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**METALLURGY IN THE BRONZE AGE TELL SETTLEMENTS
FROM THE CARPATHIAN BASIN**

(Abstract)

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The landscape of the Carpathian Basin was marked at the beginning of the Bronze Age by the re-emergence of tell settlements. Tells differ substantially from the rest of contemporary settlements both in terms of architecture and thickness of the occupation debris resulting from long-term inhabitation of the same area. The central function of these sites has been repeatedly highlighted, tells being conferred the highest position in the settlement system of the Carpathian Basin and the role of centres of production, redistribution and trade, chiefly residences of the Early and Middle Bronze Age elites. Furthermore, various papers have been dedicated to the study of architecture in the tells, the functions they fulfilled, their chronology and fortification systems.

However, there is no comprehensive research discussing all finds related to the metallurgy of Bronze Age tells from the Carpathian Basin, although matters related to this topic have been touched upon in various studies. The central role assigned to tells should also be tested by analyzing their metallurgy. A research addressing this subject could lead to a better understanding of those aspects related to their social and economic functions that can be outlined by analysing the amount and nature of finished metal products uncovered inside and the scale and diversity of metal production. A series of moulds, clay tuyères, but also metalworking tools were uncovered in the tells, thus pointing towards bronze production activities in the settlement area. What is not known is the exact intensity of these activities for each and every site, as well as the role metallurgy played in the economy of the tells.

Therefore, it is the focus of this research to study the metallurgy of Bronze Age tell settlements from the Carpathian Basin (both in terms of accumulation and hoarding of finished metal products as well as the scope of metalworking activities) and to reassess the role that these settlements played in the metal production of the region, while outlining the contacts they had with other metal production centres. With the results obtained from this research, it is anticipated to obtain a better scope on the status and functions of the Bronze Age tell settlements through the analysis of an essential element of their archaeological record. Moreover, such an approach will also improve the current state of research on Early and Middle Bronze Age metallurgy in the region.. Unfortunately, most of the artefacts related to metallurgy published from the tells are unstratified finds, so that a contextual analysis of the metalwork as well as a discussion on spatial distribution and patterns in use and deposition has been restricted by the absence of secure archaeological context and association with other classes of artefacts. The lack of stratigraphical data has also hindered, in most cases, an attempt to a finer chronological sequence of the metalwork found in the tells.

However, when such information is available, it stands as evidence that some metal types mostly known from hoards were in use much earlier than previously thought.

The thesis contains six chapters, accompanied by a concluding section, abbreviations, reference list, an appendix, plates and maps. The aim of the research is to study the metallurgy of tell settlements, determine the role played by these sites in the metallurgical production of the region and to outline the contacts with other metallurgical centres.

The first chapter (Introduction) contains preliminary informations related to the archaeological term “tell settlement” as used in the thesis, geographical setting with the available copper and tin resources in the region, research history and chronological frame. The research area overlaps with the distribution zone of Bronze Age tell settlements in the Middle Danube region, roughly encompassing parts of present day Romania (only the west), Serbia (Vojvodina), Slovakia (the southern half) and most of Hungary (the eastern and central parts). As for the non-ferrous resources in the region, most of the copper ores can be found in present-day Romania and Slovakia, while tin occurrences are mostly limited to the territory of Slovakia. Only few copper ores were identified in present day Hungary, and their possible exploitation in prehistory remains uncertain. Regarding the chronological frame, the development of the Bronze Age tell settlements from the Carpathian Basin spans from the beginning of the Early Bronze Age to the end of Middle Bronze Age (according to the regional relative chronology), when most of the tells were abandoned. In absolute chronology this period could be dated around 2500-1500/1400 BC. Taking into account both stratigraphy of tell settlements and typology of metal artefacts, the chronological system used in Hungary (where most of the tell settlements are located) was adopted in this study as well. A chronological table was inserted in the text in order to highlight correspondances with older schemes as well as with the central European chronology.

The study of the tells’ metallurgy is preceded by a thorough documentation of the artefacts related to metallurgy - finished metal products as well as metalworking-related objects - uncovered in each and every site (Chapter II). The decision to include the catalogue as a chapter at this point was motivated by the fact that the accuracy of the upcoming analysis was dependent on the quantity and quality of the information at hand. The database was compiled using the available published information, after an extensive survey of the literature dedicated to the tells (including excavation reports). The entries in the catalogue follow the alphabetical order of the tells, with each subentry presenting individual artefacts related to metallurgy uncovered in the respective site; in the description of each artefact the following details were included: typological class, archaeological find context, description,

measurements, storage place, inventory number and dating, depending on the amount of information provided in the publications. This was undertaken in order to provide the first database that covers all published data related to the metallurgy of the Bronze Age tell settlements from the Carpathian Basin. In the end 78 tell settlements which yielded evidence related to metallurgy – a total of 3273 objects, out of which 2900 are finished metal products (made of bronze, copper and gold), and the rest of 373 objects related to metalworking – were registered in the catalogue.

The next step was the analysis of the find context (Chapter III). Such an endeavour was necessary in order to both assess the reliability of the data (and, as such, the quantity and quality of information it can provide) and to highlight the interpretation possibilities of these finds. Unfortunately, even if the majority of the finds were uncovered during systematic excavations, there is little contextual information available in the published reports. What stands out is the fact that most of the finished metal artefacts (making up to 86%) were part of the 31 hoard assemblages uncovered inside 18 tell settlements. On the other hand, metalworking-related objects are almost exclusively finds coming from the settlement layers, with only one hoard containing such artefacts. The reason why most of the finished metal artefacts uncovered in the tells come from hoards while only less are known from the settlement layers can be explained by taking into consideration the life-path of these objects. In contrast to other raw materials, metal can be melted down in order to obtain new objects, and the practice of recycling was not uncommon throughout the Bronze Age, re-melting being part of many of the bronze objects' biography. Therefore it seems plausible to consider that the few objects uncovered in the settlement layers were lost or discarded, keeping in mind that some may represent deliberate depositions (although, lacking contextual information, this remains just an assumption). The case of hoards is completely different. The artefacts that make up such assemblages were deliberately taken out of circulation, which explains why metal artefacts are encountered in a significantly higher proportion in hoards as compared to settlement layers. After a glance at the structure and content of the hoards from the tells and a comparison with the wider repertoire of metalwork known from the region, it became clear that there was a conscious selection of the artefacts that were in circulation at that time. Moreover, most of the hoards contain jewellery and dress ornaments in a larger proportion, while weapons and tools are less frequently encountered. Considering the fact that some recurrent associations of artefacts were detected, it became clear that the older interpretation which viewed the hoards from the tells as signs of the violent destruction of these settlements as a result of attacks and incursions from the so-called "Tumulus Grave

people” can no longer be sustained, as it is hardly plausible that such patterning in content and structure of these assemblages could have been possible if they were indeed valuables hidden away in a hurry during the presumed attacks. While the older interpretation is also problematic from a stratigraphical and chronological point of view, it would be preferable to view the hoards from the tells not only as markers of wealth but also as part of social and ritual practices (a viewpoint largely embraced in the recent years), in which notions of place and ancestry should also be incorporated.

Chapter IV is dedicated to the study of metalworking activities in the Bronze Age tells. The analysis is preceded by a brief overview of the production process for copper and bronze, from ore to finished artefact (pointing out the tangible evidence left behind in the archaeological record), and by a short discussion of the concept of cultural biography. All metalworking-related artefacts that were uncovered so far in only 49 Bronze Age tells from the Carpathian Basin can be connected to melting and casting activities, as well as with finishing work (surface treatment and polishing). The most numerous finds are casting moulds, followed by clay nozzles, but other types of objects related to metalworking are also encountered. All these categories are handled separately in the thesis, followed up by an analysis of find context and distribution among the tell settlements. Although a quantitative difference among tells can be observed in what concerns the amount of metalworking artefacts yielded, in most cases this can be connected with limited archaeological excavations or with the lack of detailed publications. However, it is worth noting that the amount of metalworking-related evidence uncovered in the majority of the tells is rather scarce. Nonetheless, these objects are clear evidence that metalworking activities did take place in some of the tell settlements, even if at a small-scale, probably meeting the demands of the local community. Among the products manufactured in the tells, axes are the most numerous, followed by tools and weapons like chisels and daggers, other prominent types cast being ornaments such as pendants and pins. There are however some better investigated tells, where the amount of metalworking related evidence is indicative of more intense bronze production activities and where a certain specialization on manufacturing specific types of artefacts could be detected. This is the case at Pecica, where more than half of the negative forms are axes, at Tiszafüred (almost all moulds uncovered at this site contained ornaments, predominantly pendants) and at Košice-Barca – site that has yielded the most numerous moulds for the manufacture of pins.

All finds discussed in this chapter are indicative of local bronze production activities in the respective tells. However, due to the lack of precise contextual information in most

cases, the location proper of the workshops remains uncertain. There is however an exception - the house of a metalworker excavated in the tell from Mošorin „Feudvár“ - that sheds some light on the way such workshops were organised. It is one of the few instances where the workshop together with the complete inventory was documented *in situ*, providing evidence for a wide array of metalworking activities (casting in two-piece moulds with cores or using the lost-wax casting technique, polishing and finishing the metal objects). Most important, the workshop was located inside the settlement, surrounded by other houses, and had similar size and orientation with the domestic buildings from the tell. There are some other tells where objects associated with metalworking (mostly moulds) were uncovered inside houses or adjacent structures, suggesting that local bronze production inside the Bronze Age tells from the Carpathian Basin was carried out in regular buildings, well integrated in the settlements' layout of houses, and not in a specialised area or in the so-called “satellite” settlements located in the immediate vicinity of the tells which so far have not yielded any evidence of metalworking.

A consistent part of the thesis, Chapter V, is dedicated to the typological examination of the finished metal artefacts as well as the negative forms found on the moulds retrieved from the tells. As previously stated, most of the published finds are unstratified, lacking information on find context, so that a discussion on intra-site spatial distribution and patterns in use and deposition has not been possible due to the lack of data about the archaeological context and associations with other classes of artefacts. Therefore, the focus has been shifted towards categorising the metalwork along typological and functional criteria, while tracing the distribution areas of the various types of metal implements coming from the analysed sites. Another concern was outlining the time and space frameworks in which individual metal types were produced and kept in circulation and determining if there were any differences between regions as regards the attitude towards certain types of artefacts. In order to do so, the distribution maps dedicated to particular implements were provided with different symbols for different find contexts. Based on these maps, connections with other metallurgical centres could also be highlighted.

Most of the artefact types uncovered in the analysed sites are characteristic of the late Early and Middle Bronze Age bronze industry of the Carpathian Basin. This is the case for various types of shaft-hole axes, disc-butted axes, different pendants and pins, arm spirals and arm guards - artefacts produced and circulating inside the region since the second part of the Middle Bronze Age. However, metalwork with a wide distribution in the Bronze Age can also be found (such as flat and flanged axes, triangular daggers, flat and socketed chisels,

knives, sickles, spearheads, buttons, spiral tubes, the so-called “Cypriote” as well as the roll-headed pins). Several artefacts are common types of the Central European metallurgical centre (stop-ridge and shaft-tube axes, wheel and husk-shaped pendants, disc-shaped pendants with concentric ribs, pins with perforated neck or head and bracelets with horizontal ribs), while eastern types are less frequent. The typological analysis of the bronze and gold industry retrieved from the tells proves once more that these settlements were linked to both regional and supra-regional networks of exchange and interaction which facilitated the flow of goods as well as ideas and technologies. As already pointed out, a greater degree of connections could be perceived with the central European metallurgical centre. By studying the distribution maps of different artefact types provided in this chapter, it became clear that the metal objects mostly circulated along the major rivers and their tributaries. The geographic position of tell settlements along the major transport routes in the period made it possible for them to engage in regional and long-distance exchange with different regions.

From a chronological point of view, even if, in most of the cases, the lack of stratigraphical data has restricted a finer chronological sequence of the bronze and gold industry, nonetheless an increase in the repertoire of metalwork could be detected, especially beginning with the second part of the Middle Bronze Age (Reinecke A2). When stratigraphical data was available in the published reports, in some cases it stands as evidence that certain types of metal artefacts mostly known from hoards were actually produced much earlier: such is the case of a socketed chisel uncovered in an Early Bronze Age level at Tószeg, a type previously thought to be in circulation only beginning with the final part of the local Middle Bronze Age. Further examples are the casting moulds found in the workshop from Mošorin (dated in the second part of the local Middle Bronze Age – Reinecke A2 using the central European chronological scheme) which prove that artefacts such as knives, spearheads and spherical-headed pins with oblique perforation were already being manufactured at this time. A striking increase in the repertoire of the gold and bronze industry, especially in the types of jewellery and dress ornaments, can be however observed in the last sequence of the Middle Bronze Age, the time when most of the so-called “Koszider” hoards from the tells are dated.

The following chapter (Chapter VI) is an attempt to integrate and compare the metallurgy from tells (analysed in detail in the preceding chapters) to the metallurgy developed in the Carpathian Basin in the Early and Middle Bronze Age. The main aim of this section was to reassess the role played by tell settlements in the metallurgical production of the region, by gathering evidence of metalworking from contemporary sites in their

surroundings and comparing with the situation encountered in the tells. First a brief overview of the metalwork known in this area was done in order to gain a better insight into the characteristics of the bronze and gold industry from the region. Not only are most metal finds from the tells representative of the wide repertoire of metalwork in circulation in the Carpathian Basin during the late Early and the Middle Bronze Age, but also these sites have yielded casting moulds for the manufacture of a wide range of artefacts known in the region. However, it has to be noted that most metal types encountered in the Carpathian Basin during this time could have been also manufactured in other contemporary sites from the region, as shown by our analysis of casting moulds uncovered in the area (coming from flat settlements, hoards, chance finds or graves). Taking into consideration the fact that metalworking activities were also documented in other contemporary sites, the presumed control of tells over metal production in the region can no longer be sustained. It is worth noting nevertheless that metalworking-related artefacts were uncovered in a higher proportion inside the tell settlements. Of course, this is also due to the current state of research with most excavations focusing on tells. Although tell sites did play an important role in the metal production from the Carpathian Basin during the Early and Middle Bronze Age, it is clear however that there was no centralised control over specialised crafts, at least in what metallurgy is concerned, and that these activities were not exclusive to central settlements. Another noteworthy point is that the distance to copper or tin sources did not play a decisive role in choosing the location of metalworking sites, melting and casting activities being also documented in sites situated at a great distance from any known sources (such as the tells from the Great Hungarian Plain). This also proves the existence of long-distance exchange networks accounting for the procurement of raw materials, although it is more likely that metal circulated in the form of ingots.

The development of the tells' metallurgy could have not been possible without an economic surplus that could be invested in sustaining such activities. As shown throughout this study, although artefacts associated with metalworking were uncovered in 50 tells from the Carpathian Basin, their scarcity in most of the sites indicates that metalworking did not always play an important role in the economy of these settlements. Most likely, the economy of the tells was based on agriculture, which was able to produce surplus, while the concentration of metal artefacts inside these settlements and the ability to produce bronze objects can rather be regarded as indications of their prosperity. Although at the time being most artefacts associated with melting and casting activities are coming from within the tells (which is also a reflection of the current state of research), such objects were also uncovered

in contemporary flat settlements, proving that metalworking was not exclusive to tells. Furthermore, the analysis of the casting moulds from the entire Carpathian Basin dating to the period that the tells were occupied, has revealed that most of the artefact types that were in circulation in the area could have also been produced outside of these settlements, so that the claimed control of elites living in tells over specialised production of bronze artefacts can no longer be sustained. Nevertheless, as shown throughout the thesis, tell settlements played an important part in the metal production from the region, and the development of tell-economy was able to produce enough surplus in order both to sustain metalworking as well as to accumulate a large amount of finished metal artefacts, as shown by the depositions uncovered inside these sites. The geographical distribution of tell settlements in the Carpathian Basin along the two major rivers in the region (the Danube and the Tisza) and their tributaries provided access to trade and exchange routes, and some of the metal artefacts discussed in this paper are evidence of the engagement of the communities living in the tells in such networks.