

# CERAMIC PETROLOGY GROUP (CPG) MEETING

NOVEMBER 11<sup>TH</sup> – 12<sup>TH</sup> 2022



*Book of Abstracts*



GHENT HISTORICAL ARCHAEOLOGY  
UNIVERSITY RESEARCH GROUP



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## CPG Meeting 2022

	FRIDAY 11TH NOVEMBER	SATURDAY 12TH NOVEMBER
09:00 - 09:30		
09:30 - 10:00		
10:00 - 10:30		
10:30 - 11:00		
11:00 - 11:30		
11:30 - 12:00	Registration	Plenary session 2: Asia & Africa
12:00 - 12:30		
12:30 - 13:00	Welcome & Introduction	Morning break
13:00 - 13:30		Lightning session 2: Asia & Africa
13:30 - 14:00	Plenary session 1: Europe	Lunch break / CPG committee meeting
14:00 - 14:30		Live microscopy session
14:30 - 15:00		Afternoon break
15:00 - 15:30	Afternoon break	
15:30 - 16:00		Plenary session 3: Europe & South America
16:00 - 16:30	Lightning session 1: Europe	
16:30 - 17:00		Evening break
17:00 - 17:30	Evening break	Lightning session 3: Europe & South America
17:30 - 18:00		
18:00 - 18:30	Keynote by Dennis Braeckman	Closing remarks
18:30 - 19:00		
19:00 -	Conference dinner	

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Friday, November 11

## Plenary Session 1: Europe

### 13:00-13:20 Technological change and distribution patterns of early medieval greyware: Frankish influences on local pottery at the archaeological site of L'Esquerda (Catalonia), 7th – 9th Centuries AD.

*Esther Travé Allepuz<sup>1</sup>, Montserrat de Rocafiguera<sup>2</sup>, Imma Ollich Castanyer<sup>2</sup>, Albert Pratdesaba Sala<sup>2</sup>, Maria Ocaña Subirana<sup>2</sup>*

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The archaeological site of L'Esquerda was an emblematic fortified settlement since the Late Bronze Age until the violent destruction of the medieval village in 1314 AD. After a few centuries of abandonment during the Roman period, peasant populations reoccupied the site. It had some sort of military role during the political struggles of the Visigoth kingdom in the 6th and 7th centuries AD, and became a strategic place when the Frankish king Louis the Pious strengthened the Hispanic March against the Andalusian Muslim domain. In different phases along this period, a wall enclosing the main access to the site was built and the settlement was periodically refortified.

Since the early medieval reoccupation of the site, greyware pottery became the main artefact used for daily cooking purposes. As part of the Greyware research project, one hundred samples in this site have been analysed via thin section petrography combined with chemical examination in order to explore the changes occurred from a diachronic perspective in compass with the historical vicissitudes at the site. Obtained results revealed an interesting transformation in distribution patterns towards a more regionalized consumption of pottery, and the abandonment of ancient technological practices. The aim of our contribution is to determine if the presence of some imported Frankish products might have played some influence in technological change of pottery recipes or firing conditions at this site. Preliminary results of on-going research show how local products attempted to imitate the appearance of Frankish burnished pottery while preserving local practices.

### 13:20-13:40 Mineralogical and microstructural post-depositional alterations in amphorae from terrestrial and marine environments

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Amphorae, a common type of container for packing and transporting goods in the Mediterranean from the Bronze Age to the Late Roman period, represent a valuable record of trade and other economic activities that took place in ancient times. Because of their use, transport amphorae are found in different archaeological contexts, from terrestrial sites linked to production centres or sites where amphorae were discarded after their contents were used, so called consumption sites. The shape of the amphorae made them suitable for shipping, so they are often found as cargoes in wrecked ships in the sea and rivers.

In recent years, the study of amphorae by scientific methods has become common throughout the Mediterranean, not only for the study of provenance but also for the study of ancient trade routes. Since the latter study compares amphorae recovered in shipwrecks and terrestrial sites, a direct comparison of these amphorae could be hampered by different post-depositional alterations in amphorae microstructure and composition.

In the presentation, the authors will present the results of mineralogical and chemical analysis of amphorae from terrestrial sites and shipwrecks from Dalmatia (Croatia) by XRD, microstructural investigation by SEM. The aim of our analysis was to determine which parts of amphorae were more exposed to environmental conditions and whether, and if so, how the firing temperatures of amphorae affect changes in amphorae from marine and terrestrial sites.

### **13:40-14:00 Identifying Regional Pottery Production in Roman Thrace. The Case of Yurta-Stroyno**

*Petra Tušlová 1, Silvia Amicone 2, Noémi Müller 3, Evangelia Kiriati 3*

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2 Eberhard Karls Universität Tübingen, Archaeometry Research Group

3 The British School at Athens Fitch Laboratory

The vicus of Yurta-Stroyno is located along the middle stream of the Tundzha River, in the eastern part of the Roman province of Thrace, today's Bulgaria. Pottery found at the settlement included coarse cooking ware, fine table ware, and handmade pottery. Samples representing the most frequently attested shapes of these pottery classes were chosen to be analysed via thin section petrography and WD-XRF. Additionally, geological samples were collected in a radius of 15 km around the settlement. In total, 90 pottery samples and ten fired briquettes, produced from the collected clayey sediments, were analysed. The results show variability in the pottery fabrics both within and across the different pottery classes, with most of the fabrics identified appearing to match well the local geology. Within various classes of pottery, different technological approaches to the same or similar raw materials result in distinct products: for the fine table ware, for example, the red-slipped ware and the grey ware, have the same petrographic and elemental composition indicating the use of the same or a very similar clay paste, fired in either oxidising (red slipped) or reducing (grey ware) atmosphere. For the coarse fabrics, the co-existence of handmade and wheel-made cooking pots is notable, both of which are present in a range of different fabrics. Overall, the settlement seems to depend largely on a range of regional suppliers, who employ different technological approaches to regionally available raw materials.

**14:00-14:20 Geochemical and mineralogical characterisation of vitrified material on late second- early third century CE salt production sites along the southern North Sea coast**

*Michiel Dekoninck<sup>1</sup>, Eric Goemaere<sup>2</sup>, Stijn Dewaele<sup>3</sup>, Johan De Grave<sup>3</sup>, Thierry Leduc<sup>2</sup>, Dimitri Vandenberghe<sup>3</sup> & Wim De Clercq<sup>1</sup>*

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Along the southern North Sea coast, late second-early third century CE salt production sites are characterised by extensive refuse zones containing large quantities of what has been described as 'salt slags'. These 'salt slags' are in fact amorphous, heavily vitrified waste materials. This is rather surprising since large-scale vitrification has never been associated with the salt production process. In this paper, these materials are for the first time systematically studied macroscopically, mineralogically and geochemically to determine their composition, formation and relation to the salt production process. To achieve these objectives, a selection of samples was analysed using a multiproxy approach combining thin-section petrography, SEM-EDS and XRD analyses. This approach enabled a detailed characterisation of the vitrification process in the waste materials as well as the identification of high temperature mineral transformations formed in specific (archaeological) conditions. Based on the results, it is clear that the amorphous waste materials should be interpreted as vitrified hearth base fragments formed on the bottom of the hearth due to the presence of external fluxes.

**14:20-14:40 An approach to the economic networks and technical craft traditions of the LBK in Alsace (France): the contribution of analyses of ceramic materials**

*Benjamin Gehres*

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The arrival of the LBK culture in Alsace (eastern France) is dated to around 5355/5240 B.C. This culture is characterised by a strong similarity in domestic architecture, funerary practices, but also in the decorations and forms of pottery. However, local stylistic variations can be observed, particularly in Alsace, where two stylistic groups have been identified. They are located in Lower and Upper Alsace, separated by a mixed stylistic area located in the region of the city of Colmar. This distinction is particularly observable in their ceramics and decorations, and no stylistic exchange seems to have taken place for more than 500 years. How can this division be explained in terms of the settlement of the territory? Is this border only observable from a stylistic point of view, or is it also reflected in the technical traditions of the pottery? These questions are being addressed in the collective research programme "Territorial stylistic division during the LBK in Alsace", and this paper will present the first results of thin section analyses carried out on ceramic from occupations in Lower and Upper Alsace. The aim is to identify the extension of territories of exploitation of raw materials, but also to model the extension of the communities of practice, like the treatment of the clay by the potters.

These new results will help us to question the structuring of the territorial identity of the LBK in Alsace, but also to draw the first features of a socio-economic functioning between several occupations.

## Lightning Session 1: Europe

### 15:20-15:30 From pots to cultural dynamics: technological choices in 5th millennium Po Plain (Italy)

*Valeria Tiezzi<sup>1</sup>, Silvia Amicone<sup>2,3</sup>, Nicoletta Volante<sup>4</sup>, Monica Miari<sup>5</sup>*

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The middle and recent Neolithic period (5th millennium BCE) in Italy is marked by an intensification of the exchange networks in a context of growing social complexity. This phenomenon is also reflected, in northern and central Italy, in heterogeneous pottery assemblages that seem to incorporate and re-elaborate exogenous cultural traits, stylistically belonging to distinct pottery traditions. However, this phenomenon has never been extensively addressed from a technological point of view, thus neglecting aspects such as the manufacturing choices within the operational sequence and how these can change over time. In this presentation Neolithic pottery technology will be addressed using ceramic petrography, with the aim of assessing pottery recipe variability both intra-site and from a diachronic perspective. For this purpose, 58 pottery sherds recovered from three recently discovered sites in the south-eastern Po Plain were analysed. The settlements under investigation span from the middle to the recent Neolithic and are characterised by the presence of traits belonging to different pottery styles, traditionally associated with distinct material cultures of the Italian peninsula. The results shed light on the raw material procurement strategies of the Neolithic groups of the south-eastern Po Plain, and clarified numerous aspects related to paste preparation, forming techniques and firing procedures. The technological approach also enabled to better evaluate the interplay among the variety of pottery traditions present in this area. Forthcoming integration of other archaeometric analyses and traceology will expand this work even further, thus covering all the aspects of the operational sequence of pottery manufacture.

### 15:30-15:40 When the potter has a choice: petrographic study of north Italian Neolithic ceramic production

*Giulia Deimichei<sup>1</sup>, Silvia Amicone<sup>2,3</sup>, Annalisa Pedrotti<sup>1</sup>*

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2 University of Tübingen, Archaeometry Research Group

3 University College London, Institute of Archaeology

This research investigates the technology of pottery production in the Neolithic sites of Riparo Gaban and La Vela in the north-eastern Alpine region in Italy. Riparo Gaban is a rock shelter in the Adige Valley. The site is characterized by the presence of pottery that is attributed to the first Neolithic group present in the area, the so-called Gaban group (5200-4700 BCE). La Vela is an open-air site in the Adige Valley. The Ancient Neolithic layers are characterized by the presence of pottery that can be related to the Gaban group and by the first appearance of the so-called Square-mouthed pottery culture. This material culture becomes predominant in the site during the Middle Neolithic (4700-4300 BCE).

The aim of the research is to better understand these cultural phenomena through the study of ceramic technology. For the analyses a representative number of samples of different macrofabrics and of different chronological phases were chosen. Ceramic petrography was applied to them to investigate raw materials choices and technological features.

The results highlight a great variability in the choice of raw materials that reflects a knowhow of the various natural resources present in the area. Indeed, the region is characterized by the presence of different geological outcrops. The different geological formations are well represented in the pottery analysed in this study.

The preliminary results of this work give us an initial understanding of this variability, that will be monitored in future through a bigger number of samples and a detailed geological study.

### **15:40-15:50 Archaeometric study of proto-historic ceramics from the settlement of Avecasta cave, Portugal**

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Archaeometric studies of ancient ceramics of different communities from different archaeological periods have helped reveal not only ceramic provenance but also ceramic technology, including firing technology, as well as changes in ceramics' raw materials exploitation over time. While there are many documented scholarly works on the archaeometric study of ancient ceramics from villages in the centre of Portugal, there is no single publication on ceramic technology and provenance from Avecasta village in the centre of Portugal. This research attempts to fill this gap by revealing the production technology, firing technology, provenance, and changes in the raw materials used to produce forty-two ceramic samples from Avecasta cave, whose chronologies are between the Neolithic and the Iron age. Optical Microscope, X-ray diffraction, Portable X-ray Fluorescence, and Scanning Electron Microscope coupled with Energy Dispersive Spectrometer were employed to achieve these goals. The results reveal three ceramic groups of different chemical and mineralogical compositions. While two of these groups were probably made of raw materials from the geological area of Avecasta, the last group was perhaps imported. The results also show a discontinuity in the raw materials used to produce the ceramic fragments between the late Neolithic and the Iron age and also indicate that the ceramics' firing temperature ranges between 700°C and 800°C. This study will contribute to the reconstruction of the history of the people who lived in Avecasta during prehistory and spur future comparative research of ceramic technology between Avecasta and its environs to understand inter-community relations and possible trade routes.

**15:50-16:00 Technology and origin of grass-tempered ceramics preceding the Neolithic period in the northern Pannonian Basin (Slovakia)**

*Jan Petřík<sup>1</sup>, Karel Slaviček<sup>1</sup>, Katarína Adameková<sup>1</sup>, Libor Petr<sup>2</sup>, Peter Tóth<sup>3</sup>*

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There is a consensus that the origin of neolithic pottery technology in Central Europe is connected with the onset of the Neolithic way of life and the emergence of the LBK in the mid-6th millennium BC. It is supposed that pottery technology came from the Northern Balkans; however, it has also been found that independent pottery traditions spread concurrently in Eastern Europe. This indicates that two technological traditions could, hypothetically, have met in Central- Eastern Europe. Ceramics found at the Santovka site could help to fill gaps in our knowledge about the arrival of ceramic technology in the area. Pottery from the site has been dated to approximately 5600–5800 cal BC, which predates the oldest known LBK pottery. Combining several analytical techniques, namely ceramic petrography, SEM and microCT, with experiments allowed us to determine where the pottery came from and how it was made. The results indicate a non-local provenance of the pottery, which was produced from clay deposited in the floodplain of one of the rivers in the region at least about ten kilometres away, as is indicated by the presence of rounded andesite inclusions derived from material originating in the Slovak Central Mountains. The shapes of the pottery fragments indicate a box-like appearance, at least in one case, and an absence of coiling. The most striking aspect of Santovka ceramics is its high content of Festuca grass temper. The preservation of grass is associated with reduced and possibly intensive but short firing at a low temperature. The pottery style and technology, especially the organic temper, is different to what we know from the contemporary Starčevo and Körös/Criş traditions and also different to that seen in subsequent LBK ceramics.

**16:00-16:10 Insights on Neolithic Pottery Technology and Provenance from Petrographic and WD-XRF Studies: a Case Study of Siliņupe and Slocene Settlements**

*Vanda Visocka<sup>1</sup>, Valdis Bērziņš<sup>2</sup>, Artis Kōns<sup>3</sup>*

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The research is dedicated to technological aspects and provenance of the Neolithic pottery of Siliņupe and Slocene settlements through the geological and chemical analysis. The tempering tendencies and geological and chemical composition of the nearby clays and ceramics were analysed in this study. To study resource availability and possible provenance of the pottery, nearby clay resources were surveyed and further analysed with petrographic and wavelength dispersive X-ray fluorescence spectrometry. Overall, 13 thin sections of ceramics and two thin sections of the clays were made and analysed by using petrographic microscope. WD-XRF analysis was performed on eight samples – six ceramic and two clay samples.



**16.10-16:20 Pottery-making traditions and connectivity in Early Bronze Age Poliochni-Lemnos (northeast Aegean): a pilot petrographic perspective***Sergios Menelaou*The British School at Athens, Fitch Laboratory; [menelaou.sergios@gmail.com](mailto:menelaou.sergios@gmail.com)

The northeast Aegean has been overlooked in terms of ceramic analysis developments, in contrast with other regions in Greek prehistory. In addition to that, the insular eastern Aegean has long been considered as peripheral or marginal between two different 'worlds' or as passive recipient in developments channelled from western Anatolia. Poliochni on Lemnos, one of the best-known sites of the Early Bronze Age (EBA) in the region, has been characterised as proto-urban with significant evidence for metallurgy and other craft innovations, including the construction of communal, administrative buildings and the development of pottery traditions with mixed elements. Poliochni has been previously interpreted as a sea-oriented Anatolian-style community with major contacts with Mainland Greece and the Cyclades, as suggested by potential ceramic imports already since EBA I/II. This paper presents preliminary results from the pilot compositional and technological study of pottery under a diachronic perspective, using a combined assessment of morphostylistic and fabric (macroscopic and petrographic) characteristics. It aims to characterise the local tradition and how it transforms through time, but also to establish an understanding of the variation and frequency of imports up until the site's abandonment in the end of the 3rd millennium BC, adding new data in our knowledge of Aegean exchange networks and connectivity.

**16:20-16:30 Pottery kilns in the early Iron Age in western Slovenia***Manca Vinazza*University of Ljubljana; [Manca.Vinazza@ff.uni-lj.si](mailto:Manca.Vinazza@ff.uni-lj.si)

In the presentation we will discuss the use of kilns for firing pottery in Western Slovenia during the Early Iron Age. In the absence of archaeologically attested kilns, their use in this area will be studied on the basis of indirect factors, i.e. the analysis of the firing technique of the vessel, and with the help of experiments from the field of experimental archaeology. The article attempts to determine the reasons for the poor state of preservation of the kilns in the area in question. Samples from the experiments and the archaeological pottery were subjected to petrographic and mineralogical analyses (X-ray diffraction), which revealed the importance of considering the soaking time as a criterion for observing firing processes and the use of single-chamber kilns for firing pottery, even if they have not yet been discovered.

**16:30-16:40 Adopting a flexible classification system for very heterogeneous fabric groups based on late Roman 'Germanic' handmade pottery from Northwest Europe***Vince Van Thienen 1, Eric Goemaere 2*1 Ghent University, Department of Archaeology, [vince.vanthienen@ugent.be](mailto:vince.vanthienen@ugent.be)2 Royal Belgian Institute of Natural Sciences; [egoemaere@naturalsciences.be](mailto:egoemaere@naturalsciences.be)

Rural settlements in the late Roman and early medieval period in Northwest Europe contain a high amount of handmade pottery. As this is in contrast to the Roman wheel-turned pottery, this has traditionally been

interpreted as pottery deriving from invading or immigrating Germanic tribes. Ceramic petrography has been used to test this notion by analysing the geological provenance of late Roman handmade pottery with samples from Belgium, the Netherlands and Germany. During the study of more than 300 thin sections, it became clear that these ceramics are very diverse and heterogeneous, both in composition as in fabric groups. With each newly sampled site, the groupings based on mineralogical composition, general texture and tempering traditions had to be revised. To address this methodological issue, a flexible classification system was developed that allows a parallel analysis of the mineralogical inclusions and the tempering agents. Instead of fixed groups, the classification system lists significant properties and sorts them in devaluating order according to the composition observed in thin section. The system has allowed a method of analysis that can be scaled according to the research question, ranging from large synthesis studies focusing on clay provenance or tempering agents to intra-site variation within domestic ceramic production.

### **16:40-16:50 The collaborative and geolocalised online database "BasePetroCeram": A new tool to consolidate the analysis of archaeological ceramic materials**

*Benjamin Gehres & Olivier Troccaz*

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"BasePetroCeram" is a collaborative database that allows the various petrographic studies of ceramic materials to be grouped together in a geolocalised manner. The aim is to highlight the petrographic and geochemical studies of ceramic materials from a given geographical area or chronological period. This database will be open and will function thanks to the contributions of its users, by embracing the principles of "open science".

The objectives of this database will be multiple: to provide, to search and to connect:

- Providing information: The first objective is to contribute to the visibility of publications, academic works and analysis reports, by creating a simple tool for visualizing data and their geographical distribution on a map.
- Interrogate: The second objective is to allow a comparison of the results of analyses between sites or regions, by locating the studies on a map. It is then a question of being able to search within the database, by delimiting geographical areas or chronological periods.
- Connect: This database will allow collaborations to emerge between members of the discipline.

The mandatory entries will consist of a bibliographic reference (with a permalink of the publication if available), a geographical location of the site, and the type of analysis, but it will also be possible to be very precise in the description of petrographic groups and thin sections by adding micrographs or by inserting graphs or raw data from geochemical analyses. The base is under construction and should be accessible in French in 2023 before being translated later.

Saturday, November 12

## Plenary Session 2: Asia & Africa

### 09:00-09:20 An Archaeological and Experimental Investigation of Clay Paste Preparation Techniques in Neolithic Northern Taiwan

*Yu-chun Kan*

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Ceramics from Neolithic (4100~1800 BP) sites in Northern Taiwan exhibit abundant compositional and textural evidence in thin section that may be the result of clay paste preparation. In order to understand the processes that resulted in this heterogeneity and distinguish it from natural variation in raw materials, experiments were carried out using a range of techniques, including settling, wet/dry sieving, clay mixing and sand tempering. Analysis of the experimental samples under the polarizing light microscope revealed certain diagnostic criteria in terms of particle size distribution and specific features. By applying these to archaeological ceramics from seven sites it has been possible to reconstruct both long-term local traditions and technological changes in which raw materials from the same geological settings were transformed via different paste preparation recipes. Contrary to previous discussions on the simple uniform ceramic technologies in the Final Neolithic period (2500~1800 BP), these new findings provide strong evidence of the coexistence of multiple techniques across a wider geographical area, implying a far more complex image of social dynamics.

### 09:20-09:40 Continuity and change in ceramic technology in prehistoric Northwest China

*Anke Hein<sup>1</sup>, Ole Stilborg<sup>2</sup>*

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The Neolithic painted pottery of northwest China has long been known for his high level of craftsmanship, but little is known about the underlying technology and the wide range of supposedly less "beautiful" Bronze Age wares are even less well understood. Using ceramics excavated in the 1920s held in the Museum of Far Eastern Antiquities (Stockholm) where they have been lying dormant for decades, this study presents the first exploratory petrographic analyses on material from sites in the Tao River Valley, southern Gansu, dating to the Neolithic, early Bronze Age, and middle Bronze age conventionally associated with the Majiayao, Qijia, and Xindian and Kayue archaeological cultures respectively. While the change in ceramic forms and decorations between Majiayao and Qijia has previously been interpreted as a complete break in ceramic traditions, this study shows that there is actually continuity in ceramic technology. More significant changes take place in the middle Bronze Age when there is a major shift in raw material selection and preparation. This period sees a diversification in ceramic forms, decorations, and production processes with late Qijia, Xindian, and Kayue traditions co-existing within a relatively small geographic area. At the same time, there are some technological features that are shared between them, reflecting exchange between practitioners of these various pottery traditions. This study provides but a first glimpse at this complicated history of potting practices that needs to be explored further in future studies.

**09:40-10:00 Investigating the Sorath Harappan Ceramics from the site of Padri, Gujarat***Diya Mukherjee*

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The paper focuses on the ceramic assemblages from the site of Padri in comparison with Sorath ceramic assemblages to compare and co-relate the assemblages to provide a solid framework for the development of Sorath Harappan ceramics in Saurashtra; thus to find out whether the ceramic assemblage of the Mature phase was simply a sudden outgrowth of the people or was a gradual process of development resulting from the experience and craftsmanship of the people inhabiting the region considering the factors, that is, the role of the market, the demand of the people, ecological conditions which can altogether be called as the favorable conditions for the Harappan cultural people.

The paper will deal with the methodological approaches as well as scientific analyses that have been undertaken by the scholar. Along with morphological features, firing, and slip color – texture, manufacturing and burnishing techniques will be discussed during the presentation. A provenance study of the selected ceramics conducted will be discussed during the presentation.

**10:00-10:20 Bantu arrival in southern Africa. Ceramic analysis as a source of information for dating, diversity, technology transfer and nutrition***Sabrina Stempfle*

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In 2016, a research cooperation between the Eduardo Mondlane University and the German Archaeological Institute was started. Since then, this cooperation performed various surveys and geomagnetic prospection and developed with Hamburg University a dedicated research project which this contribution introduces.

The introduction of pottery to southern Africa is associated with the immigration of early farmers about 2000 years ago, which are called the Bantu speakers. Recent research challenges this model, since distinct pottery was found in archaeological contexts of hunter-gatherer or hunter-herder communities. Furthermore, the Bantu pottery in Mozambique, called Matola pottery, has been dated a few hundred years earlier, challenging the previous attribution to Early Farming Communities.

The current research project aims to study the Matola pottery using archeometric approaches to test the Bantu model and to investigate the beginning of pottery production in southern Africa regarding dating, the process and the diversity in raw material, techniques and use. The absolute ages will be re-evaluated by radiocarbon dating, thermoluminescence dating and compound specific lipid dating. The diversity in raw material, technique and use within the classified pottery unit will be determined using polarized light microscopy, lipid analysis, X-ray fluorescence analysis and infrared spectroscopy.

**10:20-10:40 Ceramic studies on 14th to 18th century pottery from the Kongo kingdom, Central Africa**

*Anna Tsoupra<sup>1</sup>, Bernard Clist<sup>2</sup>, Maria da Conceição Lopes<sup>3</sup>, Patrícia Moita<sup>1,7</sup>, Pedro Barrulas<sup>1</sup>, Maria da Piedade de Jesus<sup>4</sup>, Sónia da Silva Domingos<sup>5</sup>, Koen Bostoen<sup>6</sup> & José Mirao<sup>1,7</sup>*

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6 Ghent University, Department of Languages and Cultures

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Ceramic material encountered in three archaeological sites corresponding to the ancient Kongo kingdom (Angola and Democratic Republic of Congo), were analysed. The ceramic fragments belong to four different typological groups of pottery and are dated to the early and later kingdom period (14th-18th century). The four groups are discussed in terms of their variability and their common attributes. The implementation of a multi-analytical approach, namely XRD, TGA, petrographic analysis, XRF, VP-SEM-EDS and ICP-MS, allowed the correlation of the archaeological objects to naturally occurring materials and the determination of ceramic traditions. The use of complementary techniques made it possible to draw conclusions on exchange patterns and interaction processes, through pottery production, circulation and distribution, and thus to contribute to the knowledge regarding one of the most famous precolonial states in Central Africa.

## Lightning Session 2: Asia & Africa

**11:20-11:30 Petrographic Analysis of Tempered Earthenware from St Andrew's Cathedral (STA), Singapore**

*Alvin Chua*

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St Andrew's Cathedral (STA) is an archaeological site in Singapore that was excavated in 2003-2004. Although the current structure dates to the 19th century, excavations in the cathedral's yard have yielded artefacts dating to the pre-colonial period, i.e. 14-16th century. These include 1193 tempered earthenware sherds, based on the preliminary site report. This figure, however, does not represent the full assemblage, which includes several thousand more sherds. A total of 34 samples were selected from the partial assemblage for petrographic analysis. Preliminary results show that in terms of inclusions, quartz predominates in almost all the samples. Nevertheless, certain differences, such as the frequency of the quartz grains, were observed. These differences allowed for the grouping of the samples into fabric types and subtypes. This is the first instance of precolonial Singaporean tempered earthenware sherds being subjected to petrographic analysis. Therefore, the fabrics identified in this study may serve as a reference for future petrographic analysis conducted on such ceramics. Indeed, for my own research, petrographic analysis will be carried out on earthenware samples from other Singaporean sites. This will enable comparisons to be made between the fabrics found at these sites, so as to

determine the similarities and/or differences between them, and to hypothesize on the reasons contributing towards these similarities/differences. Moreover, my research will involve earthenware samples from neighboring areas, such as Johor (Malaysia) and Java (Indonesia) for further comparison with the Singaporean materials.

### **11:30-11:40 Chinese blue and white porcelain: a combination of analytical analysis with technological reconstructions**

*Sayan Roy<sup>1</sup>, Andreia Ruivo<sup>2</sup>, Catarina Miguel<sup>1</sup>, Silvia Bottura-Scardina<sup>1</sup>, João Pedro Veiga<sup>3,4</sup>, Fernanda Carvalho<sup>3,4</sup>, Mathilda L. Coutinho<sup>1</sup>*

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Porcelain, an aesthetically pleasing white ceramic which is translucent and vitrified in nature, is fired at very high temperatures sometimes up to 1350°C. Blue and white porcelain, which was exported en masse from China to the world during the Ming Dynasty (1368 to 1644 A.D.) (Wood 1999) was one of the most sought-after type of porcelains (Finlay 1998). Several studies have shown that cobalt pigments were used to get the unique blue color along with iron and manganese (Pinto et al., 2020) to obtain different hues and shades of blue (Coutinho et al., 2022). Still many aspects of the blue and white porcelain production are still not fully understood, particularly regarding the color of the glaze and the pigment.

In this work Chinese blue and white porcelain was studied focusing on the production process. Technological reproductions were performed in laboratory conditions being blue and white models fired at different temperature under both air and reductive atmospheres to understand the effects of firing conditions on glaze and pigments color. The models were produced with glazes obtained with two calcium sources (wollastonite and calcium carbonate) and using a combination of pigments with different proportion of cobalt, iron, and manganese. The produced samples were investigated through a multi-analytical approach to characterize the microstructure, color and mineralogical composition using scanning electron microscopy, colorimetry, hyperspectral imaging, and x-ray diffraction. Results were compared with Chinese blue and white shards dating from the Ming Dynasty provided by Fundação da Casa de Bragança.

**11:40-11:50 Ceramic Analyses as an Index for Intergroup Relationship(s) in northern Yorubaland, Nigeria***Oreoluwa Sodeke, Aleru, J.O.*University of Ibadan, Nigeria; [oresodeke@gmail.com](mailto:oresodeke@gmail.com) (corresponding author)

Emerging evidence indicates that northern Yorubaland (central Nigeria) was as a frontier region of the Imperial Oyo Empire (AD 1570-1830). The traditional classification methods of analyzing ceramics have been adopted as a strategy for understanding ceramics function in this region. However, the archaeological reconstruction of the culture of the region has not taken into consideration the knowledge of production and consumption, and as well as their roles in exchange and inter-group relationships. In this paper, we discuss the application of X-ray diffraction (XRD) and X-ray fluorescence (XRF) techniques to advance our understanding to these processes using ceramics and sediment samples from Oke-emo in Igbaja, Kwara State, northern Yorubaland. These hitherto underutilized techniques provided data about the chemical and morphological attributes of the ceramics and sediment samples from the region. The XRD and XRF results were used to answer questions that border on the provenance of the ceramic source materials. These, in turn, indicated the existence of both local and external influence from bordering communities and hence, shed light on intergroup relationships in the study area.

**Plenary Session 3: Europe & South America****15:00-15:20 Chasing shadows - Some thoughts on grog***Ole Stilborg*SKEA (Stilborg Ceramic Analysis) & University of Stockholm; [skea@stilborg.se](mailto:skea@stilborg.se)

Grog is one of the most interesting tempering materials. On the one hand, it's a very obvious, time saving choice given its accessibility in most settlement environments and low demand of effort for crushing. In terms of ceramic technology, grog is, furthermore, one of the best tempers not least because of the similar expansion rate to the clay body. On the other hand, old pottery comes with meaning that could go positively into the grog but just as well make it a taboo (polluted with a past?). Analytically, besides challenging our techniques, it lends a fascinating time depth to the fabrics and may illuminate connections between different fabric types. Drawing on analyses of grog tempered wares primarily from Neolithic sites in Northern Europe, I would like to present an idea of how grog tempering may have developed from a basic to a complex level possibly entailing a new perception of the material. And discuss why in several cases, it did not leave the basic level.

**15:20-15:40 Tracing pottery use by ceramic petrology and organic residue analyses: New Light on the Bronze Age Diet at the Nuraghe Arrubiu (Sardinia, Italy)**

*Maria Giuseppina Gradoli<sup>1</sup> & Nicolas Garnier<sup>2</sup>*

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The characterization study of 215 domestic ceramics, raw material provenance analysis and experimental archaeology permitted us to classify the samples into several fabric groups and, considering vessel shape and size, make hypotheses about their possible use.

Among them, 23 coarse cooking sherds were selected for organic residue analysis using Gas Chromatography and Mass Spectrometry to identify soluble biomarkers (from fat, oil, wax, resin and vegetables) and, by an acid-catalyzed extraction, to detect the insoluble biomarkers (aldaric and polyphenolic markers from fruits and fermented beverages).

Results were quite unexpected considering previous local authors' interpretations which attributed to these vessels a function by comparison to modern shapes. Indeed, it was demonstrated that people inhabiting the Nuraghe Arrubiu used:

a) to cook ruminant and non-ruminant meat simmered in red and white wine using pans, platters and large bowls; b) to produce fermented grape (wine), cereals (beer), and different vegetal beverages; c) to make cheese and cream from boiling milk in large carinated platters; d) to cook insects identified from animal markers and extracted cuticles wax, maybe, for medical use; e) to cook food without olive oil but using animal fat; f) to use pine resins and beeswax to reduce vessels surface permeability; g) to use raw honey; h) to extract castor oil.

**15:40-16:00 On the other side of the river: Chemical and mineralogical characterization of ceramic traditions on the precolonial Colombian Middle Orinoco archeological sites**

*Natalia Lozada Mendieta*

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As part of the "*Cotúa Archaeology Project*" (2015-2018) directed by José R. Oliver (UCL, UK), a ceramic research analysis was conducted in the Venezuelan Middle Orinoco area, specifically in the Átúres Rapids region, to identify trading and interaction process in precolonial ceramic materials. As a result of this research, a chronological occupation model was proposed, based on new radiocarbon data and the definition of new ceramic complexes in the area (Lozada-Mendieta 2020). The technical and stylistic dimensions of the ceramic complexes were identified using macro and microscopic analyzes (macro-trace, petrography, portable X-Ray fluorescence) that allowed for a reconstruction of their manufacturing process, as well as their circulation in the area.

Between 2020 and 2022, new archaeological sites in the Middle Orinoco area have been found on the Colombian side as part of the "Ancient potters of the Upper and Middle Orinoco Project" funded by Universidad de Los Andes (Colombia). This presentation focuses on new ceramic materials collected from surface surveys on open area sites and rock shelters associated with rock art and burials. A sample from 14 sites was analyzed using macro



trace analysis and petrography. The preliminary results were compared with the ceramic complexes developed for the Venezuelan side, revealing common ceramic fabrics and new paste recipes and vessel forms, most likely related to newly identified funerary traditions and post-contact communities.

### **16:00-16:20 State control of production, distribution, and consumption of Inka-Style pottery in the Southern Border of Tawantinsuyu (Inka State)**

*Andrea Martínez<sup>1</sup>, Patrick Quinn<sup>1</sup>, Bill Sillar<sup>1</sup> & Silvia Amicone<sup>2</sup>*

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<sup>2</sup> University of Tübingen

This presentation will discuss the progress of an ongoing research project, which aims to identify the nature and degree of state control over the production and distribution of Inka-style ceramics in the Aconcagua Valley and Maipo-Mapocho basin (Central Chile) during the Late Period (1400-1536 AD) and what role the Diaguita may have played in this process. The results obtained in the first stage of analysis considered 72 fragments from the upper middle basin of the Aconcagua valley. The analysis focused mainly on aríbalos and shallow plates compared to restricted vessels and bowls of local styles from the Late Intermediate Period (1000-1400 AD), as well as Diaguita and new non-Inka manifestations. The ceramics are characterized from the technological perspective of the *chaîne opératoire*, and state control is discussed based on patterns in continuities or changes in different stages of the manufacturing process besides the logic of distribution and use. Analyses were carried out at different scales including macro-trace analysis, thin-section petrography, and geochemistry (pXRF). Preliminary results suggest a distinction in raw material selection and paste preparation for Inka-style vessels compared to the other ceramic styles, as well as an unprecedented control of the firing atmosphere. At the same time, there is a continuity of the local pottery tradition in the early stages of fashioning and a similarity in surface treatment and brushed finish with Diaguita style vessels. These results will be discussed in terms of the degree of influence or control that the Inka state had, the role of foreign specialists (Diaguitas) and local agencies.

## **Lightning Session 3: Europe & South America**

### **17:00-17:10 The prevalence of organic inclusions in archaeological pottery from upper Madeira River, Amazonia**

*Thiago Kater<sup>1</sup> & Silvana Zuse<sup>2</sup>*

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Pottery is one of the main archaeological materials employed in Lowland South American archaeology, it is used to establish chronological and cultural sequences. Despite significant advances in analysis of archaeological ceramics, the use of petrography as an analytical technique is still very modest. In this sense, the purpose of this presentation is to show an initial petrographic study of archaeological ceramics collected in eight archaeological sites at the upper Madeira River, southwest Amazonia, dating from the fourth millennium BP. These occupations are mainly related to the Pocó-Açutuba Tradition, one of the firsts ceramics in South America with painting and a very fine treatment including incise decorations and adornments, although is visible a considerable degree of

variation in the smoothing, polishing and preservation of the sherds. In an attempt to characterize variations between fabrics and technological aspects among these different sites and also look for changes over time a sample of 120 thin section was analyzed. One of the main features already noted is the predominance of organic inclusions, such as the black and greyish burnt tree bark ashes, and a little variation of the identified minerals, being quartz, hematite and feldspars the most commons. These data allowed us to propose the existence of different fabrics, and also to reflect about complementary techniques which could be done in archaeological contexts with predominance of organic inclusions, such as for inference of firing conditions.

### **17:10-17:20 Traces of combustion: firing technology and materiality of the pottery kilns at Northern Maya Lowlands**

*Soledad Ortiz<sup>1</sup>, Oscar G. de Lucio<sup>2</sup>, Avto Gogichaishvili<sup>1</sup>*

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Pottery kilns around the Northern Maya Lowlands still remain a mystery. In this work we present a pyrotechnological investigation of the pottery aimed to provide some crucial information related to firing temperatures, burning conditions and kiln structure. The approach is based on a transdisciplinary methodology: thin petrographic sections were analyzed in combination with spectroscopic techniques and experimental archaeology.

The experimental record permitted to identify temperature variations due to the position of the ceramic pieces and the season in which they were produced. Traditional pottery burning is slow, it starts with a firing outside the kiln, then the fire is moved inside providing a specific temperature in a given position in the kiln. Atmosphere can be oxidizing or reducing, in accordance with the type and color of the crafted object. By using spectroscopic techniques, the clay has been described as a montmorillonite with a significant amount of CaCO<sub>3</sub> due to raw materials and manufacture- present slow hydration and carbonation processes, thus we will explore using grinding curves to identify the firing temperatures and shifts on in the Si bands. We anticipate that the features present in the thin sections arising from Si and CaCO<sub>3</sub> characterized for experimental and laboratory-controlled firings will provide information to determine the burning temperatures and the type of kiln used on the manufacture of archaeological objects.

Work supported by CONACYT-CF 2019, contract. 731762 and by CONACYT postdoctoral fellowship granted to S. Ortiz

**17:20-17:30 An analytical examination of pottery from the site of Sagalassos (SW Anatolia): From Hellenistic to Byzantine tablewares**

*Christiana Kelepeshi<sup>1</sup>, Dennis Braekmans<sup>2</sup>, Jeroen Poblome<sup>3</sup>, Patrick Degryse<sup>1</sup>*

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The ancient city of Sagalassos in southwest Anatolia is one of those sites in the eastern Mediterranean that offers the opportunity to examine ceramic production in the *longue durée*. During the later 1st c. BCE, Sagalassos became the main ceramic production center in the region with the production of a type of red-slipped tableware or sigillata, the so-called Sagalassos Red Slip Ware (SRSW). This ware was produced until at least the end of the 7th c. CE and the workshops associated with its production have been uncovered in the eastern parts of the ancient city (Eastern Suburbium). Ceramic production linked with Sagalassos as a settlement can be traced back to Late Achaemenid times, but the evidence regarding the location of the workshops in this particular period is still limited. Building on the previous archaeometric research on ceramics from Sagalassos, this project aims to reconstruct in particular tableware production organization and craft technology in the region of Sagalassos in the long-term.

This paper presents the first, preliminary results of the petrographic characterization of more than 100 samples from the site which date to different chronological phases. Through this research, we aim to demonstrate the importance of examining ceramic production in a diachronic perspective as a proxy to better understand the socio-cultural and -economical dynamics that are constantly changing over time at different rates.

**17:30-17:40 Amphorae as indicators of trade and diet in southern Pannonia**

*Anna Andrea Nagy<sup>1</sup>, György Szakmány<sup>2</sup>*

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In the Late Iron Age, the interfluvium of the Drava and Sava rivers was populated by Celtic and Pannonian tribes. Between the last third of the 1st century BC – first quarter of the 1st century AD, this territory was occupied and integrated into the Roman Empire as the southern part of a province which was later named Pannonia. With the arrival of the Roman military the trade of the wine-, olive oil-, fish sauce- and fruit-filled amphorae began.

The aim of this research was to analyze the ca. 900 amphorae that were imported from the Mediterranean using archaeological methods and to obtain the detailed petrographic description of ca. 290 fragments. Besides our observations, the geology of the source areas suggested by typology, previous archaeometric studies of the types and comparisons with reference collections of the British School at Athens, the Università degli Studi di Genova and the Università degli Studi di Padova were taken into consideration. Our goal was to suggest possible production sites, get a better knowledge of the commercial connections of the territory, exploit the historical aspects, and study the population's diet.

Goods from several parts of the Adriatic, the Eastern and Western Mediterranean, the Danube territory, Northern Africa and the Black Sea coast were imported to provision the Mediterranean military officials, veterans, settlers and the provincial elite. The Marcomannic Wars and the standardization of the military supply system set back the trade and by the 4th century AD the import was scarce and limited to Roman-controlled settlements.

**17:40-17:50 Looking for clays in the Aegean: an archaeometric study on raw materials from Naxos and east Crete (Greece)**

*Anna Tsoupra<sup>1</sup>, Pedro Barrulas<sup>1</sup>, Eleni Nodarou<sup>2</sup>, Patrícia Moita<sup>1,3</sup> & José Mirao<sup>1,3</sup>*

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Ceramic studies focusing on pottery production aim at investigating technological choices and human agency involved in the making of pottery and, thus, they provide a better understanding of production and consumption patterns. Within this framework, a geological survey on raw materials and the subsequent archaeometric analysis allow for a better understanding of ancient ceramic traditions.

Here, we present the preliminary results of a multi-analytical approach of raw materials collected from two study areas in the Aegean with strong ceramic traditions in ancient as well as in modern times: Naxos in the Cyclades and east Crete. Through intensive survey, geochemical and mineralogical analysis, and experimental archaeology we assess the properties of the clays in the study areas, we investigate inter- and intra-source regional variation and, finally, we discuss the results of our geoarchaeological approach comparatively with evidence from ancient ceramics.