semantic features and suggest their encoding according to established conventions.

Rather than replacing expert annotation, AI is approached as a research assistant operating between field documentation, formal data structuring and scholarly interpretation. Generated markup remains constrained by the template and subject to expert validation. The central methodological question is therefore not whether epigraphic encoding can be fully automated, but which tasks can be delegated to AI, where its suggestions prove useful, and where domain expertise remains indispensable.

Through concrete examples, selected from the first micro-corpus of medieval and early modern inscriptions collected in Slovenia, the presentation examines the practical possibilities and limitations of this approach, including its potential to facilitate consistent encoding and improve the accessibility and reuse of epigraphic material.

Slađana Nešković

Faculty of Philosophy, University of Belgrade, Serbia

The Replica as a Record of Process. Documenting Decisions in the 3D Digitisation and Additive Manufacturing of Archaeological Objects

The paper addresses the decisions that determine the path from the original find to the digital model and its final realisation as a physical replica. It also explores whether these decisions can be consistently recorded, so that the model and the replica remain verifiable. The question was traced through every stage of the process on a sample of nine objects from Viminacium. The objects are made of pottery, bone and bronze and date from the 2nd to the 10th centuries.

Object selection itself was treated as the first methodological step, since the properties of the material determined the choice of acquisition method. Problems that arose during scanning were resolved by adapting the procedure to each object, and all changes were recorded as part of the process.

The results showed that neither the digital model nor the physical replica is a neutral duplicate of the original. Both are the outcome of a series of decisions, from recording and data processing, through hole filling and rescaling, to orientation, support structures and post-processing. Each of these decisions leaves a trace that cannot be read from the replica itself. That trace can only be found in the documentation that accompanies the replica.

The presentation argues that additive manufacturing becomes an archaeological procedure only when the principles governing all archaeological documentation are applied to it. These are transparency of procedure, separation of what was recorded from what was reconstructed, and verifiability of every decision.

Abreha Kiros

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Reconstructing Environmental Change at Aksum: A Longitudinal Archaeological and Photogrammetric Assessment of Monumental Landscapes

The archaeological landscape of Aksum in northern Ethiopia contains monumental stelae, royal tombs, early Christian structures, and other remains associated with one of ancient Africa's most significant centers of political, economic, and religious activity. Over the past century, however, the physical setting of these monuments has changed considerably. Soil erosion, sediment accumulation, seasonal flooding, vegetation growth, changing land use, and other human and environmental pressures have altered the exposure, condition, and spatial context of archaeological remains. Despite these changes, their long-term development has not yet been examined through a systematic combination of historical and archaeological evidence. This study investigates environmental and landscape change at Aksum through a longitudinal approach that brings together historical photographs, archaeological field survey, repeat photography, close-range photogrammetry, environmental observation, and GIS-based spatial analysis. Historical photographs and expedition records are compared with recent field documentation to trace changes in monument exposure, surrounding topography, sediment deposition, drainage, and structural condition. Selected monuments and archaeological features are recorded through georeferenced photography and three-dimensional photogrammetric documentation, while field observations examine erosion, sediment movement, surface-water flow, vegetation encroachment, and other processes affecting the archaeological landscape.

By bringing archival images into direct comparison with contemporary archaeological and spatial observations, the study establishes a means of examining how Aksum's monumental landscape has changed over time. The approach also demonstrates the value of combining conventional archaeological observation with photographic and digital recording techniques for documenting site formation and monument transformation. The study contributes a practical methodological framework for longitudinal research on environmentally vulnerable archaeological landscapes, with wider relevance to the documentation and interpretation of archaeological heritage in Africa.

Beáta Barbocz

National History Museum of Transylvania, Cluj-Napoca, Romania

Quantitative Analysis of the Pottery from the Bandu Cemetery (Mureș County, Romania)

The Gepids were one of the most significant populations inhabiting the Carpathian Basin, the Banat region, and the Great Hungarian Plain between the fifth and seventh centuries AD. Since its discovery, the cemetery at Bandu has been associated with this population. However, the site's chronological development encompasses two distinct phases: the period of the Gepidic Kingdom and a subsequent phase extending into the Early Avar period.

The cemetery raises several important research questions concerning burial practices, funerary assemblages, grave reopening phenomena, and the role of pottery within mortuary contexts. Through the systematic examination of ceramic vessels recovered from graves, their morphological, technological, and decorative characteristics can be transformed into quantifiable variables within a relational database. This approach enables the identification of principal vessel types and subtypes, manufacturing techniques, fabric categories, firing conditions, and decorative practices, while also allowing the assessment of their variability across the cemetery.

The spatial dimension of the analysis is supported by a vectorised plan of the cemetery, facilitating the visualisation and investigation of the distribution of specific ceramic forms, technological traditions, and decorative motifs. Such an approach makes it possible to identify spatial patterns that may reflect chronological developments, social differentiation, or cultural practices within the burial ground. Furthermore, the integration of ceramic data with a comprehensive database of funerary inventory categories enables advanced statistical analyses using RStudio.

Beyond the examination of gender-related funerary assemblages, multivariate statistical methods can be employed to explore associations between pottery types and other categories of grave goods. These analyses provide a means of identifying recurring patterns within burial assemblages and contribute to a more nuanced understanding of the social and cultural significance of pottery in Gepidic and Early Avar mortuary practices.

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Technologies of Tradition: Archaeometric Investigations into Cucuteni Pottery Technology at Răucești-Dealul Munteni (Neamț County, Eastern Romania)

The Cucuteni culture, often regarded as the "last great Chalcolithic civilization," was marked by significant social and economic transformations. These changes are evident in new settlement patterns and the emergence of craft specialization, most notably reflected in the large-scale production of pottery with elaborate stylistic and technological features. The Răucești-Dealul Munteni archaeological site, situated in a key region for understanding inter-regional connectivity between the Subcarpathian area and the Moldavian Plateau, exemplifies these developments. Notably, the site encompasses both the Cucuteni A (4600-4000 cal. BC) and Cucuteni B (4000-3500 cal. BC) phases.

This study investigates the interplay between tradition and innovation in technological practices through the application of a chaîne opératoire approach. Methodologically, we began with an extensive macroscopic analysis, followed by a petrographic study to determine the compositional and microstructural characteristics of the clay matrix and added temper. To further examine mineralogical changes induced by firing, we conducted X-ray Powder Diffraction (XRPD) analysis. Scanning Electron Microscopy coupled with Energy-Dispersive X-ray Spectroscopy (SEM-EDX) was employed to assess the chemical composition and microstructure of the pottery samples. The composition of the red, white, and black pigments was determined using Raman spectroscopy.

The results indicate the continuity of several ceramic recipes from the Cucuteni A to the Cucuteni B phase, alongside a shift in clay sources and a narrower range of vessel types during the Cucuteni B phase. Furthermore, the study identified diverse interactions with systems of black pigment exploitation within the region.

Jasna Vuković

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Beyond Simple Modelling: Reconstructing the Manufacturing Procedures of Vinča Anthropomorphic Figurines from Pavlovac-Čukar, Southern Serbia

This paper presents a technological analysis of anthropomorphic figurines from the Late Neolithic Vinča site of Pavlovac-Čukar, focusing on the reconstruction of manufacturing sequences through the study of fracture patterns, fragmentation, and the structural composition of ceramic bodies. The assemblage is exceptionally informative because a large number of figurines exhibit breaks at points of stress that reveal their internal construction and methods of assembly.

Contrary to the common assumption that Neolithic figurines were produced through simple modelling techniques, the analysis demonstrates that their manufacture involved highly complex and diverse steps in operational sequence. A key contribution of the study is the identification of previ-

ously unrecognized structural elements that formed the internal architecture of Vinča figurines. Through the analysis of breakage patterns and manufacturing traces, it was possible to distinguish between two categories of structural elements, segments and modules, and to reconstruct their sequential assembly. Equally significant is the identification of a previously unrecognized manufacturing procedure, termed *wrapping*, involving the application of a thin clay slabs over the assembled figurine. This layer reinforced joins, regularized surfaces, and enhanced further surface finishing.

Together, the identification of structural elements and the wrapping technique provide a new framework for understanding figurine construction and reveal a level of planning and technical sophistication far greater than previously assumed. At the same time, the deliberate incorporation of such concealed structural features suggests that their significance may have extended beyond purely technological considerations, and that symbolic or ritual significance cannot be excluded.

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FIAT LUXUS. An integrated archaeological and archaeometric framework for the research of "Loka Painted Ware"

Loka Painted Ware (LPW), a group of painted and sometimes incised tableware from 16th and 17th century Slovenia, is widely recognised but has never been examined through an integrated, evidence-based framework. Its production context, technological variability, chronology and regional connections remain uncertain. The FIAT LUXUS project addresses this gap by combining archaeological and art historical research with archaeometry and digital data infrastructure. The project is assembling a standardised corpus from collections and archaeological contexts in Škofja Loka, Kranj, Ljubljana and other selected locations. Typological, stylistic, iconographic and contextual data will be linked to analyses of approximately 150 representative samples. The ceramic bodies will be studied using thin-section petrography, X-ray diffraction, X-ray fluorescence and scanning electron microscopy with energy-dispersive spectroscopy. Surface layers, glazes and painted decoration will be examined using XRF mapping, Raman and FTIR spectroscopy. By correlating material composition and manufacturing evidence with form, decoration and archaeological context, FIAT LUXUS will test whether this type of pottery represents one production tradition or several related groups. The project will also create an interoperable digital catalogue designed for long term reuse. This presentation will introduce the project's integrated research workflow and discuss how combining archaeological and archaeometric evidence can support more careful interpretations of production, circulation and consumption.

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The Last Meal of a Roman Soldier: Dietary Signatures in a Third-Century Roman Mass Grave from Mursa

Mass graves offer a rare opportunity to investigate both the human consequences of collective violence and the lives of those affected. Stable isotope analysis can reveal shared dietary practices and individual variation within past populations. This study investigates dietary patterns among individuals recovered from a Roman-period mass grave at Mursa (modern Osijek, Croatia), providing insights into subsistence in the Roman world.

Carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) stable isotope analyses were conducted on bone collagen from 23 individuals using elemental analysis coupled with isotope ratio mass spectrometry (EA-IRMS). Carbon isotope values were examined to assess the contribution of different terrestrial food webs, including potential C_4-derived resources, while nitrogen isotope values were used to explore variation in dietary protein sources and trophic-level signals.

The individuals exhibited $\delta^{13}C$ values ranging from −20.61‰ to −16.12‰ and $\delta^{15}N$ values ranging from 7.20‰ to 10.94‰. Most carbon isotope values clustered between −20‰ and −18‰, suggesting diets predominantly based on C_3-associated food webs. Less negative values in some individuals may indicate greater contributions from C_4-derived resources, such as millet, consumed directly or through animal products. Nitrogen isotope values showed appreciable interindividual variation, potentially reflecting differences in dietary protein sources, trophic position, or physiological and environmental factors. Collagen C ratios ranged from 3.10 to 3.27, supporting the suitability of the samples for dietary interpretation.

These findings suggest a broadly shared dietary foundation alongside individual variation among those buried at Mursa. Further comparison with archaeological fauna and contemporary populations will help clarify the contribution of different food resources and contextualise these patterns within Roman-period subsistence and military life. By examining diet in a mass-grave assemblage, this study contributes to a more nuanced understanding of the people behind the archaeological evidence of collective violence.

Rodica-Mariana Ion

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Roman Building Technologies across Moesia Inferior and Dacia: A Multi-Analytical Archaeometric Investigation of Raw Materials and Construction Practices

Roman construction technologies reflect the interaction between locally available geological resources, technological knowledge, and the functional requirements of military and civilian architecture. This study investigates archaeological building materials from four Roman sites located in different geographical and historical contexts: Sacidava (Dunăreni), Sucidava Moesica (Izvoarele), Vârtopu (Bumbești-Jiu), and Micia (Vețel). The research aims to identify mineralogical and microstructural characteristics associated with raw material selection, preparation technologies, and long-term physicochemical transformations.

An integrated archaeometric methodology combining optical microscopy (OM), X-ray diffraction (XRD), X-ray fluorescence (XRF), Fourier-transform infrared spectroscopy (FTIR), Raman spectroscopy, and scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDS) is applied to the characterization of historical mortars and associated construction materials. Particular attention is given to the mineralogical composition of binders and aggregates, carbonate and silicate phase associations, microstructural heterogeneity, and the identification of secondary mineral formations.

The comparative analysis addresses technological similarities and differences between construction materials originating from Roman sites in Moesia Inferior and Dacia. The correlation of mineralogical, chemical, and microstructural evidence provides a basis for distinguishing original manufacturing characteristics from post-depositional transformations, including dissolution, recrystallization, and mineral alteration induced by environmental exposure.

By integrating analytical results with archaeological and geographical contexts, this study explores the relationship between material composition, technological choices, and regional construction practices. The proposed multi-analytical approach contributes to understanding the diversity of Roman building technologies and demonstrates the importance of archaeometric investigations for reconstructing ancient material production and resource utilization.

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A Multi-Analytical Approach to HAp-Modified Lime Mortars: Linking Microstructure, Composition and Performance for Heritage Applications

Historic lime-based mortars are complex porous materials, and understanding how their composition and microstructure relate to their behaviour is essential for developing compatible conservation solutions. This study uses a multi-analytical approach to investigate natural hydraulic lime mortars modified with hydroxyapatite (HAp) and to assess their potential for heritage applications [1].

The study compares NHL 3.5 and NHL 5 mortars, with and without HAp addition, and examines how changes in mineralogical composition and microstructure are reflected in their physical properties and durability. The investigation combines scanning electron microscopy with energy-dispersive spectroscopy (SEM–EDS), Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and optical microscopy with measurements of water absorption, surface wettability, mechanical performance and resistance to freeze–thaw cycles.

The different results are considered together rather than as separate data sets. This makes it possible to explore the relationships between HAp addition, pore-related behavior, moisture interaction and material stability, and to better understand the mechanisms behind the observed changes.

By combining complementary analytical techniques, the study shows how an integrated archaeometric approach can provide a more complete assessment of modified lime mortars and support informed decisions about their compatibility and durability in historic masonry conservation.

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From archaeological park to heritage living lab: co-creation, teaching and sustainable management at San Simon's Bay, Slovenia

Living lab has become a familiar requirement in cultural heritage projects, yet the term is often applied to short-term activities without a clear long-term framework. This paper examines how the Archaeological Park of San Simon's Bay in Izola, Slovenia, has developed into an ongoing heritage living lab, and asks what is needed to make that process inclusive and sustainable. Established in 2010 and managed by the University of Primorska, the park provides a real life setting where conservation, interpretation, research and education meet. Using living lab principles of user centred co creation and experimentation in real life communities, we analyse documented projects and teaching activities at the park. Examples include research into residents' memories and attitudes to the site, work on accessibility and learning routes, student participation in in-situ conservation and public workshops and the development of Roman cuisine interpretation. These activities are considered across three connected modes: funded projects, higher-education teaching and community facing initiatives. Koper's old-town public archaeology and placemaking activities provide a comparative university–city context. The analysis asks how these initiatives engage stakeholders, connect different forms of knowledge and sustain collaboration beyond individual project cycles.

The presentation proposes a phased methodology for developing a heritage living lab from an archaeological park, linking conservation led, place-based work with inclusive co-creation, adaptive learning and durable governance. It considers both the potential of an organically evolving, bottom-up process and the institutional support needed for continuity. This approach builds on living lab understandings that place user co-creation and research in real-life communities and settings.

Annita Antoniadou

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Beyond the Monument: How Archaeological Science Literacy Shapes Public Heritage Stewardship — A Case Study from Cyprus

How can specialist archaeological knowledge be translated into meaningful public understanding, and to what extent can this process foster heritage stewardship? For decades, public archaeology across the Mediterranean has been influenced by monumental visualism, a paradigm based on the assumption that physical exposure to archaeological sites naturally cultivates public appreciation. This paper challenges that assumption through a decade-long evaluation of structured non-formal adult education seminars in Cyprus. It investigates whether developing archaeological science literacy can bridge the epistemological gap between specialist research and public understanding, strengthening perceived heritage engagement.

The study examines how complex geoarchaeological and archaeometric methodologies can be translated into accessible learning experiences through object-based pedagogy and strategic heritage branding. A quantitative pre–post evaluation assessed four outcome domains: scientific comprehension, perceived heritage relevance, brand recall and engagement, and stewardship support.

Results revealed statistically significant improvements with large effect sizes across all four domains. Multiple linear regression identified scientific comprehension as the strongest predictor of stewardship support, while prior site visitation was not significantly associated with it. Subgroup analyses further indicated that participants from secondary-level education achieved the greatest gains in scientific comprehension, suggesting that object-based learning may broaden access to specialist archaeological knowledge across educational backgrounds. These findings highlight the potential of structured non-formal adult education to bridge the gap between academic archaeological research and informed civic engagement. Through direct engagement with archaeological materials and analytical methods, object-based pedagogy can make specialist knowledge accessible and strengthen the foundations of heritage stewardship. It may also foster critical skills for evaluating heritage-related misinformation. The study contributes to public archaeology by suggesting that meaningful heritage engagement depends not only on-site visitation but also on understanding the scientific evidence through which the past is investigated and interpreted.

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From Soil to Spectrum: Experimental Burial, Cleaning Protocols and FORS Interpretation of Dyed Icelandic Wool

This study examines how different burial environments and cleaning procedures affect the FORS analysis of dyed Icelandic wool. Experimental reference samples were prepared using locally sourced undyed wool and a range of natural dyes, including *Dactylopius coccus*, *Rubia tinctorum*, *Rubia cordifolia*, previously prepared indigo-dyed wool, *Betula pubescens*, *Arctostaphylos uva-ursi* and a lichen dye, with different mordanting conditions where relevant. The samples were exposed to three contrasting Icelandic soils: general topsoil, volcanic soil and mineral-rich geothermal soil.

FORS measurements are compared at successive stages: before burial, after soil exposure, after minimal dry cleaning with air and a soft brush, after localised cleaning with deionised water, and after controlled immersion. The aim is to determine how much of the spectral change is caused by surface contamination, how much persists after cleaning, and whether the effectiveness of each treatment varies according to dye, mordant, fibre colour and soil type.

Preliminary results already show different responses between colour systems. Some samples retain their original colour characteristics relatively well after burial and cleaning, whereas others show persistent shifts in colour or loss of the original appearance. The effect of soil is also different between volcanic, geothermal and general topsoil, and visible removal of residues does not necessarily imply recovery of the original optical response.

This experiment tests how archaeological textiles can be cleaned for FORS analysis while preserving the textile and its archaeological surface. It compares different dyes, fibres and burial environments to determine which cleaning method provides the most reliable spectral information with the least intervention.

Marko Banda & Ina Miloglav

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Sunset Stones: Lithics, technological organization and everyday activities at the Late Copper Age site of Prisunjača (Eastern Croatia)

Copper Age stone tool technology remains a vastly understudied part of the archaeological record of Central and Southeastern Europe. Despite this, it represents some of the very last stages of widespread prehistoric incorporation of flaked stone into everyday life, offering a unique opportunity to explore aspects of techno-economy, cultural transmission and social organization. The lithic assemblage from Prisunjača, a Late Copper Age site in Eastern Slavonia (Croatia), is one such case. Excavations conducted since 2019 have yielded several hundred lithic artefacts from a trench containing two settlement phases associated with the Vučedol culture (2910–2470 cal. BC), including three structures, pits and other archaeological features. These areas represent domestic spaces, where lithics were used in an array of activities, stored, and discarded as everyday refuse.

Detailed typo-technological, raw material and techno-functional analyses were conducted to gain a deeper insight into Late Copper Age economic activities and technological organization. The results reveal a blade-based industry, although flake products are fairly common. Techno-economic profiles of the assemblage are fragmentary, owing to complex processes of discard, clearing and abandonment, as well as limited spatial coverage of the excavation. Nevertheless, class representation and morpho-technological characteristics suggest that the production process was at least partially carried out at the site itself. This raises the question of whether production was regarded as a specialized craft or was performed more diffusely within the population. Raw material data further suggest that regional alluvial sources were exploited, pointing to nested distribution networks within the larger settlement landscape. In terms of function, a large proportion of the stone tools represents elements of composite tools, with a significant number related to agricultural activities. Finally, the assemblage could be separated into different settlement phases, which were compared to highlight diachronic patterns across the Late Copper Age record.

Nikolina Belošević

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Tracing Stone and Sculpture: New Insights into Early Medieval Sculpture of the island of Krk

The presentation will discuss selected results of research on Early Medieval stone sculpture from the Kvarner islands, conducted within the MICOM project – *Material, Interpretation, Communication, Memory: Early Medieval Stone Sculpture of the Northern Adriatic* (UNIRI-IZ-25-177). This interdisciplinary research uses the results of mineralogical-petrographic and archaeometric analyses of stone samples, carried out for the first time on a corpus of Early Medieval stone sculpture from the Kvarner islands, as a basis for art-historical analyses.

Previous research has largely assumed that Early Medieval stone sculpture from the Kvarner islands was made from locally sourced limestone. However, the results of the analyses suggest that the raw material used for larger elements of stone liturgical furnishings was obtained from outside the islands. The analysed samples consist of carbonate sedimentary rocks, namely limestones, and their specific mineralogical and petrographic characteristics have made it possible to associate most of them with Upper Cretaceous limestones from the Istrian peninsula. These findings contribute to

identifying potential sources of stone used in the production of pre-Romanesque liturgical furnishings. Considering the location of possible stone sources and their geographical links with the Kvarner islands, the nearest ports that may have served as points of departure for transporting stone blocks to the island of Krk have also been considered.

The analytical results served as a starting point for a comparative art-historical analysis of sculpture fragments from island of Krk and fragments from areas identified as possible sources of the stone. The comparison focuses on morphological and stylistic characteristics, the selection and treatment of motifs, the use of identical or related models, and carving techniques. Particular attention is paid to specific execution details, which may be regarded as distinctive "signatures" of individual stonemasons or workshops and which can help establish connections between individual elements of the relief decoration of liturgical furnishings. By examining formal and technical similarities, the research seeks to identify possible links between the provenance of the stone and the artistic characteristics of the sculpture, as well as between raw-material procurement and the organisation of stone-carving production. Identifying similar solutions at geographically distant sites helps elucidate possible routes of stone procurement and transport, broader patterns of cultural exchange, the transmission of artistic models, and the movement of stonemasons within the Kvarner region. In addition, comparative analysis enables more precise dating of fragments whose chronology has not previously been firmly established by linking them to fragments with more securely established dates.

Boris Rozić Vašiček

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Network Analysis of Mousterian Sites in Bosnia and Herzegovina

This study examines the relationships among Mousterian sites in Bosnia and Herzegovina through network analysis, with the aim of identifying patterns of connectivity and assessing the potential of relational approaches to the study of Middle Palaeolithic landscapes. The analysis encompasses 20 sites identified in the archaeological literature and draws on published and available lithic assemblages classified according to Bordes' typology. Three network approaches were employed: co-occurrence of lithic tool types, Proximal Point Analysis (PPA), and networks based on geographic distance. Standard centrality measures were used to examine the structural position of individual sites and compare patterns of connectivity at different spatial scales.

The results reveal distinct patterns of connectivity depending on the criteria used to construct each network. In the co-occurrence network, sites with larger and more diverse lithic assemblages tend to occupy more central positions, highlighting the influence of differences in research intensity and data availability. On the other hand, PPA, which links sites to their three nearest neighbours sharing lithic types, identifies Rastuša as a prominent central site, while distance-based networks reveal broader patterns of regional connectivity. At a 100 km threshold, Danilovića brdo emerges as the most prominent node, while the 50 km network provides a more localised perspective on site relationships.

These findings demonstrate the value of network analysis for investigating relationships among Mousterian sites beyond their individual typological and geographic characteristics. However, uneven research coverage and differences in assemblage size limit the representativeness of the results. Network analysis therefore offers a complementary framework for evaluating site relationships and identifying priorities for future archaeological investigation.

Laura Sisto[1], Giulia Tagliabue[1], Michele Boracchi[1], Domenico Di Candia[1], Ciara O'Brien Butler[2], Richard Madgwick[2], Cristina Cattaneo[1] & Lucie Natividad Jeannine Biehler-Gomez[1]

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Less is More: An integrated analytical approach to osteological material in the DOMINA Project

Osteological materials represent irreplaceable sources of biological and cultural information. However, multiple analytical approaches may require sampling of the same specimen, progressively reducing material availability. The challenge is therefore to obtain more data, maximizing information while minimizing destructive sampling.

This approach is implemented in the DOMINA project, which investigates women's lives in Milan over 2,000 years through an interdisciplinary bioarchaeological framework. A subsample representing 30% of the total 1,000 skeletons was selected to support planned analyses while maintaining statistical robustness. To enable comparisons between affected and unaffected individuals, the study included 20 females and 20 males with skeletal indicators of poor health per period as well as 10 females and 10 males without lesions as control group.

The analytical workflows integrate evidence on nutrition, lifestyle, health, and exposure to external substances. Dental calculus investigations, stable isotope analyses ($\delta^{13}C$, $\delta^{15}N$, $\delta^{18}O$, $\delta^{34}S$, and $^{87}Sr/^{86}Sr$), and aDNA results contribute complementary information on diet, mobility and geographic origins. Archaeotoxicological analyses, targeting xenobiotics and trace elements, provide another perspective on environmental exposures and living conditions. Combined with skeletal indicators of health, these data illuminate biological experiences and their variation across chronological periods. To minimize material loss, workflows have been designed to reuse the same specimens across analytical procedures. Dental calculus is collected from the lingual surface whenever possible, while isotope sampling requires only a small incision on the lingual surface below the cemento-enamel junction. For toxicological investigations, powder obtained from the same vertebral body fragments can be allocated to different analyses, including HPLC-MS/MS and ICP-MS.

By integrating complementary evidence across time, this strategy aims to investigate changes in women's lives while standardizing sampling procedures and maximizing the information obtained from limited material. This strategy promotes a more comprehensive scientific investigation while respecting ethical standards for the long-term conservation and musealization of human osteological remains.

Barbara Kriletić

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Amelogenin - small sample, big answer

Estimating the biological sex of individuals is an important part of bioarchaeological analysis because it can lead to a better understanding of life, health, and relationships within communities from the past. However, determining biological sex using only morphological analysis can be difficult, especially in non-adults, where sexual dimorphism is not yet fully developed, but also in poorly preserved or fragmented skeletal remains.

In such cases, proteomic analysis can be a useful method for determining biological sex. Amelogenin is a protein found in tooth enamel. By analysing its sex-specific forms, AMELX and AMELY, it is pos-

sible to determine biological sex using only a small sample of enamel. Since tooth enamel is one of the most resilient tissues in the human body and is often well preserved, this makes the method particularly interesting for the analysis of archaeological material. It is also relatively quick and less expensive than ancient DNA (aDNA) analysis. Additionally, aDNA analysis can be limited by poor DNA preservation, as DNA degrades over time, and the procedure itself can be expensive and time-consuming.

In this presentation, I will show the laboratory procedure and protocol for amelogenin analysis, from sampling and sample preparation to mass spectrometry. Through a few archaeological examples, I will present how this analysis can complement osteological data, but also contribute to the interpretation of archaeological findings.

Amelogenin analysis is especially important in the study of non-adults. By combining biological sex estimation with osteological data and other analyses, such as stable isotope analysis, we can investigate whether there were differences in diet, breastfeeding, and weaning practices between boys and girls.

Even though amelogenin cannot answer all our questions, it represents an important part of an interdisciplinary approach in bioarchaeology.

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No worms plenty of fish: Rethinking the "absence of evidence" in paleoparasitology through isotopic analysis, a case study of two Polish towns: Chełm and Puck

This study addresses the methodological challenges of integrating bioarchaeological, paleoparasitological, and isotopic data to reconstruct past diet and parasite exposure in coastal Puck (14th–18th c.), using comparative material from the Early Modern city of Chełm. Through the lens of fish consumption and parasite dynamics, we examine how single-proxy datasets can lead to contradicting conclusions.

Initial paleoparasitological analysis of burials from Puck (n=22) yielded no fish-borne parasites, detecting only Trichuris sp. and Ascaris sp. eggs. In contrast, Dibothriocephalus sp. was identified in individuals from Chełm (n=100).

Both zooarchaeological evidence and stable isotope analyses (δ13C, δ15N) provided proof of regular fish consumption in Puck and revealed statistically significant isotopic differences compared to Chełm (δ13C: $p=0.036$, δ15N: $p<0.001$). Crucially, in Chełm, parasite-positive individuals exhibited isotopic signatures indicating only sporadic fish intake.

To resolve the paradox in Puck, paleoparasitological investigations were expanded to latrines from different sectors of the town. Despite excellent preservation, fish-borne parasites were detected in only one latrine, demonstrating spatial heterogeneity.

These findings demonstrate the dual nature of methodological misinterpretation: relying solely on negative burial evidence risks overestimating thermal processing or assuming a lack of fish intake (Puck), while assuming that parasite presence implies heavy, habitual consumption is equally flawed (Chełm). This highlights the necessity of multi-proxy and multi-context sampling strategies in archaeological science to avoid misinterpreting both the presence and absence of evidence.

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AMS Radiocarbon Dating of Neolithic Sites in the Kashmir Valley, India: A Case Study in Minimally Invasive Sampling Strategies

This study presents accelerator mass spectrometry (AMS) radiocarbon dates from three endangered Neolithic sites in the Kashmir Valley—Gufkral (Extension), Hariparigam and Qasim Bagh. As these sites are threatened by ongoing anthropogenic activities and are not suitable for large-scale excavation, samples were collected from exposed stratigraphic sections using a minimally invasive approach. Twenty samples, including charcoal, bone, ash and charred seeds, were analysed and calibrated using the IntCal20 calibration curve. The resulting dates range from c. 2890 to 516bce and indicate that a substantial part of the Neolithic occupation falls between 2500 and 2200bce. The dates broadly correspond with the established chronology of excavated Neolithic sites such as Burzahom and Gufkral, while also providing new chronological information from previously unexcavated locations. The study reports the first direct AMS dates on bone and ash samples from the Kashmir Neolithic and suggests an earlier date for the ceramic Neolithic at Hariparigam. The results demonstrate that carefully targeted sampling from exposed deposits can provide valuable chronological data while minimizing disturbance to fragile archaeological contexts.

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Animals as Sources of Food and Raw Materials: Subsistence and Tool Production at the Late Copper Age Site of Prisunjača–Ciganica (Eastern Croatia)

The site of Prisunjača–Ciganica is situated in vicinity of Vinkovci in Slavonia region in eastern Croatia. The excavations, carried out in 2019–2026, revealed a rich prehistoric site, with the most prominent remains from the Late Copper Age Vučedol culture (2910–2470 cal BC). Rich portable finds were recovered, including faunal remains. In this paper will be presented preliminary results of the analyses of fauna and worked bone, and models of animal exploitation will be discussed.

Due to the scarcity of zooarchaeological data from Vučedol culture sites, the assemblage from Prisunjača-Ciganica represents a valuable opportunity to investigate subsistence strategies and food practices. The results indicate a strong reliance on suids, with domestic pigs and wild boars playing prominent roles in the local economy. The nearly equal representation of domestic and wild animals suggests broad exploitation of available resources. Alongside pigs, cattle were an important source of additional animal protein, while caprines appear to have contributed minimally. Overall, the assemblage highlights the importance of animal husbandry and hunting in the subsistence economy, shaped by the opportunities offered by its local environment.

Worked bone assemblage comprises approximately 50 items. Raw materials included different bones, red deer antlers and boar tusks. Antler segments show that at least some of them were shed, i.e., obtained by collecting. The small amount of worked bone does not allow statistical interpretation of selection of raw materials, but shows interesting pattern of exploiting skeletal elements from both domestic and wild species. Typological repertoire encompasses mainly pointed and burnishing tools, along with manufacturing debris, and the most interesting find is one possible ornament from antler, although fragmented.

By integrating zooarchaeological analysis with the technological and typological study of worked bone, this research provides a more comprehensive understanding of animal exploitation, from subsistence practices to raw material selection and tool production. This combined methodological approach highlights the potential of different analytical perspectives for reconstructing human–animal relationships in past communities.

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Beyond Subsistence: Interpreting Seal Remains from Subneolithic Šventoji, Western Lithuania

Zooarchaeological research has traditionally been central to the study of past subsistence practices, including the exploitation of marine mammals. Yet animal remains may also provide evidence of relations that extended beyond their economic value, including their possible social, symbolic, and cosmological significance. Patterns of selective treatment and modification of bones may raise questions about how particular animals were perceived, treated, and incorporated into human practices.

This paper explores the methodological potential and limitations of combining zooarchaeological evidence with anthropological approaches to human-animal relations. The study focuses on seal hunting in the Subneolithic southeastern Baltic, with particular attention to the archaeological assemblages from Šventoji, western Lithuania. Species composition, hunting seasonality, and skeletal representation are considered alongside the selective treatment and modification of seal bones. These patterns are used to examine whether the treatment of seal remains provides evidence of human-animal engagement that cannot be explained solely by subsistence-oriented interpretations.

The paper argues that integrating zooarchaeology with anthropological perspectives can broaden the interpretation of animal remains from evidence of resource exploitation to evidence of relationships between humans, animals, and coastal environments. At the same time, maintaining a clear distinction between archaeological evidence, anthropological analogy, and interpretive inference is essential for developing more robust accounts of past human-animal relations.

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Measuring Charred Seeds: Insights into the Late Neolithic Use of Flax in Serbia

Measuring and quantifying the morphology of archaeobotanical macro-remains (seeds and fruits) have provided unique insights into the evolution and biodiversity of plants consumed and/or managed by humans in the past. The analysis of size (morphometrics) or shape (geometric morphometrics) enables the identification of plant subspecies and landraces that emerge through adaptation to local environmental conditions and field management practices.

The application of morphometric analysis to archaeobotanical material from the central Balkans remains limited. However, the expansion of archaeobotanical sampling and the accumulation of suitable assemblages offer considerable potential for such studies. This paper focuses on charred flax

(*Linum usitatissimum L.)* seeds from Late Neolithic sites of the Vinča culture in Serbia (c. 5400–4500 BC). Flax is one of the earliest domesticated oilseed and fibre crops, aptly described as an 'extremely useful plant'. Its dual purpose is associated with two distinct phenotypes: an oilseed type, characterised by larger and more numerous seeds, and a fibre type, with longer stems and smaller seeds.

This study explores the potential and limitations of using flax seed size to investigate past cultivation and use. It considers the effects of charring on seed size and shape; whether the archaeobotanical record is biased towards oilseed flax, as seeds intended for consumption may have been more likely to become charred than seeds of fibre flax; whether patterns in seed size across different archaeological contexts can provide insights into the intended use of flax. The results will be discussed in the context of other archaeological evidence for flax use, including consumption, oil extraction and textile production.

Saša Kovačević

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The Individual and the Collective: Methodological Approaches to Iron Age Identities in Eastern Varaždin County

The Early Iron Age in continental Croatia, particularly within the Drava River basin, represents a period of dynamic socio-political transformation and landscape restructuring. This paper examines the complex relationship between elite individual monuments and broader communal structures in the eastern part of Varaždin County. The three-zone archaeological landscape here is dynamically structured not only by the major Drava River to the north, but also by smaller watercourses like the Plitvica and Bednja rivers. The region is defined by monumental landscape features such as the prominent tumuli clusters and settlements of Jalžabet, Martijanec, Slanje, and others. By shifting the analytical lens from traditional "culture-historical " classification to a multidirectional landscape-oriented approach, we question how individual identity and community cohesion were materially negotiated and expressed. Drawing on recent, targeted archaeological excavations, LIDAR and prospection datasets, legacy archival records, and the challenging burial assemblages from these sites, this study contrasts the highly visible, exclusionary space of "princely" burial mounds with the everyday spatial organization of settlements. We argue that these monumental burial practices did not merely reflect static social hierarchies, but actively functioned as arenas where power dynamics, collective memories, and regional identities were continuously renegotiated. Ultimately, this paper demonstrates how a multidirectional approach to archaeological landscape developments in eastern Varaždin County offers critical insights into the shifting boundaries between the individual and the collective during the Hallstatt period.

POSTER PRESENTATIONS

14TH

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Reassessing the Archaeological Potential of Slovenian Karst Caves through Systematic Non-Invasive Surveys

Despite Slovenia's long tradition of speleological research, archaeological investigations of caves over the past three decades have focused primarily on individual sites rather than systematic regional surveys. We addressed this gap by developing and applying a standardized, non-invasive survey protocol to document previously unrecorded archaeological evidence and reassess the archaeological potential of Slovenian karst caves.

The protocol combines surface surveys, structured field recording and spatial analysis. Recorded attributes include cave morphology, sediment characteristics, archaeological finds, anthropogenic structures, other traces of human activity, and evidence of taphonomic processes. Particular attention is given to less conspicuous evidence, including dry-stone structures, soot deposits, and anthropogenic modifications of speleothems. Cave mapping and photographic documentation are supplemented by terrestrial laser scanning of selected caves and LiDAR analysis of the surrounding landscapes.

Between 2023 and 2026, we surveyed 101 caves selected for their anticipated archaeological potential. Evidence of past human activity was recorded in 58 caves. Chronologically atrributable remains range from the Neolithic to the Second World War, with prehistoric evidence recorded in 26 caves, Roman-period remains in four, medieval remains in four, post-medieval remains in 22, and Second World War-era remains in six. Chronologically undetermined remains were documented in 14 caves. Documented evidence includes pottery fragments, metal objects, anthropogenic structures and deposits, and animal and human skeletal remains. Significant discoveries include a Roman-period burial site and a second cave containing prehistoric and Roman-period material alongside human skeletal remains, representing at least six individuals. Ritual use of the latter cave ramains a provisional interpretation.

The results highlight the value of systematic, non-invasive cave surveys for identifying and documenting archaeological evidence in caves. The protocol provides a replicable framework for assessing caves as integral components of archaeological landscapes, while emphasizing site protection and the responsible dissemination of sensitive archaeological information.

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Morphometric and Spatial Analysis of Prehistoric Burial Mounds in Eastern Herzegovina

Prehistoric burial mounds (gomile) are among the most widespread archaeological features in eastern Herzegovina. Despite their prevalence, their regional distribution, morphological characteristics, and spatial relationships with the surrounding landscape remain poorly understood. This research aims to systematically document and analyse prehistoric burial mounds across approximately 3,800 km² of predominantly karst terrain using airborne laser scanning (ALS) data, deep learning, and spatial modelling.

The methodological approach combines automated detection using convolutional neural networks (ADAF) with GIS-based post-processing to identify and delineate individual burial mounds. Initial detections are refined through morphological filtering, geometric constraints, and terrain analysis to reduce false positives, particularly those associated with complex natural karst landforms. Additional segmentation procedures aim to identify mound boundaries through the analysis of elevation profiles, slope, curvature, and local relief. The resulting polygons provide the basis for quantitative morphometric measurements, including basal diameter, height, volume, and morphological indicators of preservation and disturbance.

The resulting spatial inventory will enable regional analyses of burial mound distribution, density, and clustering using spatial statistical methods, including kernel density estimation, nearest-neighbour analysis, and Ripley's K function. Additional analyses of topographic position, visibility, intervisibility, accessibility, and environmental characteristics will investigate potential patterns in prehistoric mound placement and landscape organisation.

By integrating automated archaeological feature detection with quantitative landscape analysis, this research seeks to improve our understanding of the spatial organisation of prehistoric funerary landscapes in eastern Herzegovina while establishing a transferable methodological framework for investigating burial mounds in complex terrain.

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Seeing Is Believing: Applying Remote Sensing to Archaeological Surveys. A Case Study from Medvednica Mountain, Croatia

Medvednica Mountain is an area of substantial archaeological potential; however, its northern slopes have not yet been systematically surveyed through a rigorous archaeological investigation. The field survey was conducted through a combination of remote sensing, analysis of modern and historical cartographic sources, GIS-based spatial data processing of digital terrain models (DTMs), and targeted ground-truthing of selected locations.

This integrated approach enabled the identification of anthropogenic landscape features, including terraces, plateaus, ramparts, and other potential archaeological structures. It also facilitated assessment of landscape transformations caused by vegetation change, settlement expansion, road construction, deforestation, and agricultural activity, processes that may expose, damage, or obscure archaeological remains.

The most significant results concern prehistoric activity. Six locations indicate intensive use of northern Medvednica landscape: Pregorščina, Borje, Tepčina Špica, Lipa, Slani Potok, and Zgoreti Breg. At Pregorščina, an elongated plateau bounded by a visible earthen embankment was recorded, while Borje comprises a newly documented group of stone and earthen mounds of uncertain chronology. Likewise, at Tepčina Špica, prehistoric pottery and daub were identified at a site previously associated exclusively with the antiquity and medieval period.

Particularly important is the newly discovered site of Lipa, which features settlement terraces, a plateau, and an earthen rampart. Numerous fragments of prehistoric pottery, daub, animal bones, and iron slag were recovered from a forest-road profile, indicating a prehistoric settlement and raising questions regarding communication routes and resource exploitation. At Slani Potok, pottery near a saline spring may indicate prehistoric use of local resources. Zgoreti Breg features terraces, a leveled plateau, pottery tentatively dated to the Late Bronze Age, and evidence of later metallurgical activity were documented.

These results reveal a substantially more complex prehistoric archaeological landscape on northern and northeastern Medvednica than previously recognized and demonstrate the value of integrating LiDAR, GIS, historical cartography, and targeted field survey in densely forested terrain.

Sayem Ahmed

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Revealing Hidden Landscapes: Artificial Intelligence and Satellite Remote Sensing for Archaeological Reconstruction in the Bengal Delta

The Bengal Delta represents a particularly complex yet underexplored environment for landscape archaeology, where long-term fluvial dynamics, sediment deposition, subsidence, climatic variability, and intensive land-use transformation have continually reshaped the archaeological landscape. These processes frequently obscure, relocate, or bury traces of past human occupation, making conventional archaeological survey methods insufficient for reconstructing ancient settlement systems and paleolandscapes. This paper examines the methodological potential of integrating Artificial Intelligence (AI), machine learning, satellite remote sensing, and geospatial analysis to investigate buried and transformed archaeological landscapes across the Bengal Delta.

The study proposes a multidisciplinary framework combining multispectral satellite imagery, Digital Elevation Models (DEMs), spectral and geomorphological analysis, and geospatial machine-learning techniques to detect subtle surface and subsurface anomalies associated with ancient settlements, palaeochannels, transportation corridors, and patterns of human mobility. Particular emphasis is placed on the capacity of computational approaches to identify spatial relationships and landscape signatures that remain difficult to detect through conventional field-based methods.

At the same time, the paper critically evaluates the methodological limitations of AI-assisted archaeological interpretation in dynamic tropical Bengal deltaic environments. These include limitations in spatial and temporal data resolution, agricultural modification of archaeological landscapes, sedimentary burial, environmental degradation, and the risk of algorithmic overinterpretation. Rather than positioning computational technologies as substitutes for archaeological investigation, the study advocates their integration with field survey, historical evidence, geomorphology, and established archaeological theory.

By developing a bridge between emerging geospatial technologies and traditional archaeological methodologies, this research contributes to a more adaptive framework for reconstructing ancient cultural landscapes and settlement patterns in the Bengal Delta, while also offering new methodological perspectives for archaeological research in other dynamic deltaic environments.

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Spatial Proximity and Technological Similarity: Building Practices at the Late Neolithic Settlement of Drenovac near Paraćin, Serbia

Knowledge of building practices is acquired and transmitted through social relationships, yet identifying these processes in the archaeological record presents an interpretative challenge. Spatial proximity between households may have facilitated direct learning and cooperation. To what extent, however, does proximity between houses correspond to similarity in construction technology?

This study explores the potential and limitations of integrating spatial and technological data to investigate the transmission of building knowledge. It examines six houses situated at varying distances from one another within the latest occupation horizon at the Late Neolithic settlement of Drenovac near Paraćin, Serbia. The analysis is based on a comparison of the shapes and dimensions of timber impressions preserved in wall daub, with particular emphasis on the relative proportions of timber elements of different diameters.

The results reveal shared construction characteristics alongside variations in timber use that do not consistently correspond to the distances between houses.

The study highlights the potential of wall daub analysis for identifying shared building practices, while also recognising the limitations of inferring social relationships from technological similarity. It thus contributes to methodological discussions of how material remains can inform interpretations of learning, cooperation and knowledge transmission in the past.

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Geoarchaeological Approaches to Identifying Iron Production Landscapes: Linking Production Sites and Potential Bog Iron Ore Sources in Altered Environments

Identifying past iron production landscapes requires an understanding of the spatial relationships between archaeological production sites, ore resources and the environmental conditions governing their formation and preservation. In landscapes affected by agriculture, drainage and river regulation, these relationships are often obscured. This study presents an integrated, multiscale geoarchaeological approach to investigating iron production sites and potential bog iron ore sources in the Drava River Valley, northern Croatia.

Approximately 150 archaeological sites with surface evidence of iron production have been recorded within this lowland area. Excavations documented primary iron production during Late Antiquity

and the Early Middle Ages, while provenance studies indicated the use of local bog iron ore. However, surviving ore occurrences are scarce and fragmented. To investigate this discrepancy, surface survey and soil coring were combined with mineralogical, geochemical and textural analyses and predictive spatial modelling. On a case study site Kalinovac – Hrastova greda, where three developmental stages of bog iron ore were identified, systematic grid topsoil sampling integrated mineralogical (XRD), geochemical(p-XRF), particle-size and soil pH analyses with terrain and hydrological data. Wider regional analysis examines geological and pedological characteristics, groundwater chemistry, relief and archaeological site distribution.

Results associate bog iron ore formation with shallow depressions, sandy-silty soils and fluctuating groundwater with elevated iron content. Goethite and elevated iron, phosphorus and arsenic provide indicators of ore development and occurrence in soils. Archaeological production sites occupy sandy elevations near areas favourable for ore formation, suggesting a spatial relationship between production locations and resources. Integrating these observations helps identify potential ore-bearing areas and investigate their spatial relationship with production sites.

The study demonstrates how geoarchaeological methods can connect fragmentary resource evidence with archaeological site distributions to reconstruct past iron production landscapes, while accounting for subsequent landscape alteration and its effects on ore preservation and renewal.

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Mapping Technological Knowledge through Pottery: The PotNet Research Project

Pottery production represents more than a set of technical procedures because technological choices, raw-material selection, production sequences, and learned practices reflect socially embedded systems of knowledge. The PotNet research project (*Mapping Knowledge of Past Societies: Reconstructing Technological Networks through Pottery Practices*, HRZZ-IP-2026-7065) explores how archaeological, archaeometric, spatial, and comparative evidence can be integrated to investigate technological variability and reconstruct aspects of technological knowledge in past societies. PotNet builds on an established research resource comprising archaeologically contextualised ceramic and geological samples, analytical data, and reference materials accumulated through previous research projects, including the preceding prePOT project. This resource is curated within LaKeS (Laboratory for the Analysis of Archaeological Ceramics and Raw Materials), which provides the research infrastructure for managing the associated sample collections, analytical data, and reference materials. Rather than establishing a new dataset from scratch, PotNet extends and connects these existing resources by bringing different forms of evidence into a common analytical framework.

The primary empirical focus is prehistoric pottery, particularly Bronze Age assemblages from continental Croatia and the Adriatic coast and hinterland. The project combines macroscopic technological and stylistic analysis, use-wear observations, petrographic and mineralogical characterisation, and geochemical analysis. These observations will be linked with archaeological context, chronology, raw-material information, and spatial data to create comparable technological profiles at the level of individual ceramic samples. The resulting dataset will provide a basis for investigating patterns of technological variability within and between sites and regions, as well as changes through time. In parallel, a complementary ethnographic component examines traditional Croatian pottery practices and provides comparative information on production sequences, raw-material procurement, technological choices, social organisation, and knowledge transmission. In this way, the project integrates the existing data resource and infrastructure with a standardised sample-level data model and analytical workflow, bringing together archaeological, archaeometric, ethnographic, and spatial evidence.

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Secrets on the Surface: A Characterization of Late Bronze Age and Early Iron Age Wares from the Vedi River Valley Using Non-Destructive Techniques

Newly excavated sherds from the sites of the Vedi Fortress and Urtsiberd-2 located within the Vedi River Valley provide an opportunity to complete characterization of several Late Bronze Age and Early Iron Age wares from the Vedi River Valley. Using visual analysis of over 4,000 sherds and pXRF, colorimetry, and gloss analysis of a 76-sherd subsample, a similar technical tradition was discovered between the Vedi Fortress and Urtsiberd-2 of often burnished wares of black, grey, and brown color, which are often incised and impressed. A small number of red-slipped sherds were also found at these sites, which feature painted decoration. While provenance is not able to be determined with the present data collection and analysis, the three groups all demonstrate differences in chemistry–including elevated chromium and nickel in the Urtsiberd-2 material consistent with nearby ophiolitic geology, and differing levels of calcium between the groups–which suggest the possibility of different sourcing or clay preparation. Additionally, methodological comparison of visual Munsell recording with instrumental spectrophotometer measurement further shows general agreement between the two methods alongside some systematic differences. Although much work remains to be done to continue investigating the production of these ceramics, this study lays the groundwork for further scientific analysis of pottery in the Vedi River Valley and broader Southern Caucasus.

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Archaeometry of pottery from the Neolithic site of Graduša – Lokve

In contrast to the well-documented stylistic and typological characteristics of Neolithic pottery from eastern Adriatic, archaeometric studies addressing the composition and manufacturing technology of these ceramics remain limited. This study presents an integrated archaeometric investigation of twelve ceramic fragments attributed to the Middle and Late Neolithic, recovered from the site of Graduša-Lokve in northern Dalmatia. Non-invasive digital microscopy (DM) and energy-dispersive X-ray fluorescence (ED-XRF), together with micro-invasive polarized light optical microscopy (PL-OM) and X-ray diffraction (XRD), were used to characterize the ceramic fabrics and their elemental and mineralogical composition.

The results reveal a heterogeneous assemblage composed of Fe-based clayey matrices with variable proportions of angular, poorly to moderately sorted non-plastic inclusions. Petrographic observations distinguish different fabric types based on matrix texture and the abundance, grain size and nature of the aplastic fraction, indicating variability in paste preparation and/or raw-material selection. Multivariate analysis of the ED-XRF data (Principal Component Analysis and Hierarchical Cluster Analysis) further highlights compositional differences, although the chemical and petrographic groupings are only partially coincident.

The widespread occurrence of calcite is a significant characteristic of the investigated sherds, but its preservation cannot be used as a simple firing-temperature indicator, as carbonate alteration depends on several firing and microstructural factors. Most samples are consistent with generally moderate firing conditions less than 750°C.

Overall, the combined elemental, petrographic and mineralogical evidence highlights technological variability within the assemblage, while the available data do not allow definitive geological provenances to be established. The study provides new evidence for the diversity of ceramic production practices at Graduša–Lokve and a basis for comparison with other Middle and Late Neolithic assemblages from eastern Adriatic.

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Archaeometric Investigations of Precucuteni Figurines from Romania: Technology and Production

The poster presents the results of an interdisciplinary study of anthropomorphic figurines of the Precucuteni culture recovered at the archaeological site of Topolița (north-eastern Romania), with particular emphasis on their manufacturing technology. The study employed high-resolution computed tomography (CT), thin-section ceramic petrography, and portable energy-dispersive X-ray fluorescence (ED-XRF). The results were compared with those from pottery vessels

in the same cultural context. Archaeometric methods enabled reconstruction of figurine-forming strategies, identification of raw materials, and assessment of key technological parameters, including porosity, internal structure, and firing conditions.

The results demonstrate that the figurines are technologically distinct from pottery vessels, exhibiting higher overall porosity, a greater proportion of large pores, and a less homogeneous internal structure. CT analyses revealed at least three figurine-forming strategies. Petrographic and chemical data indicate the use of locally available clay raw materials, together with variability in ceramic paste preparation. This technological diversity, combined with an emphasis on visual appearance rather than material performance, suggests flexible and partly individualized production practices. These were most likely embedded in domestic or non-specialized workshop contexts. These findings offer new insights into ceramic production and contribute to broader discussions of figurines' symbolic and ritual roles within Precucuteni communities.

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A multi-method approach to study miniature ceramic vessels from area of the Cucuteni – Trypillia culture

Miniature ceramic vessels from the area of Cucuteni - Trypillia Culture, one of the remarkable cultural expressions of the Copper Age.

The main objective of this present work provides a study on structure and spectroscopic properties of the miniature ceramic vessels. According to the archeological description, the vessels are well-purified, the ceramic materials is compact without traces of pained decoration.

Advanced spectroscopic investigation (X – ray diffraction (XRD), Scanning electron microscopy with energy dispersive X – ray microanalysis (SEM – EDX), Fourier Transformed Infrared (FT – IR) spectroscopy and Ultraviolet – visible spectroscopy (UV – Vis)) identified quartz (SiO_2) (SiO_2), as a major crystalline constituent of all investigated samples. Quartz is accompanied by variable amounts of feldspathic phase, particularly the plagioclase-type aluminosilicate anorthite $Ca(Al_2 Si_2O_8)$ as well as carbonate phases, including calcite $Ca(CaCO_3 CaCO_3)$. Minor amounts of hematite (α – Fe_2aO_3 α –Fe_2O_3) were also identified. The presence of plagioclase confirms the firing temperature between 860°C – 950°C and the presence of hematite in the potteries indicates that they were fired in an oxidizing atmosphere.

SEM analysis revealed no evidence of grog inclusions, which are typically associated with the intentional addition of crushed ceramic fragments or previously fired clay to the raw material. The observed surfaces exhibit irregular textures, particles of varying sizes and shapes, and small cracks, fissures, and pores distributed throughout the samples.

In addition to the major elements associated with the identified mineral phases, EDX analysis revealed the presence of other elements, including K, Mg, Cl, Ti, S, and Na. These elements may be

associated with distinct mineral phases or other constituents of the ceramic matrix. Their relative abundance varies among samples and, in some cases, within individual samples, depending on the composition of the specific areas analyzed and the presence of mineral inclusions.

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When the Method Meets the Laboratory: Implementing SEM-EDS Analysis of Archaeological Ceramics in Croatia

Analytical methods are often presented as transferable procedures, yet their successful application depends on instrumentation, sample preparation, technical expertise, and laboratory-specific experience. This paper discusses the practical challenges encountered while attempting to implement SEM-EDS analysis of archaeological ceramics in Croatian research context, following the successful application of the method abroad. The method was selected to address specific archaeological question concerning grog-tempered Bronze Age pottery. Grog–ceramic fragments intentionally added into the paste, can provide evidence for technological choices and production practices. The study investigates whether grog was compositionally similar to the clay matrix and derived from related clay material, or whether different raw materials were selected. Ceramic assemblages from multiple sites in two regions of Croatia with the same chronological framework but different cultural influences are compared. Addressing this question requires targeted SEM-EDS analysis of individual grog inclusions, followed by compositional comparison with surrounding clay matrix and selected samples. This places particular demands on sample preparation, analytical settings, and operator experience. Although the analytical protocol had previously been successfully applied at University College London, transferring the method to the Croatian context proved more complex than anticipated. Attempts to identify suitable analytical infrastructure revealed obstacles related to instrument availability and condition, technical expertise, and the preparation of archaeological ceramic samples. Establishing a collaboration with a suitable laboratory therefore shifted the focus from simply accessing instrumentation to developing a reproducible analytical workflow.

The paper uses this experience to examine the conditions required for transferring analytical methods between research environments. It argues that methodological capacity extends beyond access to instrumentation and depends on the interaction between institutional/laboratory collaboration, equipment, expertise, sample preparation, analytical protocols, and the archaeological research question. The Croatian case study illustrates how these factors can shape both the feasibility of an analytical method and the design and interpretation of archaeological research.

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Like Gold, Like Platinum: An Interdisciplinary investigation about gold and silver earrings from grave context from V century BC in Northeastern Bulgaria

The present study is focused on archeometallurgical observations of the pairs of silver and gold earrings found near Ruse, Northeastern Bulgaria.

The pair of silver earrings are made of twisted wire with open ends. They are made of a silver alloy consisting of 97.91% silver, 1.42% copper, and 0.67% sulfur. Their parallels can be traced in the sites located primary at Northwestern Bulgaria. Note that three nuggets of pure silver were discovered near the sites of the aforementioned parallels in the Lesidren area, as well as one larger nugget from the Devetaška Cave. These are the only such finds in Bulgarian territory.

The gold earrings are with open, profiled ends. They are made of a gold-based alloy with a high silver content and a small amount of copper (Au-82.14%; Ag-16.03%; Cu-1.83% and Au-71.91%; Ag-25.80%; Cu-2.29%). During the technological examination, high magnifications (x25, x50, and x100) using a Keyence digital microscope, interesting inclusions were discovered in the gold composition within the marks left by the tool used to separate the terminal heads. These inclusions are distinguished as tiny, whitish inclusions scattered randomly across the gold surface. The morphology and micro-relief surface features of the examined samples were studied by imaging them in backscattered electron (BSE) and secondary electron (SE) modes, while the elemental composition of the alloy and the mineral inclusions were determined by area analyses using an energy-dispersive X-ray microanalyzer (EDX) under the following conditions: U (accelerating voltage): 30 kV; WD (working distance): 9 mm; PC (current): 43 µm; high vacuum mode.

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Archaeometric Characterization of Mortar and Plaster from Late Antique sites along the eastern Adriatic coast (Croatia)

Ancient mortars represent an important source of information on the procurement of raw materials, production technologies, and construction chronology of ancient structures. Despite their research potential, archaeometric studies of ancient mortars remain relatively scarce in Croatia. A significant progress has been made through the Re:Set (HRZZ IP-2024-05-6792) project, which investigates the transformations of the settlement pattern during Late Antiquity along the eastern Adriatic coast.

Within this project, mortar and plaster analysis aims to determine construction phases, characterise the raw materials, and identify manufacturing techniques employed at Late Antique sites along the eastern Adriatic coast. To date, 93 mortar and plaster samples have been included in the research. The samples originate from fortified sites, rural villae, and urban centres within two study areas: the

island of Rab and the Roman municipium of Rider in central Dalmatia. Alongside archaeological mortars and plasters, potential raw materials are also being collected from the vicinity of the sites. Both groups of samples are subjected to a range of analytical methods. Most of the samples have already undergone petrographic analysis, enabling the characterisation of raw material composition, provenance and identification of technological features while also playing an important role in assessing the suitability of samples for radiocarbon dating. Further mineralogical and geochemical analyses, primarily using XRPD and SEM-EDS, are planned to provide more detailed insights into the composition and microstructural characteristics of the mortars. All samples are analysed at the LaKeS laboratory (Laboratory for Analysis of Archaeological Ceramics and Raw Materials) at the Institute of Archaeology in Zagreb. The samples and their analytical data are systematically documented in the LaKeS digital database and linked to the physical collection, providing a reference resource for future archaeometric research on archaeological building materials.

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Charcoal Evidence of Bronze Age Pastoral Practices at Spila nad Procjepom, Mljet

This study presents a combined chemical extraction and digital image analysis applied to a sediment profile from Spila nad Procjepom cave (Mljet Island, Croatia) to reconstruct Bronze Age cave use and landscape use. The charcoal record was split into two independent size fractions to track different taphonomic sources. Macroscopic charcoal was isolated via water-sieving and quantified by weight as milligrams per gram of dry sediment. In parallel, the microscopic charcoal fraction was chemically extracted from sediment samples within standard palynological processing, using sodium pyrophosphate, cold HCl, and heavy liquid mineral separation (sodium polytungstate). Residues were sieved through a 15 µm nylon mesh. To calculate precise area concentrations, high-resolution digital micro-photographs were processed using Fiji software. Grayscale threshold segmentation and automated particle analysis were applied to calculate the total area of opaque charcoal fragments, calibrated and converted to concentrations with the Benninghoff (1962) marker-spore equation using added Lycopodium spore markers.

The profile records a distinct transition from a stable, undisturbed Early Bronze Age Pinus canopy baseline into an intensive agropastoral phase. Profile measurements show a vertical divergence between fractions: macro-charcoal reaches its maximum at the lower part of the layer but drops at the overlying horizon. Rather than a decline in human activity, correlation with spatial field data suggests this drop is an artifact of sampling geometry that bypassed the stone linings of a dense, four-hearth palimpsest. In contrast, the upper horizon preserves a significant micro-charcoal concentration spike occurring simultaneously with the absolute erasure of Pinus pollen. This correlation points toward a severe regional canopy crisis systematically exploited by prehistoric pastoralists, who gathered opportunistic pioneer ferns (Polypodiaceae) and ruderal herbs (Asteraceae) for specialized livestock bedding and stall fodder inside the cave gallery.

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Stable isotope analyses and settlement archaeology approach indicate high variability in dietary and settlement patterns of the Neolithic communities in the Southern Carpathian Basin between the 7th and 5th millennium cal. BC

The Southern Carpathian Basin (SCB) is one of the key regions for examining the nature and dynamics of agropastoral expansion and the adaptations of different aspects of the "Neolithic package" into new natural environments. Project MOVE uses a multidisciplinary approach to study the origins of the sedentary lifestyle by examining the residential and lifetime mobility and settlement patterns of pioneer farmers and their successors in the SCB during the Neolithic (~6250-4500 cal BCE). Through the application of stable isotope analyses on bone collagen (δ13C, δ15N, δ34S) and teeth apatite (87Sr/86Sr), we directly estimate the degree of individuals' mobility in their lifetimes and reveal the dietary and environmental exploitation patterns of Neolithic communities.

Overall, results suggest that Neolithic communities practiced mixed subsistence strategies that combined plant and animal resources, and that only a few consumed aquatic resources in moderate amounts. The trend toward greater consumption of domestic animals during the Late Neolithic could be related to agricultural intensification, with increased sedentism and a certain regional homogenization. These results also suggested that the Neolithic communities were quite rooted locally. Contextual analysis and Bayesian modeling of radiocarbon dates indicate a dynamic nature of the processes of Neolithization and consolidation of Neolithic practices. Variability in settlement size, organization, and duration is more pronounced in the initial phases of the Neolithic. Differences observed among sites, both regarding dietary and settlement patterns, might reflect communities' adaptation to local environments and food sources. This research was supported by the Science Fund of the Republic of Serbia, GRANT No. 7498, Moving across the plain: reconstructing the lifetime movements of farming pioneers and their successors during the Neolithic in the Southern Carpathian Basin-MOVE.

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Radiocarbon Dating and Cremation Practices at the 3rd Millennium BC Cemetery of Tarnayne, Northwestern Bulgaria

The study of prehistoric cremation cemeteries presents significant challenges for establishing reliable chronological frameworks and reconstructing funerary practices. The direct radiocarbon dating of cremated human remains, combined with detailed archaeological contextual analysis, provides an important methodological approach to understanding these complex burial traditions.

This poster presents the results of radiocarbon dating of human bone samples from the 3rd millennium BC cemetery of Tarnayne, located in Vidin District, Northwestern Bulgaria, excavated in 2021. During the rescue archaeological excavations were studied two distinctive patterns of deposition: cremated human remains placed directly among clusters of stones and cremated remains deposited within concentrations of deliberately fragmented pottery vessels also placed among stones. Of particular interest is the fact that only a portion of the cremated remains was deposited. The ceramic assemblage exhibits characteristics typical of the Coțofeni culture. These practices raise important questions concerning the organization of funerary space, the treatment of human remains, and the possible ritual significance of stone and ceramic deposits.

The radiocarbon determinations place the dated remains within the 3rd millennium BC, providing an independent chronological basis for examining these funerary contexts. The integration of radiocarbon evidence with the spatial distribution and archaeological characteristics of the deposits offers an opportunity to investigate chronological relationships between the different burial practices.

The research demonstrates the importance of combining radiocarbon dating of cremated human bone with contextual archaeological analysis. The research aims to give new evidence of the cremation traditions and funerary practices of Coțofeni culture.

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Tracing the Sacred: Historical Mobility and the Material Cultural Heritage of Saints' Relics in Croatia

The relics of saints are one of the most valuable material and cultural assets of Croatia. The history of them helps understand the process of transportation of holy relics between countries, their change of ownership and meaning through time. The research concerns relics that were venerated and preserved in the different places in Croatia. In particular, it pays attention to the collection of relics in Vodnjan, which were transferred from Venice to Croatia in 1818 by Venetian painter and collector Gaetano Grezler to protect them from religious persecution in the period of Napoleonic domination. It illustrates the integration of sacred relics in the new cultural context. The research studies the history of the relics, their origin, transportation and conservation on the base of historical sources. Nevertheless, the historical sources do not necessarily tell the whole history of the object and should be analyzed critically. Different cases of the different Croatian locations illustrate various circumstances under which the transportation, preservation and conservation of the relics took place. Besides, the research also studies the role of historical sources and possibility of reconstruction of the history of the object based on them. Through the analysis of historical sources and archaeological evidence, this research contributes to a better understanding of the movement, preservation, and changing significance of relics in Croatia.

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The Barice-Gređani Group in Eastern Slavonia: Illuminating the Strizivojna-Šimenica Site in the Late Bronze Age Through New Discoveries

With the permission of the Conservation Department in Osijek, an archaeological reconnaissance was carried out at the Šimenica site in Strizivojna in spring 2025 to recover and document archaeological finds brought to the surface by ploughing. Previous investigations at the site included archaeological reconnaissance in 1979 and 1980, a small-scale excavation in 1980, during which a La Tène pottery kiln was investigated, and rescue excavations along a gas pipeline route in 1985. After a gap of nearly 40 years, further field surveys were conducted by students from the Department of Archaeology at the University of Zagreb in 2022 and 2023 as part of the Pagus Sztrisivoina project. Previous and recent investigations have shown that the site was occupied during the Bronze Age, Iron Age, La Tène period, and Roman period.

The 2025 survey yielded a large quantity of pottery, daub (some fragments of which bear branch impressions), and lithic artefacts. These finds were collected from cadastral parcel 662, also known as location 3 during the previous field survey. Among the 27 surveyed areas, location 3 produced the largest quantity of finds. Based on a macroscopic analysis of vessel types, technological characteristics (fabric and colour), and comparisons with finds from other sites, the pottery has been dated to the Late Bronze Age and attributed to the regional Barice-Gređani Group (approximately from the early 14th century BC to the mid-12th century BC; Br C2–Ha A1 phases according to Müller-Karpe). This group is associated with the Sava River region and the Požega Valley and belongs to the earlier phase of the Urnfield culture. The paper presents finds associated with this group, examines selected types of ceramic vessels, compares them with finds from other archaeological sites, and considers possible interpretations of the site's function at the beginning of the Late Bronze Age.



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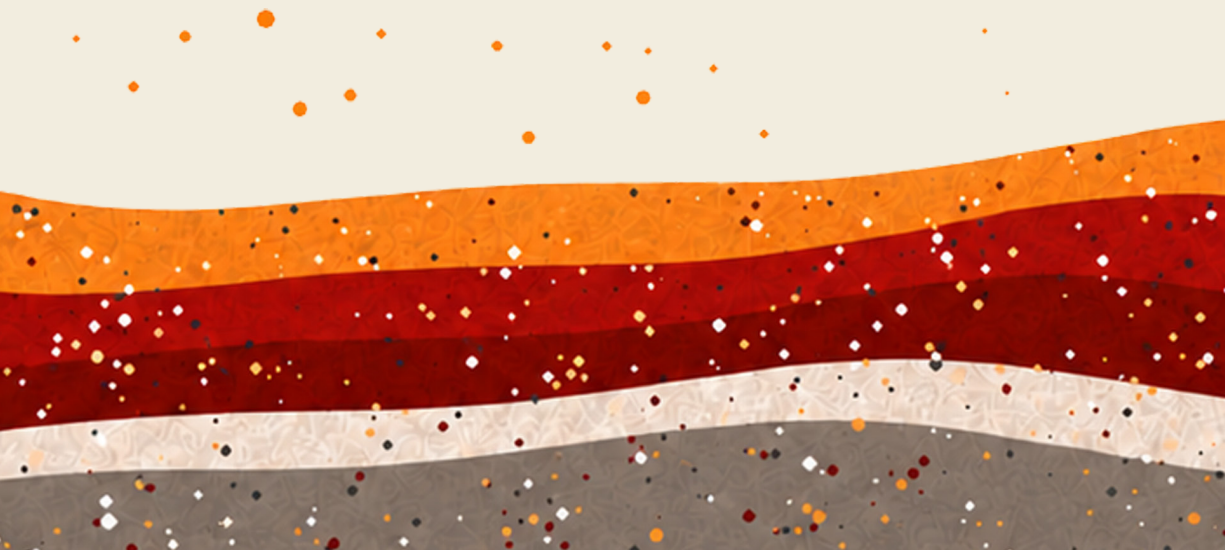
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Papers from the 1st and 2nd conference *Methodology and Archaeometry* are published in the Journal *Opuscula Archaeologica* 39/40, Department of Archaeology, Faculty of Humanities and Social Sciences of the University of Zagreb, Zagreb, 2018.

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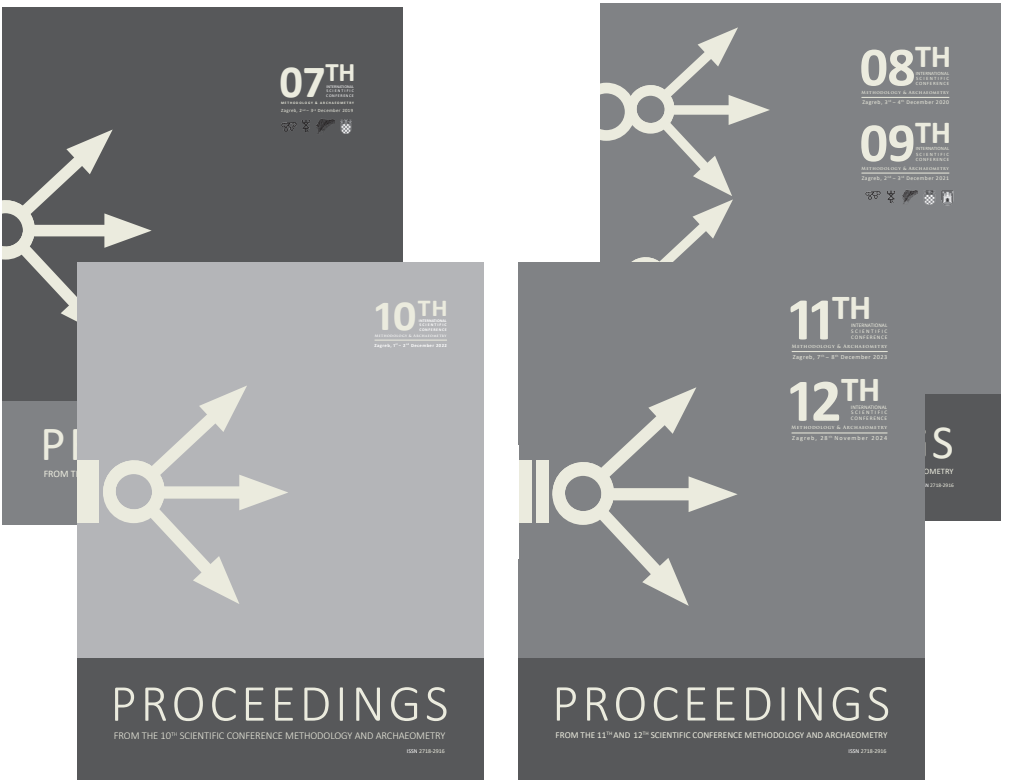
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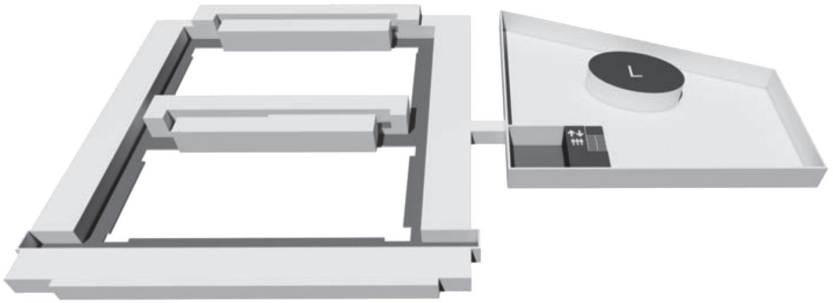


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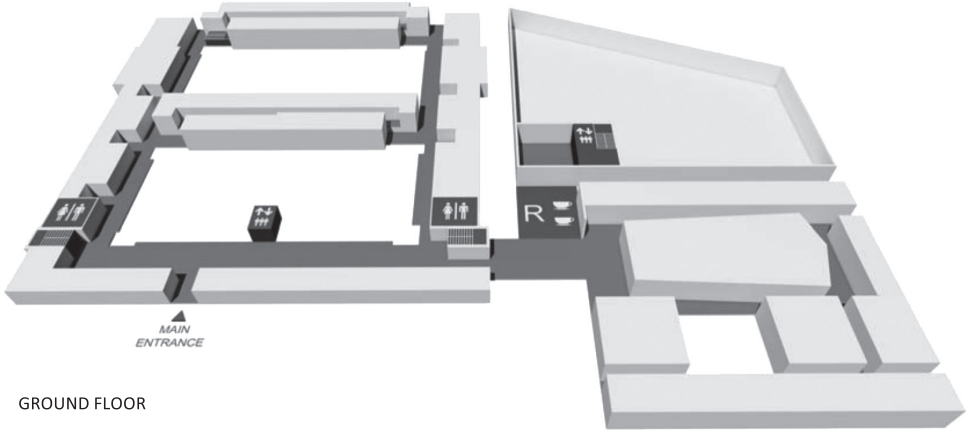
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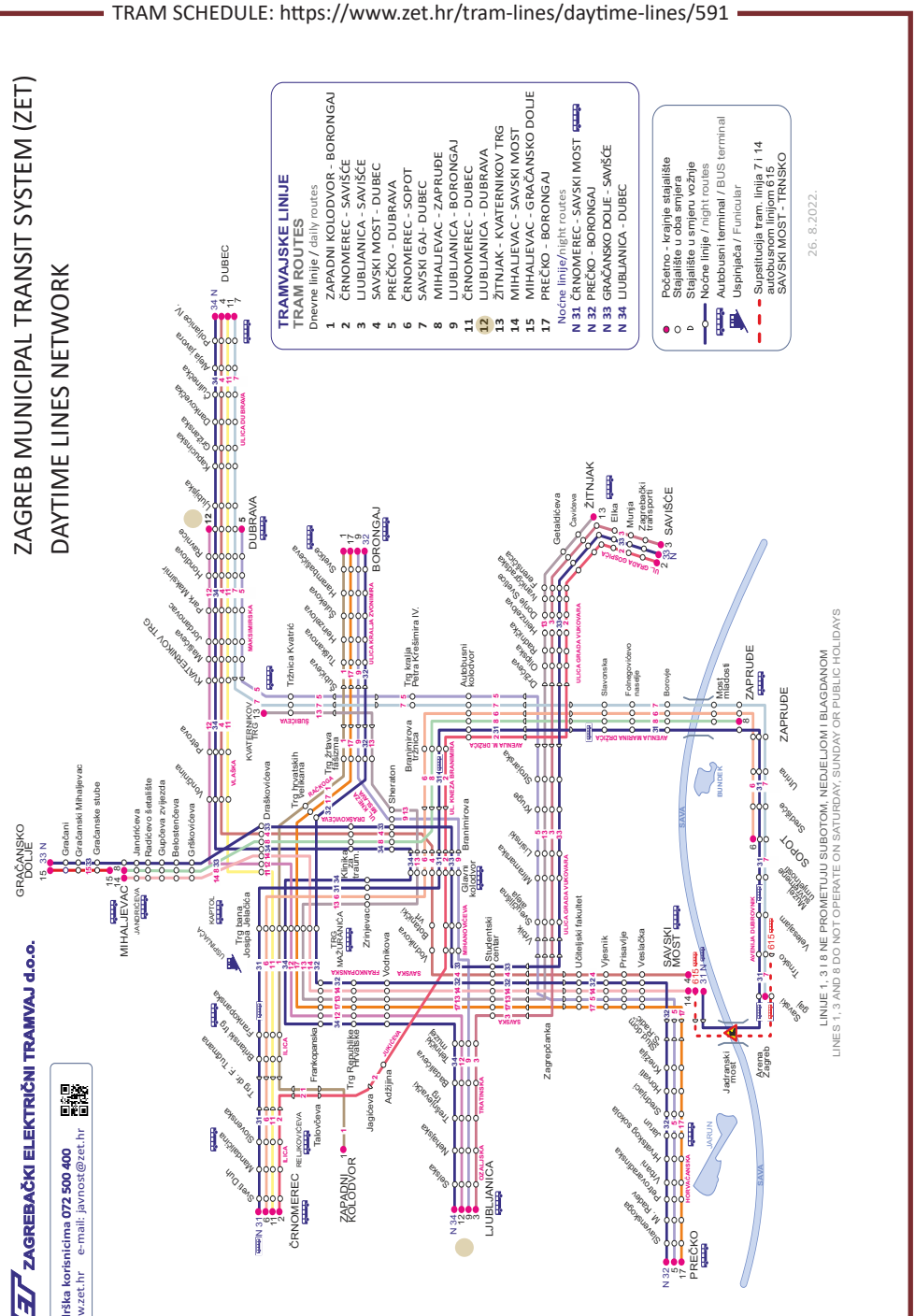
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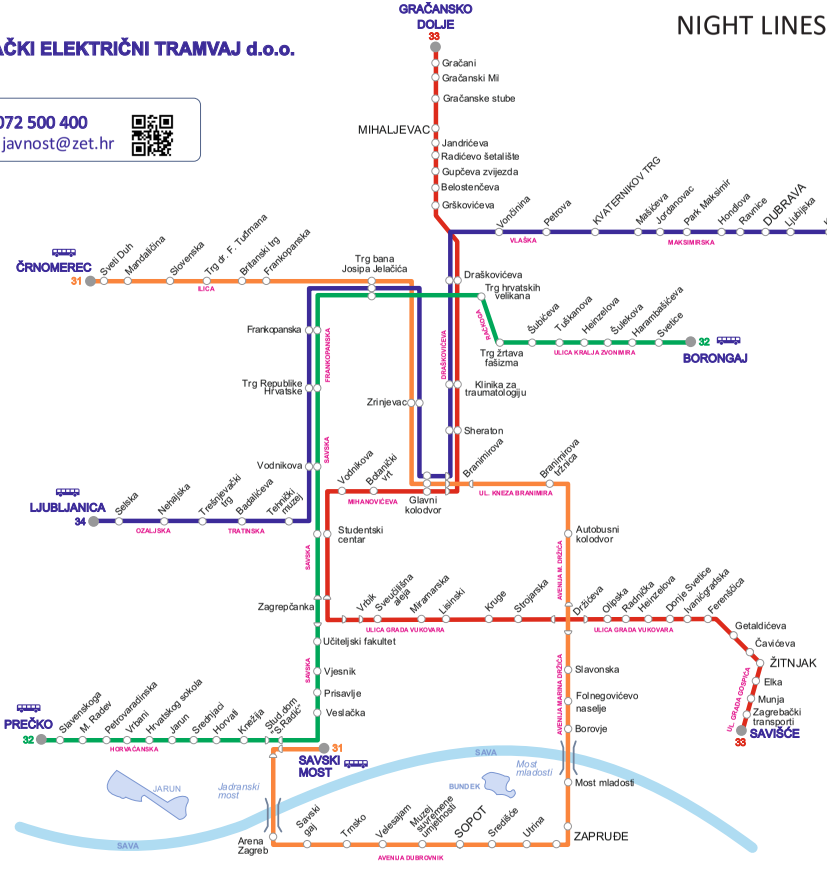
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