The Rise of Metallurgy in Eurasia

Evolution, Organisation and Consumption of Early Metal in the Balkans

Edited by Miljana Radivojević, Benjamin W. Roberts, Miroslav Marić, Julka Kuzmanović Cvetković and Thilo Rehren
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To the memory of Borislav Jovanović, our colleague, friend and inspiration

(1930 – 2015)
Contents

List of Authors ....................................................................................................................................................... v
Foreword by Evgeniy N. Chernykh .......................................................................................................................... xi
Foreword by Barbara S. Ottaway ............................................................................................................................ xiii
Foreword by Stephen J. Shennan ............................................................................................................................ xiv
Acknowledgements ..................................................................................................................................................... xvii

Part 1 Introduction ..................................................................................................................................................... 1

Chapter 1 The birth of archaeometallurgy in Serbia: a reflection ............................................................................. 3
Julka Kuzmanović Cvetković

Chapter 2 The Rise of Metallurgy in Eurasia: Evolution, organisation and consumption of early metal in the Balkans: an introduction to the project ............................................................. 7
Thilo Rehren, Miljana Radivojević and Benjamin W. Roberts

Chapter 3 Balkan metallurgy and society, 6200–3700 BC ......................................................................................... 11
Miljana Radivojević and Benjamin W. Roberts

Chapter 4 The Vinča culture: an overview .............................................................................................................. 38
Benjamin W. Roberts, Miljana Radivojević and Miroslav Marić

Chapter 5 Introduction to Belovode and results of archaeometallurgical research 1993–2012 ......................... 47
Miljana Radivojević

Chapter 6 Introduction to Pločnik and the results of archaeometallurgical research 1996–2011 ...................... 60
Miljana Radivojević

Chapter 7 Excavation methodology for the sites of Belovode and Pločnik ......................................................... 77
Miroslav Marić, Benjamin W. Roberts and Jugoslav Pendić

Part 2 Belovode ......................................................................................................................................................... 81

Chapter 8 Belovode: landscape and settlement perspectives ............................................................................... 83
Miroslav Marić

Chapter 9 Belovode: geomagnetic data as a proxy for the reconstruction of house numbers, population size and the internal spatial structure ................................................................................. 94
Knut Rassmann, Roman Scholz, Patrick Mertl, Kai Radloff, Jugoslav Pendić and Aleksandar Jablanović

Chapter 10 Belovode: excavation results ............................................................................................................. 108
Miroslav Marić, Benjamin W. Roberts and Miljana Radivojević

Chapter 11 Belovode: technology of metal production ....................................................................................... 123
Miljana Radivojević and Thilo Rehren

Chapter 12 Pottery from Trench 18 at Belovode ................................................................................................. 152
Neda Mirković-Marić, Marija Savić and Milica Rajićić
Chapter 13 Chronological attribution of pottery from Trench 18 at Belovode based on correspondence analysis ................................................................. 170
Miroslav Marić and Neda Mirković-Marić

Chapter 14 Belovode: technology of pottery production ................................................................. 186
Silvia Amicone

Chapter 15 Figurines from Belovode ................................................................. 199
Julka Kuzmanović Cvetković

Chapter 16 Ground and abrasive stone tools from Belovode ................................................................. 205
Vidan Dimić and Dragana Antonović

Chapter 17 Bone industry from Belovode ................................................................. 215
Selena Vitezović

Chapter 18 Chipped stone industry at Belovode ................................................................. 221
Elmira Ibragimova

Chapter 19 Chemical and technological analyses of obsidian from Belovode ................................................................. 233
Marina Milić

Chapter 20 Archaeobotanical evidence of plant use at the site of Belovode ................................................................. 236
Dragana Filipović

Chapter 21 Animal remains from Belovode ................................................................. 249
Ivana Dimitrijević and David Orton

Chapter 22 Belovode: past, present and future ................................................................. 259
Benjamin W. Roberts and Miljana Radivojević

Part 3 Pločnik ................................................................. 263

Chapter 23 Pločnik: landscape and settlement perspectives ................................................................. 265
Miroslav Marić

Chapter 24 Pločnik: geomagnetic prospection data as a proxy for the reconstruction of house numbers, population size and the internal spatial structure ................................................................. 271
Knut Rassmann, Roman Scholz, Patrick Mertl, Jugoslav Pendić and Aleksandar Jablanović

Chapter 25 Pločnik: excavation results ................................................................. 281
Miroslav Marić, Jugoslav Pendić, Benjamin W. Roberts and Miljana Radivojević

Chapter 26 Pločnik: technology of metal production ................................................................. 301
Miljana Radivojević and Thilo Rehren

Chapter 27 Pottery from Trench 24 at Pločnik ................................................................. 317
Neda Mirković-Marić, Marija Savić and Milica Rajičić

Chapter 28 Chronological attribution of pottery from Trench 24 at Pločnik based on correspondence analysis ................................................................. 345
Neda Mirković-Marić and Miroslav Marić

Chapter 29 Pločnik: technology of pottery production ................................................................. 362
Silvia Amicone
Chapter 47 Chipped stone industries in the Vinča culture .......................................................... 564
Elmira Ibragimova

Chapter 48 Geochemical characterisation of chipped stones from Belovode and Pločnik .................. 566
Enrica Bonato, Martin Rittner and Silvia Amicone

Chapter 49 Belovode obsidian in a regional context .................................................................. 570
Marina Milić

Chapter 50 Plant consumption at Belovode and Pločnik: a comparison ........................................ 574
Dragana Filipović

Chapter 51 Evidence for animal use in the central Balkan Neolithic across the early metallurgical horizon: the animal remains from Belovode and Pločnik in context .......................................................... 585
David Orton, Jelena Bulatović and Ivana Dimitrijević

Part 5 The Rise of Metallurgy in Eurasia and Beyond .................................................................. 599

Chapter 52 Balkan metallurgy in a Eurasian context ................................................................. 601
Miljana Radivojević and Benjamin W. Roberts

Chapter 53 Where do we take global early metallurgy studies next? ............................................ 619
Benjamin W. Roberts, Miljana Radivojević and Thilo Rehren

Appendices .................................................................................................................................. 624
Bibliography ................................................................................................................................. 627
The Neolithic–Chalcolithic site of Belovode covers approximately 40 ha (Figure 1). In the two fieldwork campaigns of 2012 and 2013, only 31.5 m² was excavated due to the archaeometallurgical focus of the project. The trench was positioned on the eastern platform of the settlement, where previous excavations had uncovered significant metallurgical evidence in Trenches 3 (Šljivar and Jacanović 1997c, Radivojević et al. 2010a) and 17, which are located to the north and the south of Trench 18 respectively. A 5 x 5 m area was opened in the 2012 season and then, based on the preliminary spatial analysis of metallurgical finds, in 2013 the trench was slightly expanded with a 2 x 3 m extension on the eastern side.

The 2.3 m of archaeological layers in Trench 18 are not the thickest found at the site. In the central part of the plateau, the stratigraphy comprised 4 m (Šljivar and Jacanović 1996a: 55). Such variation mostly reflects the occurrence of pits in the earliest occupation horizon of the site. These tend to be dug well into the natural layer. It can also be assumed with a high degree of certainty that the outer extents of the site have significantly thinner occupation evidence than those towards the centre. This is due to the settlement gradually increasing in size throughout the duration of occupation at the site and shown by the geophysical evidence of several enclosure/defensive ditches that were, on several occasions, overlaid by wattle and...
Figure 2. Relative stratigraphy of Trench 18.
daub structures. It should also be emphasised that the position of the settlement on a sloping plateau and the perennial agricultural activity may have led to significant soil erosion the extent of which could not be established in full by the small-scale excavations.

The single context excavation and recording method employed at the site led to the establishment of multiple phases within the trench. Based upon the vertical stratigraphy and superimposition of the contexts discovered we devised a relative stratigraphic sequence of five settlement horizons (Figure 2). These horizons are marked with numbers between 1 and 5, with Horizon 1 being chronologically the latest and Horizon 5 the earliest. It must be noted that these horizons do not imply specific chronological phasing within the framework of any of the existing relative chronology periodisations (e.g. Garašanin 1979, 1993; Schier 1995), but rather represent the discernible settlement construction phases in this particular part of Belovode. A more precise relative and absolute chronology of the site is explained in Chapter 39 of this volume.

This chapter presents the use of occupation space revealed by Trench 18 using a catalogue and description of the key features. As the only wattle and daub structure (Feature 3) is found at the very end of the occupation layers, we are quite certain that this portion of the site can be characterised as a predominantly non-dwelling area of the settlement. Here, in parallel to the description of features, we will illustrate the temporal and spatial contexts, starting from the latest horizon and moving towards the earliest. Further detail regarding the excavation results can be accessed in the Appendices (see Chapter 7)

**Structural features in Trench 18**

The archaeological remains found in Trench 18 are numerous. During the two excavation seasons, 51 features were discovered within the trench. These can be subdivided into several classes and include: a wattle and daub structure; several pits; multiple hearths and ash bins; several pottery concentrations; and a circular structure comprising six sub-oval post holes. Some of the structures show clear signs of superimposition as described below but, for the sake of brevity, only selected structures will be detailed individually in this chapter.

**Horizon 1**

Feature 1 was discovered at the border between the plough soil and the archaeological layers. It comprises a concentration of pottery fragments belonging to one larger vessel – an amphora with two (possibly four) looped handles on the middle section. Within the widest area of the amphora, the belly, several unworked stones were discovered, possibly the original content of the vessel. It cannot be said with certainty why these stones were kept in the vessel.

Feature 2 was found at the bottom of spit 4 and is another concentration of pottery shards belonging to several vessels although, unlike Feature 1, the vessel profiles could not be identified in situ with certainty. Several unworked stones were discovered in the southeast corner of the feature.

Feature 3 is a rectangular structure made of wattle and daub and was found at the base of spit 3, in the northwest corner of the trench and possibly extends under the west profile. It measured 3 x 3.2 m (Figure 3) but was damaged near the western profile of the trench and it may well have been larger. Based on the preserved section, the structure was oriented north-south with a declination towards the east of about 18°. Massive fragments of wall daub were fired bright red; beneath the structure lay the remains of vessels fired in the same fire that destroyed it. The vessels found on the structure floor were smashed in situ. Amongst the debris were two large grindstones as well as several smaller stone tools and 16 pieces of malachite. No heating installation or domed kilns were found in the remains. On removal of the orange fired floor level, the imprints of wooden planks that had been part of the floor construction became visible (Figure 4). The planks were placed parallel to each other and were oriented northwest-southeast, i.e. perpendicular to the longer wall of the structure.

No foundation trench or post holes could be detected, but least some post holes would have been needed to support the wattle construction of the wall. This kind of quadratic structure is not very common on Vinča culture sites, but at least one similar feature was detected during excavations at Belo Brdo (Tasić 2007). This had similar dimensions of 3 x 2.8 m, and also had several groups of in situ vessels on the floor but no evidence for cooking or heating installation. The lack of a heating or cooking installation could identify this structure as a storage feature, most likely related to a larger dwelling structure located nearby.

Feature 6 is a small, bowl-shaped (?) pit, 75 cm in diameter and 35 cm deep. The pit was detected as an oval area of orange daub mixed with pottery sherds, charcoal and ash. The infill was very similar to the surface material. This feature is unique due to its association with metallurgical debris (see Chapter 11, this volume). Slagged sherds, free slag pieces, metal droplets and even a copper metal artefact a bit further away, all demonstrate high temperature activities happening in this horizon. More closely, slagged sherds in the zone of burning confirm previous assumptions about the nature of the earliest copper smelting.
installations – that they were hole in the ground lined with fragmented ceramic sherds. The fact that none of these sherds can be identified as crucibles, and that in form and nature of contact with pyrometallurgical activities they resemble previously studied samples (Radivojević and Rehren 2016) show that there is a consistency in metal smelting technology across the site of Belovode. Although these hole-in-the-ground
installations were previously only assumed, this is the first time we are able to discern them in direct association with metal production on this site.

It could be hypothesised that the pit contained refuse from an unidentified burning that occurred nearby.

Feature 8 is a concentration of five pots which were found next to the southeast corner of the trench in spit 6 but extends further into the eastern profile of the trench. The vessels were found in situ, and a polished stone chisel was discovered inside Vessel B. The vessels include various forms and functions and can broadly be divided into those used for cooking and for storage. When the vessels were removed, a small, irregularly shaped pit was detected in spit 7.

Feature 9 is a large oval pit next to the south profile of the trench which was detected and excavated from spit 6. This steep-sided pit measured 2.6 x 1.9 m with a maximum depth of 1.2 m (Figure 5). The infill of the pit consisted predominantly of dark brown soil with daub, ash and charcoal fragments, and occasional yellow clay lumps. The pit contained a high quantity of pottery shards, animal bones and several fragments of malachite, figurines and a miniature cup. The nature of finds and the quality of infill indicates that this feature can be treated as a refuse pit, possibly connected to Feature 3 to the northwest.

Feature 20 is a sub-oval feature similar in shape to Feature 8, with evidence of burning, daub, animal bones and pottery fragments. The longer axis of the feature is oriented northwest-southeast and measures 1.45 m. The feature is only a few cm thick. No clear function can be attributed.

**Horizon 2**

Feature 16 is a concentration of daub, irregular in shape, and damaged on several sides by two pits (Features 9 and 19). It consists of the fragments of a destroyed kiln (or several of them) and is easily distinguishable by dome and floor fragments found in the debris (Figure 6). The remainder of the feature consists of white ash and charcoal. The layer was between 10 and 15 cm thick, and at its north-south axis measured 1.82 m, whilst at its west-east axis it measures just under 1 m in diameter. It is potentially part of Feature 32, a pit with various infills (see below).
Chapter 10 Belovode: excavation results

Figure 5. Feature 9 outline.
Feature 18 is a circular pit filled with the remains of orange, baked daub. It was cut by the later pit, Feature 9, in its southeast part. The diameter of the pit is between 1.11 and 1.12 m in all directions, whilst its depth is around 30 cm (Figure 7). The walls of the pit were burned to a black colour, so it can be assumed that the daub was still hot when deposited into the pit. The fragments most likely originate from the wall of a structure rather than a kiln. A large amount of charred chaff and seeds were retrieved from in between the fragments, as a macro botanical sample.

Feature 19 is a large elliptical pit located in the eastern part of the trench. The longer axis of the pit is oriented northeast to southwest. The top of the pit was detected in spit 8 as an area of mixed daub, pottery, stone, and charcoal. The pit dimensions are 3.1 x 1.8 m with a maximum depth of about 70 cm (Figure 8). Its sides are funnel shaped, narrowing towards the bottom. The finds consist mainly of pottery and animal bones, indicating that the feature was used as a refuse pit. Most of the finds were found concentrated at the very bottom. A significant discovery within this feature was a significant quantity of thermally altered malachite. It is unclear whether this represents a direct by-product of a nearby smelting operation or displaced smelting refuse deposited in this location upon the clearance of a smelting installation in a different portion of the site.

Figure 6. Feature 16: daub concentration of a destroyed kiln.
Chapter 10  Belovode: excavation results

Feature 21 is an oval pit next to the north profile of the trench. It was detected in spit 12 and is 1.6 m at the longer axis and 1.4 m at the shorter axis (Figure 9). Several malachite pieces and importantly, two copper metal droplets were recovered from the pit, as well as one fragment of obsidian. The feature could be interpreted as a refuse pit. It is striking that the content was very compact and difficult to excavate, most likely due to the pressure of debris from wattle and daub structure Feature 3 that lay on top of it. These metal droplets stand out as the earliest directly documented metal production debris during the excavation campaigns 2012/13. They also further confirm the dating of the original findings of copper slag (c. 5000

Figure 7. Feature 18 and its relationship with Feature 9.
Feature 35 is a circular hearth with a diameter 26 cm and depth of 10 cm discovered in spit 13. It is located close to the northeast corner of the Trench 18 extension (Figure 12). It has a thin, orange, baked wall and is filled with white ash and charcoal. An interesting find from the bottom half of the feature is part of the wall of a ceramic vessel, which was found against the side and base of the feature.

Feature 39 was found in immediately southeast of Feature 35 and is an elliptical ash bin with excavated dimensions of 25 x 40 cm and depth of 5–10 cm (Figure 12). The bin was only partially excavated as it extended under the eastern profile of Trench 18 extension. It contained white and grey compact ash mixed with charcoal and occasional orange daub lump. It is without doubt related to the activity conducted in Feature 35.

Horizon 3

Features 30, 31, 32 and 43 comprise a large pit which was partially excavated in the eastern extension of the trench. Its edges were detected in Feature 19, making of later date. The exact shape of the pit could not be detected as it extended under both the eastern and
Figure 9. The appearance of Feature 21 in spit 12.

Figure 10. Feature 26 upon detection and when subsequently emptied.
southern profiles of trench extension (Figure 13). The detected dimensions are 3.3 x 1.4 m, but it is clearly somewhat larger. It was first detected in spit 12 and extended as far as spit 17. The infill of the pit consisted of several different types of soil, including a compact, predominantly red and orange burnt layer of soil with lots of fragments of daub, charcoal and ash (Feature 43). This varied infill could indicate that the pit was in use for a longer period. In the deepest part, next to the southeast corner of the trench extension, it was 80 cm deep, which would indicate a rather large feature. The infill consists of various items, predominantly pottery and animal bones, but a significant quantity of malachite fragments was also recovered.

**Horizon 4 (a and b?)**

**Horizon 4a**

Features 36, 41, 44 and 50 comprise four kiln floors detected at the bottom of spit 17 and extending into spit 18 throughout the entire area of the trench (Figure 14). The kiln floors are not found in situ but are re-deposited; they are all disposed of in approximately the same horizon (between 173.30 and 173.40 m). They do not seem to originate from the same kiln and, whilst Features 36 and 41 are somewhat compact, Features 42 and 50 are not. The same character and the similar horizon of these features indicates that they belong to the same process.
Features 37 and 38 are two smaller pits. Feature 37 is elliptical whilst Feature 38 is circular. They were discovered in spit 17 in the southwest corner of the trench. The infill of the pits differed in content and colour from the surrounding area. The infills consisted of grey, compact soil with daub and charcoal fragments. The area around the features was predominantly brown in colour. Very few finds were discovered in the infill. It is possible that both pits are the remains of clay outcrops used for pottery production or another similar activity.

Horizon 4b

Features 40, 45 and 46 are three short lived hearths which were discovered in situ. Feature 45 and Feature 46 are elliptical in shape whilst Feature 40 is circular (Figure 15). Feature 45, which is the best preserved of the three, is 50 cm on the long axis and 38 cm on the short axis. Feature 46 could be only partially excavated as some of it remained under the north profile of the trench. All the hearths have thin, orange baked walls on the perimeter and are filled with the original content of the last firing episode, which consists of white ash and black charcoal mixed with occasional lumps of orange daub. Similar features are known from the early Vinča culture sites of Masinske Njive and Jaričište 1 in the Kolubara region, but both sites are currently unpublished or partially published (Marić 2013b).

Figure 12. Features 35 and 39 in the east extension of Trench 18.

Figure 13. The outline of Feature 32.
Horizon 5

Feature 47 is a large, irregularly shaped feature, with its long axis being oriented northwest-southeast (Figure 16). It is 3.1 m long and 1.12 m wide at its broadest extent. Its depth does not exceed 20 cm. The presence of only very few finds in the infill indicates that the feature was not backfilled but rather left to fill through natural causes. It is possible that the feature is a clay outcrop used for extracting raw material, potentially for either pottery or in construction. The presence of Feature 49 in its immediate vicinity can potentially corroborate this interpretation.
Feature 49, a large hearth, was found to the northwest of Feature 47 (Figure 16). It was only partially excavated as it extended under the north profile of the trench. This feature consists of orange burnt soil along the walls encompassing black burnt soil in the centre. In the excavated part, it was roughly circular in shape. Aside from a large fragment of a stone there were no other finds in the feature. The absolute dating of the feature puts it at the very beginning of Vinča culture at the turn of the 5th millennium BC.
Figure 16. Features 47 and 49: the earliest structures in Trench 18.

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Miljana Radivojević holds the Archaeomaterials Lectureship at the UCL Institute of Archaeology (UK), where she graduated in Archaeometallurgy. She has spent more than 20 years publishing on early metallurgy in the Balkans and southwest Asia and the role of aesthetics in the invention of novel technologies. She continues to explore the evolution of metallurgy across most of prehistoric Eurasia as a means of uncovering the histories of metalsmiths, and the societies and environments they lived in.

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The Rise of Metallurgy in Eurasia is a landmark study in the origins of metallurgy. The project aimed to trace the invention and innovation of metallurgy in the Balkans. It combined targeted excavations and surveys with extensive scientific analyses at two Neolithic-Chalcolithic copper production and consumption sites, Belovode and Pločnik, in Serbia. At Belovode, the project revealed chronologically and contextually secure evidence for copper smelting in the 49th century BC. This confirms the earlier interpretation of c. 7000-year-old metallurgy at the site, making it the earliest record of fully developed metallurgical activity in the world. However, far from being a rare and elite practice, metallurgy at both Belovode and Pločnik is demonstrated to have been a common and communal craft activity.

This monograph reviews the pre-existing scholarship on early metallurgy in the Balkans. It subsequently presents detailed results from the excavations, surveys and scientific analyses conducted at Belovode and Pločnik. These are followed by new and up-to-date regional syntheses by leading specialists on the Neolithic-Chalcolithic material culture, technologies, settlement and subsistence practices in the Central Balkans. Finally, the monograph places the project results in the context of major debates surrounding early metallurgy in Eurasia before proposing a new agenda for global early metallurgy studies.