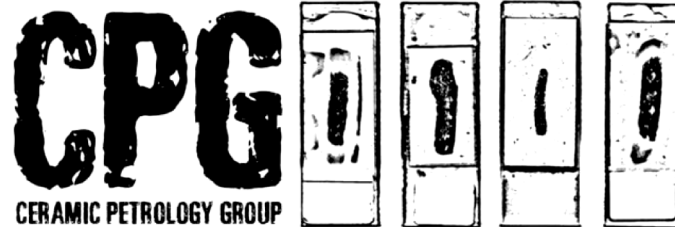




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Before the Trojan War: Preliminary Petrographic Analysis of Early Bronze Age Pottery from Troy

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Troy stands as one of the most significant and discussed sites in Mediterranean and Aegean archaeology, particularly due to its prominence in Bronze Age history and its associations with the Mycenaean period and the Trojan War. Despite 150 years of systematic excavations and extensive research conducted by German and American archaeological teams since Heinrich Schliemann's discovery in 1870, there remains a notable gap in the analytical, laboratory-based study of Early Bronze Age (EBA) pottery (Felts 1942; Kibaroglu & Thumm-Doğrayan 2013). The EBA, a period marked by significant sociopolitical and cultural transformations, offers valuable insights through the study of pottery into human-environment interactions, manufacturing strategies, and exchange systems.

This paper seeks to address this gap by presenting preliminary results from the analysis of Schliemann's legacy material housed at the National Archaeological Museum in Athens (Easton 2002). The research aims to characterise local ceramic production at Troy and to investigate its connectivity with other regions. The study includes the petrographic analysis of representative pottery samples, selected for their macroscopic variability, which allowed distinctions between local products and imports. The preliminary results reveal diachronic changes in the local raw material recipes and newly identified fabrics that suggest vessel movement from the central and southern Aegean. These results contribute to discussions about Troy's strategic importance within connectivity networks during the 3rd millennium BC.

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Exploring Human Adaptation to Societal Fragmentation. The Early Bronze Age Ceramic Corpus from Kani Shaie, Iraqi Kurdistan: Preliminary Petrographic Results.

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The first half of the Early Bronze Age (EBA; c.3200-2600 BCE), featured rapid societal transformations including settlement abandonment and/or violent destruction, changing burial patterns, a return to rural settlement patterns and the sudden appearance of regionalised, highly decorative pottery traditions across Mesopotamia (modern Iraq, Syria, south-eastern Türkiye and western Iran). The EBA stands in contrast to the millennium immediately preceding it, which featured a highly interconnected network of the Uruk Phenomenon, reflected in homogenous material cultural horizons across Mesopotamia. The first half of the EBA then features somewhat as a period of major cultural fragmentation and is even cited as one of societal collapse.

This presentation will focus on human adaptation to large-scale societal transformation and its aftermath—an area rarely explored in northern Mesopotamia for this period, and yet to be examined at all in Iraqi Kurdistan. Despite the significance of this era, very few studies have investigated its impact on local communities. The application of petrography in combination with USB photomicrography and macroscopic analysis of pottery from the site of Kani Shaie in Iraqi Kurdistan, allows for exploration of continuity and change in pottery production during this period. The site of Kani Shaie which shows evidence of continuous occupation through this transition, serves then as a key case-study for understanding how societal transformations affected the people living there.

Resources Procurement and Paste Preparation at Ogliastretto (CS). A Quantitative Approach to the Petrographic Analysis of Pottery and Raw Materials

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The Neolithic (6th millennium BCE) and Copper Age (3rd millennium BCE) settlement of Ogliastretto is located in the southern hilly edge of the Plain of Sybaris (Calabria, Italy). Macroscopic characterization of the two pottery assemblages and thin section petrography of 42 vessels and daub fragments were carried out for the compositional and the technological classification of the ceramic pastes. The main paste recipe, identified as the IM3 fabric, is locally produced, heterogeneous in granulometry, and comprises the majority of the ceramic assemblage. A smaller portion shows compositional variability, reflecting the local intrusive-metamorphic lithology, and is grouped into different macroscopic impasto classes and petrographic fabrics. To interpret the textural and compositional diversity in relation to resource procurement strategies and paste preparation methods, 12 samples of locally available raw materials were collected within 7 km from the site. Petrographic analysis involved a quantitative approach by performing digital point-counting on 2D images to achieve an accurate modal and textural analysis and a reliable comparison between sands, soils and ceramics. Cluster and correspondence analyses of modal data reveal distinct groupings samples based on composition, suggesting the targeted exploitation of specific resources available in the immediate vicinity of the site and, to a lesser extent and mainly during the Copper Age, on various sources at the local level. The textural analysis shows some evidence for the manipulation of raw materials through practices like hand-picking and tempering. This approach has represented a valuable tool for the in-depth investigation of deposits exploitation strategies at the local scale, and to better define the local crafting tradition and the social implications involved.

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A Bone to Pick: Experimental Approaches to Study the Bone Temper in Neolithic Pottery in Northeast Italy (6th–5th Millennia cal. BCE)

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The use of bone as a temper in Early Neolithic pottery production in Europe is uncommon, and its function has been widely debated. Bone temper may have been used to increase vessel strength, control moisture during drying, or simply as a recycled material. Identifying bone temper, however, can be challenging, especially when fragments are small, making detection difficult both macroscopically and microscopically. This often results in its underrepresentation in archaeological studies.

This paper, developed as part of a PhD project on Early Neolithic ceramic production in northern Italy (ca. 5400–4800 cal. BCE), addresses key issues related to bone temper. The study is based on the macroscopic and petrographic analysis of over 100 ceramic samples from four major sites in the western Veneto plain. Preliminary results indicate the use of bone temper, particularly in Early Neolithic vessels.

To further understand the role of bone temper in ceramic production, an experimental approach was developed, comparing recreated ceramic paste with archaeological samples. The analysis has two primary objectives: first, to establish a reliable method for identifying bone temper in ceramic paste through the analysis of experimental samples; and second, to examine the practical and functional advantages or disadvantages of using bone as an inclusion.

By employing an interdisciplinary approach, this study offers a significant contribution to understanding the role of bone tempering in pottery production, providing new insights into ceramic production techniques and the social dimensions of Neolithic communities in the Veneto region.

A Multi-Analytical Approach to Understand the Production and Role of Technical Ceramics in Bronze Age Metallurgy in the Po Plain

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This study is part of a multi-proxy project investigating the chaîne opératoire of metal production during Bronze Age in the Po' plain, with a focus on the Terramare culture. We present preliminary results of archaeometric analyses on technical ceramics (crucibles, blow-pipes, tuyères, and perforated plates) from different key archaeological sites and on experimental replicas. Terramare are characterised by a striking metal production testified both by the abundance and peculiarity of metal objects and by the clear traces of metalworking at several sites (e.g. Montale, Beneceto, Solarolo etc.). The importance of investigating technical ceramics in the metallurgical process has been recognised in the international literature (Angelini et al. 2013; Molloy & Mödlinger 2020; Roberts & Thornton 2014), for its core role in understanding the whole chaîne opératoire (Orfanou et al. 2022). While similar studies have progressed substantially in Europe through archaeometric techniques and experimental archaeology (Eklöv Pettersson 2012; Evely et al. 2012; Rademakers & Rehren 2016), Italian research in this field remains limited to rare typological and analytical studies (Angelini et al. 2013, Bianchi 2018). In this study we apply a multi-analytical approach to explore various aspects of these productions, including the type and provenance of raw materials, the temperatures reached, the technology involved in the manufacture of the ceramic tools themselves, and the degree of specialisation of the production. Through a combination of analytical methods (thin section petrography, XRD, XRF, ICP-MS and SEM-EDS) we tested the actual involvement of ceramic objects in metal production and reconstructed their productive process also in comparison with local domestic pottery production. Experimental replicas of crucibles were modelled after the morphological and analytic data acquired through archaeometric analyses. These replicas were subjected to archaeometric analyses post-experimentation to draw comparisons with archaeological items, helping to clarify the metallurgical activities that characterized these Bronze Age communities.

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Exploring Production and Exchange: An Archaeometric Study of Early Iron Age Pottery from Duna Feniglia (Orbetello, Central Italy)

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Starting in the 10th century BCE, southern Etruria (central Italy) underwent profound changes, marked by the emergence of proto-urban settlements associated with the Villanovan culture.

In the Fiora Valley, these shifts included people relocations to the Vulci plateau and an intensified coastal occupation, with sites like Duna Feniglia (dated to the late 9th to early 8th century BCE). Excavations at Duna Feniglia site uncovered numerous pottery sherds, primarily fragments of *olle ad impasto rossiccio* (reddish coarse ware jars), as well as several structural remains likely associated with some type of production installations.

This study examines the sources of clay used at Duna Feniglia and explores whether the pottery found at the site was locally produced or imported, aiming to uncover its technological features and understand the site's role within wider trade networks. To address these questions, we applied an integrated archaeometric approach—encompassing ceramic petrography, X-ray fluorescence, and X-ray diffraction—to 65 pottery samples.

Our results indicate considerable variability in petrographic fabrics, revealing significant differences in raw material selection and processing within each type. This heterogeneity suggests that the assemblage may represent outputs from multiple production places across Etruria. To further test this hypothesis, we analysed geological samples from the surrounding area and compared the Duna Feniglia data with a broad set of Villanovan ceramic samples from other Etrurian sites. Additionally, comparisons were made with *olle* found on the island of Tavolara, Sardinia. This comprehensive dataset, produced within the framework of the "Crafts and the City" project, offers valuable insights into regional ceramic production networks and the economic landscape of early Etruria.

The Ceramic of Helawa (Kurdistan, Northern Iraq): Integrated Analytical Methods to Explore Pottery Production Across Millennia

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The archaeological excavation at Helawa (Kurdistan Region, northern Iraq) carried out in the last years, has yielded a large quantity of potsherds. Tell/Girdi Helawa is a pre- and proto-historic site with a substantial occupation spanning from the Halaf to the Bronze Age (from 6000 to 1200 BCE), until it was definitely abandoned. Excavations along the mound's southern slope have revealed a rich stratigraphic sequence of in-situ structures and deposits with associated pottery. This sequence provided a basis for assessing ceramic typology and exploring changes in pottery production and manufacturing techniques over the time. The relevant number and size of samples collected by the Italian Archaeological Expedition of the University of Milan at the Erbil Plain enabled an in-depth mineralogical and petrographic characterization campaign.

This study aimed to analyse the features of sherds from the four distinct periods at the Helawa site: Halaf (6000-5300 BCE), Ubaid (5300-4000 BCE), Late Chalcolithic (4000-3000 BCE), and Late Bronze Age (1600-1200 BCE). A set of 92 potsherds were analysed using a multi-analytical protocol to unveil raw material sources, production technology, and firing conditions. A combined approach consisting in X-ray powder diffraction (applying the Rietveld full-profile fit to the experimental data for quantitative analysis) and thin-section petrography was successful to obtain mineralogical and textural information. Additionally, micro-Raman spectroscopy and X-ray fluorescence were employed to investigate the —often decorated— surfaces of the samples along with their bulk chemical composition.

The experimental results provided important information for reconstructing the production processes of the ceramic at Helawa, over the different periods of the site occupation, revealing the evolution in pottery practices.

Archaeometric Analysis of Early Iron Age Ceramic Artefacts from Two Buildings at Pungrt Hillfort (Central Slovenia)

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Atop of the Pungrt hill above Ig near Ljubljana (central Slovenia) recent excavations, conducted in the years 2020-2021, unearthed a fortified settlement, occupied from the Early Iron Age to the Roman Period. With a continuous excavation area of 8,800 m², it is the most extensively excavated hillfort in Slovenia. The ongoing project The proto-urban hillfort of Pungrt above Ig: from 10ha to 10 microns (2021–2024) focuses among others on the detailed study of buildings 21 and 24. In addition to extensive and intensive geoarchaeological investigations, including micromorphology, micro-refuse analysis and geochemical analysis, we conducted also a multi-method archaeometric study of ceramic remains, including thin-section petrography, X-ray fluorescence (XRF), X-ray diffraction (XRD), and scanning electron microscopy (SEM) analyses. Over 1000 ceramic artefacts, encompassing both pottery and building materials, have been analysed from these two buildings. Based on archaeological finds, both buildings were initially interpreted as residential buildings. However, subsequent micro-refuse material analysis revealed evidence of metallurgical activities, as well as the use of the building as a stable.

Our study focused on the analysis of 45 ceramic thin-sections, including building materials, metallurgical, textile and cooking utensils, and coarse and fine wares. The analysis helps to identify different type of building materials and provide insight into local ceramic production in both fine and coarse wares, reflecting the technological expertise of craftsmen during the 6th and 5th centuries BC.

Notably, our study represents the first attempt of this kind in Slovenia.

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Quantitative Forming Technique Analysis of Archaeological Pottery

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Archaeology has always been adaptive to apply methods developed for other disciplines (i.e. geology, chemistry, physics, biology, etc.) in order to improve its ways to characterise archaeological materials and through that, to better understand past human societies and behaviours. In ceramic studies, identifying where vessels were made is one of the main aims of the analysis, and for this purpose, intensive methodological development has been carried out over the past decades. While in the past, stylistic/macroscale studies were the dominant methods for localising pottery production, today chemical and mineralogical characterisation is also a basic requirement for examining such questions.

Similarly to provenance analysis, understanding the technological choices made during pottery production, especially identifying pottery forming techniques, is an equally important aspect of ceramic studies. However, compared to compositional analysis, considerably less attention has been paid to develop new, more rigorous, quantitative methodologies for forming technique studies. Nonetheless, of particular interest within archaeological pottery studies, has been the identification of composite techniques (e.g. coil-wheeling), and the differentiation of the primary and secondary use of the wheel.

In this paper, we present two independent techniques based on X-ray microtomography (μ -CT) and small-angle neutron scattering (SANS) that allow quantitative identification of primary forming techniques. Both μ -CT and SANS utilise the orientation of particles and voids within the ceramic matrix, but they differ in the size range of the objects analysed. With μ -CT, typically fine to coarse sand-sized objects can be segmented, while SANS gives information on the nano-scale domains (predominantly of clay minerals). In this study, we give an overview of these two quantitative methods, including the theoretical and practical differences, and their advantages and limitations. The application of μ -CT and SANS are illustrated through archaeological case studies, with a specific focus on differentiating wheel-throwing and wheel-shaping techniques.

Cathodoluminescence Microscopy to Study the Heating Process in Clays: a Case Study of Raw Materials from North-western Tuscany

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Cathodoluminescence microscopy is a technique that reveals defects of a material's crystal structure by emitting luminescence upon electron excitation. In archaeological ceramics, it effectively complements traditional imaging methods for characterisation¹, technological studies² and provenance determination³. It is also valuable for studying mineral transformations during firing processes and their colour emissions related to vitrification and/or mineral phase changes⁴.

To investigate the potential of this method for the analysis of firing processes under controlled conditions and for characterizing reference raw materials, we studied experimental briquettes made from 26 clays, sampled from documented production sites in Tuscany, refined and fired in an oxidising atmosphere at three temperatures. The analysis of mineral inclusions and their transformations during firing was carried out using CL imaging, XRD and SEM-EDX, at the laboratories of the Universities Bordeaux Montaigne and Florence.

This study contributes to the creation of a catalogue of clays used in ceramics production in north-western Tuscany. It will serve as a reference database for determining the provenance of archaeological wares and their manufacturing processes. Thin sections and microscopic images catalogue will be published as an open dataset in the University of Pisa MOD archive.

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Lying on the Seabed: Investigation of Post-depositional Phases in underwater Ceramics

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Microstructural and compositional transformations in amphora fragments from various underwater archaeological sites on the Apulian and Dalmatian coasts were studied in order to investigate the post-depositional changes that occurred in ceramic materials buried on the seabed for centuries [1]. The results of mineralogical analysis (XRPD) and SEM-EDS microstructural characterisation performed on some representative samples are presented here. The outcomes suggested that, assuming a similar primary clay composition and firing temperatures, the environmental conditions of the underwater depositional context influence the precipitation and degree of crystallisation of some post-depositional phases. The presence of lamellar structures of hydrotalcite-like phases was detected in ceramic samples deposited at the greatest depths in both the Dalmatian and Apulian seabed. The occurrence of magnesium aluminosilicate hydrated phases (M-A-S-H) [2], was found around the pores or reaction edges in most of the examined samples as gels or in the form of a crystalline structure. Framboids of pyrite microcrystals were often found in pores or in voids left by fossils. All these phases are absent in on-land ceramic amphoras samples used for comparison. Gypsum and magnesium calcite were spotted as post-depositional phases especially in Apulian samples. The possible usefulness of cathodoluminescence imaging was also tested to highlight the chromatic alteration layers found in several underwater samples probably linked to the enrichment and/or depletion of specific chemical elements.

ZEISS Digital Classroom: Connected Digital Microscopy System for Teaching

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Teaching is the art of passing knowledge of the few on to the many. For this you need a good overview of all the learners, a deep insight into the individuals, and the option of networking them all together. A digital classroom with connected microscopes is a valuable tool in teaching today. It enables endless opportunities to create hands-on, customizable learning experiences and build deep understanding in the classroom.

Students learn easily from each other and experience learning successes in a playful way. Connected microscopes offer an interactive, digital platform which increases attention and motivation, and also gives freedom to the teacher.

During the education, larger groups of students are required to spend several days per week in a microscopic lab. Learning time is always limited and the course leader often needs to set-up and dismantle the systems in shortest time. The microscopes must be robust and easy to-use. A digital classroom is a major benefit to course leaders it allows them to use microscopes that are connected to each other, and digital tools to support and enhance teaching and learning.

The images and videos can be shared directly with students. This allows open discussion and the explanation of the visible components. Fast acquisition, taking notes and annotating, saving and sharing the results are necessary. Direct access to each student's microscopic live image for the course leader makes the classroom more interactive. Students, as well as course leaders, should be inspired and have fun.

Chronological Evolution of Cocciopesto Mortars in Hierapolis: an Archaeometric Study from the Roman to Byzantine Period

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Hierapolis in Phrygia, an ancient city in western Turkey that has been under UNESCO protection since 1988. The city's buildings, which have been damaged by earthquakes, restored or even rebuilt, are an ideal laboratory for archaeological and archaeometric research. Cocciopesto mortars used in public buildings of Hierapolis from the Roman to the Byzantine period were selected, shedding light on the mineral-petrographic characteristics of the ceramic fragments they contain. The Roman and Byzantine mortar samples were analysed using a multi-analytical approach that combines optical microscope (PML) analysis on thin sections with digital image analysis (DIA), X-ray powder diffraction (XRPD) analysis and SEM-EDS analysis. The petrographic analysis of the samples, supported by the knowledge of the geology of the Hierapolis area, proved to be fundamental not only for tracing the sources of the raw materials, but also showed the evolution over time of the composition and technologies of both the cocciopesto mortars and the ceramic materials used as aggregates. In order to understand the durability and hydraulicity of these mortars, μ XRD mapping was performed on selected samples to highlight the mineralogical phases within the reaction edge between the ceramic fragments and the binder. The results of our work show that cocciopesto was used according to different criteria in the different periods. In the Roman period, cocciopesto mortar was used in water-related contexts (e.g., Nymphaeum of the Tritons, Stoa of the Springs, the Great Building—Roman Baths). In the Byzantine period, however, mortar with ceramic aggregates was also used in areas where the masonry had no hydraulic function. The analyses revealed that the production technologies of the mortars changed over time, while the origin of the raw materials and the use of ceramic aggregates from exclusively local production remained almost constant.

Traditions in Transition: Analysing indigenous ceramics and colonial influence in 16th-17th cent. AD Cartagena de Indias (Colombia)

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Cartagena de Indias, in modern-day Colombia, was strategically located along colonial trade routes connecting the Americas to Spain. Initially a hub for the extraction of resources from Indigenous communities it evolved into a major port linking Europe with the New World. This trade brought together Indigenous peoples, African slaves, and European colonists within a colonial system that imposed control over the colonised populations. The blend of cultural influences is tangibly manifested through ceramics, a ubiquitous artefact that reflects the social, cultural, and economic transformations brought by colonization in this city.

This research explores the colonial impact in the Colombian Caribbean through the study of 101 Indigenous pottery sherds from Museo del Oro Zenú. The ceramics, consisting of cookingware, and identified by archaeologists as Crespo Rojo Arenoso, Crespo Café Arenoso, Crespo Fino, and Crespo Concha Triturada, were analysed using X-ray fluorescence (XRF), X-ray diffraction (XRD), and Petrographic examination (PE). These techniques reveal the possible provenance, raw materials, production methods, and firing conditions of the pottery, shedding light on how Indigenous potters adapted to or resisted colonial pressures.

As the first detailed reconstruction of Indigenous pottery-making technology, this research makes a significant contribution to understanding the effects of European colonisation on local craftsmanship. It effectively bridges the gap between pre-contact and post-contact ceramic technologies, illuminating the transformations in ceramic practices among Indigenous populations in Colombian Caribbean.

The findings reveal distinct Indigenous production methods, with chemical analysis identifying new local chemical groups and petrographic examination detailing raw material sources and manufacturing techniques. These results highlight the potters' geographical and technological choices. By reconstructing Indigenous ceramic technology, the study uncovers technological transfers and adaptations during the colonial period, demonstrating the resilience of local traditions. Thus, this research deepens our understanding of cultural dynamics in colonial Cartagena, showing how Indigenous pottery practices evolved under European influence.

Ionian Cups from Cumae: A Multidisciplinary Study Towards the Identification of a Local Production

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Cumae, located in the Bay of Naples, is recognised as the most ancient Greek colony in Western Mediterranean, founded by the Euboeans around 730 BC, opposite the island and trading hub of Pithecusae. From the earliest colonial times, Cumae developed a distinctive artisanal craftmanship, based on the reception and rielaboration of models that come both from Greece and Eastern Mediterranean, as well as from the inner centers of archaic Campania.

This paper analyse an assemblage of ceramic fragments, belonging to the so-called Ionian cups, unearthed in two main religious sites at Cumae: the Temple of Apollo on the acropolis and the suburban sanctuary of Fondo Valentino. The macroscopic observation has revealed four main macro-groups of fabrics, distinguished by colour, macro-inclusions and surface treatment. A selection of samples was accordingly investigated in the laboratory through scientific methods. The method combined mineralogical and chemical analyses, including thin-section observation with a polarised microscope, X-ray fluorescence and X-ray diffraction. The results identified the primary fabrics and some technological features of the samples, providing fresh insights into the local production of Ionian cups in Archaic Campania.

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Byzantine Amphorae in Kyivan Rus'. Archaeometric Characterisation and Compositional Group Distribution

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The presentation is focused on the summary of the interim results of archaeometric analysis of Byzantine amphorae found in the territory of Kyivan (Early) Rus', modern Ukraine and Poland.

Our research covered six urban centres of Rus' (Kyiv, Chernihiv, Pereiaslav, Volodymyr, Chełm, Cherven'/Czermno), as well as Kraków, the capital of Piast Kingdom in Poland, dating from the 11th to 14th century. So far, 154 fragments were analysed, which belong to c. 140 objects/vessels. All fragments were subjected to petrographic and chemical analysis (WD-XRF carried out at the Lyon Laboratory). The objectives were to investigate the provenance and distribution of amphora groups, to compare compositional groups and typology. Using the Lyon Laboratory database, the centres of production of main groups and some 'loners' were established or confirmed: the European coastal region of the Dardanelles strait (including Ganos), Chalcis (central Greece), probably the southern coast of Crimea and Corinth.

Analysis of site profiles conducted using statistical tools suitable for small samples (Fisher's exact test for counts) have shown that differences in the distribution of compositional groups may exist for some sites, but systematic (sampling) bias can still strongly influence the results. Consideration of diversity indicators allows us to preliminarily identify groups of sites with different intensity and patterns of trade activity. Thus, the greatest intensity of contacts is demonstrated by Kyiv, the capital of Rus', followed by a group of large urban centres situated on the main medieval trade routes – the Route from the Varangians to the Greeks and Via Regia (Chernihiv, Pereiaslav, Volodymyr).

The project is ongoing and follow-up work will be related to improving the representativeness of the samples and to find the production centres of unidentified groups of amphorae.

Interdisciplinary Perspectives on White-Paste Inlay: Regional and Exotic Materials in Lower Romania Chalcolithic Ceramic Technology

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The present study examines the phenomenon of white-paste inlaid ceramics from the Chalcolithic period in the Balkans, associated with the human groups of the second wave of Anatolian Neolithic migration, which developed for more than a millennium (c. 5300–3900 BCE). Despite the use of this decorative technique by ceramic cultures from Chalcolithic, Middle Bronze Age, all the way to the first millennium BCE, existing research provides only a general overview of the paste composition, production techniques, and pyrotechnology, especially for Balkan Chalcolithic contexts. Comprehensive archaeometric studies are still lacking, leaving significant gaps in our understanding of local and regional variations, hence more data is required.

Addressing this gap, this study focuses on the production methods and compositional diversity of white-paste inlays in Boian and Gumelnița chalcolithic ceramic traditions, specifically within the multi-layered site of Vlădiceasca– „Ghergălăul Mare” in the Mostiștea Valley (Călărași County, Romania). As such, it offers new perspectives on understanding cultural and technological transmission from the Boian to the Gumelnița tradition by examining material culture differences within the same spatial context, the Mostiștea Valley.

To better understand the compositional and technological variability of the inlaid ceramic batch, archaeometric methods were employed, including analyses performed using SEM-EDS and XRF, as well as statistical analyses such as PCA clustering.

Preliminary results revealed a complex blend of local and imported resources (e.g., limestone, calcite, calcined bone, diatomaceous earth), as well as significant variation in purification and thermal treatment techniques, suggesting adaptation to regional materials and preferences. These findings offer insights regarding the processes of cultural and technological transmission between Boian and Gumelnița traditions, improving how we understand the transition between the two communities, which have selectively integrated exotic materials and locally available resources to achieve the desired inlay.

An Obsession with Clay! Experimental Approaches to Longstanding Problems with Ancient Corinthian Pottery Production

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Corinth is renowned for its prolific pottery production dating from the Bronze Age onwards, with extensive studies exploring various archaeological questions focusing on the ceramic products of the site. Despite substantial progress over the past 50 years in understanding these ceramics, the origin of the clay used in Corinthian pottery production remains a mystery, intriguing numerous researchers over several decades. Since the 1960s, studies have consistently shown that the local clayey raw materials in and around Corinth do not match the elemental composition of the pottery found at the site and are often unsuitable for production, disintegrating upon firing.

With recent shifts in our approaches to the study of archaeological ceramics, often drawing insights from ethnographic studies and contemporary potters, we know that almost no clays are used 'as found'. While previous studies have proposed various clay preparation techniques, many lacked the opportunity to experimentally test these hypotheses or have yet to publish findings. This presentation introduces results from an extensive six-year project at the Fitch Laboratory, where we have experimentally examined proposed methods of clay treatment, paste preparation, and post firing treatments, supported by comprehensive analyses of archaeological ceramics from Corinth and its surroundings. We present our findings as potential answers to the questions surrounding Corinthian clays, offering new insights into this longstanding archaeological question.

Graphite-Tempered Vessels from a Medieval Village in Hungary

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Around one hundred ceramic fragments were found during the excavation of an Árpáadian Age (11–12th century) village in Ács (Hungary) including cooking pots, cauldrons and storage vessels. From a macroscopic point of view three main types of household vessels were identified: reddish-brown, white and graphite-tempered vessels. Part of a complex archaeometric and bioarchaeological investigation, our goal was to understand the contemporary trade connections of the village through the analyses of ceramics, particularly the provenance of graphite-tempered vessels. Polarising microscopy and SEM-EDX analysis were carried out to determine the fabric, mineral inclusions and chemical compositions of the ceramic bodies. The chemical composition of the ceramic body of the three groups shows that different raw materials were used.

Graphitic vessels contain pure graphite and graphitic rock fragments (granitoid-metagranitoid/gneiss) as well as sand temper. The provenance of graphite-tempered ceramics in this period is particularly interesting, since there are no graphite-bearing rock formations in Hungary that could be used as raw materials. However, only a few studies report on the detailed petrographic and geochemical analyses of these ceramics. Graphite-tempered vessels were widespread in the western part of the Carpathian Basin during the 10–12th centuries. The majority of the archaeological sites are situated next to the river Danube, suggesting a possible trade route. Petrographic and geochemical analysis of the graphitic rock fragments (characteristic minerals: sillimanite, clinopyroxene, amphibole (hornblende), garnet, rutile) imply that the potential origin of the graphite could be the southern part of the Bohemian Massif (Czech Republic).

Ceramic Imitations of Silverware at Mytilene at the Time of the Roman Conquest, between Late Hellenistic Traditions and new Developments

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Based on a petrographic analysis of ceramic imitations of silverware, this paper explores pottery traditions at Mytilene on Lesbos during the Late Roman Republic and Early Empire, a crucial period in the history of the city that is underdocumented in the archaeological literature. The goal is to provide new insights into the local sociocultural traditions and socioeconomic organisation at the time of the Roman conquest. After siding with Mithridates VI of Pontus, Mytilene fell under the military control of Rome in 80 BC ; it was used as a naval base in Pompey's war against the pirates; the Roman magistrate restored the city's freedom in 62 BC on bequest of Theophanes of Mytilene ; in 27 BC, Augustus conferred the status of Roman ally to the city that would later host him as well as Agrippa on their visits to the Asian provinces.

The study focuses on decorated tablewares found during excavations by the Canadian Institute in Greece at the ancient acropolis of Mytilene: black-glazed hemispherical bowls, lead-glazed cups and bowls, eastern sigillata wares, the so-called "Tenedos" and "sanded" wares, and the "portrait" bowls picturing Theophanes. These ostentatious vessels are all identified by their shapes, surface finish, and moulded decoration as affordable and readily made imitations of the expensive metalware. They were obviously praised by the local population, and they show a diversification of shapes and surface covers under Roman rule. The fabrics exhibit a fairly homogeneous set of mineralogical features, which demonstrates a long-lasting tradition of exploiting one single set of clay resources in the vicinity of the urban center. Variations in texture and microstructure, however, suggest a diversification of clay processing methods that goes hand-in-hand with stylistic developments of the vessels, probably starting under Augustus, at a time of the renewed influence of Rome over the island.

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Doing it for the Money!(?) Reflections, Tricks and Tips from 15 Years of Commercial Ceramic Petrography (and Occasional Geochemistry and SEM)

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Since 2009, the author of this presentation has undertaken regular scientific analysis of archaeological pottery and other ceramics on a consultancy basis, to generate income for his laboratory and university department. This work differs in several ways from that conducted as part of regular academic research projects on ancient ceramics. The present talk will outline this diverse commercial activity, which has covered a range of projects, types of ceramics, periods, parts of the world and applied several approaches in addition to thin section petrography. The experienced gained over 15 years working for commercial units, museums, academics and private individuals will be reflected on, and tricks and tips will be shared. The presentation will hopefully be of interest to ceramic analysts who also work on a consultancy basis, or are considering applying their skills in this way.

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Remains of a Sacred Past: Archaeometric Characterization of Protogeometric to Archaic Ceramics from the Sanctuary of Apollo Pythios in Gortyn, Crete

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This research aims to analyze the ceramic material recently recovered from the sanctuary of Apollo Pythios in Gortyn, Crete (Greece), dated from the Protogeometric to the Archaic period. An archaeometric analysis was performed on 46 ceramic sherds, consisting on a petrographic characterization through optical microscopy applied in 17 of the samples, corresponding to the coarse grained material, chemical analysis through X-Ray Fluorescence to identify the major and trace elements of 20 of the samples, and all the samples were characterized in terms of mineralogical composition through X-Ray Powder Diffraction. The results were combined with the typo-chronological data of the material and with the macroscopic analysis of the fabric in the early stages of this work and that enabled the identification of some characteristics of the ceramic body that allowed an initial classification of the material into macrofabric. From this multi-analytical research, it was possible to evaluate the continuities or discontinuities in the paste preparation from the Protogeometric to the Archaic period, potentially hinting changes in local production techniques, cultural and social dynamics of the city.

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Visualisation Software for Petrographic Image Analysis

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This visualisation tool enhances the efficiency of petrographic grouping and ceramic paste analysis by enabling users to view, manually sort, and cluster large sets of image data in one workspace. Unlike existing petrography software, which is primarily designed toward geological research, this tool addresses specific archaeological needs, such as the ability to compare multiple samples simultaneously. Key features include free-hand sorting, side-by-side scrolling and synchronised zoom of photomicrographs or thin-section scans. The tool will enable users to switch between different views of a pottery sample: from microscopic to macroscopic and vice versa. This "flip-view" functionality allows users to link microscopic fabric details and macroscopic features like shape or decoration, enhancing the ability to connect fabrics with pottery types. Developed openly on GitHub with an OSI-approved license, this software is designed as a sustainable tool, allowing open use and adaptation of the source code (in Python) to meet the specific needs of individual projects involving image data analysis. The software is scheduled for release in spring 2025 and the authors would like to use the opportunity at the CPG to disseminate the software for beta-testing and feedback to interested colleagues.

Orientalising Pottery in Etruria: Archaeometric Insights into Craft Organisation and Social Change

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The early Orientalising period (late 8th to mid 7th cent. BCE) represents a dynamic phase of sociocultural transformation across the Mediterranean, during which Etruria (central Italy) experienced significant urbanisation and the emergence of city-states with increasingly complex social structures. Technological innovations, such as the adoption of wheel-throwing, facilitated new artistic developments within Etruscan pottery production.

Despite considerable research into this transformative period, studies have predominantly focused on stylistic and typological analyses of Orientalising pottery, often suggesting the existence of organised workshops. However, direct scientific investigations into the underlying material culture—specifically ceramic technology, production organisation, and their broader social implications—remain relatively limited.

This study seeks to examine the organisation of pottery production in Southern Etruria through archaeometric methods, providing indirect insights into the structure and technology of local crafts associated with Orientalising pottery. By analysing pottery recipes, technological choices, and material characteristics across various sites, the research aimed to infer relationships among production centres and explore the social dynamics that influenced their operation. Comparative data across sites, including Veio, Cerveteri, Tarquinia, and Vulci, were obtained through ceramic petrography and X-ray fluorescence analyses on 84 pottery samples, representative of the Orientalising ceramics.

Results indicate an unprecedented level of standardisation across the region, in which each site employing distinctive, consistently repeated ceramic recipes, with evidence of inter-site circulation/exchanges. This trend highlights a significant degree of potter specialisation and organisational sophistication, aligning with the broader sociopolitical centralisation observed during the Orientalising period.

The ComPAS Project: preliminary insights on the Late Bronze Age Egyptian Jars from Pyla-Kokkinokremos, Cyprus

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This poster presents the preliminary results of the analytical study of selected ceramic vessels from the site of Pyla-Kokkinokremos (Cyprus) (late 13th to early 12th century BC), in the context of the ComPAS project (ERC Starting Grant GA no. 947749, hosted at the Archaeological Research Unit of the University of Cyprus). By using a material-based approach, focusing on the holistic study of Maritime Transport Containers from key Late Bronze Age (LBA, ca. 1650-1100 BC) and Early Iron Age (EIA, ca. 1100-750 BC) archaeological sites in Cyprus, the ComPAS project aims to provide new insights into the interregional commercial strategies and intercultural connectivity that characterised the LBA and EIA communities of the eastern Mediterranean. The current presentation focuses on illustrating the integrated science-based analytical programme which has been designed to provide both quantitative and qualitative data, compositional and technological on the selected ceramic assemblages. As case study, the preliminary results of the combined macroscopic and lab-based study of the Late Bronze Age Egyptian Jars from Pyla-Kokkinokremos will be presented. After a thorough macroscopic study based on the visual characterisation of the assemblage, handheld X-ray fluorescence spectrometry (pXRF) was applied as qualitative and non-invasive method to test whether any compositional patterns can be associated with any of the recorded typo-morphological characteristics. Finally, a number of targeted samples covering the overall morphological, compositional, and technological variabilities, both on synchronic and diachronic levels, was selected for ceramic thin section petrographic analysis, providing both compositional and technological insights, to be further confirmed by future targeted chemical analysis.

Uncovering Sugar Production in Potries: Ceramic Analysis and Regional Comparisons in the Comunitat Valenciana

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Sugar production in the Iberian Peninsula began in the 10th century in the Al-Andalus region (modern-day southern Spain), and later expanded eastwards across the peninsula during the 12th and 13th centuries, reaching its greatest peak between the 15th and 17th centuries. The eastern region was an area where several sugar production sites have been documented. The area under study is in the Comunitat Valenciana, where a major production center has been identified in the Comarca de La Safor, with three key production sites: Gandía, Oliva, and Potries, all of which have yielded numerous remains of sugar cones.

This study focuses on a set of ceramic pieces used in sugar production, originating from the town of Potries and dating to the 15th and 16th centuries. In the following presentation, we will analyse how these pieces were produced, as little information is available regarding sugar cone production in Potries. A total of 30 ceramic samples were analysed. These were studied through the analysis of the chemical composition of the clays using X-ray fluorescence (XRF), the mineralogical composition using X-ray diffraction (XRD), and a statistical comparison of these 30 samples with others from the towns of Gandía and Oliva.

The results of the study revealed two distinct compositional groups. Furthermore, by comparing the 30 samples from Potries with those from Gandía and Oliva, we were able to identify several that shared the same composition. This suggests that Potries was a ceramic production centre that supplied these towns. These findings provide valuable information about ceramic production in Potries, an area where such information was previously lacking.

The Preliminary Results of Thin-Section Petrography Analysis of the Pottery from Tuwaneh, Jordan

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In 2018, the archaeological survey was undertaken in southwestern Jordan by Polish researchers from the Jagiellonian University and AGH University of Krakow. The project aimed to document and prospect two archaeological sites, Dajaniya (Ma'an Husseiniyeh) and Tuwaneh (Tafila Hessa), and collect the surface material to assess the general chronology of the site. Most of the pottery sherds might be dated between the Nabatean and Byzantine periods. A selection of 20 sherds from the area of Tuwaneh, representing different fabrics and classes, was made to conduct the thin-section petrography analysis. The study aims to understand the potential source of raw material and relations between different wares to assess their potential provenance. The preliminary results of the study will be presented and discussed in comparison with data that has already been published on pottery from Jordan.

Colourful Connections: Investigating Hellenistic Ceramics from the Cyclades

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Macroscopic examination of Hellenistic ceramic materials from the Sarapieia on Delos as well as the Sanctuary of Poseidon and Amphitrite on Tinos showed that the same group of ceramics made in red-firing fabric rich in epidote is frequent on both islands. This group includes building materials, transport amphorae, cooking, utilitarian and table wares, weaving tools, beehives, lamps, moulds, as well as ritual objects. In order to check the provenance of this group and to investigate the economic relationship between the islands, selected samples were subjected to thin section petrography and elemental analysis (WD-XRF). In addition, raw material prospection was undertaken on Tinos and geological materials were analysed petrographically. This poster presents the results of integrated macroscopic and laboratory investigation, which indicated that Tinos is a potential source of this group. This has a great impact on studies of close-regional connectivity within the Cyclades, and especially on Delos since most research of pottery from this island has been focused on long-distance trade during the Late Hellenistic period.

Towards a Multidisciplinary Approach in the Study of Prehistoric Iranian Pottery. The Case of Painted Pottery from Mahtoutabad (South-eastern Iran)

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This paper examines pottery from the site of Mahtoutabad and the surrounding area, located in the Halil Rud Valley (Jiroft), southeastern Iran, dating from the late 5th to the 3rd millennium BCE. This pottery is distinguished by painted decorations that vary across periods, presenting bichrome and polychrome (black, white, red) examples. Recent archaeological research has established Jiroft as a significant cultural hub between Mesopotamia and the Indus Valley during the Bronze Age, particularly with the discovery of chlorite vessels and other key findings. Pottery, especially its painted decorations, plays a crucial role in understanding the technological and cultural context of the region during the Chalcolithic and the Bronze Age. This study employs a multidisciplinary approach to analyze painted decorated pottery types found in the area, combining macroscopic analysis with scientific techniques to examine both the ceramic body and its decorative features. The goal is to offer a comprehensive technological characterization of the pottery, contributing to the reconstruction of the archaeological and historical information in an area with a significantly disturbed archaeological context. Furthermore, this study aims to establish a methodological protocol for analyzing painted decorated pottery through archaeometric analyses and experimental work. This includes testing raw materials and firing processes to replicate color variations, followed by the creation and decoration of complete pottery vessels. This research contributes to a deeper understanding of ancient ceramic production in the Halil Rud valley and its broader cultural significance.

Baby (Ceramic) Steps in the Late Prehistoric Maghreb: Preliminary Characterisation of Potting Traditions at the Final Neolithic Site of Oued Beht, Morocco (ca.3400–2900 BCE)

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The Maghreb in north-west Africa played an important role in Mediterranean narratives of the Palaeolithic and the later Phoenician to Islamic periods. Nonetheless, information about its Later Prehistory (c.4000-1000 BCE) is rather limited. This lacuna of knowledge has recently been reduced by intensive survey and excavation at the site of Oued Beht (Khémisset province, Morocco), undertaken by a British-Italian-Moroccan collaboration (Broodbank et al. 2024). The published results of this work indicate the presence of a large complex farming community (ca.9-10ha) reciprocally engaged with its contemporaries in southern Iberia between at least the late-4th and early-3rd millennium BCE — revealing the active role of north-west Africa in cross-Mediterranean interactions. The vast majority of the retrieved material comprises ceramic sherds indicating that pottery played a key role in the life of people. Acknowledging the scarcity of previous knowledge about these ceramics, this poster offers a preliminary outline of the potting traditions at Oued Beht. It first presents an overview of the pottery typology of this site, built-up from the systematic recording of diagnostic sherds. Then, using thin section petrography and comparisons with raw materials collected from the vicinity of the site, it discusses the choices of local potters in the making of their ceramics. It highlights the use of two different fabrics, with clays retrieved from different geological environments, as well as the regular application of grog tempering in both of them. Moreover, a few fabric-outliers have been identified raising the possibility of imports at this community. Overall, this poster offers valuable insights into the active role of pots in the making of the earliest known complex society of north-west Africa.

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Local and Foreign Influences: New Insights into the Ceramic Trade in Guam through Archaeometric Analysis

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Guam, located in the Mariana Islands, played a pivotal role in the 17th century as a key stopover on the Manila Galleon trade route. This trans-Pacific route connected Manila (Philippines) to Acapulco (Mexico), and continued through Veracruz (Mexico) to Seville (Spain) across the Atlantic Ocean. As a crucial nexus in this trade network, Guam facilitated the movement of Asian goods—such as porcelain, spices, metals, and textiles—while becoming a point of convergence for people, material culture, ideas, and knowledge between Asia, the Americas, and Europe.

This study presents the archaeometric analysis of 30 ceramic samples recovered from the San Dionisio Church and cemetery excavations in Humita, Guam, dated to the 17th–19th centuries. The sample includes a variety of ceramics, including porcelain, stoneware, earthenware, and construction materials. By examining the provenance and production techniques of these artefacts, the research aims to provide insights into the material culture of Guam during the colonial period, as well as the technological choices and cultural exchanges that shaped its ceramics. Analytical techniques—such as wavelength-dispersive X-ray fluorescence (WD-XRF), powder X-ray diffraction (PXRD), petrographic analysis, and scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX)—were employed to characterise the ceramic samples.

The results suggest that most of the ceramics were locally produced, providing important evidence of local pottery practices and the use of local raw materials. Additionally, the analysis reveals the presence of foreign ceramic influences, indicating the exchange of techniques and materials. These findings offer new perspectives on the technological evolution of ceramics in Guam during the colonial period, highlighting the island's role as a hub for cultural and material exchanges within the larger global trade network.

An Assemblage of “Spello” Amphorae from Spoletino: Manufacture and Diffusion of Flat Bottom Amphorae in the Tiber Valley.

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The recent excavations in the cistern of Spoletino-Torricella in the municipality of Civitella d’Agliano (VT), conducted by the University of Roma 3 between 2014 and 2018, in collaboration with the Soprintendenza, and a survey campaign made in 2019 by the same organizers, have contributed to new insights about the archaeological evidence attested in Middle Tiber Valley, during the roman period. This area, like all the Tiber Valley, was an active production area which had a direct correspondence with the market of Rome.

Among the many goods produced in the Valley, wine, mentioned as Hirtiola by the ancients, had a significant impact. However, dealing with wine cannot be separated from their transport vessels, which, in this specific case, were mainly productions of flat bottom amphorae, classified as “Spello” amphorae or Ostia III 369/370. These amphorae productions have still a lot of issues that require further study, such as the chronological frame of manufacture, the differences between the productions, and their distribution areas.

To start addressing these issues, my research analyses an assemblage of “Spello” amphorae discovered at the cistern of Spoletino, which are dated by context at the middle decades of the I century CE. These amphorae have been investigated through chemical (XRF and SEM) and petrographic analysis (thin sections) looking for differences in the manufacturing processes and possible correlation between clay fabrics and typology.

This study is the first step for an analysis of the role played by flat bottom amphorae productions in the distribution of Italic wine in the Tiber Valley, between the I and the V centuries CE.

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Crafting Resilience 2: Stories from the Survey Materials Around the Site of Rocavecchia between the Middle and the End of the II Millennium BC

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Through the second millennium BC, Bronze Age communities of Southern Italy have shown a remarkable degree of resilience in coping with changes in cultural interaction and the landscape. The site of Roca (South Apulia, Italy) located on the coast of modern-day southern Italy hosted one of the most important Bronze Age communities in the Central Mediterranean, and experienced a complex history including phases of violent destruction and rebuilding phases, in a moment when the long-range connection with the Aegean world was at their historical peak. Roca was also part of a broad landscape that has only now become accessible for analysis thanks to the results of the Roca Archaeological Survey (RAS), the first systematic archaeological survey focusing on the hinterland of the site.

This presentation builds on the one given at the last CPG meeting where the locally made impasto ware coming from the Middle to the Final Bronze Age at the site was introduced. The study revealed consistent technological choices over the phases along with a later introduction of a new fabric with very different characteristics to produce light-surface vessels. We will present the study of the material from the survey (30 individuals) contrasting the results from the site in order to explore how changes in the complex history of the settlement and the surrounding landscape are matched in technological choices operated by the local community responsible for the production of impasto pottery. Ceramics were analysed using ceramic petrography and scanning electron microscopy to observe technological change occurring in fabrics and firing strategies along the phases.

We will discuss the crucial role of re-entangling landscape in ceramic studies and the issues related to studying survey materials. Space will be devoted to discuss about the ferruginous inclusions typical of the deposits of this part of Apulia.

Ceramic Technology at the Late Bronze Age Site of Berzo Inferiore – Colle di San Michele

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Based on my Master's thesis research, the methodology to analyze petrographically and archaeologically a pottery assemblage from the Late Bronze Age settlement of Berzo Inferiore – Colle di San Michele (Val Camonica Northern Italy) is going to be presented. Late Bronze Age pottery from Val Camonica is of difficult interpretation, as some settlements display traits that are more similar to Protovillanovan assemblages, and some settlements have been interpreted as very similar to Luco-Laugen ceramics from Trentino, for example, Calcinato-Ponte S.Marco (Marzatico, 2012; Poggiani Keller et alii, 2022; Rondini, 2022) . The aim of this research is to define the provenance of the materials used for the Late Bronze Age ceramics from Berzo Inferiore – Colle di San Michele and to compare their petrographic composition with the local geology, with the studies already published on Luco-Laugen pottery (Maggetti, 2005) and on pottery from Val Camonica in later periods (Riccardi et alii, 2010). This poster is mainly going to underline the methodology to approach this issue, which is based on a first general phase of selection of fabrics (macro) that have been recorded in a database taking in consideration both archaeological and geo-petrographic aspects, and a second phase (micro) where non diagnostic fragments were selected as representative of fabric groups for thin sections.

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Islamic Glazed Ceramics from Mértola (Portugal). An Archaeometric Study of Metallic Lustre Glazed Wares

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The largest set of metallic lustre ceramics of the Islamic era of the Gharb al-Andalus, known to date in Portuguese territory, was found in Mértola. It is a ceramic set dated between the second half of the 11th century and the first decades of the 13th. The fragments, from the typological point of view, are quite diversified and belong to a set of metallic lustre ceramics produced in the time of the Seville Abbey dynasty (second half of the 11th century) and several other types of the Almohad era (12th -13th century) among which pots, jarins, cups and dishes. This study aims to identify the technology of glaze and lustre on Islamic ceramics and potentially establish the existence of a lusterware workshop in Mertola through archaeometric analysis. The material analysed in this study is 11 ceramic samples from Mertola dated from the 11th to the 13th century. By comparing these samples with others from Mertola, Coimbra and Calatrava la Vieja, the aim is to discern differences and similarities in both the raw materials used and the techniques employed for glazing and lustre application. This comparative analysis may help identify potential trade routes connecting these significant cities and further the Iberian Peninsula's already expanding area of Islamic archaeology, especially in the field of Islamic ceramics.

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Practice, Interactions and Regional Identity in Pottery Production, Halaf and Ubaid Periods, Tell Arpachiyah, Iraq

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The 6th millennium Halaf and Ubaid periods in the Near East are characterised by widespread material culture which suggests interactions. While pottery styles and decoration have been used extensively to interpret chronology and social connections (e.g. Mallowan and Rose 1935, 25) there have been fewer investigations of the mineralogy and chemistry of sherds, particularly of coarse ware, to interpret associations. Archaeometric methods, including mineralogical, structural and compositional analysis, can yield insights into trade or exchange, production processes and social connections and traditions (Quinn 2022, 1). The mineralogy of coarse ware in particular may provide evidence for the location of pottery production.

A Halaf/Ubaid sequence is well preserved at Tell Arpachiyah, near Mosel, Iraq. University College London has an extensive collection of sherds collected in the 1930s. The collection provides an opportunity to compare the mineralogy, chemistry and microstructure of samples to determine whether there is evidence for long-term, local traditions in pottery making; the extent to which regional styles are present; and whether there is evidence for the export of locally produced ceramics to other sites. Fine and coarse ware from the Halaf period and painted and unpainted ware from the Ubaid period will be investigated using macroscopic, microscopic and geochemical analysis and the results compared, including with published data for Tell Arpachiyah and other sites including Domuztepe, Tell Halaf, Chagar Bazar (Spataro and Fletcher 2010, 91-113).

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Bronze Age Ceramic Technology in Østfold, Norway. Preliminary Results

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This paper will present the preliminary results of a multi-method approach investigating the ceramic technology and knowledge networks from 1100 - 400 BC, south-eastern Norway through the use of pXRF, XRD and thin section analysis. Ceramics are among the rather few finds in Norway dated to the Late Bronze Age, and data collected by the multi-method approach are a basis for the analysis of the local knowledge networks, and their relation to similar finds in other parts of the Scandinavian Peninsula. The finds are coming from most currently known excavated funerary contexts, workshops and settlements in Østfold from between 1100 - 400 BC, and the ceramic material is supplied by samples of local raw clay from possible prehistoric supply sites. Ceramics encapsulate geological, technological and cultural information that may be obtained by a mixture of scientific analyses and theoretical approaches. The main focus of the project lies therefore on the analysis of clays and temper through provenance studies, as well as the ceramic manufacturing technology. The material exhibits contextual, typological and technological parallels with sites from Sweden, as well as the continental Europe. By including material from a large number of sites within the area of Østfold, the project aims at finding the local variations of the ceramic knowledge shared between sites and to understand how it relates to equivalent finds across the Scandinavian Peninsula and beyond.

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The Significance of Detail: Corded-Tool Impressed Pottery at al-Khiday as Evidence of Regional Identity

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Pottery production in the Nile Valley, spanning from south of the First Cataract to the confluence of the White and Blue Nile rivers, dates back to the 9th millennium BC. This activity occurred within a context of hunter-gatherer-fisher communities. While the pottery exhibits some shared characteristics, it also demonstrates significant regional variation along the north-south axis.

Although pottery manufacturing was primarily family-based and thus highly variable, analytical studies have enabled the identification of several macro-regions, each characterized by distinctive features, particularly regarding techniques, tools, and decorative motifs. Among these, impressions created using tools with cord elements have been mentioned in the literature but never subjected to detailed study. Such impressions are frequently observed in the pottery produced at the al-Khiday sites, located on the left bank of the White Nile and dating to the 7th millennium BC.

Building on detailed observations of ceramic fragments, we conducted experimental studies to identify the specific tools used and to replicate the motifs found on ancient pottery. Finally, the formal analysis of these decorative motifs has once again proven to be a critical tool for understanding the peopling dynamics of the Nile Valley. This study has identified the cord-impressed decorations documented at al-Khiday as characteristic of a distinct macro-region along the White Nile.

Characterization of Nuragic Pottery from the Nuraghe Candelargiu Archaeological Site

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This study presents the preliminary characterization of pottery from the Nuraghe Candelargiu archaeological site, located in S. Giovanni Suergiu, Cagliari (IT). The samples were selected based on their archaeological context, historical period, aesthetic appearance, and small size, which made them unsuitable for museum exposition. Micro-invasive analyses, including thin section observations and X-ray diffraction, were conducted to provide initial insights into the clays and temper used, firing temperature, and texture, important data for reconstructing the history of production and trade of the Nuragic population. Preliminary results indicate that a consistent group of ceramics, from the oldest stratigraphic localization, presents temper materials likely matching the local andesitic outcrops. Other more recent samples, on the contrary, present rounded quartz and a different temper-to-clay ratio, suggesting both different manufacture and raw material provenance. We are extending the analysis to approximately one hundred samples, to increase statistical significance of the results. These data will also be correlated to chemical data, which is currently being carried out using the X-ray fluorescence technique.

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Urns Under the Microscope: Petrographic Analysis of Eight Iron Age Pots from Funen, Denmark

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This project is a small petrographic case study of eight ceramic pots used as urns at a burial site in Bellinge Fælled near Odense in Denmark dated to around 300-500 AD (Younger Danish Iron Age). Four pots with ornamentations and four without were chosen to investigate any mineralogical and technological differences between the two groups of ceramics in order to examine whether they could have been produced by different potters and maybe even in different local areas. The petrographic analysis of the eight pots has shown that there is a difference between the urns with and without ornamentations. The pottery with ornamentations has been carefully produced from similar clay- and temper sources with uniform technology which reflects a great knowledge of the resources available and a choice to use a specific recipe and technology for this type of pottery. The four studied pots without ornamentations, on the other hand, show variations in both color and inclusions which are caused by different clay- and temper sources and variation in the preparation of the clay and the burning process. These pots could have been produced by different individuals and might have been reused from the household pottery. Since reference samples of local clay sources were not available, it was not possible to determine the provenance of the eight pots in the petrographic study. Further geochemical studies will try to define the provenance of the pottery using ICP-MA/ES and investigate whether they are all produced locally at the island of Funen. It will be interesting to compare the results acquired with the two different methods and see how they can support each other.

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Late Medieval and Modern Greyware from Barcelona, Spain. A Petrographic Approach to the Pottery from of La Foneria, 15th – 18th Centuries AD

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This poster presents the results of petrographic analysis and characterisation of a 65-sample assemblage obtained from the site of La Foneria (Barcelona, Spain). Within urban development work the Ciutat Vella district in the 1990s, substantial ceramic material was recovered from the archaeological excavation of the former Common House of the copper-smelters' guild (Álvaro et al. 2015). The assemblage includes a representative collection of greyware produced for cooking and domestic use between the 15th and 18th centuries AD together with some lead-glazed boiling pots and jars.

Among the general assemblage of granitic, metamorphic, and calcareous fabrics, detailed examination of these coarse wares has enabled the identification of locally produced Barcelonese ceramics, alongside significant imports from a wider regional area. Pottery fired under reducing conditions reveals notable changes in vessel shape and function, alongside broader shifts in production and consumption areas. Several prominent medieval workshops declined from the 14th century onwards, while smaller production centres expanded, eventually dominating the main supply circuits in modern Catalonia (Travé et al. 2023).

The Barcelonese ceramics at this site provide a valuable case study for understanding these transformations. Due to the coarse nature of most pastes, ceramic petrography has proven effective in identifying key fabrics with known parallels across Catalonia. While Barcelona was renowned for glazed pottery and tableware (Buxeda et al. 2011), its greyware production was less prominent and primarily obtained from its hinterland (López-Mullor & Bertrán de Heredia 2009). The analysis of the materials from La Foneria within the broader context of Catalonian greyware offers new and compelling insights into this subject.

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The Blue Colour in Pavia Majolica from the 17th and 18th Centuries: a Petro-archaeometric Study

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The petro-archaeometric study of historic ceramic glazes gives valuable insights into technical skills acquired by societies, in addition to providing useful information for the development of conservation strategies (Pradell et al., 2020). The “latesini” are well-known white-body majolica artefacts, produced in Pavia between the 17th and the 18th centuries (Pelizzoni et al., 1997). These objects have so far been studied only from the archaeological point of view, hence lacking a petro-archaeometric characterization. This study aims to fill this gap by focusing on the blue decorations of some samples, which were discovered in 1976 in Viale Lungo Ticino Sforza, during the excavation procedures of the sewer. These cultural heritage samples are nowadays stored at the Musei Civici in Pavia, where their high production examples are visible to the audience. The multi-technique approach, including both non-invasive, such as optical microscopy, colorimetry and micro-Raman Spectroscopy, and invasive techniques, like Scanning Electron Microscopy with Energy-Dispersive Spectrometry (SEM/EDS), allowed us to identify and characterize the pigment used to obtain blue color (Co^{2+}), as well as to formulate a hypothesis about the production technology. In fact, two different decorative levels have been distinguished: the glaze and the glassy blue decoration, characterized by different texture and mineral phases distribution. The identification of some peculiar mineral phases in the blue level allowed us to formulate also a preliminary hypothesis about the firing temperature range of different steps of the manufacturing process.

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