19–20 FEBRUARY 2026, LJUBLJANA, SLOVENIA

CERAMIC PETROLOGY GROUP

Annual Meeting 2026

Book of Abstracts

UNIVERSITY OF LJUBLJANA | FF Faculty of Arts

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Edited by
Manca Vinazza, Nastja Rogan Šmuc, Danica Mitrova

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PROGRAMME

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15.00	**Microscopy session** *Location: Department of Geology, Faculty of Natural Sciences, Aškerčeva 12, Ljubljana, room 209–210*
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09.50–10.10	**Eglė Šatavičė** Identifying grog: diversity of argillaceous inclusions in Neolithic ceramics from West Lithuania
10.10–10.30	**Florica Mățău, Vasile Diaconu, Mitică Pintilei, Ovidiu Chișcan** Technological features of the Cucuteni B pottery identified at Vânători-*La Izvoare* (Neamț County, Eastern Romania)
10.30–10.50	**Marie Usadel** The making of Nuragic pottery. A case study from the site of Grutt'i Acqua, Sant'Antioco (Sardinia)
10.50–11.20	*Coffee break & Poster session*
11.20–11.40	**Valeria Tiezzi, Bartłomiej Lis, Anthi Batziou** Provenancing transport stirrup jars at the harbour of Pefkakia (Thessaly, Greece) in the Late Bronze Age

11.40–12.00	**Marcella Giobbe, Noémi S. Müller, Antoniades Charalambous, Demetrios Ioannides, Artemis Georgiou** Canaanite jars in Late Bronze Age Pyla-*Kokkinokremos* (Cyprus)
12.00–12.20	**Maja Miše, Liam Richards, Sarah James, Vedran Barbarić** Local production and technological choices in Late Bronze Age–Early Iron Age kitchenware from Rat Vičja Luka hillfort (Brač Island, Croatia)
12.20–14.30	*Lunch break & Poster session*
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14.50–15.10	**Dorottya Györkös, Attila Kreiter, Erika Kereskényi, Szabolcs Czifra** Unique clay stamp seal with griffins from the Hallstatt culture: local or import?
15.10–15.30	**Beatrijs de Groot, Luis Berrocal-Rangel, Manuel Fernández-Götz** Ceramic production and geodiversity in Iron Age Iberia: an archaeometric study of pottery from Castrejón de Capote
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ABSTRACTS

Patrick Quinn[1], Kevin Cootes[2] and Mackenzie Saunders[1]

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Neolithic pottery-making recipes at Mount Pleasant and their implications for settlement patterns, mobility, and cultural interaction in the Peak District National Park, UK

Petrographic analysis of 233 sherds of Early Bronze Age to Early Iron Age ceramics from 24 sites across the two landscape zones of the Peak District National Park, UK by Cootes and Quinn (2017) revealed the widespread dominance of a single, geographically restricted temper of basic igneous rock. This indicates that people travelled widely across the region or interacted with other groups to obtain specific favoured resources. The existence of a widespread, long-ranging craft tradition seems to suggest a common identity that was shared by inhabitants of both the limestone plateau and gritstone uplands.

Building on this large study, the present research casts an eye back to the Neolithic to examine the pottery technology of this earlier period and its implications in terms of the settlement patterns, mobility, and interaction of the people who inhabited the Peak District prior to the establishment of farming communities in the region. The site of Mount Pleasant near Kenslow (Garton and Beswick 1983) has been chosen as a starting point for this endeavour due to its stylistically diverse assemblage of several easily recognisable wares and macroscopic fabrics.

Thin section petrography and bulk geochemistry have been applied to 41 sherds selected from each ware and macroscopic fabric, across several activity areas detected during field walking and excavation. This has been used to characterise the composition and paste preparation technology of the sherds and compare them to the recipes detected in the Early Bronze Age–Early Iron Age by Cootes and Quinn (2017). Comparisons have also been made with a database of 79 geological samples collected across the Peak District to link the sherds to landscape and detect the movement of pottery and/or raw materials within the Neolithic Peak District. Selected

SEM-EDS has provided complimentary data on the composition of specific temper types and the base clay to which they were added.

References

Cootes, K. V. E. and Quinn, P. S. 2017. Prehistoric Settlement, Mobility and Societal Structure in the Peak District National Park: New Evidence from Ceramic Compositional Analysis. Archaeometry, 60: 678-694.

Garton, D. and Beswick, P. 1983. The survey and excavation of a Neolithic Settlement area at Mount Pleasant, Kenslow, 1980-1983. The Derbyshire Archaeological Journal, 103: 7-40.

Eglė Šatavičė[1]

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Identifying grog: diversity of argillaceous inclusions in Neolithic ceramics from Western Lithuania

Grog temper in the Eastern Baltic region is commonly associated with the Corded Ware culture. However, new analyses of Neolithic ceramics from Western Lithuania, representing three distinct cultural traditions, reveal a more nuanced picture. The dataset includes classic Corded Ware vessel types, such as beakers and short-wave – moulded pots, examined alongside sherds of Narva and Globular Amphora Wares that also contain argillaceous inclusions.

Seven representative Corded Ware and 23 Narva and Globular Amphora samples were analysed to characterise the variability of argillaceous inclusions across cultural groups. Optical microscopy and SEM–EDS of thin sections were employed to determine mineralogical, microstructural, and geochemical relationships between the ceramic matrix and the inclusions.

The results show that clay pellets and dry clay lumps – materials visually resembling grog ––occur not only in Corded Ware but also in Narva and Globular Amphora pottery. In Corded Ware, however, argillaceous inclusions display greater textural and chemical variability. Some inclusions previously assumed to be grog were identified as charred organic matter, while others form interwoven clay domains that obscure which domain represents the primary paste matrix. These findings indicate multiple formation pathways, ranging from the intentional addition of crushed ceramic or dried clay materials to the accidental incorporation of heterogeneous raw clay sources. Recognising these different origins is essential for reconstructing technological choices, craft traditions, and social practices in Neolithic communities of Western Lithuania.

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Technological features of the Cucuteni B pottery identified at Vânători-*La Izvoare* (Neamț County, Eastern Romania)

This paper aims to investigate the *chaîne opératoire* of the ceramic assemblage identified at Vânători-*La Oglinzi* (Neamț County) and to compare the data with that obtained for the nearby sites located at Răucești and Pometea for assessing the degree of interaction existing within the Late Chalcolithic pottery production system.

The archaeological site is situated in the Subcarpathian region of present-day eastern Romania, an area highly used by the Cucuteni communities. Recently, the site was assigned based on the typological features of the ceramic assemblage to the Cucuteni B phase (3800–3600/3500 cal BC) of the Cucuteni culture.

The dataset investigated in this study is representative of the stylistic and functional variability detected at the site. To gain insights into the various stages of the *chaîne opératoire* (raw material selection, paste preparation, manufacturing procedures, surface finishing, and firing conditions), we analysed the pottery samples using an integrated analytical approach that combined macroscopic observations with thin-section petrography and mineralogical investigations performed by X-ray powder diffraction (XRPD). Our findings showed considerable variability in the processing and firing sequences, along with a high level of refinement in the clay processing. Additionally, the comparison of the three ceramic assemblages demonstrated the coexistence of inter-site variability and a shared manufacturing tradition, which may be indicative of a well-established system of knowledge transmission.

Marie Usadel[1]

[1] Institut für Archäologische Wissenschaften, Ruhr-Universität Bochum, Germany

The making of Nuragic pottery. A case study from the site of Grutt'i Acqua, Sant'Antioco (Sardinia)

While the archaeology of Nuragic Sardinia has a strong tradition of topographical studies focused on the eponymous Nuraghi and related megalithic architecture, Nuragic pottery has mainly been used to advance typological studies and chronological discussions. Although there have been analytical approaches since the 1980s and increasing interest in recent years, only a little is known about the production and use of Middle to Late Bronze Age Nuragic pottery.

Through petrographic analysis and the comparison of finds from the Grutt'i Acqua settlement and available raw materials on the island of Sant'Antioco, questions of provenance and production techniques are addressed. Furthermore, the composition of pottery is seen as a product of decisions based on the knowledge and contextualisation of the environment, where the specific choice of raw materials reflects social and political norms and is likely influenced by other practices, such as agriculture. Under this premise, the mineral composition of Nuragic pottery can be used to advance the discussion of regional networks of Nuraghi, not only by questioning how and where production was organised, but also whether and how exchange between sites took place. In combination with typological studies, it is possible to identify specific production practices according to vessel composition and design, and to apply the results within the prevailing typological and chronological discussions.

Valeria Tiezzi[1]*, Bartłomiej Lis[1], Anthi Batziou[2]

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Provenancing transport stirrup jars at the harbour of Pefkakia (Thessaly, Greece) in the Late Bronze Age

Among the Late Bronze Age maritime transport containers of the Aegean world, Transport Stirrup Jars (TSJs) represent one of most extensively investigated, owing to their easily recognisable shape and widespread presence in the Aegean and beyond, including the main Mycenaean palatial centres, where they were stored in large quantities. As such, a considerable body of literature has focussed on the investigation of the provenance of these containers, revealing a vast distribution network stemming from multiple production centres located not only in Crete, but also on the mainland and possibly the Aegean islands. Remarkably, recent excavations at the Late Bronze Age site of Pefkakia in Thessaly (Greece), believed to have been the main harbour of the Pagasetic Gulf at this chronological stage, uncovered a considerable number of such transport containers deriving from several contexts spanning the 14th and 13th centuries BC. At present, these findings position Pefkakia as the northernmost known distribution point for TSJs in mainland Greece. With the aim of understanding the possible provenance of such containers and thus outlining the trade networks that connected the harbour of Pefkakia with the wider Mycenaean world, 44 samples of TSJs were prepared as thin sections and analysed via polarising microscopy. Our preliminary findings indicate the presence of multiple specimens interpreted as imports from various areas of Crete, with a minor yet important group of TSJs likely to be geologically compatible with other production centres situated on the Greek mainland. In our presentation, we will briefly discuss the identified petrofabrics, together with their possible provenance, drawing attention to clay manipulation strategies as possible 'technological fingerprints' of distinct TSJ workshops. These initial results serve as evidence for a dynamic web of connections in which Pefkakia actively participated throughout the Late Bronze Age.

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Canaanite jars in Late Bronze Age Pyla-*Kokkinokremos* (Cyprus)

This contribution presents the results of the integrated science-based analytical programme conducted on a type of Levantine Maritime Transport Containers (MTCs), commonly referred to as Canaanite jars, from the Late Bronze Age coastal settlement of Pyla-*Kokkinokremos* (Cyprus). The study forms part of the ERC Starting Grant project *ComPAS*, which investigates interregional exchange networks and cultural interactions in the Eastern Mediterranean between ca. 1650 and 750 BCE, with particular emphasis on the role of Cyprus as a central maritime hub linking the Levant, Egypt, and the Aegean. Central to the *ComPAS* framework is the investigation of MTCs as key material indicators of long-distance commerce, combining archaeological classification with interdisciplinary analytical approaches to reconstruct the artefacts' life cycles. Following a comprehensive macroscopic examination of the ceramic assemblage, portable X-ray fluorescence (pXRF) was employed as a non-invasive method for the rapid compositional screening of a large number of vessels, guiding the targeted selection of representative samples for subsequent laboratory-based analyses. Thin-section petrography and wavelength-dispersive X-ray fluorescence analysis (WD-XRF) were then applied to characterise ceramic fabrics, reveal technological choices related to raw material procurement and paste preparation, and determine ceramic provenance through the integration of mineralogical and chemical datasets. Despite the short-lived occupation of Pyla-*Kokkinokremos* during the transitional period between the late 13th and early 12th centuries BCE, the results reveal marked compositional and technological variability within the MTCs' assemblage. This variability points to the coexistence of multiple production centres of Canaanite Jars in the wider region and underscores the deep entanglement of Cypriot communities within the broader networks of maritime trade and cultural connectivity spanning the Eastern Mediterranean. The results also serve as

a reminder of the limitations of provenance assessments based solely on macroscopic criteria, reinforcing the necessity of holistic, interdisciplinary approaches grounded in scientific ceramic analysis.

Maja Miše[1*], Liam Richards[1], Sarah James[2], Vedran Barbarić[3]

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Local production and technological choices in Late Bronze Age–Early Iron Age kitchenware from Rat Vičja Luka hillfort (Brač Island, Croatia)

This paper presents the first integrated typological and archaeometric study of Late Bronze Age–Early Iron Age kitchen and cooking ware from the hillfort settlement of Rat Vičja Luka on the island of Brač (Croatia). While Dalmatian islands are increasingly recognised as active participants in Adriatic interaction networks during later prehistory, the organisation of ceramic production within insular communities remains poorly understood. In particular, local manufacture of utilitarian pottery has not previously been systematically demonstrated for prehistoric island contexts in central Dalmatia.

The study aims to identify local production and technological choices in kitchen and cooking ware by combining traditional typological analysis with ceramic petrography and geochemical characterisation. Macroscopic and typological assessment focuses on vessel morphology, surface treatment, and use-wear patterns associated with food preparation and cooking practices. These data are integrated with thin-section petrography and geochemical analysis of selected ceramic samples in order to characterise fabric groups and raw material recipes. The results are cross-referenced with clay samples collected in the immediate vicinity of the Rat Vičja Luka settlement to evaluate the provenance of raw materials and the likelihood of local clay exploitation.

Preliminary results indicate a strong correspondence between ceramic fabrics and locally available geological resources, suggesting insular production of utilitarian pottery using accessible clay sources and simple technological solutions adapted to everyday domestic needs. The emphasis on functional forms and coarse fabrics reflects practical cooking requirements rather than stylistic display.

By providing the first direct evidence for local ceramic production among prehistoric communities on Dalmatian islands, this research contributes to broader discussions on insular self-sufficiency, technological knowledge transmission, and daily practices in the Late Bronze Age–Early Iron Age Adriatic.

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Local and non-local pottery from the Early Iron Age site of "Questura", Riv. Ruzante-via Santa Chiara in Padua. Archaeometric analysis and cultural framework

The site of "Questura", Riv. Ruzante-via Santa Chiara in Padua, today occupied by the Police Headquarters, was investigated between 2000 and 2001 as part of a major rescue archaeology project. It represents one of the most significant pieces of evidence for the earliest layout of proto-urban Padua; its strategic location near a counter-meander of the Brenta/*Meduacus* River, together with its dual residential and productive functions, makes this context a unicum within the protohistoric landscape of pre-Roman Veneto. Several productive workshops were identified across different areas of the site, including installations for metalworking, pottery production, and deer antler processing. The ceramic assemblage is particularly abundant and reflects the complexity of vessel typologies characteristic of the Early Iron Age in the Veneto region. At the same time, it reveals interesting elements of contact with neighbouring geographical and cultural spheres. To determine the technological choices employed in the production of the ceramic assemblage from the "Questura" site, the provenance of raw materials, and the potential circulation trajectories of the finished products, a multi-analytical study was conducted. This included macroscopic and petrographic descriptions along with mineralogical, geochemical, and microstructural analyses. The investigation allowed the identification of the main technological and compositional features of the locally produced pottery – from coarse to finer wares – and the isolation of a sample of vessels, mostly *ollae*, characterised by the presence of carbonate inclusions (calcite and/or do-

lomite) intentionally added after grinding. Chemical analyses, considered within the broader interpretative framework, consistently point to an origin for these items in the areas between the eastern Veneto margins and the *Caput Adriae*.

Dorottya Györkös[1], Attila Kreiter[1], Erika Kereskényi[1], Szabolcs Czifra[2]

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Unique clay stamp seal with griffins from the Hallstatt culture: local or import?

A large and exceptional fired clay stamp seal (width 23.5cm, height 20cm, thickness 2.0–2.2cm), decorated with griffin motifs depicted in an artistic tradition characteristic of the 6th–5th centuries BCE (c. 550–450 BCE), was discovered during archaeological excavations at the site of Bátaszék–Kört-vélyes-dűlő (Hungary), located in the southern part of the Carpathian Basin. The site lies within the Danube corridor, a region known for intensive cross-cultural interaction during the Iron Age, where Hallstatt communities integrated into Western cultural networks coexisted and interacted with Vekerzug groups maintaining strong connections with the Scythian world. Both the form and the decoration of the stamp seal diverge markedly from the Hallstatt cultural milieu of Transdanubia and instead suggest a foreign cultural affiliation. Griffin imagery is widespread in Scythian contexts – particularly along the northern coast of the Black Sea – where it reflects Ancient Near Eastern and Greek influences, while such motifs are comparatively rare within the Carpathian Basin. These observations prompted an investigation into the artefact's provenance.

Petrographic and SEM–EDS analyses were carried out on the stamp seal and on ceramic finds from the same archaeological context. In addition, one sediment sample and three clay samples collected in the immediate vicinity of the site were also analysed for comparison. Preliminary results indicate that, despite its iconographic distinctiveness, the stamp seal was produced using locally available raw materials. This apparent discrepancy between stylistic affiliation and material composition suggests local manufacture using available resources, most likely by a craftsman working within a non-local artistic tradition, rather than the importation of a finished object.

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Ceramic production and geodiversity in Iron Age Iberia: an archaeometric study of pottery from Castrejón de Capote

Geodiversity is best described as a high natural range of geological, geomorphological, hydrological, and soil variability. Geodiverse landscapes have housed societies past and present, often serving as locales for the extraction of highly valued geomaterials. One site in such a geodiverse region is the hillfort of Castrejón de Capote; one of the best investigated settlements of Late Iron Age southwest Iberia. Located in the territory that the classical sources attributed to the *Celtici*, it was occupied between the early 4th and the 1st centuries BCE. The excavations from the 1980s and 1990s have brought to light an extensive and diverse ceramic assemblage, including hand-made and wheel-made pottery, elaborate incense burners, spindle-whorls, storage vessels, and several non-local ceramic types (Ibero-Phoenician pottery, black-gloss 'Campanian' ware, and amphorae).

This paper presents insights from the first technological analysis of the site's ceramics, revealing the compositional and technological diversity of this assemblage. It utilises a broad spectrum of archaeometric methods (ceramic petrography, X-ray diffraction, inductively coupled plasma spectrometry, and scanning electron microscopy). However, despite the high-tech methodology employed, it has proven a challenge to distinguish local and non-local groups in the assemblage, even though the assemblage includes several ceramics that are typologically aligned with non-local categories. This presentation will examine how geodiverse landscapes might pose a challenge for archaeometric provenancing analysis, and that relying on good old ceramic petrography might prove the most effective way to understand such assemblages.

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Archaeometric analysis of Roman pottery from the Speicher–Herforst production district (Rhineland-Palatinate, Germany) during the 2nd to 5th centuries

The area near Speicher and Herforst (Rhineland-Palatinate, Germany) was an extensive pottery production district in the north-western Roman provinces. Within an area of approximately 4km², numerous kiln sites have been documented, indicating an intensive and long-lived ceramic industry from the 2nd to the 5th centuries. Despite this, the material-technological characteristics of Speicher pottery and the internal organisation of production remain poorly understood. This landscape therefore provides an important context for investigating technological choices and production organisation in Roman pottery manufacture.

This study focuses on characterising ceramic technology at the Speicher kiln site by examining intra- and inter-ware variability, identifying fabric types, and assessing technological decisions reflected in raw material selection, clay mixing practices, and tempering strategies. Macroscopic fabric analysis was conducted on 100 pottery sherds, from which 55 samples were selected for thin-section petrography (OP) and 30 samples for geochemical analysis (LA-ICP-MS). This combined dataset provides a basis for evaluating mineralogical and elemental variation relevant to technological practices.

This pilot study will present the first petrographic-geochemical characterisation of pottery from the Speicher production zone, providing a basis for examining technological differentiation, variation in clay recipes and tempering practices, and potential workshop-level variability. By outlining these patterns, the study aims to contribute to a better understanding of links between workshops, the level of production organisation, and the range of production strategies involved in the manufacture of Speicher pottery.

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Petrographic characterisation of African sigillata, "Red Slip Ware", from the site of *Thapsus*: presentation and contribution of the results

Benefiting from a strategic location on the eastern coast of Byzacena, the city of Ras Dimas, ancient *Thapsus*, is distinguished by a rich Punic past, with the earliest attestation dating back to the mid-6th century BC. The Roman city is historically renowned and several public structures remain, such as the amphitheatre, public cisterns, an aqueduct, and a thermal complex. Traces of Byzantine domination remain largely unknown.

For many years, the site has been the subject of several research projects addressing historical and archaeological issues. The study of ceramic material, particularly from the Roman period, raises many questions but also provides answers regarding the material culture of the ancient city and its exchange flows within its regional, interprovincial, and intraprovincial context.

Our interest focuses on the study of African fine tableware, universally known as African sigillata or "African Red Slip Ware", produced mainly in the modern-day Tunisia from the 1st to the 7th century AD. This category, which is very abundant on the site, as in all of North Africa and the Mediterranean basin, still poses a dating problem, as well as other issues related to manufacturing techniques and production centres.

Within the framework of creating a reference collection of the Roman ceramics from the site, around 60 representative fragments of African sigillata were selected at the INP headquarters in *Thapsus* and subjected to paste sampling. Some fragments were classified and studied under a binocular microscope, while others underwent petrographic analysis in thin sections. The combination of the results allowed the research to advance on several levels:

- Identification of two groups of sigillata: imported and African;
- Evidence of several distinct African production centres, geographically and technologically differentiated, identified through compari-

son with petrographic data from previously documented production workshops;

- Identification of a new group of sigillata whose distribution area remains uncertain.

The integration of the petrographic and archaeological approaches has influenced experts' understanding of the site's history in general, and its economic history in particular.

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Petrographic characterisation of coarseware and fine tableware from the deserted medieval market town of Gutenwerd (Slovenia)

The study presents a petrographic analysis of coarse ware and fine tableware from the archaeological site of Otok near Dobrava, situated along the Krka River in the southeast Dolenjska region of present-day Slovenia. In the Middle Ages, this was the site of the medieval market town of Gutenwerd, which functioned as an urban and administrative centre for the Bishopric of Freising's Lower Carniola estates. A selection of pottery fragments representing both ware types, dating to the High and Late Middle Ages and including some post-medieval examples, was analysed using thin-section optical microscopy with a polarising light microscope (PLM). The study aimed to identify and characterise fabric groups, examine raw material selection and processing as reflected in ceramic fabrics, and assess technological choices related to paste preparation and forming practices over time. The results highlight patterns of both continuity and variability in pottery fabrics and raw materials employed across the analysed periods.

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Emergence of high medieval pottery in Czech lands – analyses of kiln batches

The paper presents an analysis of pottery assemblages recovered from kiln contexts dated between AD 1250 and 1400, a period marked by significant technological and social transformation in Central Europe. These changes include the adoption of pottery kilns, the use of rotational kinetic energy in vessel forming, and the professionalisation of pottery production. The study draws on material from 11 kilns located across the Czech lands and Lower Austria, allowing for inter-regional comparison. The assemblages were examined through macroscopic analysis, with a strong focus on forming and firing traces, complemented by a suite of archaeometric methods, including ceramic petrography, 3D analysis, X-ray fluorescence (XRF), and X-ray diffraction (XRD) analyses. Extensive experimental pottery production and firing was also integrated into the research design to contextualise and interpret the archaeological observations. The results document a shift from relatively simple pottery production towards controlled kiln firing and the emergence of thin-walled, smoke-fired wares which in some regions persisted until the early 1900s. The research outcomes are synthesised in an English-language monograph, funded by the Czech Science Foundation (GA23-07863S).

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Rethinking ceramic traditions in Catalonian greyware pottery: new insights on production, exchange, and cultural significance from a multi-scalar and interdisciplinary framework (Catalonia, Spain, 11th–18th cent.)

Greyware pottery constitutes one of the most distinctive ceramic categories in medieval and modern Catalonia, spanning a wide chronological frame and often associated with both domestic and specialised contexts. Despite its apparent homogeneity, petrographic analyses have revealed significant technological variability, reflecting diverse production choices and social dynamics. The study of Greyware therefore provides a valuable lens through which to approach broader issues of technological tradition, economic organisation, and cultural interaction.

This contribution offers a critical overview of the state of research on Catalan Greyware, with a particular focus on the methodological strategies that have been developed to enhance its study. Ceramic petrography has served as the central analytical tool, but its integration with other techniques, such as XRF, XRD, and SEM-EDS, has greatly increased the resolution of provenance and technological studies. The incorporation of written and oral sources in more recent work has further expanded the interpretative framework, enabling a more holistic understanding of the relationship between technological knowledge, communities of practice, and cultural perceptions of ceramic production.

Attention will also be given to the evidence of interregional (and far beyond) connections, which challenge interpretations framed solely within a regional perspective. Our current data actually support broader exchange networks in the Western Mediterranean, opening new discussions about mobility, connectivity, and the circulation of technological traditions.

Rather than focusing exclusively on the current state-of-the-art, we aim to stress how the accumulated knowledge provides the foundation for future research. New perspectives emerge from adopting multi-scalar approaches, combining archaeometric, archaeological, and historical evidence written in documents. By doing so, Greyware studies can continue to shed light on production, distribution, and consumption practices, as well as on the social and cultural significance of ceramics in past Mediterranean societies.

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Local production versus trans-local networks? Provenancing potter communities in the Congo Basin through integrated mineralogical and geochemical analysis

Archaeological interpretations of Central African prehistory have long relied on ceramic styles as proxies for social groups, mobility, and large-scale historical processes such as the so-called Bantu-Expansion. This approach is particularly problematic in the Congo Basin, where settlement evidence is scarce and ceramics constitute the primary material record. While stylistic variability has been documented in detail, little is known about the organisation of pottery production itself, including the location of production centres and the extent to which ceramics circulated beyond their place of manufacture.

This project addresses this gap by investigating ceramics from the Congo Basin using an integrated mineralogical and geochemical approach. The current dataset comprises 354 ceramic samples from 64 sites, representing 37 distinct pottery types spanning from the onset of pottery production in the late 1st millennium BCE to the recent past. Petrographic thin-section analysis is combined with portable X-ray fluorescence (pXRF) measurements to disentangle similarities caused by shared raw materials environments from those resulting from common *chaîne opératoires* within potter communities.

Preliminary results indicate that many ceramics with near-identical mineralogical characteristics, largely reflecting the widespread use of fluvial clays, exhibit distinct elemental signatures. This suggests that several pottery types traditionally interpreted as locally produced at multiple sites may instead originate from spatially restricted production zones, possibly even from individual potter communities, and were distributed across wide areas. By systematically comparing intra- and inter-site variability within pottery types, the project evaluates the scale of ceramic production and exchange and reconstructs networks of trans-local potter communities.

By shifting the analytical focus from stylistic similarity to production and distribution practices, this study provides a more robust basis for interpreting social networks, mobility, and regional interaction in the prehistoric Congo Basin, challenging long-standing assumptions about the relationship between ceramics, communities, and cultural change.

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Materials and manufacture: experimental approaches to technological choices in ceramics

Ceramic manufacture involves a series of technological choices that influence the performance of vessels during manufacture and use, alter their compositional characteristics, and ultimately shape how archaeologists interpret ceramic assemblages and what they represent.

A very substantial body of research addresses these issues, ranging from the identification of manufacturing practices in archaeological materials, to the effects of technological choices on performance during manufacture and use, often with particular attention to specialised vessel forms designed to meet specific functional demands, such as crucibles, cooking vessels, or structural ceramics, and to the ways in which such choices may affect compositional characteristics relevant to, e.g. provenance studies. However, a number of questions still remain.

This paper provides an overview of these strands of research, highlighting key findings, current limitations, and unresolved questions. By synthesising evidence across analytical, experimental, and archaeological approaches, it outlines a roadmap for future research aimed at more robustly linking technological choices, material composition and affordance, and archaeological interpretation.

POSTERS

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A closer look – Petrographic and archaeometric analysis of Early Neolithic ceramics from the site of Movila lui Deciov

This presentation investigates the technological development of ceramic production at the early Neolithic site of Movila lui Deciov through an interdisciplinary approach. The site is located in the Banat region of Romania, near the town of Dudeștii Vechi, and dates to the 6th millennium cal BC. The primary objective of this research is to examine technological advancements and potential adaptations in ceramic production during the site's occupation, with a particular focus on differences between Phase 1 (~5760–5740 cal BC.) and Phase 2 (~5710–5620 cal BC.), which represent the earliest phases of habitation.

The ceramic assemblage was first subjected to macroscopic analysis to identify macro traces related to crafting techniques. This was further complemented by petrographic analysis of 51 ceramic samples, representing a broad spectrum of vessel types from both occupation phases. Additionally, a small number of geological samples were collected for comparative analysis.

This study seeks to provide a comprehensive understanding of ceramic diversity and its technological evolution at Movila lui Deciov, contextualising these findings within the broader archaeological framework of the site and the early Neolithic period in the Banat region. Two petrographic fabrics were identified, with an additional subgroup of one. Both fabrics are stably present in both phases. In regard to forming techniques, only one is present in Phase 1. It is also present in Phase 2, but joined by a second forming technique. Thus, the ceramic of Movila lui Deciov shows an interesting mixture of continuity and transformation, possibly suggesting contact with a new second group of potters in Phase 2.

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Tempering traditions: mapping bone use in Iberian Neolithic pottery

The use of bone temper in prehistoric pottery is documented at several archaeological sites across Europe. It has traditionally been associated with pottery-producing hunter-gatherer communities in Northern Europe, particularly in the Baltic and Scandinavian regions, where it features prominently in *Trichterbecherkultur* (TRB) contexts (Kowalski et al. 2020). Bone temper has also been identified in other cultural settings, including *Linearbandkeramik* communities (Constantin et al. 2010), *Hoguette* pottery (Manen and Mazurie de Keroualin 2003), and within the Cardial and Epicardial horizons of southern France, notably in Languedoc and Provence (Binder et al. 2010; Convertini 2010).

In Iberia, however, evidence for bone temper remains scarce and geographically dispersed. The phenomenon was first documented in the Middle Tagus Basin (Díaz-del-Río et al. 2011) and has been expanded more recently through new petrographic research (Clop et al. 2025). Beyond this area, bone temper has only been identified at Buraco da Amoura (Guarda, Portugal) (Jorge et al. 2005) and La Dehesilla (Cádiz, Spain) (Taylor and García-Rivero 2020), raising questions regarding the extent, chronology, and technological significance of this practice in south-western Europe.

This poster presents an updated overview of bone temper use in Iberian Neolithic pottery, incorporating new evidence derived from petrographic analysis. Thin sections were examined using optical microscopy and con-

textualised through an extensive review of the archaeological and bibliographic record.

This new data allows the identification of additional pottery samples containing bone inclusions, confirming a marked concentration in the Middle Tagus Basin around 5300 cal BC. A progressive decrease in both frequency and abundance is observed with increasing distance from this core area, suggesting a technologically localised phenomenon.

Overall, the results indicate that the use of bone temper in Iberia represents a distinct technological tradition, likely embedded within regional systems of ceramic production and learning, with only limited diffusion into surrounding areas.

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Tracing pottery-making traditions at the Vinča–Tisza borderland: evidence from Gradište–Idjoš

The expansion of the so-called Tisza phenomenon from its core area in the middle Tisza River into Serbia begins during the period of the fully developed Vinča settlements in northern Banat (5200–5000 cal BCE). At several sites in northern and central Banat, pottery of the Vinča and Tisza styles occurs contemporaneously, suggesting possible coexistence and interaction between the two traditions. This interaction is further indicated by the occurrence of finds displaying characteristics of both styles (Mirković-Marić, Amicone 2019).

One of these sites is Gradište-Idjoš, located in the Serbian part of the Banat region and subjected to multidisciplinary archaeological investigation since 2014. According to old excavation data, the site was occupied from the late 6th millennium BCE, exhibiting a Starčevo/Körös pottery tradition, followed by Vinča-style pottery, and, subsequently, mixed Vinča and Tisza assemblages (Marić et al. 2025). Previous research on a limited number of samples from these mixed assemblages highlighted differences in the technological choices concerning certain aspects of pottery production.

In this study, we expand the investigated assemblage to include material from the new excavations, aiming to gain a better understanding of the technological choices reflected in ceramic production at Gradište. To achieve this, we selected samples that represent a range of shapes, pastes, and functions from a well-dated context spanning two distinct occupation phases. We applied a multidisciplinary approach, combining macroscopic investigation of manufacturing traces with archaeometric techniques, including petrographic analysis and X-ray diffraction analysis, to reconstruct

the *chaîne opératoire*, from raw material selection and forming techniques to firing technology. This approach aims to shed new light on pottery-making traditions in this liminal area.

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Petrographic and geochemical analysis of Early Bronze Age Hatvan Culture ceramics from Včelince, South-Central Slovakia

The archaeological site of Včelince, located in the Rimavská kotlina basin of south-central Slovakia, preserves a stratified sequence of seven layers representing five successive Bronze Age cultural phases: Hatvan, Hatvan-Otomani, Otomani-Füzesabony, Piliny, and Kyjatice. This study examines the earliest phase, the Hatvan culture, radiocarbon dated to 3710 ± 38 BP, through a comprehensive analysis of 40 ceramic samples attributed to this horizon. The main objective is to explore technological practices in ceramic production and the provenance of raw materials, thereby contributing to an understanding of Early Bronze Age craft specialisation and resource management in the region.

A multidisciplinary analytical approach was applied, integrating macroscopic and petrographic observations with scanning electron microscopy coupled with energy-dispersive spectroscopy (SEM-EDS), electron probe microanalysis with wavelength-dispersive spectroscopy (EPMA-WDS), and X-ray diffraction (XRD). These methods enabled detailed characterisation of ceramic fabrics regarding inclusion types, matrix textures, elemental compositions, mineral phases, and firing conditions.

Fine ware samples were largely reduced-fired and exhibited evidence of controlled manufacturing, whereas coarse wares showed heterogeneous firing, higher porosity, and frequent microfractures –patterns reflecting functional differentiation between tableware and utilitarian ceramics.

Three compositional groups were identified. The dominant group contained granitoids, gneiss, and sandstones or siltstones corresponding to local geology. A second group, enriched in biogenic silica and calcite, likely derived from regional Paleogene or Neogene sediments, possibly affected by

post-depositional processes. A third group, characterised by rhyolitic tuff and pumice, points to the use of non-local materials and participation in broader exchange networks.

Overall, the evidence suggests predominantly local ceramic production supplemented by regional resource exploitation and selective long-distance interactions. These findings establish a comparative framework for examining technological continuity and change in later Bronze Age phases at Včelince and across related assemblages in central Europe.

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Between Ljubljana and Cetina: archaeometric insights into 3rd millennium BC ceramics from the Karst

The Karst region of north-eastern Italy and south-western Slovenia is characterised by a dense concentration of caves and rock shelters, which provide the main source of prehistoric evidence prior to the Bronze Age. Uneven research histories and variable excavation and documentation standards have resulted in a heterogeneous archaeological record, complicating reconstructions of cultural and technological developments. These issues are particularly evident for the 3rd millennium BC and the relationship between the Ljubljana and Cetina cultural horizons.

This poster presents the results of an ongoing archaeometric study of ceramics from cave and rare open-air sites on the Trieste Karst, focusing on technological variability and potential links between the Ljubljana and Cetina traditions. The dataset includes ca. 90 vessels dated from the Neolithic to the Early Bronze Age, with a particular emphasis on newly analysed Cetina material from four Karst sites (Ciclami, Zingari, Mitreo, and Castellazzo di Doberdò).

Analyses combine optical microscopy, X-ray diffraction (XRD), microCT and portable X-ray fluorescence (pXRF), allowing integrated petrographic and geochemical characterisation of ceramic fabrics.

Preliminary results indicate a major technological shift between earlier prehistoric pottery and 3rd-millennium assemblages, marked by a transition from calcite-rich fabrics to quartz-dominated pastes with frequent grog temper. Within the 3rd millennium BC material, no clear technological separation between Ljubljana and Cetina ceramics has been so far observed.

The poster discusses these patterns in relation to emerging stratigraphic evidence and explores their implications for technological knowledge transfer and cultural interaction in the Northern Adriatic during the 3rd millennium BC.

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From shale temper to shale clay: preliminary results of ceramic paste preparation strategies at Qurayyah, NW Arabia

The ANAPAN project "*A New Approach to Pottery from Arabia and its Neighbors*" (FWF-ANAPAN, PI M. Luciani), through petrographic analyses of MBA–early LBA (mid-2nd millennium cal BCE) pottery from the firing kiln in Area A at the oasis of Qurayyah, NW Arabia, has established a baseline for identifying in-situ production, which is mainly characterised by a non-calcareous clay tempered with shales. While shale tempering dominates in the kiln production throughout the Iron Age, earlier assemblages display more varied raw materials and paste preparation modes. We now wish to investigate all diachronic trends in pottery manufacture and socio-economic organisation.

The present study focuses on a distinctive characteristic observed in a subset of locally-produced ceramics dating exclusively to the EBAIV–MBA (late 3rd–mid 2nd mill. cal BCE). Two petrographic groups contain unusually high quantities of rounded argillaceous rock fragments with diffuse boundaries and marked optical activity, closely resembling the surrounding matrix. This suggests either the use of shale-derived clays or post-extraction processing of raw materials, involving clay maturation and fragmentation. The former has been documented since Predynastic Egypt (Ownby, Köhler 2021) and is experimentally applied in modern brick, tile, and artistic production, where shales contribute to improved workability. Nevertheless, despite their techno-functional advantages, archaeological case studies involving shale-derived clays remain limited.

By integrating petrographic observations with preliminary experimental tests, this research explores the suitability of locally sourced shales for clay extraction and paste preparation. The restricted chronological distribution of this practice suggests a distinct *chaîne opératoire* for raw-material processing at Qurayyah, reflecting a specific manufacturing strategy that di-

verged from earlier traditions and was subsequently discontinued in later phases. This evidence adds to the ongoing project results and offers a novel perspective on resource management, technological choices, and the evolving production trends within the oasis.

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The mineralogical analysis of pottery assemblages from Amaovoko Lejja, Southeastern Nigeria

This research is centred on the mineralogical analysis of pottery assemblages from Lejja, an iron smelting site in south-eastern Nigeria. The study seeks to identify the mineralogical constituents, provenance, and stylistic elements of some selected potsherds. For context, Lejja is a cluster of villages in south-eastern Nigeria renowned for its ancient iron smelting activities from the second millennium BC. However, the archaeological importance of Lejja extends beyond its iron working technologies to its array of decorated pottery assemblages, which have remained largely unexplored, hence the need for this research, which aims, to study the mineralogical assay of Lejja potsherds for the first time. Analysis of the potsherds reveals minerals such as kaolinite, illite, feldspar, quartz, and other rock fragments which suggest the use of different materials and tempering agents, as well as specific choices in raw materials selection consistent with previous studies. The minerals identified also suggest that the raw materials were locally sourced, reflecting self-sufficiency and abundance of the material in the region.

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Traces of colour/paint on the rock-reliefs of the Assyrian irrigation system at Faida and Khinis (Iraqi Kurdistan)

The impressive water-management system built in the 8th–7th centuries BC by the Assyrian king Sennacherib in the hinterland of Nineveh, on the left bank of the Tigris River in Mesopotamia (Iraqi Kurdistan), consists of a network of hundreds of kilometres of artificial channels designed to irrigate the plain of the ancient capital of the Assyrian Empire.

During the extensive cleaning and restoration of these reliefs, carried out as part of the Land of Nineveh Archaeological Project (LoNAP) at the archaeological sites of Khinis and Faida, numerous micro-samples were collected to analyse the reliefs' surfaces. Some areas were very compact, smoothed, and brown-reddish, prompting investigation into whether this was the result of natural alteration of the rock or related to the possible presence of an applied coating.

Optical and electronic microscopy indicated that the relief samples are composed of two different components: i) the dolomitic rock on which the reliefs were carved; ii) a very fine-grained calcite layer corresponding to a limewash. High-resolution micro-stratigraphic analysis indicated that this limewash is composed of numerous layers, each with a thickness of a few micrometres, often exhibiting a carbonation surface characterised by denser material. This suggests that at least a few hours elapsed between the application of successive layers. This microstructure is typical of fresco techniques used in wall paintings.

This finishing technique was likely used both to increase the resistance of the relief's surface to atmospheric weathering and to prepare a suitable substrate for pigments, allowing the magnificent sculptures to be seen from a distance.

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Heterogeneous fabrics in a complex landscape: reading the Fiora Valley in the ceramics of Vulci

Between the late 10th and early 7th century BCE, Vulci – located in the Fiora Valley, central Italy – underwent major social and political changes, transitioning from early Villanovan proto-urban communities to an urbanised centre during the Orientalising period, when it flourished as one of the most important Etruscan cities.

These transformations are reflected in its ceramic production, which, in the early phases, appears highly decentralised and technologically diverse. Combined with the geological setting of the Fiora Valley – where volcanic deposits intersect with sedimentary formations – this geological diversity and non-centralised production results in numerous heterogeneous ceramic fabrics. Ultimately, this gives rise to difficulties in the identification of production centres and in provenance studies.

In the light of these challenges, this study aims to evaluate whether the geological variability of the Fiora Valley is reflected in the ceramic fabrics identified at Vulci, and to determine whether meaningful correlations can be established between pottery composition and the local geological framework. Ceramic samples from settlement and necropolis contexts were analysed through ceramic petrography, dating from the Villanovan to the Orientalising period. The identified fabrics were compared with thin-sec-

tioned geological samples collected from strategic points across the valley, including sandy clay deposits along the Fiora River.

Preliminary findings reveal some overlapping mineralogical and lithological signatures between the archaeological and geological samples, marked by a mixture of effusive, sedimentary, and metamorphic components. This correspondence indicates that the complex geology of the Fiora Valley contributes to the high degree of heterogeneity observed in Vulci's ceramic assemblage and must be considered when addressing issues of provenance. Overall, the study provides new insights into ceramic production in southern Etruria and contributes to a more robust methodological framework for exploring the interplay between landscape, resource availability, and technological choices.

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What story can a kiln tell? Insights into potters' practices at the *Ceramico* of Motya, Italy

The *Ceramico* on the island of Motya, a Phoenician-Punic settlement in western Sicily, is one of the best-preserved ceramic workshops in the ancient Mediterranean, featuring various production remains, such as kilns, basins, wells, storage spaces, and a potter's wheel. Therefore, it provides evidence of a complete operational sequence of ceramic production, offering rare insight into the technical and social organisation of craft activities.

Although multiple kilns are present, research has focused primarily on the ceramic materials they produced rather than on the structures themselves, resulting in a limited understanding of technological practices, resource management, and craft production systems within the workshop. By examining the life cycle of a newly excavated firing installation – kiln 6438, active from the 6th century BCE – this study aims to shed light on the potters' technological, operational, and post-operational practices within *Ceramico* and, more broadly, to advance a methodological framework for the study of firing installations.

To achieve this, an interdisciplinary approach combining archaeometric, geoarchaeological, and palaeobotanical techniques was applied. Ceramic petrography was used to characterise the composition of the kiln's clay lining, while soil micromorphology and micro-remains analysis were employed to elucidate fuel choices and the kiln's use and abandonment history.

The results of this study offer valuable insights into the selection of raw materials and the clay-based building technologies employed in the kiln's

construction. In addition, the analysis sheds light on the types of fuel used by potters to fire the kiln, as well as on its operational phases and post-abandonment history, including its secondary use as a discard area. Taken together, these observations allow for a nuanced reconstruction of the kiln's life cycle. More broadly, this research provides a robust and replicable methodological framework for the study of firing installations and associated materials from ceramic production sites across the Mediterranean and beyond.

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From the city to the gods: raw materials and ceramic circulation between Caere and its maritime sanctuary of Pyrgi (Southern Etruria)

Between the 6th and 3rd centuries BC, the Etruscan inland town of Cerveteri – ancient *Caere* – experienced significant economic and cultural growth thanks to the presence of its port, known to the Greeks as "*Pyrgi*". Located approximately 12 kilometres from the main city, the harbour not only represented *Caere*'s projection towards the Mediterranean Sea, but also hosted two remarkable sacred areas characterised by different regimes of votive offerings. Surprisingly, from a geological perspective, *Pyrgi* possessed all the resources necessary to meet this substantial demand, yet ceramic petrography revealed a different picture. Analyses conducted on both geological and ceramic samples showed that the production system was in fact more centralised than expected, concentrated around the city of *Caere*. Worshippers, merchants, and settlers evidently prompted Cerveteri to supply pottery used at the port for ritual purposes as well as for everyday needs. Moreover, profound changes in production technology occurred over time as a result of dynamics that closely correspond to historical and cultural shifts: the political and cultural encounter with foreign peoples and their distinct know-how, such as the Greeks, and the Roman expansion throughout the Italian peninsula. Ceramic petrography, in other words, sheds new light on how the city of *Caere* controlled its territory and the supply chain, as well as on how the presence of foreign individuals – especially craftsmen and visitors – influenced local material culture.

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Ancient lime mortars as cultural proxies: insights from the central mediterranean

Ancient lime mortars and plasters, likely originating from the Eastern Mediterranean, were omnipresent across the architecture of Classical Antiquity. The Phoenician-Punics played a major role in the widespread dissemination of this heterogeneous material across the Mediterranean basin. Over time, the ancient mortar technology was further influenced by the Romans. This human-made, composite material today provides for extensive research opportunities, serving as a gateway to past human activities and their evolution through space and time. Archaeological and archaeometric investigations contribute to the scientific understanding of the raw material, mortar recipes, and technology trade.

The ongoing project focuses its study on ancient lime mortars and plasters from three culturally interconnected sites from the Central Mediterranean – Carthage, Pantelleria, and Solunt. Dating from the 5th century BCE to the 1st century CE, the lime mortars embody diverse socio-cultural theory models that are being interpreted with the help of multi-analytical quantitative and qualitative tools. Polarised light microscopy, XRD, SEM, and FTIR aim to decipher the composition, characteristics, and trade aspects of these Punic-Roman lime mortars, highlighting the material diversity influenced by geology, environment, and craftsmanship.

Central to the research framework of this project is the implementation of a structured research data management strategy. These archaeological sites, among others, across the Mediterranean provide an exhaustive repository of mortar recipes and technologies spanning long time periods. Given the

multiple ongoing studies in this field, systematically recording results from diverse sites and different periods enables the creation of a detailed, structured database. The goal of this digital archive is to document, standardise, and integrate archaeometric datasets on a single platform, while also serving as an analytical model for interpreting technological change and mapping potential dissemination pathways.

A combined archaeological and archaeometric study, along with the structured data management system, of these ancient mortars and plasters, aims to clarify the role of Punic and Roman actors in creating and spreading mortar technologies across the central Mediterranean.

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Sudden shift or gradual development? Insights into changes in pottery production in Central Europe during the 1st century BC

Attributes of pottery and characteristics of the production process are determined by various factors, including the properties of raw materials used, the intended functions of vessels, and the cultural background of their creators and users. At the same time, these attributes change at different speeds and potentially due to different factors. For this reason, research on pottery and its manufacturing process can be used to study development within society and possible drivers of change, for example, during transitional periods.

One such transition occurred in Central Europe during the 1st century BC, at the end of the La Tène and the beginning of the Roman periods. During this time, settlement structure, long-distance contacts, technologies, and material culture underwent substantial changes, which are often interpreted as a result of the collapse of La Tène society and the arrival of a new population. Specifically, pottery production is presumed to have been completely discontinued. However, this presumption is based mainly on visual attributes of pottery, while only minimal attention has been paid to the materials used and the production process.

To validate the presumed sharp shift in pottery production during the 1st century BC and to obtain new insights into the topic, we have examined multiple ceramic assemblages from various parts of Bohemia, using macroscopic observation, chemical composition analysis (ED-XRF), and thin-section analysis, studying not only visual attributes of pottery but also techniques and materials used. The results show that while pottery underwent significant transformation, the manufacturing process was not entirely discontinued, and its adjustments were often specific to individual regions. Overall, changes in pottery production seem to be more akin to an adapta-

tion and reorganisation of society due to gradual development rather than a sudden break caused by complete population replacement.

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An archaeometrical approach to the study of the maritime circulation of roof tiles in the Northeastern Adriatic in the Roman period

This contribution presents an archaeometrical investigation of the ceramic roofing materials recovered from a group of shipwrecks located in the north-eastern Adriatic, including Molat 1, Vrgada, Uljeva D, and Stella 1. The assemblages consist primarily of small- to medium-sized cargoes of roof tiles and cover tiles dated to the Roman period for the Croatian maritime sites, while the riverine barge Stella 1 is attributed to the 1st–2nd century CE. The main objective of this study is to characterise the technological and compositional features of ceramic roofing materials from different underwater contexts and to explore potential similarities between the cargoes. Through a comparative approach, the research aims to identify possible links between production areas and to outline preliminary hypotheses concerning circulation patterns in the north-eastern Adriatic. Particular attention is given to the comparison between maritime and fluvial transport contexts, despite the discrepancies in the nature and quantity of the available data.

The analytical methodology is based on the sampling of approximately 20–25 specimens per site, where preservation conditions allow. All samples were analysed at the laboratories of the Department of Geosciences, University of Padua, using an integrated, multi-analytical approach. This includes thin section petrography for fabric characterisation, X-ray fluorescence (XRF) for bulk chemical composition, X-ray powder diffraction (XRPD) for mineralogical analysis, and scanning electron microscopy (SEM) for the investigation of microstructural features and firing conditions.

Roman ceramic roofing materials are often regarded as ballast or secondary cargoes; however, their frequent and excellent preservation in underwater environments makes them a valuable source of information. This poster highlights the potential of archaeometrical analyses to enhance the

study of the circulation of ceramic building materials and to contribute to a more detailed reconstruction of production organisation and distribution networks in the Roman Adriatic.

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Mortaria from the eastern suburb of *Colonia Iulia Emona* (Ljubljana, Slovenia): technology, production, and exchange

Recent excavations at the Križanke complex in the eastern suburb of *Colonia Iulia Emona* (Ljubljana, Slovenia) have revealed a notable assemblage of Roman ceramic *mortaria* recovered from deposits spanning the mid-to-late Augustan period to the decline of *Emona*. The continued use of the area provides a chronologically continuous dataset for investigating production technologies and exchange networks.

This study integrates macroscopic fabric analysis, mineralogical-petrographic characterisation of the paste, analysis of forming and shaping techniques, and typological-chronological evaluation, providing a basis for reconstructing manufacturing sequences, identifying technological groups, and inferring production origins. *Mortaria* from present-day Slovenia have not yet been systematically examined in this manner.

Eight technological groups were distinguished, with the presence or absence of glaze providing additional differentiation. Unglazed *mortaria* display characteristics consistent with production in two zones: Central-Southern Italy and Northern Italy. Two potters' stamps corroborate workshop production in the Po Valley, with mineralogical-petrographic analysis further refining the probable production area. Glazed *mortaria* most likely also originate from external workshops, though their exact provenance remains uncertain due to less diagnostic mineralogical-petrographic features and limited comparative material.

These results demonstrate the interaction of local consumption and ceramic supply in Emona, highlighting technological choices and distribution patterns of everyday wares. Analysis of raw materials and manufacturing techniques has revealed distinct paste recipes and craft practices. For stamped *mortaria*, this provided a more tangible connection to individual potters and their recipes. The study also establishes a reliable technological

reference collection, which will support ongoing research on unanswered questions concerning the technology, chronology, and origin of late Roman glazed pottery from *Emona*, as well as future research on *mortaria* and other pottery found in the town.

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Primary source analysis for ceramic production in Mengeš (Slovenia)

This study focused on the structure of the clay pastes used to make ceramic items found at Osnovna Šola Mengeš – Stara telovadnica (Slovenia). The excavations unearthed a multiperiodic site populated from the late Bronze Age until Late Antiquity. A total of 899 items were macroscopically analysed, from which a total of 30 samples were chosen for mineralogical-petrographic analysis.

The results show that the most frequent tempers in the younger phases were carbonates. The other frequent temper is quartz. A rare temper were lithic grains of sedimentary and igneous rocks. Another frequent temper is grog. Another clay-based temper are clay lumps. Organic temper was only rarely present. The most frequent inclusions are muscovite, iron oxides, quartz, carbonates, clay pellets, and clay lumps. The frequency of the inclusions shows us different clay sources. Some of the items were not made from clay but out of silt.

The ceramic items from the older phases of the site contain the same tempers, but the use of grog, quartz, and other non-carbonate tempers increases. The Iron Age samples are still mainly tempered with carbonates, but the amount of quartz and grog is a little larger. Towards the oldest phases of the Late Bronze Age settlement, quartz and grog become the main tempers. There are also samples where the most prevalent tempers are lithic grains.

We can, to an extent, conclude that most of the sampled ceramics were made locally, considering there are not many differences in the inclusions in the clays used to make them. According to the local geology, we can also presume a local origin for most of the tempers, excluding the igneous lithic grains, whose nearest outcrops are 19km away from the site. Out of the samples, only one was clearly imported, which is a Late Iron Age jar, tempered with graphite.

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Investigating ceramic circulation in Early Medieval Tuscany: preliminary evidence from the royal court of San Quirico (Montelupo Fiorentino, Italy)

The royal court of San Quirico (Montelupo Fiorentino, Italy) is first documented in 937 AD in the *dotarium* (dower charter) of King Hugh of Arles, among the *curtes regiae* granted to his wife, Queen Berta. Situated at the confluence of the Arno and Pesa rivers, San Quirico occupied a strategic position within the communication and exchange routes of early medieval Tuscany, and it was centred on a church that can be associated with the present-day Church of Saints *Quiricus* and *Lucia* at *L'Ambrogiana*.

This contribution presents preliminary results from the analysis of the ceramic assemblage recovered during both the September 2024 excavation campaign and the earlier campaigns conducted between 1996 and 2002. The material comprises four ceramic classes (fine ware, coarse ware, red-slipped ware, and sparse-glazed ware) dated from the 8th to the early 11th century and has been analysed from both typological and technological perspectives. For the coarser wares, macroscopic fabric observation has been combined with petrographic thin-section analysis, and the petrographic data have been cross-checked with those obtained from raw material samples collected from local sources in northern Tuscany as part of the author's comparative sampling project. These analyses aim to assess provenance and distribution patterns and to reconstruct the circulation of pottery within regional networks.

This study represents the first archaeometric investigation of the site and provides new data for understanding ceramic production and exchange systems in Tuscany.

The integration of archaeological and archaeometric data highlights the complexity of supply networks connected to elite estates and sheds light on the role of royal properties as active nodes in the circulation of goods during the Early Middle Ages.

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Historic brick monuments from the Mughal period in Khyber Pakhtunkhwa

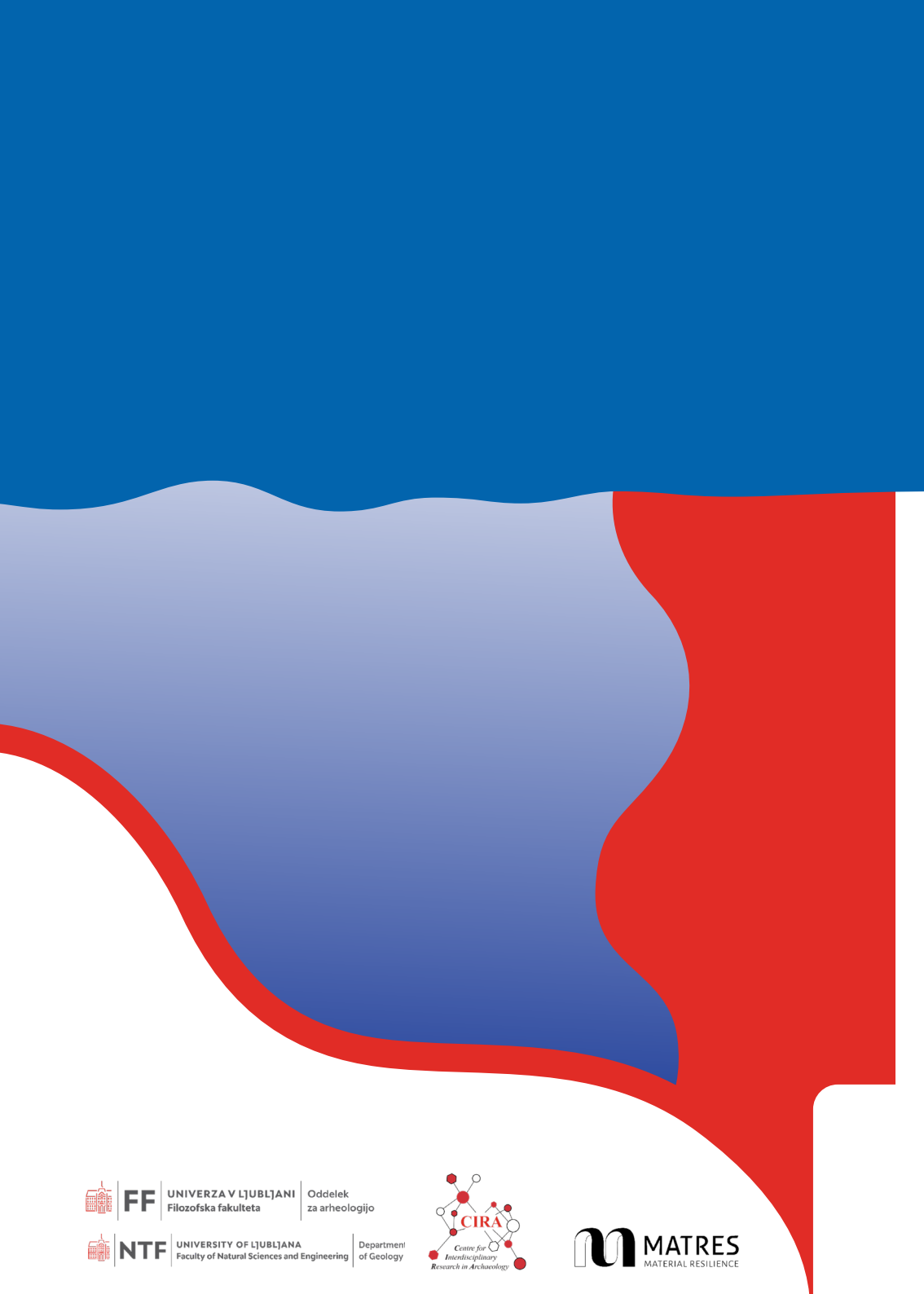
Historic brick monuments from the Mughal period in Khyber Pakhtunkhwa, Pakistan, are undergoing accelerated deterioration due to environmental exposure and inadequate conservation practices. As porous ceramic materials, bricks are highly vulnerable to physical and chemical damage, including salt crystallisation, thermal stress, and pollution-related decay. This study presents experimental investigations on brick samples collected from selected Mughal sites, with the aim of understanding their material properties, modes of deterioration, and conservation challenges.

A combination of analytical approaches, including microscopic examination and laboratory testing, was applied to assess the mineralogical composition, porosity, and mechanical strength of the samples. The results reveal significant variability in firing quality and raw material selection, directly influencing the susceptibility of the bricks to weathering. Field observations corroborate these findings, showing widespread surface scaling, granular disintegration, and loss of decorative architectural features.

By linking intrinsic material characteristics with extrinsic environmental stressors, the research highlights how historical construction choices interact with modern urban and climatic conditions to accelerate decay. The findings underscore the urgent need for site-specific conservation strategies that integrate scientific analysis of historic materials with environmental risk assessment. Such an approach can inform the development of compatible repair materials and preventive measures, contributing to the long-term preservation of this vulnerable Mughal heritage.

This study not only documents the ongoing material transformation of Mughal monuments in north-western Pakistan but also situates them within broader discussions on the conservation of historic ceramics in challenging environmental contexts.

Notes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