2018 ANNUAL MEETING OF THE CERAMIC PETROLOGY GROUP (CPG)
Competence Center Archaeometry - Baden-Wuerttemberg
University of Tübingen, Germany
8th-9th November 2018

Book of Abstracts
Program of the 2018 ANNUAL MEETING OF THE CERAMIC PETROLOGY GROUP (CPG)
November 8th - 9th 2018 at the Competence Center Archaeometry - Baden-Wuerttemberg (CCA-BW),
University of Tübingen, Germany

Thursday (8th Nov)
17:00 - 18:00 Keynote
Patrick Quinn
University College London
Ceramic Compositional Analysis: The Scientific Interrogation of Ancient Pottery and
Interpretation of its Hidden Cultural Meaning

18:00 - 19:00 Wine Reception

Friday (9th Nov)
9:00 - 9:20 Welcome

9:20 - 10:00 Talk 1
Katalin Bajna
University of Szeged
Technological Change and Exchange between
peasant communities in the Upper Arács Basin

10:00 - 10:20 Talk 2
Dorka Györkös
Hungarian Academy of Sciences
Petrographic and X-Ray Diffraction studies on Late Roman Glazed Ceramics
found in kilns at Kőrnye (Hungary)

10:20 - 11:00 Coffee break

11:00 - 11:20 Talk 4
Sara Machin
University of Reading
Relief-patterned flue tiles: itinerant craftsmen or long-distance trade commodity?

11:20 - 12:00 Talk 5
Carlootta Gardiner
British School at Athens
Cross-craft interactions between the ceramics, metals, and glass industries of Roman
Britain, through the analysis of ceramic crucibles.

11:40 - 12:20 Talk 6
Maja Mite
University College London
Economy of Pre-Roman Adriatic Communities: amphora production and trade patterns in a changing world

12:00 - 12:20 Talk 7
Jose Mirao
University of Évora
Mineralogical and geochemical characterization of Iron Age ceramics from Garvão votive
site (Portugal)

12:20 - 13:20 Lunch break

13:20 - 14:00 Poster Presentation

14:00 - 14:20 Talk 8
Anastasia Dimoulas
Aristotle University of Thessaloniki
Prehistoric cooking fabrics: an exploration of their variability and uses

14:20 - 14:40 Talk 9
Maria De Falco
Durham University
Pottery for the living and the dead: Copper Age Campania through the ceramic record

14:40 - 15:00 Talk 10
Alessandra Cecarelli
Cambridge University
Networks of craftspeople and ceramic traditions in NW India: an ethnoarchaeological study of the Kumhars in Haryana and western Uttar Pradesh.

15:00 - 15:20 Talk 11
Nadia Cantin
Université Bordeaux Montaigne
Ceramic petrography and actualism: a contribution from Senegal

15:20 - 15:50 Coffee break

15:50 - 16:10 Talk 12
Julia Daub
Friedrich-Alexander-Universität
Looking at gold: clast transformation in the golden slip ware production (Šatov valley, north-western Pakistan)

16:10 - 16:30 Talk 13
Lara Marlan
University of Padova
Fast chemical analysis of ceramic raw materials by total-reflection X-ray fluorescence
spectroscopy (TXRF)

16:30 - 16:50 Talk 14
Ignacio Almagre
University of Lleida
As red as blood, as black as ebony: Throwing a glance on traces of pottery technology on Hallstatt Period pottery

16:50 - 17:30 Final discussion

19:30 - ... Dinner (not covered by conference fee) at the „Ratskeller“ in Tübingen Old Town center
(Haagsgasse 4, http://www.ratskeller-tuebingen.com)

Posters:
1. Emmie Beaumont (Université Bordeaux Montaigne): Contribution of LA-ICP-MS analysis to lead glaze investigation: two case-studies in medieval and modern archaeology
2. Sara Díaz Bonilla (Universitat Autònoma de Barcelona): Surface treatments in Neolithic pottery in northeastern of Iberian Peninsula: an experimental approach
3. Cléa Cervera (Université de Geneve): Study of ceramics from Djoutoubay: techno-stylistic and petrographic approaches combined
4. Lara Marlan (University of Padova): Northern Black Polished (NBP) Ware from Barikot (north-western Pakistan): an archaeometric analysis
5. Julia Menne & Christopher Heilman (University of Kiel): X-ray microtomography scans (μ-CT) of Neolithic ceramics – The reconstruction of the matrices in comparison with XRF spectroscopy, portable XRF spectroscopy and petrographic thin sections on diagnostic pottery finds
6. Maria De los Mercedes Martinez Milanetti (University of Évora): The Potential for Ceramic Petrology in the Early Ostrogothic Period (600-1200 AD) in Puerto Rico
7. Shapiro Anastasia (Israel Antiquities Authority): Non-Destructive Petrology of the Clay Seals from the Excavations of the Hellenistic Nysa-Scythopolis
8. Esther Travé (University of Barcelona): Pottery Production and Importation at the Medieval Town of Martorell (Barcelona, Spain). New data and methodological perspectives for a chronological review through the petrographic and morphometric analysis
Talks
Technological Change and Exchange between peasant communities in the Upper Arlanza Basin

E. Travé and K. Álvaro

GRAMP.UB Medieval and Postmedieval Research Group, University of Barcelona

The Upper Arlanza Basin (Burgos, Spain) is a 1200-metre-high mountain valley at the foot of the Iberian Mountain Range. Plenty of early medieval rock-cut cemeteries have been known for so long in the valley. Recent research revealed the existence of peasant communities living in relative isolation in this area with regard to central political powers in Roman, Visigoth or Muslim Spain between the 5th and 9th Centuries. The valley was not integrated within the feudal domain of the Alfoz de Lara until the 11th Century.

Late antique and early medieval sunken featured buildings have been discovered and the chronological sequence has been carefully registered during archaeological fieldwork in one of these villages at the site of Revenga (Comunero de Revenga, Burgos). The identification of different ceramic contexts allowed us to discover some types of simple, utilitarian, cooking and storage earthenware from 5-10th Centuries which were pretty unknown. Given the precarious state of preservation, the utilitarian character of these products and the existing lack of knowledge in this domain, the materials found introduce some interpretative problems.

We attempted to solve some of these problems throughout the petrographic characterization of these pottery sherds and the integration of macroscopic, microscopic, stylistic and contextual data. Provenance and technological issues were addressed and results revealed a complex panorama of technological change, raw material selection and interregional and cross-cultural exchange. This presentation introduces preliminary results, and offers some methodological suggestions with regard to sampling strategies in order to get a better insight of the communities that produced, exchanged and used this pottery.
Traditions and transitions of pottery production in 5-6th century Pannonia: preliminary archaeological and petrographic results of ceramic studies of Early Mediaeval Western Hungary

K. Bajnok¹,², G. Szakmány³

¹ Wigner Research Centre for Physics, Hungarian Academy of Sciences
² Institute of Archaeological Sciences, Eötvös Loránd University, Budapest
³ Department of Lithology and Geochemistry, Eötvös Loránd University, Budapest

After the disintegration of the Roman public administration in Pannonia province (now Western Hungary) during the 4th and early 5th centuries A.D., in the territory of the former Roman province the following centuries were dominated by the migration of many different eastern and Germanic tribes (i.e. Huns, Alans, Goths, Gepids, Langobards, Quads, Vandals etc.). While, according to historical sources, the administrative elite left the province during this period, based on the archaeological sources late antique elements were staying present after centuries on despite the intensive migration of tribes and people in this area. However, how this new structure of locals and settlers worked, how their traditions and material culture affected on each other, how they can be plotted in a wider European context, has been in the spotlight of archaeological research in the last two decades.

Our research focuses on the transformation of pottery production of this region. Ceramics of settlements and cemeteries were examined with combined archaeological and petrographic methods. Up to now no pottery workshops or kilns have been found in Pannonia from the 5-6th century, therefore in our work the analysis of the raw materials (clay, temper) used and technological examinations were carried out.

According to our results, in the first half/third quarter of the 5th century connections with more distant territories (Lower Austria, Moravia/Bohemia, even Italy) were found, which is probably the continuation of the previous trade connections of the provincial time. From the late 5th century however, these connections appear to descended, and local and regional production appears instead. One of the regional centres we found was around Sopron (Scarbantia). Our preliminary results show that even though the late roman trade system becomes less and less detectable and new, more regional centres show up, the late antique shapes (and perhaps technology as well) stay popular and widely used in the 6th century as well.
Petrographic and X-ray diffraction studies on late roman glazed ceramics found in kilns at Környe (Hungary)

D. Györkös¹, B. Bajnócki¹, G. Szakmány², M. Szabó¹, S. Petényi³ and M. Tóth¹

¹ Institute for Geological and Geochemical Research, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Budapest
² Department of Petrology and Geochemistry, Eötvös Loránd University, Budapest
³ Kuny Domokos Museum, Tata

Two late Roman pottery kilns, one of them containing several glazed vessel fragments, were found during archaeological excavations at Környe in 2008. Környe is situated 5 kms southwest from the city Tatabánya in Transdanubian part of Hungary, on the northern side of the former Pannonia provinces. The kilns made of stones are situated at right angle to each other in the economic area of a villa and used the same pit. The curiosity of the site is the presence of bungled glazed vessels and solidified melt of the kiln material in various size. Green and brown coloured glaze in different shades usually do not cover the whole surface of the vessels, only small glaze patches are present. In order to determine the production technology of the vessels first the ceramic body was investigated petrographically in thin sections by polarizing microscopy and mineralogically by X-ray powder diffraction. Based on the petrographic features (texture, type of mineral particles and rock fragments) the body of the ceramic findings can be classified into three main groups. The ceramic body of the largest group is reddish and has hiatal texture containing large, rounded calcareous, metamorphic (quartzite) and argillaceous rock fragments. Non-plastic inclusions up to 1200 µm are poorly sorted. Intentionally tempering is assumed. Due to the variable proportions of the different non-plastic components and the diversity of the matrix (various amount of micas) several subgroups are present. Second group contains fine-grained ceramics with serial texture. Besides mineral particles (mainly quartz, less than 150 µm in size) argillaceous rock fragments (<350 µm) appear in the matrix. A few grey coloured, fine-grained vessel fragments compose an independent group due to the lack of argillaceous rock fragments.
Relief-patterned flue tiles: itinerant craftsmen or long distance trade commodity?

S. Machin

Department of Archaeology, University of Reading

Traditional models of the production and distribution of ceramic building materials (CBM) typically conclude that it was a high bulk, low value commodity and therefore made close to the demand centre with very limited movement further afield. Lowther (1948) published a study of the distribution of relief-patterned flue-tile dies. He concluded that the apparent widespread distributions must mean they were made by specialist itinerant tilemakers moving between production centres, rather than the long-distance transportation of the tiles from tileries to towns. From a starting point of the CBM archive at Silchester Roman town, I have sought to test this hypothesis of the itinerant tilemaker. All examples of each of the represented die types in the Silchester collection (seven in total) have been sampled, along with all known examples of the same dies found at other sites across Britain. Geo-chemical and petrographic analysis of these samples have been compared, along with materials from known production centres. Were specialist tilemakers moving between tileries making roller-stamped flue-tiles or were relief-patterned flue-tiles subject to transportation over longer distances than expected?
Cross-craft interactions between the ceramics, metals, and glass industries of Roman Britain, through the analysis of ceramic crucibles

C. Gardner¹ and I. Freestone²

¹ The Fitch Laboratory, British School at Athens
² Institute of Archaeology, University College London

Ceramic objects and structures were integral to metalworking and glassworking processes in archaeological contexts. Through the analysis of these materials it is possible to explore the technological choices of the craftspeople using and making them. A detailed study of Roman period crucibles, which focused on this key theme, has revealed that at major settlements there was a clear tendency of metalworkers to use wheel-thrown vessels as crucibles. Furthermore, reviews of published literature have indicated this choice was also made for glass-melting crucibles at some sites across Roman Britain. This paper will present the results of this analytical study of Roman crucibles and discuss issues of dependency and cross-craft interactions. It will compare the forms, fabrics, and chemical composition of these wheel-thrown crucibles with products of Roman kiln sites to assess whether specialist crucibles were produced or if craftspeople re-purposed pottery vessels intended for the domestic market. In addition, it will consider the interaction and transfer of knowledge between the three industries/crafts.
Economy of Pre-Roman Adriatic Communities: amphora production and trade patterns in a changing world

M. Miše

Institute of Archaeology, University College London

The Marie-Curie funded research project Economy of Pre-Roman Adriatic Communities: amphora production and trade patterns in a changing world (EPRAC) studies the economy of the Adriatic region during the Pre-Roman period, via the distribution of amphorae and trade in wine and olive oil. It focuses on the under-studied period between the establishment of Greek settlements in the 4th c. BC until the consolidation of Roman power toward the end of the last millennium BC. The project seeks to detail the nature of trade and interaction between indigenous communities on both Adriatic coasts, as well as with the Aegean and nearby Italy. The objectives of the two-year project are to characterise amphorae production at two Greek workshops, Issa and Pharos, on the Dalmatian Islands, southern Croatia and to establish compositional reference groups. These will be compared to the composition of vessels from selected consumption sites and shipwrecks along the Eastern Adriatic coast in order to track amphorae circulation within the Pre-Roman Adriatic. This presentation will outline the EPRAC project, discuss some of the challenges it faces and anticipate its wider impact.
Mineralogical and geochemical characterization of Iron Age ceramics from Garvão votive site (Portugal)

L. Rosado¹, M.C. Lopes², A.E. Candeias³ and J. Mirão¹

¹ HERCULES Laboratory and Geosciences Department, Science and Technology School, University of Évora Évora
² University of Coimbra, CEAACP, Coimbra
³ HERCULES Laboratory and Chemistry Department, Science and Technology School, University of Évora Évora

The Garvão (Southwest Iberia) votive deposit is attributed to the second Iron Age period [1]. The recovered materials (especially ceramics) were intentionally deposited, carefully arranged in order to optimize the available space. Some complete pieces and some shards are from painted pottery, decorated with black, white and red-brown pigments.

Special emphasis will be given to the provenance of the pottery, the technological aspects and the relationship between populations and Garvão votive site. The study of geological raw materials applying and combining techniques of earth materials sciences and archaeological knowledge can provide a better understanding of the Garvão importance in this area of the Iberian Peninsula. A multi-analytical methodology was setup using optical microscopy (petrography), XRD, pXRF and SEM-EDS.

The petrography of the ceramics show the presence of plutonic (gabbro or diorite), volcanic and sedimentary rocks lithoclasts and monomineralic clasts of quartz, feldspar, pyroxene, amphibole and opaque minerals. Three different mineralogical associations was detected.

The XRD demonstrates that quartz is the more abundant mineral and feldspar is important on the coarse ceramic. The SEM-EDS confirm the presence of pyroxene and Ca-feldspar. The use of PXRF allows to distinguish between ceramics produce with and without potter wheel.

Prehistoric cooking fabrics: an exploration of their variability and uses

A. Dimoula¹, Z. Tsirtsoni² and S. M. Valamoti¹

¹ School of History and Archaeology, Aristotle University of Thessaloniki
² Archéologies et Sciences de l’Antiquité, CNRS

The ERC project PlantCult aims to identify the plant food cultures of ancient Europe through the interdisciplinary investigation of archaeological remains related to the collection, processing, production and consumption of food and drinks in the context of past societies, among which ceramic vessels. The methodology adapted for the study of prehistoric cooking pots in Southeastern Europe integrates large scale bibliographical research and the development of a database, along with study of contextualized archaeological material, on a macroscopical and analytical level.

In this meeting we will discuss the results of the petrographic analyses carried out so far in the context of the project’s cooking pottery study. More specifically, we will present the fabrics identified in cooking pottery assemblages from a series of prehistoric sites, Neolithic and Bronze Age, in northern Greece and Bulgaria. These assemblages were characterized as cooking on the basis of their context, the morphological characteristics of pots and use wear traces. We will discuss the technological characteristics of the fabrics, following the stages from raw material selection and processing up to firing, with emphasis to particular attributes related to the vessels’ use over fire, either requirements or effects. Finally, we will attempt to interpret cooking fabric variability with respect to human choices in exploring the environment, in manufacturing pots, but mostly in using them in different contexts and ways.
Pottery for the living and the dead:
Copper Age Campania through the ceramic record

M. De Falco

*Institute of Archaeology, Durham University*

The aim of this paper is to give a preliminary overview and outline the research framework of a petrography-based study of ceramic assemblages from Copper Age sites in Campania, Southern Italy. The study, which is the subject of ongoing PhD research at Durham University, aims to investigate technology, production processes, the presence of foreign goods and the local re-elaboration of exogenous influences. The project re-evaluates established typologies and, for the first time, aims to add a geochemical and petrographic dimension. This talk will detail the materials and methods planned for the research project and seeks to spark a broader discussion about emerging multi-disciplinary approaches to prehistoric ceramics in Europe. The work focuses on villages and burial grounds developing in Campania between the IV and III millennia BC. During this time, Southern Italy and the Campania region see the widespread transcultural circulation of goods, symbols and concepts. The pottery record for Copper Age Campania is used as one of the main indicators of intra-regional cultural variation and inter-regional mobility and connections. It shows a high level of local variability, but also provides clear indications of broader connections and circulation. However, the total lack of archaeometric analyses has led to an unfortunate gap in our knowledge of the provenance and production processes relating to this pottery, hindering our understanding of the development of this important early pottery tradition.
Networks of craftspeople and ceramic traditions in NW India: an ethnoarchaeological study of the Kumhars in Haryana and western Uttar Pradesh.

A. Ceccarelli¹, P. Quinn², R.N. Singh³ and C. A. Petrie¹

¹ Department of Archaeology, University of Cambridge
² Institute of Archaeology, University College London
³ Department of Archaeology, Banaras Hindu University

Archaeological interpretations often depend on inferential reasoning, and ethnoarchaeological research can be used as a valuable tool to build stronger discussions related to material culture patterning, especially concerning prehistoric social and technological theories. Ethnoarchaeological research can be applied to several aspects of ceramic production, such as the investigation of manufacturing techniques and technology, producers and craft specialisation, the role of producers within societies, castes or sub-castes, the nature of producer identity and religious affiliation, and the structure of regional and village-based ceramic production. This paper presents an ethnoarchaeological study of the Kumhars potter caste in modern Haryana and Uttar Pradesh, which was carried out as part of my PhD research into Indus Civilisation ceramic traditions.

After providing a brief overview of the methods adopted and the five families of Kumhars potters interviewed for this project, this paper will focus on the preliminary results of the ethnographic study, touching upon (1) tools and resilience of manufacturing techniques; (2) regional network of crafters; (3) vernacular knowledge of landscape and clay sources; and (4) the relevance of such observations on archaeological interpretations.
Ceramic petrography and actualism: a contribution from Senegal

N. Cantin¹ and A. Mayor²

¹ IRAMAT-CRP2A, UMR 5060 CNRS, Université Bordeaux Montaigne; Maison de l’archéologie
² Laboratoire Archéologie et peuplement de l’Afrique, Unité d’anthropologie de l’Université de Genève, pour l’archéologie et l’ethnoarchéologie

As a part of the international program “Human settlement and paleoenvironment in Africa” an ethnographic research has been undertaken since 2012 on pottery traditions in eastern Senegal. During fieldwork we sampled pottery products and corresponding raw materials for laboratory analyses. This paper presents our results pertaining to the region of eastern Senegal stretching from the Mauritanian, through the Malian, to the Guinean borders. Pottery traditions were investigated in 46 villages distributed over various environmental settings, but connected in various ways through shared elements of social history and common cultural identities. We selected 39 ceramic samples and 55 raw material samples (including clay sediments and tempers) for chemical and mineralogical examination using combined petrographic, XRD, SEM-EDS and XRF analyses. The aim of this paper is to provide a reflection of interpreting archaeometric results in relation to ancient ceramic technology. The discussion will be articulated around the following questions: which results can contribute to a better interpretation of archaeological sherds? Can we identify each step of the production process and within it, the materials, paste recipes and techniques employed? Is it possible to identify the part of choices made by potters following environmental or cultural constraints? What is the potential for application to regional archaeology and to which extent is the production of theoretical models possible?
As red as blood, as black as ebony: throwing a glance on traces of pottery technology on Hallstatt Period pottery

J. Daub

Department Alte Welt und Asiatische Kulturen, Friedrich-Alexander-Universität Erlangen-Nürnberg

The pottery of the late Hallstatt Period is approximately contemporary with the blackfigured vase-painting in Greece. The craftsmanship of the Hallstatt Culture, however, has been mostly considered inferior to the Mediterranean concerning the technical proficiency. This presentation outlines the techniques found on pottery samples from a Hallstatt D settlement Rottendorf-Rothof near Würzburg, Lower Franconia within the scope of my Master’s thesis. It does not show one single technique, but a whole range of techniques applied on different pottery vessels. Even though the state of preservation of ceramics in this settlement leaves much to be desired, some perceptions concerning the ceramic technique were even visible to the naked eye, some more using magnifying glasses or simple optical microscopes. The surface of some potsherds showed traces of the tools used in the process of making and finishing the ceramics. Moreover, some sherds showed a dark red coat, usually referred to in literature as red engobe or paint containing ochre. The examination of the ochre and the tools in the settlement however indicate that this red surface may not be a red engobe at all. Even one technique previously supposed not to be used by the Hallstatt Culture potters was discovered: Two sherds show the use of black reducing-fired slip on red or brown, oxidizing-fired clay ground. As a conclusion, Hallstatt pottery craftsmanship was a lot more advanced than previously thought and prehistoric pottery in general is definitively worth closer research.
Looking like gold: chlorite and talc transformation in the golden slip ware production (Swat valley, north-western Pakistan)

L. Maritan¹*, R. Piovesan², M. Ch. Dalconi¹, J. Rius³, A. Crespi³, O. Vallcorba⁴, L. Casas⁵, M. Vidale⁶ and L. M. Olivieri⁷

¹ Department of Geosciences, University of Padova
² Piovesan Consulting, Volpago del Montello
³ Institut de Ciència de Materials de Barcelona (ICMAB), Campus de la UAB
⁴ ALBA Synchrotron Light Facility, Barcelona
⁵ Departament de Geologia, Universitat Autònoma de Barcelona
⁶ Department of Cultural Heritage: Archaeology and History of Art, Cinema and Music, University of Padova
⁷ ISMEO Italian Archaeological Mission in Pakistan, Saidu Sharif (Swat)

The archaeometric study of the “golden slip” ware (second century BCE - forth century CE) at the site of Barikot (Swat, northern Pakistan) aimed to define its manufacturing technology and provenance of the raw materials used. For this reason, a multianalytical approach, consisting in the microscopic, microstructural and mineralogical analysis of both the golden slip and the ceramic paste, was adopted. The slip resulted to be composed by platy minerals, microchemically identified as talc and chlorite, their the intimate association of which clearly indicated clearly that they derived from a chlorite-talc schist. This rock is geologically available near the site in the “green stones” lenses within the Mingora ophiolites outcropping in the Swat valley. Due to the use of this stone also for the production of stone tools, it cannot be excluded that the chlorite-talc schist used for the golden slip probably can derived from manufacturing residues of the Gandharan sculptures. In order to constrain the firing production technology, laboratory replicas were produced using a locally-collected clay and coating themit with ground chlorite-talc schist. On the basis of the mineralogical association observed in both the slip and the ceramic paste and the thermodynamic stability of the pristine mineral phases, the golden slip pottery underwent firing under oxidising conditions and in the temperature interval between 800°C and 850°C. The golden and shining look of the slip was here interpreted as the result of the combined light reflectance of the platy structure of the talc-based coating and the uniform, bright red colour of the oxidized ceramic background.
Fast chemical analysis of ceramic raw materials by total-reflection X-ray fluorescence spectroscopy (TXRF)

I. Allegretta¹, B. Ciasca², V. M. T. Lattanzio² and R. Terzano¹

¹ Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti, Università degli studi di Bari Aldo Moro
² Consiglio Nazionale delle Ricerche, Istituto Scienze delle Produzioni Alimentari, ISPA-CNR, Bari

In order to understand the provenance and characteristics of ceramics, the chemical analysis of the clay material from which it was produced is extremely important. Nowadays, several analytical techniques are used to perform quantitative chemical analysis of clay. Among them, ICP-OES, ICP-MS, WDXRF and NAA are the most used. However, they are often time-consuming (either in the sample preparation or analysis) and require the use of chemicals and large sample amounts. In the last two decades, total-reflection X-ray fluorescence spectroscopy (TXRF) has proven to be a sensitive and fast technique for the elemental analysis of several types of matrices (both organic and inorganic), requiring only a low amount of sample (few mg) and a simple sample preparation.

In this work, a simple, fast and reliable method for the elemental analysis of clays using TXRF is proposed. Clays are analysed by TXRF as suspensions deposited on sample carriers (reflectors). The method has been optimized using a two level full factorial design, using selenium as internal standard, to obtain the best recovery rate for each focused element. In particular, the following factors have been evaluated: sample amount, surfactant volume and reflector type. The optimized method has been subjected to in-house validation to evaluate analytical performances such as linearity, quantification limits, trueness and precision. The validation study included the analysis of certified reference materials. Satisfactory performances were obtained for most of the major elements (Mg, Al, Si, K, Ca, Ti, Mn and Fe) and some minor elements (Cl, Ni, Zn, Ga, Rb, Sr and Pb).
Posters
Contribution of LA-ICP-MS analysis to lead glaze investigation: two case-studies in medieval and modern archaeology

E. Beauvoit¹, F. Liard¹, R. Chapoulie¹, B. Gratuze², A. Ben Amara¹

¹ IRAMAT-CRP2A, UMR 5060 CNRS, Université Bordeaux Montaigne, Maison de l’Archéologie, Domaine Universitaire
² IRAMAT-CEB, UMR 5060 CNRS, Université d’Orléans, 3D

Over the past fifteen years, electron backscatter diffraction (EBSD) coupled with energy dispersive X-ray spectrometry (EDS) have become routine analytical methods used on the scanning electron microscope (SEM) for exploring archaeological issues pertaining to glazing technology, to the use of pigments, and more broadly to decoration techniques of ancient ceramics. These approaches provide critical information on the microstructure and on the chemical composition of decorative materials. However, they have their limitations. They are not suitable for the detection of minor elements (<1%) nor for the detection of light chemical elements (Z<9) contained within the glazes. Therefore, for a thorough study of glazing technology, SEM-EDS analyses must be combined with other techniques. Laser ablation inductively coupled plasma – mass spectrometry (LA-ICP-MS) allows for an in-depth investigation of trace and light elemental composition of glazes. This poster illustrates two examples of a combined SEM-EDS and LA-ICP-MS analysis of archaeological lead-rich glazes. The first corpus consists of 150 samples of 12th- to 14th-century sgraffito tablewares from medieval Greece, for which SEM-EDS testings indicate the occurrence of tin- and antimonate-based pigments at the detection limit of SEM-EDS. The second corpus is composed of 80 samples of 19th-century white earthenwares from the Johnston-Vieillard manufactory in Bordeaux, France. SEM-EDS allowed us to determine that most glazes contain boron, but it did not enable us to quantify accurately concentrations in this light element (Z =5). The overarching aim of this research is to reconstruct raw material choices, glaze and recipes used for producing specific decorative styles; thereby offering further insights into craft traditions of the time. When combined with archaeological and historical investigation, such data is expected to further our understanding of how glazing technology was entangled into broader social and economic conditions shaping access to raw materials, learning between craftsmen, consumer tastes and demands.
Surface treatments in Neolithic pottery in northeastern of Iberian Peninsula: an experimental approach

S. Díaz Bonilla¹, X. Clop Garcia¹, E. Gassiot Ballbè¹ and I. C. Conte²

¹ Departamento de Prehistoria. Universidad Autonoma de Barcelona (UAB)
² Arqueología de las Dinámicas Sociales. Consejo Superior de Investigaciones Científicas (CSIC)
Institución Milá y Fontanals (IMF)

As evidenced by the archaeology and ethnography, the treatment of the internal and external surfaces are indispensable. However, the references about such treatments are usually very concise and descriptive, far from the attention given to other aspects of products, such as their shapes or decorations. The ceramic vessels are produced objects and, as such, they are the result of specific labor processes. Studying in detail the different aspects involved in the work process allows us to know aspects related to the specific forms of productive organization of the communities where pottery is produced. Treatments of the surfaces constitute an important phase of these production process. We’ll study their specificities (to define with precision the treatment carried out, the tools used, the investment of work, the precise moment in the fact that these treatments are carried out, etc.). Therefore, it constitutes invaluable information to know the labor processes carried out in each case.

The adequate knowledge of the different aspects related to the treatment of the surfaces needs, nevertheless, the development of extensive experimental programs. That will allow knowing the different elements and processes implied. The main objective is establishing solid frames of reference that allow us analyzing and understanding the archaeological evidences. In this work we offer the theoretical and methodological bases and the first results of a wide experimental program. That is being developed with the objective to study the surface treatments carried out in Neolithic ceramic products in the Northeast of the Iberian Peninsula.
Study of ceramics from Djoutoubaya: techno-stylistic and petrographic approaches combined

C. Cervera¹, N. Cantin² and A. Mayor¹

¹ Laboratoire Archéologie et peuplement de l’Afrique, Unité d’anthropologie de l’Université de Genève, pour l’archéologie et l’ethnoarchéologie
² IRAMAT-CRP2A, UMR 5060 CNRS, Université Bordeaux Montaigne; Maison de l’archéologie, Esplanade des Antilles

The protohistoric settlement of Djoutoubaya, located in the Falémé Valley (eastern Senegal), seems to be a major site of gold metallurgy in western Africa during a pivotal period between the Ghana and Mali empires. Between the 9th and 13th centuries AD, the site produced a large amount of ceramics with various decorations and pastes. Despite the fragmentary state of the material, we have developed a method combining both techno-stylistic and petrographic approaches. The first consisted of studying forms and decorations, and examining macro traces under stereomicroscope. The second approach was based on the examination and quantification of inclusions.

The aim was two-folds: a) to interpret the origin of the ceramics through an anthropological perspective, and b) to compare technical and compositional evolutions over time. The interpretation of the sherds as indigenous or exogenous ceramics benefited from our ethnoarchaeometric work on the resources currently used as raw materials for the manufacture of pottery in eastern Senegal.

Finally, we established strong “petro-techno-stylistic groups” that have enabled the identification of six “chaînes opératoires” using at least six different raw materials, including known regional clay sediments. Their synchronic and diachronic interpretation provide answers in terms of site economy (local or imported productions) and/or site occupation. The results provide a better understanding of the temporal dynamics of the site and offer a genuine guide in considering its function.
The Potential for Ceramic Petrology in the Early Ostionoid Period (600-1200 AD) in Puerto Rico

M. M. Martínez Milantchi¹, A. Tsoupra¹, L. A. Curet², P. Moita¹ and J. Mirão¹

¹ HERCULES Laboratory, Science and Technology School, University of Évora Évora
² National Museum of the American Indian, Smithsonian Institution. Washington, D.C.

Employing petrography and complementary geochemical methods, this study focuses on ceramics from Tibes and three other sites in south central Puerto Rico (PO-42, PO-43, and PO-48). The main goal was to gain insight on (1) raw material provenance, (2) interpretation of function, and (3) manufacturing technology in the early Ostionoid Caribbean (600-1200 AD), to further understand ceramic variability between sites and within sites. Mineralogical (Petrography, X-Ray Diffraction) and chemical (Energy Dispersive X-Ray Fluorescence, Inductively Coupled Plasma Mass Spectrometry, and Scanning Electron Microscopy) analysis were conducted on 50 samples, and the results were integrated within the archaeological context. Four different raw material sources, and consequently, four distinct paste recipes were discerned. The anthropological implications of intersite and intrasite ceramic variability in south central Puerto Rico, and its relationship to the concomitant rise of chiefdoms in the region are discussed.
Northern Black Polished (NBP) Ware from Barikot (north-western Pakistan): an archaeometric analysis

L. Maritan¹, L. Nodari², L. Olivieri³ and M. Vidale⁴

¹ Department of Geosciences, University of Padova
² Institute of Condensed Matter Chemistry and Technologies for Energy, Padova
³ ISMEO Italian Archaeological Mission in Pakistan (ACT Project)
⁴ Department of Cultural Heritage, Archaeology and History of Art, Cinema and Music, University of Padova

The northern black polished (NBP) ware is a luxury ceramic class dated to the late Iron Age or early historic period that spread simultaneously to the growth of large urban centres in the northern Indo-Pakistani subcontinent. It is characterised by a thick, uniform black slip that visually resembles those of the late classical times in the Mediterranean.

The archaeometric analysis of a set of ten potsherds of NBP ware, dated between the III-II century BCE and the I century CE, found at the site of Barikot (Swat Valley, north-western Pakistan), was addressed to define the provenance of this pottery and to constrain the production technology of both the ceramic body and the black slip in terms of raw materials used and firing conditions. For this reason, all the ceramic body were petrographically, chemically and mineralogically analysed by polarised light microscopy, X-ray fluorescence (XRF) and X-ray powder diffraction (XRPD), respectively, and the chemical data were statistically treated (principal component analysis and cluster analysis).

The chemical composition of this ceramic class resulted quite homogeneous, indicating the use of similar clay materials and preparation procedures, especially in terms of clay levigation. A low-calcium clay material, rich in both potassium and iron, was used. When samples are considered in diachronic terms, a progressive, although not drastic, change can be observed among them. Although the paste is quite fine, some medium and fine sand-sized inclusions indicates that the pottery was produced within the region and possibly in Barikot. As for its production technology, the mineralogical associations indicate that the firing temperature was in the thermal interval between 750°C and 950°C, and the presence of spinel and magnetite that the firing was in reducing conditions.

As for the slip, the microstructural analysis by scanning electron microscopy (SEM) indicates that it was obtained using a very fine-grained material, derived from the levigation of an iron-rich clay material. Moreover, the Moessbauer spectroscopy on the slip allowed to better constrain the production technology of this characteristic black polished coating.
X-ray microtomography scans (µ-CT) of neolithic ceramics: the reconstruction of the matrixes in comparison with XRF spectroscopy, portable XRF spectroscopy and petrographic thin sections on diagnostic pottery finds

J. Menne¹ and Ch. Heilmann²

¹ Graduate School "Human Development in Landscapes", Christian-Albrechts-Universität zu Kiel
² Institute of Geosciences - Experimental and Theoretical Petrology, Christian-Albrechts-Universität zu Kiel

The investigation of ceramics with regard to their material composition allows insights into the material composition, production techniques and manufacturing processes. In addition to conventional microscopic examination and petrographic thin sections, ceramic finds have also been examined by XRF spectroscopy analysis (XRF) and portable XRF spectroscopy (pXRF) for some time now. However, the link between these two methods is less common in order to obtain the necessary comparison of the two methods to verify the reliability of the results. In this study, the samples are additionally examined with 'X-ray microtomography (µ-CT). The aim is to determine the individual components of the temper and the associated porosity non-destructively. This approach provides the opportunity to verify and extend the proven methods and to find new areas of application.
Non-Destructive Petrology of the Clay Sealings from the Excavations of the Hellenistic Nysa-Scythopolis

A. Shapiro

Israel Antiquities Authority

The city of Bet She'an in the Hellenistic, Roman and Byzantine periods was known as Nysa-Scythopolis. The archaeological excavations by the Israel Antiquities Authority exposed fortifications, public and administrative buildings, and residential quarters with an orderly axial plan. The latter was divided to living units by a network of intersecting side streets. Each unit had a central courtyard and two wings of the two-story houses. The dwelling houses were all in a layer of destruction, and intense fire. Even though, excavating the collapse, it was possible to separate stratigraphically the finds from the second and the first floor. In one of these houses, within the level of the second floor, were unearthed two amphorae. In and around them, there were ninety six clay sealings of remarkably preserved iconography, which comprises mythological figures, portraits of people, animals, plants and apparently ritual objects. Because of the uniqueness of the artifacts and their very small size no petrographic thin sections could be made. Instead, non-destructive petrological examination was deemed appropriate. This entailed the examination of the fabrics under a binocular microscope at magnifications up to ×40. The petrological research enabled to divide the sealings into groups according to their lithology. Fifty-four of them were made of the local raw materials, from three clay sources. A second group of twenty three samples are made of the raw materials that can be found less than 100 km away from Nysa-Scythopolis. And the last nineteen sealings were brought from remote areas. Such a distribution may shed an additional light on a better understanding of the city's population and the possible official relations of its residents with distant partners, including those overseas.
Pottery Production and Importation at the Medieval Town of Martorell (Barcelona, Spain): new data and methodological perspectives for a chronological review through the petrographic and morphometric analysis

E. Travé¹ and J. Socorregut²

¹ GRAMP.UB Medieval and Postmedieval Research Group, University of Barcelona
² Sistemes de Gestió de Patrimoni SCCL, Rosario Navarro, Centre d’Estudis Martorellens

The archaeological site of Santa Margarida (Martorell, Barcelona) was uninterruptedly occupied from the 5th to the 20th Century. The most ancient evidence is an Early Christian church with tripartite apse and its extensive necropolis. During the period between the 6th to the 12th Centuries this site experienced a great transformation in accordance to the surrounding landscape articulation, the origin of the medieval village of Martorell and the refurbishment of the church, transformed into a Romanesque building.

This transformation widened the communication and exchange network of the site that turned into a sacred space or sacraria, wherein population searched for Church protection against feudal domain. The most striking evidence of this fact is the presence of a great amount of silos piercing most of the site’s surface within different medieval horizons. Once abandoned, these storage pits were filled with broken or wasted greyware pottery, animal bones and other refuse. Greyware potsherds of four selected silos from different chronological horizons were sampled according to their morphometric characterization and examined via optical microscopy.

Whilst some high quality boiling pots or ollas were imported from the neighbouring medieval kiln site of Cabrera d’Anoia, medieval Martorell developed a local production of greyware vessels. Despite the homogeneity of these vessels throughout the Catalanian landscape, a combined approach of morphometric analysis and petrographic characterization allowed us to determine several differences related to the chronological sequence of this site. Our study has been of great importance to identify the local production and to characterize a reference group, amongst which we found a particular vessel shape-related to distillery and used as a liquid receptacle from a probable alembic. These findings open new research perspectives about the daily activities at this site and the greyware pottery production and distribution in Medieval Catalonia.