

*Tracing pottery making recipes in the Balkans,
6th – 4th millennium BC*

*International Workshop
Belgrade, Serbia, 19-20 September 2014*



Location:

Serbian Academy of Sciences and Arts, Belgrade
Rectorate of the University of Belgrade

Organisers

Silvia Amicone
Dr Miljana Radivojević
Miroslav Maric
Dr Patrick Quinn
Professor Thilo Rehren



Workshop Concept

The Neolithisation of southeast Europe is one of the most dynamic periods in European prehistory, including, amongst many other features rapid developments in pyrotechnologies, particularly pottery and metal making. These developments, roughly placed between c. 6500 – 4000 BC, blend into the Chalcolithic period and are characterised by very high standards of pottery firing and decoration techniques. Pottery assemblages are abundantly preserved and lay the foundation for our understanding of the cultural developments at the time. To date, pottery studies in the Balkans are mostly dominated by extensive typological classifications, which are used as the main evidence for differentiation among various co-existing cultures in this area from the 7th to the 5th millennium BC. Although broad regional pottery typologies charts shaped our initial understanding of cultural manifestations and developments, a more nuanced approach to the knowledge and skills behind pottery making is now needed to provide a deeper understanding of both technology and its place within broader social and environmental spheres at the time.

This international workshop aims to gather archaeologists and scientists working in the field of pottery technology studies from the Balkans, and beyond, in order to exchange ideas, investigate the current state of art in the field and establish an interdisciplinary network of scholars with an active interest in this topic. In recent years there has been an increasing number of attempts to shed new light on early pottery production in the Balkans by applying interdisciplinary methods and investigating technological choices and recipes in the production process. Accordingly, the number of researchers exploring the potential of archaeometric studies of pottery technology in the Neolithic and Chalcolithic Balkans has significantly increased. Facilitating their communication is now a priority for the future of pottery research in the area. The emphasis of this international event is on gathering emerging scholars (PhD students and junior researchers) with a selected number of senior colleagues, and provide a much-needed opportunity to exchange ideas and discuss prospects of future cooperation. One of the main workshop outcomes would be the first ever publication on the studies of pottery technology in the Balkans. Therefore, the main goals of this gathering are:

1. Sharing results of current research on the development of pottery technological traditions in the Balkans from c. 6500-4000 BC.
2. Discussing advances in methodological approach.
3. Investigating the potential for future interdisciplinary research on the Balkan Neolithic and Chalcolithic pottery.

Workshop participants will be encouraged to consider the relevance of their research to these archaeological questions and wider goals. These will be assimilated to provide an overview of Balkan pottery technology as a key outcome of the meeting.

The workshop has been organised by Silvia Amicone, Miljana Radivojević, Miroslav Marić, Thilo Rehren and Patrick Quinn, as collaborative activity between the UCL Institute of Archaeology and the Institute for Balkan Studies (Serbian Academy of Arts and Sciences). This workshop would have not been possible without the generous contribution of the Institute of Archaeometallurgical Studies (IAMS) which supporting this event aims to promote the understanding of the socio-technological development at the time of the rise of metallurgy in this part of the world.

Programme

First day **19th September**

Venue: Academy of Science and Art (Knez Mihailova 35, Belgrade, room 3)

9.00-9.20 *Opening*

9.00-9.10 **Dr Dušan T. Bataković** (Institute of Balkan Studies)

9.10-9.20 **Amicone S.** *Why tracing pottery making recipes?*

Session 1: Methodology: reconstructing pottery technology and function.

1. Methods for macroscopic assessment.

9.20-10.40

Chair: Prof Nenad Tasić

9.20-9.40 **Vuković J.** *Technology and function: usage aspects of the Neolithic pottery of the central Balkans.*

9.40-10.00 **Manem S.** *Model the evolution of ceramics traditions and apprenticeship networks: a method based on a phylogenetic approach and the chaîne opératoire analysis.*

10.00-10.20 **Ganecovski G.** *Experimental pottery production based on early Neolithic technologies.*

10.20-10.40 **Djordjevic B.** *Making, using and breaking bread-baking pans: ethnoarchaeological research in Serbia.*

10.40-11.00 Coffee break

2. Archaeometry and technology reconstruction.

11.00-12.20

Chair: Dr Michela Spataro

11.00-11.20 **Patrick S. Q.** *Scientific approaches to the reconstruction of ancient ceramic technology: a critical review.*

11.20-11.40 **Gajić-Kvašček M. and Jančić-Heinemann R.** *Non-destructive characterisation and sourcing the origin of archaeological ceramic findings from Pločnik, Vinča and Bubanj Sites.*

11.40-12.00 **Miloglav I.** *What can pottery tell us? Connecting the past through ceramic sherds.*

12.00-12.20 **De Groot B.** *Ceramic assemblages of the Neolithic Balkans: the dynamics between stylistic and technological changes.*

12.20-14.00 Lunch break

Session 2: Pottery technology in early and middle Neolithic.

14.00-15.20 *Chair: Professor Petya Georgevia*

14.00-14.20 **Salanova L.** *The first potters from Bulgaria (6200-6000 cal. BC): interpreting diversity.*

14.20-14.40 **Spataro M.** *Tradition and change in pottery technology: the early and middle Neolithic in Dalmatia and in the central Balkans.*

14.40-15.00 **Perić O.** *Knowledge and skill in pottery painting: Middle Neolithic painted pottery from the site Starčevo-Grad, Serbia.*

15.00-15.20 **Suvandzhiev I.** *Colours and firing technologies of the black-topped pottery from southwestern Bulgaria.*

15.20-15.40 Coffee break

Session 3: Pottery technology from early to late Neolithic.

14.00-15.20 *Chair: Dr. Jasna Vuković*

15.40-16.00 **Saridaki N., Kotsakis K., Urem-Kotsou D., Papadakou T., Papaioannou A.** *Production practices during the Neolithic in Pieria (Northern Greece),*

16.00-16.20 **Kreiter A.** *Ceramic technological traditions from the early to the late Neolithic in Hungary: problems and prospects.*

16.20-16.40 **Mirković-Marić N. and Amicone S.** *Technological variances between Tisza and Vinča pottery in Serbian Banat.*

16.40-17.00 **Szакmány G., Vanicsek K., Bendő Z., Kreiter A., Pető A., Horváth F.** *Results of petrological analysis of late Neolithic ceramics from Gorzsa tell (SE-Hungary).*

20.00 **Dinner at the restaurant Dva jelena (Skadarska 32, Belgrade)**

Second day 20th September

Venue: University of Belgrade, Rectorate (Kapetan Mišina Building Studentski Trg 1a, Belgrade, room 16)

10.30-11.50 *Session 4: Pottery technology from early to late Neolithic to Chalcolithic.*
Chair: Dr Patrick Quinn

10.30-10.50 **Amicone S., Quinn P., Radivojević M., Rehren Th.** *Pottery technology at the dawn of the Metal Age: a look from Belovode and Pločnik.*

10.50-11.10 **Radivojević M. and Amicone S.** *On pottery in early metal production: a case study from Belovode, a Vinča culture site in eastern Serbia.*

11.10-11.30 **Cristian S.** *Some aspects concerning pottery making at Radovanu-La Muscalu, Romania (first half of the 5th millennium BC).*

11.30-11.50 **Georgevia P.** *On the organization of ceramic production within the cultures Kodzhadermen-Gumelnita-Karanovo VI, Varna and Krivodol-Salkutsa- Bubanj Hum Ia.*

11.50-12.10 Coffee break

12.10-12.30 **Danov V.** *The pottery from Gradeshnitsa (Bulgaria).*

12.30-12.50 **Popova M.** *Graphite painted pottery of the Kodjadermen-Gumelnita-Karanovo VI culture.*

12.50-14.00 Lunch break

14.00-16.00 Round table and concluding remarks

Book of abstracts

Pottery technology at the Dawn of the Metal Age: a look from Belovode and Pločnik

Silvia Amicone¹, Quinn Patrick¹, Radivojević Miljana¹, Rehren Thilo²

¹University College London, United Kingdom.

²UCL Qatar, Hamad bin Khalifa University, Doha, Qatar.

The Serbian Neolithic/Chalcolithic sites of Pločnik and Belovode have recently yielded some of the earliest known copper artefacts in Eurasia, dated at c. 5000 BC, significantly increasing our understanding of the rise of metallurgy in this part of the world. This study focuses on the development of pottery production technology leading up to and following the emergence of copper metallurgy at this important site (c. 5400 – 4600 BC).

The study covers the full spectrum of the Vinča culture pottery from the sites of Pločnik and Belovode using thin section petrography, XRF, XRPD and SEM in order to characterise the raw materials and processes employed in ceramic production at these sites. Particular emphasis is placed on pyrotechnology behind Black Burnished Graphite Painted Ware, which may have been a precursor to metal smelting pyrotechnology. Our initial XRPD results allow for the revision of the previous analysis conducted on the firing temperatures of this particular ware. Moreover, the thin section analyses results allow us to discuss the possibility for pottery trade and exchange, on a regional and interregional scale, based on a systematic geological prospection of the clay sources available.

Our research makes a significant contribution to the study of late Neolithic and early Chalcolithic communities in the Balkans at a time of the major technological change. It also highlights the plethora of choices that were applied when producing some of the most exceptional examples of the 5th-millennium BC pottery in this part of Eurasia, demonstrating the remarkable craftsmanship, as well as the market demands, of the time.

The Pottery from Gradeshnitsa

Veselin Danov, *Sofia University, Bulgaria*

Ceramics is an important chronological and cultural indicator for late prehistory, which makes it an extremely important subject of study.

This paper presents the ceramics from Gradeshnitsa, site eponymous for the culture that spread throughout the territory of modern northwestern Bulgaria during the first half of the fifth millennium BC. Special attention is paid to the vessels' shaping technology and decoration. The results achieved from the investigation of the ceramics from Gradeshnitsa and other adjacent sites provide a way of locating the margins of, and the contact areas between, the Vinča and Gradeshnitsa cultures.

**Ceramic assemblages of the Neolithic Balkans:
The dynamics between stylistic and technological changes**

Beatrijs De Groot, *University College London, United Kingdom*

This paper will discuss some of the results of an interregional comparison of Neolithic ceramic assemblages in Anatolia and the southeastern Balkans. The method proposed uses spatial statistics in order to delineate similarities and differences between ceramic technology and style. The resulting patterns can be used to understand the relationships between ceramic traditions of the earliest farming sites in this area. In order to understand ceramic production in this context, I will focus on northeastern Bulgaria.

The results from the petrographic analysis of thin-sections of Early Neolithic ceramics from Dzhulyunitsa-Smardesh will be compared with the emerging body of work relating to Early Neolithic ceramic production in the Balkans. The dynamics between the spread of ceramic technology and morphological and stylistic aspects of Neolithic ceramic assemblages will be used to understand the underlying social processes that coincided with the spread of the Neolithic way of life.

**Making, using and breaking bread-baking pans:
ethnoarchaeological research in Serbia**

Biljana Djordjević, *National Museum in Belgrade, Serbia*

Bread-baking pans are ceramic vessels identified in archaeological contexts, particularly settlements, from the Late Neolithic period down to the present. The technological aspects and making techniques, as well as the use, breaking and reuse of Neolithic bread-baking pans are still under investigation. Some possible answers could be obtained through the ethnoarchaeological research conducted in Stara Planina Mt (Serbia) over the past few years.

Non-Destructive characterisation, and sourcing the origin of archaeological ceramic findings from Pločnik, Vinča and Bubanj Sites

Maja Gajić-Kvašček¹ and Radmila Jančić-Heinemann¹

¹University of Belgrade, Serbia

The objective of this research was guided by the fact that systematic analytical examination of archaeological ceramics from the Vinča culture is very obscure. Archaeological ceramic findings excavated at three Neolithic sites – Vinča-Belo Brdo near Belgrade, Pločnik near Prokuplje, and Bubanj near Niš – were examined by portable Energy Dispersive X-ray Fluorescence spectrometry (pEDXRF), which is the most commonly used analytical technique in modern provenience studies. Seventy-five pottery sherds, organised in three sample assemblages according to their well-known provenance based on archaeological evidence, were analysed.

Another issue was whether pattern recognition methods could be applied to the data obtained by EDXRF analysis. A fully developed decision-making procedure has been employed to classify unknown ceramic findings based on their elemental compositions derived by pEDXRF spectrometry.

The results show that information gained by pEDXRF can be used in provenience studies and for the classification of unknown pieces.

Experimental pottery production based on early Neolithic Technologies

Georgi Ganetsovski, *Sofia University, Bulgaria*

These proceedings are solely based on the unearthed ceramic material found during the excavations of the Early Neolithic settlement of Ohoden-Valoga (Vratsa municipality, north-western Bulgaria). The relative chronology and absolute C14 dating unquestionably point towards a date for the establishment of the settlement at the end of the 7th and beginning of the 6th millennium BC; it developed in two stages with somewhat of a hiatus between the two. The first building horizon belongs to the so-called Monochrome Neolithic; this material is characteristic of the earliest appearance of agrarian societies in Bulgaria.

The latest archaeological findings in Western Serbia have unearthed prehistoric settlements of agriculturalists, members of a local Late Mesolithic population. Various finds, connected to daily and agricultural activities, found at the Early Neolithic site at Ohoden, have significant similarities with objects from Western Serbia (Divostin, Padina, Lepenski Vir, Hajdushka Vodenica, Drenovac, Mezdurech, Vlasac).

Experimental archaeology in itself requires trial and error strategies, based on accumulated scientific information. These trials could affirm, denounce or further inform the knowledge of ancient, prehistoric technologies. What is required are tangible scientific claims, conclusions and results, which should be easily comparable with concrete site data.

Our experimental demonstrations of Early Neolithic ceramic production and the utilization of fire energy have been conducted since 2005. What we have consistently used is clay material with organic tempering. The vessels are modelled with the so-called “rope technique” or in moulds. For the firing of the vessels we have used earthen pits, laid with clay stakes or completely covered pits, for which an anoxic firing environment and a black colour for the ceramics are ensured. The results of these experiments provide valuable information about Early Neolithic ceramic firing technologies.

On the organization of ceramic production within the cultures Kodzhadermen-Gumelnita-Karanovo VI, Varna and Krivodol-Salkutsa- Bubanj Hum Ia

Petya Georgieva, *Sofia University, Bulgaria*

It was during the 5th millennium BC, the time of the Copper Age (the Eneolithic), that the inhabitants of the Balkans discovered and developed copper mining and metallurgy for the first time. The production of copper objects, unlike all other types of production until then, required specialization. Metallurgy was the first true craft. The mastering of the technologies required for producing copper objects led to an interest in gold. The first gold treasures appeared. In necropoleis we find rich and poor graves. The size and organization of the settlements and buildings point to an egalitarian society, which does not match the view of the social structure that we have from the necropoleis and the few researched production centres — a society with a complex social structure and stratification of property, similar in characteristics to the early states. One of the main issues discussed with regard to this "pre-civilization" is whether or not changes in manufacturing organization appear within the whole economy, or affect only the production of rare "prestigious" materials.

Considered in this paper are new elements in the organization of ceramic production from the end of the 5th millennium, which testify to the transformation of pottery into craft: data on the standardization of the shape and size of vessels, and data on ceramic workshops with reusable kilns.

Ceramic technological traditions from the Early to the Late Neolithic in Hungary: problems and prospects

Attila Kreiter, Hungarian National Museum, Budapest

This study compares the ceramic technological traditions from the Early to the Late Neolithic in Hungary, and assesses continuity and change in the technological practices of the different phases of the Neolithic. Early Neolithic is characterised by very similar technological traditions. Minimal technological variability is observed: potters used a limited number of raw materials, and tempered these with organic material. Middle Neolithic shows more variability in ceramic technological practices, namely, the use of a wider range of raw materials and tempers. Organic tempering is still ubiquitous, but seems to decrease towards the end of this period. Late Neolithic also shows changes in ceramic technology: grog tempering appears as a new technological practice, and the use of organic temper decreases further, before apparently disappearing by the end of the period. Even though the ceramic technological traditions of each Neolithic period can be generally described, relationships between cultural groups and the possible ways they affected each other in terms of ceramic technological traditions are little understood. This study brings attention to this specific aspect.

Modelling the evolution of ceramic traditions and apprenticeship networks: a method based on a phylogenetic approach and the chaîne opératoire analysis

Sébastien Manem, *University College London, United Kingdom*

This presentation describes a method of modelling the evolution of ceramic traditions based on the phylogenetic approach and the chaîne opératoire of shaping and finishing in the European Bronze Age context (France and the United Kingdom). The results reveal a complex and heterogeneous development depending on the nature of the operating sequences. Different technical behaviours are more resistant to change than others. Moreover, the evolution of technical behaviours requiring motor habits, such as shaping, will stabilize fairly quickly, unlike the finishing operations, which will continue to evolve throughout the Bronze Age. In general, the horizontal transfers remain rare and operate according to a phenomenon of ricochet from one apprenticeship network to another. The evolution of the apprenticeship network of the Middle Bronze Age is largely based on a process of phylogenesis anchored in the Early Bronze Age, inducing a common origin between the English and French technical traditions. This method has been developed and tested on a Bronze Age context, but the goal of this Marie Curie project is to develop a method that can be applied to a diversity of archaeological contexts.

What can pottery tell us? Connecting the past through ceramic sherds

Ina Miloglav, *University of Zagreb, Croatia*

Ceramic vessels, like all products that are part of human activity, reveal a social context of man in the past – his behaviour and activities, as well as the social, economic and political conditioning of those activities. Pottery from two Vučedol sites from the Copper age in eastern Croatia was studied according to a methodological framework that aims to interpret the entire lifecycle of a ceramic vessel as much as possible: from the choice of material, through the shaping and treatment of the surface, to the vessel's use and its final discarding in the archaeological environment. Finally, ceramic material is placed in the context in which it was produced, distributed and consumed.

This study calls for a multidisciplinary approach. Hence, the methodology includes: 1) the classification and sorting of ceramic material, which results in the creation of a typology of ceramic assemblages for both sites; 2) descriptive statistics, produced using *SPSS*; 3) standardization testing, undertaken using the coefficient of variation; 4) a technological study, substantiated by mineralogical-petrographic analysis and by the X-Ray Diffraction method; 5) the functional component of the ceramic vessels, supplemented with chemical analysis of organic residues in the vessel walls by Gas Chromatography-Mass Spectrometry; 6) the absolute dating of both sites with ¹⁴C analysis.

Technological variances between Tisza and Vinča pottery in the Serbian Banat

Neda Mirković-Marić¹, Silvia Amicone².

¹Terra Arhe, Belgrade

²University College London, United Kingdom

The expansion of Tisza communities from the core areas in the middle portion of the Tisza stream begins in the period of the fully formed Vinča settlements in the northern Banat.

On the basis of the material culture of the Tisza communities at the sites in the Serbian Banat we can argue for the existence of different types of relationship between the Tisza communities and their neighbors. Trade connections are evidenced by individual finds of Tisza pottery at some Vinča sites. At several sites there is contemporaneous occurrence of material culture of both communities in an equal amount, which might indicate their coexistence in the southern periphery areas of the Tisza communities. Also, there are finds of hybrid vessels made according to Tisza traditions, but decorated using typical Vinča motifs.

In order to shed light on inter-societal connections, technological variances between Tisza and Vinča pottery in the region of northern Serbian Banat are studied with different methods. These comprise both macroscopic and microscopic techniques for assessing pottery's technological attributes. Mineralogical characterisation has been obtained through thin section petrography. The results revealed different technological choices taken by these Neolithic communities. These point to the employment of different distinctive recipes in the manufacture of Vinča and Tisza pottery, a phenomenon whose social dimension is worth exploring.

Unraveling the links: pottery technology and exchange networks in Neolithic Thessaly

Areti Pentedeka, Aristotle University of Thessaloniki, Greece

Thessaly stands as a landmark for our knowledge of the Neolithic period in the Aegean. The history of research in this area is exceptionally rich, starting at the beginning of the previous century; nevertheless, our understanding of pottery exchange – its extent, intensity and form – is still limited. Previous archaeometric research on Neolithic decorated pottery from Thessaly verified the circulation of particular wares by analysing chemically a large number of surface pottery finds. Present research re-examines pottery exchange during the Neolithic by perceiving pottery as the multifaceted expression of human practice, materiality being developed in the three interrelated dimensions of production, exchange and consumption. Towards this end, petrographic analysis of ca. 600 pottery samples of both undecorated and decorated wares was carried out. The samples date to the Middle and Late Neolithic (6th and 5th millennia BC), and derive mostly from stratified excavation assemblages.

The integrated approach, adopted with the combination of old and new analytical data, distinguished the existence of several pottery exchange networks, most of them being ware-specific and presenting different scattering. Exchange intensifies during the Late Neolithic, as the parallel activity of different exchange networks attests. These networks are characterised by different scattering and variable degrees and forms of participation for each settlement, resulting in different patterns of settlement involvement. This outcome has significant connotations for the unravelling of the complex relations and exchange networks that developed between settlements in Thessaly, with some playing noticeably different roles.

**Knowledge and skill in pottery painting:
Middle Neolithic painted pottery from the site of Starčevo-Grad, Serbia**

Olga Perić, Institute of Archaeology, Belgrade, Serbia

Studies of Early and Middle Neolithic painted pottery from the Central Balkans (Starčevo culture, 6200 – 5400 BC) have mostly focused on developing chronological sequences of archaeological cultures in the area. Paint color and motifs were the primary tools used for creating these sequences, which is why other aspects of painted pottery have been neglected. So far, little is known about how it was produced and about what contributed to what has been viewed as a uniform style. Since style is a result of learned practice, in this talk I will present different approaches to the phenomenon of painted pottery, which move the focus of research onto the specific knowledge, skills and practices that underlie style. Several aspects of painted pottery will be discussed: the planning and visualisation of ornamentation, the preparation and use of paint, and painting as a motor skill required for the creation of a desired effect. Methodological issues and the influence of post-depositional effects will be considered. The approach will be presented through the case study of Starčevo Grad.

Graphite painted pottery of the Kodjadermen-Gumelnita-Karanovo VI culture

*(Results from a study of the ceramics from tell settlements
in northeast Bulgaria, Thrace and Romania)*

Margarita Popova, *Sofia University, Bulgaria*

This paper presents the main characteristics of the graphite painted pottery of the Kodjadermen-Gumelnita-Karanovo VI culture. Eneolithic graphite painted decoration impresses researchers and attracts their attention because of its aesthetic qualities. It is a phenomenon that defines the specific character of the pottery assemblages of the Eneolithic cultures in the territory of southeastern Europe. Graphite painted pottery belongs to the group of fine or tableware – the most luxurious pottery of the fifth millennium – whose ornamentation reflects the aesthetic norms and the ideology of the Eneolithic people. Apart from being an art tool, graphite painted decoration was an element of the material culture that changed comparatively quickly. Based on this, assumptions about periodization, relative chronology, and local cultural differences and similarities can be made.

Scientific approaches to the reconstruction of ancient ceramic technology: a critical review

Patrick Quinn, *University College London, United Kingdom*

This presentation will summarise and critically review the application of scientific techniques to the reconstruction of ancient ceramic technology. It will detail how techniques from physics, chemistry and the earth sciences can be used alongside traditional macroscopic approaches to decipher the various steps involved in the production of pottery and other ceramic artefacts, from raw material choice, processing and paste preparation, to vessel forming, decoration and firing. It will compare and contrast the most commonly-used mineralogical, geochemical and microstructural techniques of analysis and demonstrate how these can be alongside ethnography and experimental archaeology to delve into ancient traditions of pottery making. The presentation will draw upon a diverse range of case studies from ceramics research at the Institute of Archaeology, University College London.

On pottery in early metal production: a case study from Belovode, a Vinča culture site in eastern Serbia

Miljana Radivojević¹ and Silvia Amicone¹

¹University College London, United Kingdom

Studies of technical ceramics in metallurgy remain a topic of continuous interest as well as one of the fundamental blocks in building regional and global narratives on the evolution of metallurgy worldwide. The traditional emphasis in studies of technical ceramics has been set on analysing metallurgical debris attached to the walls of various clay-based objects, usually coming from historical periods. However, only a few studies concentrate on analysing choices for making the most suitable ceramic containers for metallurgical activities.

Here we present the results of a comparative study of domestic pottery and pottery used in the earliest documented copper smelting in the world, from the site of Belovode. We use petrographic and compositional analysis to characterise the raw materials and the processes employed in pottery manufacturing in order to distinguish similarities and differences in the technological choices used to produce everyday pottery and technical pottery. We also show analysis of ceramics used in experimental reconstruction of copper smelting to support our claims. Our aim is to contribute to the debate on the development of technical pottery during the early stage of the evolution of metallurgy.

The first potters from Bulgaria (6200-6000 cal. BC): interpreting diversity

Laure Salanova, *CNRS, Nanterre, France*

Pottery has often been used in the debate on the Neolithisation of Europe, mainly for dating settlement sequences, and for proving contacts between regions and the involvement of local populations during the Neolithic emergence. Few studies have focused exclusively on pottery production, as a way of understanding the meaning of the diversity that has been underlined in many cases since the onset of the emergence of pottery.

The study developed at Kovačevo (southwest Bulgaria) aims to create an analytical method that takes into account all the aspects of the pottery assemblage, in order to understand the typological diversity. The good level of preservation of the assemblage from Kovačevo, its size (23 tonnes) and the context of its discovery in the best sequence currently known for the Early Neolithic of this area have made it possible to question the diversity of shapes, styles and techniques according to social, cultural and functional purposes.

This contribution will focus on the earliest pottery production from the site, and will propose some interpretations of the different categories, each of which refer to separate phenomena. Some are more important to a discussion of the identities of the inhabitants and the conditions of t this study brings attention to that the he Neolithic spread in southwest Bulgaria.

Production practices during the Neolithic in Pieria (Northern Greece)

Niki Saridaki¹, Kostas Kotsakis¹, Dushanka-Christina Urem-Kotsou²,
Papadakou T.¹, Papaioannou A.¹

¹Aristotle University of Thessaloniki, Greece

²Democritus University of Thrace, Greece,

The presentation will focus on aspects of pottery technology and production based on pottery collected from four Neolithic settlements in Pieria, Northern Greece. Pottery assemblages from Paliambela-Kolindrou (EN), Revenia Korinou (EN-MN), Ritini (LEN-MN) and Makrigialos Pierias (LN) were included in our study. The material under investigation covers the whole Neolithic Period, from the earliest phase to the latest ones. Thus, a diachronic approach, comparing the characteristics of pottery production between different phases, was combined with a synchronic approach, comparing different sites during the same period.

The basic methodological toolkit for the study was macroscopic examination of pottery sherds, as well as thin-section analysis through the use of a polarizing microscope, to which a selected group of sherds was subjected. Additionally, refiring tests on the same group of sherds and analysis of experimental clay sediment samples from the wider area of Pieria were used to support the hypotheses.

The outcome of this research showed diversity in pottery recipes, which reflects a variety of activities associated with the making of pottery at each site. Evidence also suggests that exchange networks were already functioning in the area in the early phases of the period.

Tradition and change in pottery technology: the early and middle Neolithic in Dalmatia and in the central Balkans

Michela Spataro, *British Museum, United Kingdom*

In this paper I would like to present an overview stemming from the scientific study of almost 1,000 potsherds from the Adriatic region and the central Balkans, highlighting the technological differences and the different trajectories followed by pottery production in the two regions.

In Dalmatia and in the central Balkans, some middle Neolithic settlements overlie early Neolithic sites, but, from a typological point of view, the artefacts and the domestic structures are very different between the two phases. The pottery, in particular, has different shapes and surface treatments, usually considered more advanced and refined. Nevertheless, the same recipe and firing technology was used to manufacture ceramics along the Dalmatian coastline throughout the 6th and 5th millennia cal BC, despite the introduction of different shapes and surface treatments throughout the Impressed Ware, Danilo and Hvar cultures. In the central Balkans, by contrast, the early and middle Neolithic Starčevo and Vinča cultures seem to share very few technological aspects. The long-term organic-temper tradition seems to have been almost completely abandoned, and multiple new pottery technologies appear almost simultaneously at different sites.

**Some aspects concerning pottery making at Radovanu-La Muscalu,
Romania (first half of the 5th millennium BC)**

Cristian Eduard Ștefan, *Institute of Archaeology of the Romanian Academy, Romania*

The chalcolithic settlement of Radovanu-*La Muscalu* (Romania) was investigated by Eugen Comșa over a period of 30 years, between 1960 and 1990. Unfortunately, most of his work remains unpublished to this day. The aim of this presentation is to underline a few aspects concerning *le chaîne opératoire* of pottery making at Radovanu, such as sources of clay, firing processes and ornamentation. Several radiocarbon dates from this settlement belong to the Spanțov phase of the Boian culture, and thus put this habitation in the first half of the 5th millennium BC.

Colours and firing technologies of the black-topped pottery from southwestern Bulgaria

Ivan Suvandzhiev, *University of Veliko Turnovo, Bulgaria*

The black-topped pottery forms part of the ceramic/pottery assemblage in the Central Balkans between 5400–5000/4900 BC. Its main characteristic is the presence of two different colours on the upper and lower part of a vessel. The top is always black, while the part below the shoulder is most often red, but can also be brown, orange or yellow. Sometimes these two main parts are divided by a stripe of a different colour. The technology for firing these vessels is part of the development of pottery production. The heat treatment in reduction appears in the second half of the Neolithic, and it is widespread throughout southeastern Europe and Asia Minor, but the making of black-topped forms is typical of certain areas: Serbia, Transylvania and Banat in southwestern Romania, eastern Bosnia and Herzegovina, eastern Albania, southwestern Bulgaria, Macedonia, northern Greece down to Thessaly, and the European part of Turkey.

This report introduces the black-topped pottery from 7 out of a total of 13 sites in Bulgaria: Dragodan-Pandurska mound, Drenkovo-Ploshteko, Radomir-Vahovo, Slatino-Chardako, Balgarchevo, Sapareva banya, Damyanitsa and Promachonas-Topolnitsa. The analysis reveals the presence of four different methods, which are used together, even in the assemblage from a single site.

Results of petrological analysis of Late Neolithic ceramics from Gorzsa tell (SE-Hungary)

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Gorzsa is a Late Neolithic (5000-4500/4000 BC) Tisza culture tell. This multi-layered settlement (tell) is situated in the southeastern part of the Great Hungarian Plain in Hungary, at the confluence of the Tisza and Maros rivers. The area is covered with Pleistocene loessic sand and Holocene clayey silt. The tell lies 3-4 meters above the floodplain, formerly surrounded by back swamps, oxbow-lakes and minor watercourses.

The aim of our study is to provide archaeometric data on the ceramics from Gorzsa, and to answer questions concerning their composition and technological characteristics. Vessels were examined in thin sections by polarising microscopy and SEM-EDX analysis.

The 72 examined vessels were divided into several groups, based on their fabric. Ceramics were made from non-calcareous silty clay. The basic raw materials of the Gorzsa ceramics are very fine- or fine-grained, and the amounts of non-plastic inclusions are moderate to abundant (10-40%), being mainly comprised of monocrystalline quartz and muscovite mica. The following fabrics could be distinguished: ARF/grog tempered; fine sand tempered; tempered with organic material (plants); ceramics containing metamorphic-granitoid rock clasts and ceramics without tempering material.

Technology and function: usage aspects of the Neolithic pottery of the central Balkans

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Technology is usually defined as the processes and practices associated with production and consumption, from design to discard; hence, pottery use is part of a complex series of social interactions that constitute technological systems. Functional analysis therefore comprises several different lines of investigation. These will be examined in this paper, as well as their application to Early (Starčevo) and Late Neolithic (Vinča) pottery:

1. A vessel's intended function conditions its design process, or, in another words, a vessel's performance characteristics (resistivity to mechanical and thermal stress during use) depend on modes of manufacture and choice of raw materials; analysis is based on formal properties (fabric, surface finishing, decoration and wall thickness).
2. Chemical analysis of food residues preserved in a vessel's walls.
3. Morphological analysis, based on analysis of a vessel's shape and its suitability for a specific use, and quantitative analysis focused on examination of metric parameters (diameters of rim, shoulder and bottom, and volume and height), and indices based on their ratios.
4. Use-alteration analysis, based on examination of traces originated during use, handling and manipulation of pottery.

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