The Rise of Metallurgy in Eurasia

Evolution, Organisation and Consumption of Early Metal in the Balkans

Edited by
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ARCHAEOPRESS ARCHAEOLOGY
To the memory of Borislav Jovanović, our colleague, friend and inspiration
(1930 – 2015)
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Pločnik: excavation results

Miroslav Marić, Jugoslav Pendić, Benjamin W. Roberts and Miljana Radivojević

The results of the geophysical survey conducted at the site of Pločnik in 2012 and 2013 indicate that the total area of the settlement can be estimated at 35 ha (Figure 1, see Chapter 38 this volume), although it may have been larger during the Neolithic-Chalcolithic periods. The meandering of the Toplica river may have destroyed a significant portion of the site through erosion, a process that is visible even today after the seasonal swelling of the river during the spring and late autumn. The archaeological excavations were undertaken in the southwest part of the site since copper implements were previously discovered in this area of the settlement (e.g. Grbić 1929; Šljivar and Kuzmanović 1997a; Šljivar et al. 2006; Stalio 1964; Stalio 1973). The single trench, Trench 24, was placed between two previously excavated trenches, that is Trenches 20 (to the north) and 21 (to the south), which had yielded metallurgical finds, including both the earliest copper and tin bronze production, anywhere (Radivojević et al. 2013; Radivojević and Kuzmanović 2014). It was also deliberately placed over an area which, in an earlier survey, had registered geophysical anomalies indicating...
Figure 2. Relative stratigraphy of Trench 24.
archaeological features (currently unpublished). As at Belovode, the initial size of the trench was planned to be 5 x 5 m but was quickly extended towards the south in order to encompass the full extent of Feature 1, a burnt wattle and daub structure found in the final occupational horizon at the site. In the 2013 excavation season, the trench was shortened to its originally planned extent due to financial and time constraints.

The two archaeological field seasons in Trench 24 showed that there is approximately 3.7 m of stratified archaeology in this area of Pločnik, which is not unusual for the site when compared to excavated trenches from earlier campaigns (Šljivar 1996: 85). It appears that the thickness of archaeological deposits increases with proximity to the Toplica river, which could imply that the meandering of the river has destroyed the core of the settlement over the millennia. It can be assumed that the settlement gradually expanded from its core area (as is also very probable at Belovode) towards the hilly terrain in the background. This core area would have been to the east of Trench 24 and has now been destroyed by the Toplica.

The same single context excavation and recording methodology applied at Belovode was used at Pločnik (see Chapter 724, this volume). A sequence of five phases (Figure 2) was established based upon the relative stratigraphy of archaeological features found in Trench 24. As at Belovode, these horizons were labelled 1 to 5, with the first being the latest and the last being the earliest settlement occupation horizon. However, beyond the relative stratigraphy, these divisions are dated absolutely by radiocarbon dating (see Chapter 37, this volume). The relative horizons do not reflect a specific chronological phasing based upon finds, even though the finds corroborate the proposed divisions (see Chapter 37). In this chapter we will describe the characteristics of features discovered and, where applicable, try to elaborate upon their possible function. The features will be presented following the relative chronology established by the excavations with the more important features outlined in detail. Where possible, 3D models of features are also provided, with interactive models published on the project website and in the Appendices (see Chapter 7).

**Structural features in Trench 24**

The excavations during 2012 and 2013 in Trench 24 revealed and recorded 39 archaeological features with the majority being fully excavated. These features can be divided into several different types based upon their form and function, including wattle and daub rectangular structures; kilns; finds concentrations; pits; and dwelling dugouts. The following catalogue of excavated features begins with the most recent settlement horizon.

### Horizon 1

Features 1, 2, 4, 5, 6 and 10 form the remains of a rectangular wattle and daub structure which was discovered at the bottom of spit 6 and extended down to spit 10. The excavated dimensions of the structure are 6.3 x 3.5 m which is not uncommon for Vinča structures, albeit that their dimensions tend to be larger towards the end of the period (cf. Bogdanović 1988: 47–48, Tables 5.3 and 5.4; Marić 2011: 72, Tables 3 and 4). The larger part of the wall debris was not found, and it seems to have been cleared out in the past or destroyed by later ploughing. In spits 1–5 there were extremely low quantities of architectural debris or archaeological finds, so it remains unclear how the wall debris disappeared. The remaining daub is orange baked and well made, although damaged by later activities in certain places (Figure 3). The occurrence of larger stone blocks on the sides of the daub and in the central area indicates the possible existence of pedestals for load-bearing beams that comprised the main construction of the walls (Figure 4). This building technique seems indigenous to the site, as at least one other feature was discovered in previous excavations with the same evidence for construction, although unfortunately it remains unpublished. The finds discovered in the debris were rather scarce and consist of a small number of orange burnt vessel fragments, one polished stone axe which was found in the central area, a small handful of fragments of metal artefacts, and a metal droplet, the latter of which indicates potential association of this large rectangular structure with metal extraction activities (see Chapter 26, this volume).

Immediately to the northwest of the daub, a concentration of stones and pottery fragments was discovered on the same level as the debris and may represent the original house inventory that was removed from the daub following the destruction of the structure. It is interesting that no heating or cooking installations were identified in the debris.

Upon removing the floor level of the structure, a substructure made of split timbers arranged in parallel rows following the longer axis of the daub outline was discovered (Figures 5 and 6). An identical floor construction method was discovered in Grivac, in the Late Vinča culture horizon (Bogdanović 2004: 180, Figure 8.15, 197, Figures 8.48–8.49). The individual timbers had diameters of between 7 and 11 cm and were placed flat side down, with the curved side forming the actual substructure of the floor upon which the clay was placed and compacted to produce the floor level. At the widest preserved part of the structure, 34 or 35 parallel rows of timber could be counted. The floor construction is somewhat different to that of Feature 3 at Belovode where laid wooden planks were flat on both sides. Unfortunately, the wood used for this
Feature 3 was detected next to the west profile of the trench, close to corner A (Figure 7). It is a small feature consisting of several large stones mixed with the remains of a burnt structure that could have been a kiln, or possibly a furnace, due to the find of a copper metal ring/band (see Chapter 26, this volume and Figure 7) in its vicinity. The shape of the feature is unusual: like a portion of a slightly elevated wall of an almost rectangular structure, or at least an edge of such a structure. Its remit is unknown as it remains incompletely excavated, however it has a striking resemblance to the excavated rectangular firing structures in Trenches 20 and 21 (see Figure 8, Chapter 6, this volume) (Radivojević et al. 2013: 1033, Figure 2; Šljivar and Kuzmanović Cvetković 2009a: 61), which
also had metal artefacts and casting debris associated with them. What separates Feature 3 from the previous finds is the fact that it was possibly located just outside the rectangular wattle and daub (dwelling?) structure (see Figure 5). Yet, it would not be unusual to have the fireplace for metallurgical activities in an economic area, as we have seen at Belovode (Chapter 11). Fragments of metal artefacts found inside the rectangular wattle
and daub structure in Trench 24 further enforces the argument of the potential association of this structure with metallurgical activities (i.e. casting, working).

Feature 7 is a sub-oval concentration of finds discovered to the northwest of Feature 1 in spit 8 (Figure 3). These included numerous fragments of worked and unworked stone, pottery fragments and animal bones. It is not completely clear whether this concentration represents the context of Feature 1 as there are almost no fragments of wall debris amongst the finds, and only some of the discovered pottery fragments revealed traces of intensive burning (Figure 4) which is usually connected with the destruction of daub structures.

Feature 8 is a smaller concentration of pottery and stone fragments extending from the eastern edge of Feature 1 towards the eastern profile of Trench 24 (Figure 5, upper left corner). The exact shape of the concentration is uncertain as it extends under the profile of the trench. It can be assumed that the finds do not originate from Feature 1 as some of the fragments extend under the substructure of the floor (Feature 2). It is possible that these represent material deposited between structures in order to harden the walking surfaces. Similar cases are known at other sites of the period.

Feature 9 was located to the southwest of Feature 1 and is a concentration of large ground stone axes (Antonović 2003: 53; see Chapter 31). These were made from white stone and mixed with several grinding stones (Figure 8); they possibly represent the remains of a workshop for the production of these implements that was located close to the burnt wattle and daub structure (Feature 1).
Figure 6. Orthogonal view of floor substructure (Feature 2), Feature 3 and Feature 8.
These white stone axes are a common find in the Late Vinča period on central Serbian sites (Antonović 1997: 34). It is notable that these white stone axes are the only types of non-metal artefacts found associated with massive copper implements at Pločnik (see Chapter 6) (Šljivar 1999; Šljivar et al. 2006: 261–265).

**Horizon 2**

Feature 11 represents the remains of a kiln found close to corner D of Trench 24 in spit 11. The kiln was only partially excavated as a significant portion remained under the west profile of the trench, but it was a typical horseshoe shaped kiln, as found on almost all Vinča culture sites. No dome or wall remains were detected and four kiln floors were excavated, all of which were damaged in the southeast section. Each kiln floor had been constructed upon foundations of a mixture of pottery fragments and stones (Figure 9). It is interesting to note that the earliest foundation level of the kiln consisted exclusively of large stone fragments (Figure 10). The kiln does not appear to be within a structure made of wattle and daub, and the number of floor renovations indicates that it was in use for a long period.

**Horizon 3**

Features 14 and 15 were detected in spit 14 and represent the *in situ* remains of a kiln as well as the
surrounding ash (Figure 11). Feature 14 is the kiln and is located next to the eastern profile of the trench. As with Feature 11, only the remains of two kiln floors were found, whilst the dome and the walls were dismantled prior to its abandonment. A large pile of white ash with charcoal was found around it, most likely the by-product of kiln operation. It is interesting to note that the second kiln floor had a foundation only of pebbles (Figure 12) whilst the first kiln floor had pebbles tightly packed with pottery fragments in a basin constructed of brown, compact soil (Figures 13 and 14). During the renovation, the kiln also seems to have been enlarged. It appears to have been free standing, without a structure around it, for the entire duration of its use. Both floors were somewhat tilted towards the south, which would indicate that the firebox opening was on that side.

Features 16 and 21 comprise a large concentration of finds consisting predominantly of pottery fragments. The concentration was detected in spit 14 (Feature 16) and extended into spit 15 (Feature 21). It has a roughly elliptical form, and could have been a part of a pit, although the edges were not detectable. The dimensions measure 1.7 x 1.5 m. Besides pottery, several broken grindstones were found in the concentration (Figure 15).

Features 17, 22, 25 were found in spit 14 in the southwest part of Trench 24 and comprise an approximately triangular area consisting of lumps and patches of yellow and red soil (Figure 15 and 16). These features most likely represent the daub of a destroyed structure, the majority of which is under the southwest...
profile of the trench. Its general orientation is similar to that of wattle and daub structures found in this area of the site.

Features 35, 36, and 37 are three post holes which were found underneath Features 17, 22 and 25 (Figure 16). An additional post hole was also visible in the west profile of the trench but was not excavated as a separate feature as the majority was under the trench profile. The post holes were constructed by digging large individual holes, which were round in the case of Features 35 and 36 (diameter 70–74 cm), and elliptical for Feature 36 (diameter 85 cm). A post was then placed vertically, and the soil backfilled and compacted to keep it in place. The presence of an entire post hole detected in the west profile (A-D profile), we can say with certainty that the holes were dug to a depth of about 1.15 m. This technique is known from other Vinča period sites in the region (Bogdanović 1988: 42, Figure 5.6; Bogdanović 2004: 169, Figure 8.4, 177, Figure 8.12, 178, Figure 8.13, 179, Figure 8.14), and appears parallel to the construction of foundation trenches.

Feature 19 is a sub oval concentration of finds (Figure 15) which was detected in spit 14. It is close to 1.2 m in diameter and is located close to corner C. The content of the feature comprised largely broken grind stones and unworked stones, mixed with pottery fragments. The feature was most likely the infill of a pit whose outline could not be identified with certainty.
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Figure 10. The primary foundation of Feature 11 comprising damaged ground stone implements.
Horizon 4

Feature 29 is a roughly rectangular feature in the southeast corner (C) of Trench 24 which was detected in spit 20 (Figure 17). The feature comprises different layers of burnt soil, ash and charcoal mixed with finds. It resembles a pit that extended into the eastern and southern profiles. Unfortunately, due to time and money constraints it was not completely excavated, and the excavation was ended at the bottom of spit 22.

Feature 30 consists of a very compact, dark brown and red fired soil with charcoal found in spit 20 (Figure 17). It is several centimetres thick and contained almost no finds. Its lower boundary is Feature 34.

Feature 31 is a layer of several centimetres of white and grey ash deposit which was found in spit 20 (Figure 17). It is about 1.5 x 0.9 m in dimensions and its thickness varies from 3 to 10 cm in places. Its lower boundary is Feature 34.
Chapter 25  Pločnik: excavation results

Figure 13. The substructure of pebbles and pottery in Feature 14.

Figure 14. The basin used to hold the substructure of floor 1 in Feature 14.
Feature 32 was found in spit 20 and is a thick (10–15 cm) crescent shaped feature consisting of orange fired daub, charcoal and grey ash (Figure 17). The largest span of the feature is 1 x 0.65 m. The feature represents the remains of a destroyed kiln, but the remains were not found in situ.

Feature 34 is a large, irregular rectangular area of white ash, several centimetres thick (Figures 18 and 19). The feature covered most of the trench surface in spit 21. It consists of several finely deposited layers of white ash, occasionally mixed with charcoal, daub fragments and orange or red baked soil. It was damaged by later activities on the site, including by the cuts of the holes (Features 35, 36 and 37) dug for the construction of the structure defined through units 17, 22 and 25 (Figure 18). It is unclear what the exact function of this feature may have been, but its rather regular dimensions and thickness may indicate the remains of a structure made of light materials (e.g. hay or straw) that was burnt in a fire. The direct dates set this feature right at the beginning of the 5th millennium BC (Chapter 37, Table 1), which is about the time when the earliest copper metal artefacts appear at the site. It is therefore possible that this massive ash deposit feature was associated with metallurgical activities.

**Horizon 5**

Due to monetary, safety and time constraints, towards the end of 2013 field campaign it became necessary to cease excavations on an area of Trench 24. It was
decided that just the western part of the trench would be excavated until the natural soil was reached. During this process Feature 38 was detected between spits 22 and 25. It soon became clear that it was a pit structure with several separate cells (Figure 20) and was found in its secondary role as a refuse pit. This was clearly evidenced by the highly fragmented finds and the diversity of layers comprising the infill of the cut. Layers of ash were separated by thin charcoal and soil layers until the natural soil which occurred at the base of spit 25. The feature extended beyond the excavated part towards the west and east, whilst towards the north and south, the edges of the pit were clearly visible. At its deepest the feature was over 80 cm deep and consisted of at least two cells, the first to the southeast and the second to the northwest. Based on this evidence, it was possible to deduce that it may have had a figure eight shape, which is not uncommon for late Starčevo and early Vinča period pits in the central Balkans (Bogdanović 1988: 38, Figure 5.2; Petrović 1999/2000: 8, Figure 5; Marić 2013b: 20, Figure 3, 25, Figure 8).

Feature 39 was detected in spit 24 and within the extent of Feature 38 at the very northeast edge of the excavated area in Trench 24. It consisted of orange baked daub which had an elliptical shape and extended under the eastern profile (Figure 20), so that only about half of the feature could be excavated. The inside of the baked daub wall consisted of charred soil filled with carbonised seeds lying on a red baked floor (Figure 21).
Based upon parallels from the late Starčevo-early Vinča site of Jaričište 1 (Marić 2013b: 20, Figure 4) it could be concluded that the feature represented the remains of a kiln constructed in the side wall of the pit house by digging a hole in the soil which was then strengthened through repeating firing.

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Figure 18. Feature 34 which was damaged by Features 35, 36, and 37 cutting it.
Figure 19. Feature 34 upon discovery in spit 21. Pits (Features 35, 36 and 37) visible in the ash.
Figure 20. Feature 38 and 39, spit 25.
Figure 21. Cross-section of Feature 39. Photo taken from the west.
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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.