Metal Casting Equipment in the Bronze Age Burials in Europe

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The article is devoted to the analysis of the finds of foundry implements in the Bronze Age burials in Europe. In addition, it revises criteria for identifying burials of metalworkers. In all probability, complexes where the professional sphere of the buried is represented only by tools associated with metal work and by those with a full set of tools suitable for work should be attributed to those of metalworkers. As a result of comparison of aspects and dynamics of this phenomena, common and specific characteristics of Eastern Europe, on the one side, and Central and Western — on the other, have been revealed. Burials with casting equipment in Europe first emerged in the Late Aeneolithic Age and existed in the Early Bronze Age. In the Middle Bronze Age, this tradition was widespread in the south of Eastern Europe, especially among the Catacomb cultures. In Central and Western Europe, in contrast, burials of metalworkers are almost totally absent in the Middle Bronze Age. Casting equipment in the funerary context emerged anew in Central and Western Europe in the Late Bronze Age. However, these finds are mostly located in the burial grounds and are connected with the burials. In Eastern Europe, only one Late Bronze Age complex with casting equipment is known. Nevertheless, in Transural region, Western Siberia and Kazakhstan they existed in the same period. These complexes are very different from the Middle Bronze Age burials of metalworkers. Overall, discrepancies in the development of this phenomenon in the eastern and western European regions are related to their cultural development in the course of the Bronze Age.

Keywords: burials with manufacturing equipment, burials of metalworkers, metal casting equipment, East European Bronze Age, Bronze Age of Central and Western Europe.

Литейный инвентарь в погребениях эпохи бронзы на территории Европы

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Работа посвящена анализу находок литейного инвентаря (тиглей, сопел, литейных форм) в погребальных комплексах эпохи бронзы на территории Европы. Рассмотрены критерии выделения погребений литейщиков. К ним с наибольшей вероятностью можно отнести комплексы, в которых сфера деятельности погребенного представлена

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только инструментами, связанными с металлообработкой, а также в которых представлен наиболее полный производственный набор с инструментами, пригодными к использованию. В результате сравнения проявлений и динамики развития исследуемого феномена в разные эпохи в Восточной Европе, с одной стороны, и в Центральной и Западной Европе, с другой, выявлены общие и специфические черты для каждого региона. Погребения с литейным инвентарем появляются в Европе в эпоху позднего энеолита и существуют в раннем бронзовом веке. В среднем бронзовом веке данная традиция широко представлена на юге Восточной Европы, преимущественно в памятниках катакомбных культур. В Центральной и Западной Европы, напротив, погребения литейщиков в памятниках среднего бронзового века практически отсутствуют. Находки литейного инструментария в погребальном контексте появляются в Центральной и Западной Европе в позднем бронзовом веке, однако в большинстве случаев они происходят из могильников и не имеют привязки к конкретным погребениям. В Восточной Европе в эпоху поздней бронзы известен лишь один погребальный комплекс с литейным инвентарем. Однако находки литейного инструментария в это время известны в погребениях на территории Зауралья, Западной Сибири и Казахстана. Характер этих комплексов существенно отличается от погребений среднего бронзового века. В целом данный феномен тесно связан с процессами культурогенеза на исследуемых территориях. Отсутствие погребений литейщиков в среднем бронзовом веке в Центральной и Западной Европе и в позднем бронзовом веке в Восточной Европе, вероятно, обусловлено сменой культур: появлением на западе курганной культуры, а в восточных областях — срубной.

Ключевые слова: погребения с производственным инвентарем, погребения литейщиков, литейный инвентарь, эпоха бронзы Восточной Европы, эпоха бронзы Центральной и Западной Европы.

Despite of its scarcity, finds of metal casting equipment (casting moulds, tuyeres and crucibles) in the burials play an important role in studying the ancient metal production as well as the social status of metalworkers. G. Childe was the first to address this theme discussing the absence of metalworkers' burials of the Middle Bronze Age in Britain[1]. A series of discoveries in the second half of the XX century that took place mainly in Eastern Europe provoked a discussion about the significance of burials with metal moulding tools and their correspondence to the level of specialization in metal production. By the present time in Eastern Europe and in the nearby regions, more than 50 burials with metal casting equipment have been revealed. Most of them are well-known and published. Information of the finds of metalworking tools in the Central and Western European burial complexes has been collected over the last decades by J. Mojen[2], J. Batora[3] and A. Jockenhövel[4].

Thus, available data allows to make a panoramic review of such finds in the burials and to compare the specificity of these phenomena in Eastern Europe, on the one hand, and, in Western and Central Europe, on the other hand, as well as of its development in both regions.

[1] *Childe G.* Prehistoric communities of the British Isles. London, 1947. P. 163.

[2] *Mohen J. P.* Les sépultures de métallurgistes du début des âges des métaux en Europe // Découverte du métal. [s. l.], 1991.

[3] *Batora J.* Contribution to the problem of "craftsmen" graves at the end of aeneolithic and in the early bronze age in central, western and eastern Europe // Slovenská archeológia. 2002. L. 2. P. 179–228.

[4] *Jockenhövel A.* Alteuropäische Gräber der Kupferzeit, Bronzezeit und älteren Eisenzeit mit beigaben aus dem Giessereiwesen (Giessformen, Düsen, Tiegel) // Overbeck M. Die Gießformen in West- und Süddeutschland (Saarland, Rheinland-Pfalz, Hessen, Baden-Württemberg, Bayern). Stuttgart, 2018. P. 213–317.

Our data set comprises 112 finds of the metal casting equipment (crucibles, tuyeres and casting moulds) that were discovered in the Bronze Age burial grounds. Such finds are spread over a vast territory from Scandinavia to the Northern Caucasus, and from the Atlantic coast of France to West Siberia (Fig. 1). Their highest concentration is observed in the steppe and forest-steppe regions of Eastern Europe. Both in Central and Western as well as in Eastern Europe such burials fit the chronological frames from the Late Aeneolithic until the Late Bronze Age. However, the beginning and the end of the chronological periods in Eastern Europe was not synchronous to that of Central and Western Europe. The oldest known burials of metalworkers in Eastern Europe belong to the Late Aeneolithic Age and are dated to the middle-second half of the 4th millennium BC. In the Early Bronze Age (end of the 4th — beginning of the 3rd millennium BC) their number increased. In the 3rd millennium BC, the Middle Bronze Age began on this territory, and at the turn of the 3rd to 2nd millennium BC the Late Bronze Age emerged. In Central and Western Europe, the Aeneolithic and Early Bronze Ages are dated 2300–2200 BC, which roughly corresponded to the end of the Middle Bronze Age in Eastern Europe. The Middle Bronze Age in Central and Western Europe embraces the middle of the 2nd millennium BC (1600–1400 BC), and the Late Bronze Ages commences about 1300 BC and comes to end at the beginning of the 1st millennium BC[5].

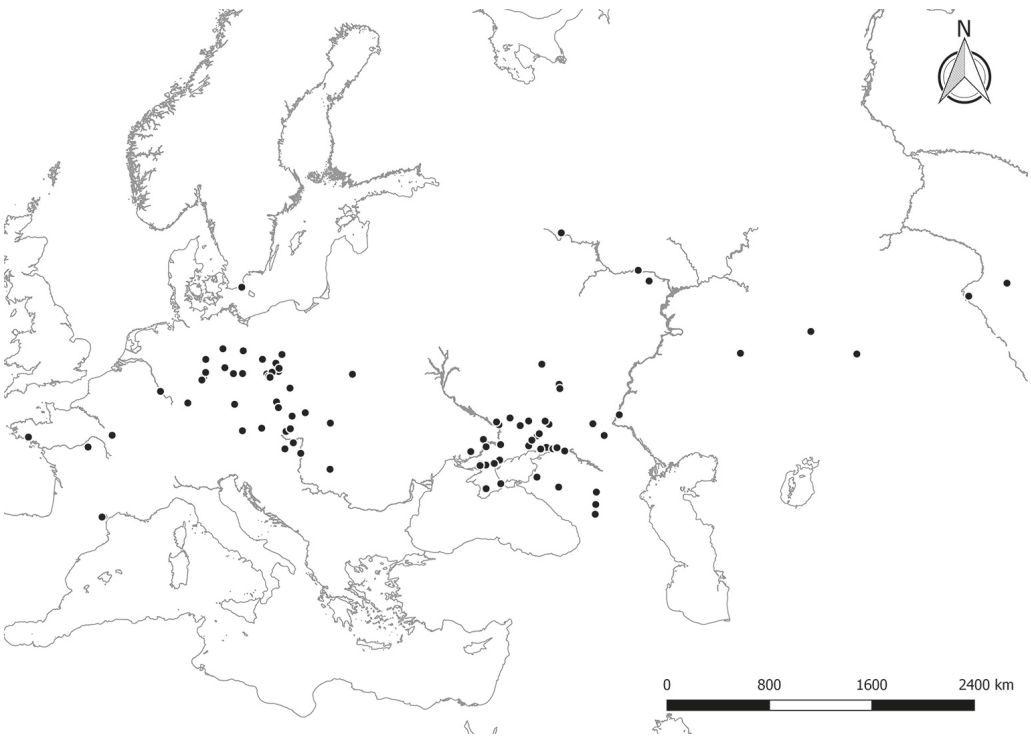

Fig. 1. Finds of metal casting equipment in funerary context in the Bronze Age in Europe. Illustration by A. V. Batasova

[5] Gaben an die Götter: Schätze der Bronzezeit Europas / A. Hänsel, B. Hänsel (Hrsg.). Berlin, 1997. P. 102–103.

Therefore, the Early Bronze Age in Eastern Europe began about a thousand years earlier than in Central and Western Europe. Consequently, in absolute chronology the Aeneolithic and Early Bronze Ages in Central and Western Europe on certain timespan synchronized with the East European Late Bronze Age[6]. This observation allows drawing conclusion that the rates of adoption and development of innovations in metal processing were substantially different in the western European regions and in the eastern ones. In this regard, Eastern Europe was significantly ahead of Central and Western[7].

The fact that the periods of the Bronze Age in different European regions do not chronologically coincide, complicates the comparison of these regions with each other. During most of the period of the existence of Bronze Age metallurgy in Eastern Europe, which is confirmed by burials with metal foundry equipment, Central and Western Europe were at the Aeneolithic stage with relatively poorly developed metal production and, therefore, no "burials of metalworkers" attested. Since for the emergence of this tradition, the conditions under which it could appear, the relationships between its development and cultural history of the region are of great importance, the specifics of this phenomenon will be compared in the frames of stages of the Bronze Age. In other words, the situation in Eastern Europe of the Early Bronze Age will be compared with the situation in Central Europe of the Early Bronze Age despite the fact that in absolute chronology they are completely different timespans.

Before starting the review of finds of metal casting equipment in the burials of different ages, it is necessary to discuss the term "burials of foundry workers". As it has been already mentioned, it mostly covers burial complexes where the implements directly related to the sphere of metalworking (casting moulds, tuyeres and crucibles) has been found. As long as production activity demands certain professional skills, it was proposed that the finds of casting equipment in the burials point towards the professional specialization of the buried[8]. This idea was supported by the analysis of the skeleton remains from two burial complexes: mounds Pepkinskii and Pershin 1.4. In both cases, high concentration of copper in the bones was detected that might have been related to the direct involvement of these individuals in the metalworking process[9]. In the absence of such direct evidence, the burials of metalworkers may be identified based on the analysis of function and structure of the funeral rite.

A burial rite was defined by A. van Gennep as the one of the rites of passage. Such rites are aimed at providing a person with a passage from one state of being to the other because of changes in age, occupation or social status[10]. A burial rite in this sense is a rite

[6] *Dergachev V. A., Bochkarev V. S.* Metallicheskie serpy pozdnei bronzy Vostochnoi Evropy. Kishinev, 2002. P. 12–13.

[7] *Bochkarev V. S.* Radiokarbonnaia revoliutsiia i problema periodizatsii pamiatnikov epokhi bronzy iuzhnoi poloviny Vostochnoi Evropy // Printsipy datirovaniia pamiatnikov epokhi bronzy, zheleznogo veka i Srednevekov'ia. St. Petersburg, 2013. P. 63.

[8] *Childe G.* Prehistoric communities of the British Isles. London, 1947; *Bochkarev V. S.* Pogrebeniia liteishchikov epokhi bronzy (metodologicheskii peresmotr) // Problemy arkheologii. Vol. II. Leningrad, 1978. P. 48–53; *Shilov V. P.* O drevnei metallurgii i metalloobrabotke v Nizhnem Povolzh'e // Materialy i issledovaniia po arkheologii SSSR. 1959. No. 60. P. 20.

[9] *Dobrovol'skaia M. V.* Khimicheskii sostav mineral'noi chasti skeleta // Kargaly. Moscow, 2005, vol. 4: Nekropoli na Kargalakh; Naselenie Kargalov: paleoantropologicheskie issledovaniia. P. 181; *Dobrovol'skaia M. V., Mednikova M. B.* «Mednye liudi» epokhi bronzy: rekonstruktsiia sostoyaniia zdorov'ia i sotsial'nogo statusa // Arkheologiia, etnografiia i antropologiia Evrazii. 2011. No. 2 (46). P. 144.

[10] *Van Gennep A.* Obriady perekhoda. Moscow, 1999. P. 9.

that should help a dead person to move to the other world and to be incorporated in the life after death. The transition from the world of the living to the one of the dead is often imagined as a travel for the success of which a set of material and non-material things is needed[11]. The material things may be cloths, food, tools, weapon and means of transport. The non-material (symbolic) things may include amulets, identification signs etc.[12] Perceiving the funeral rite in accordance with this approach, enables to assume that the equipment found in the burial complexes is a set that serves for the journey to the other world and identification there. Therefore, the fact of placing casting equipment in the burial chamber is of great importance because such implements performed certain functions in the individual burial rite. At the same time, finds with unclear origin or without a clear association with the specific burials, may be not taken into account while exploring the given theme as far as their relation to the funeral rite is not established. In addition, certain relations between the categories of the burial equipment and the elements of funeral rite mentioned by van Gennep may be established. Thus, carts, sledges, boats as well as their imitations and models that are found in the burial of different cultures may be referred to as means of transport. Undoubtedly, vessels that were often put in the graves should be identified as a food supply for the dead. The last statement is proved by various natural-science analysis[13]. Signs of age, occupation (including professional), and social status (symbols of power, luxuries) serve to a personal identification. Of course, the set of funeral rite's functions is not limited to the named categories, and functions of some elements of the rite can't be unequivocally interpreted. For example, depending on a cultural specificity and a context of a burial, a weapon may be considered a sign of age and gender, occupation (warrior) or social status. Within this approach, manufacturing equipment may be regarded as an attribute of a professional specialization and therewith of a social status. However, its symbolical meaning should not be excluded as well. Ample ethnographical evidence from Africa is indicative of a spectrum of magic beliefs concerning the sphere of metal production and metalworking, including the ones regarding human reproduction and fertility[14]. A series of burial complexes of the Middle Bronze where the crucibles were used as incense-burners ("zharovni")[15] can testify to ambiguous semantics of metal casting equipment. According to the hypothesis by L. S. Il'iukov, such crucibles might have been associated with the portable hearth or furnace[16].

Thus, taking into account the complexity of the issue in question and interpretation of the function of funerary equipment, we can suggest, nevertheless, that some aspects of such burials may point towards using metalworking tools in a burial as an attribute of a professional specialization.

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[11] *Petrukhin V. Ya.* Zagrobnyi mir // Mify narodov mira. Moscow, 1998. Vol. 1. P. 453.

[12] *Van Gennep A.* Obriady perekhoda. P. 140–141.

[13] *Khomutova T. E., Dushchanova K. S., Borisov A. V.* Ispol'zovanie metoda mul'tisubstratnogo testirovaniia dykhatel'noi aktivnosti mikrobnykh soobshchestv dlia rekonstruktsii iskhodnogo soderzhimogo ritual'nykh sosudov // Arkheologiia i estestvennye nauki v izuchenii kul'turnogo sloia ob"yektov arkheologicheskogo naslediia. Moscow, 2018. P. 187–190; *Pozhidaev V. M., Zaitseva I. E., Sergeeva Ia. E., Iatsishina E. B.* Identifikatsiia ostatkov pogreval'noi pishchi v glinianykh lepnykh sosudakh metodami gazovoi khromatografii i mass-spektrometrii // Butlerovskie soobshcheniia. 2019. No. 4, vol. 58. P. 146–156.

[14] *Chernyh E. N.* Kargaly. Moscow, 2007. P. 134–169.

[15] These burials will be further reviewed in the course of the discussion of the Middle Bronze Age burials.

[16] *Il'iukov L. S.* Pogrebeniia liteishchikov epokhi srednei bronzy iz severo-vostochnogo Priazov'ia // Sovetskaia arkheologiia. 1986. No. 2. P. 230.

1. The burial complex. The first aspect that draws attention while determining the function of foundry implements in the burials is location of the finds. Professional attributes placed in a burial chamber or urn in the vicinity of a buried person are more likely to have been personal belongings. Relationship between the buried and the artifacts originating from the periphery of the burial complex or from an unclear context is obscure.

2. Complementary production implements. If the funeral rite is considered a rite of passage, then metalworking equipment ought to serve a deceased person in his afterlife, either as an attribute of the professional specialization or as a symbol. To shed light upon its function, it is necessary to examine its relationships with other elements of a burial rite. Burials with metalworking equipement as the only attribute of professional specialization and status are more likely to have belonged to foundry workers than those with metalworking tools as a part of a spectrum of activities.

3. Tool kit. Foundry implements discovered in burials are associated with the main stages of the production process: melting metal in crucibles, maintaining the melting temperature using tuyeres, pouring metal into casting moulds. Thus, the richer a tool kit in a burial and the more production operations it embodies, the stronger the reasons are to consider metalworking implements professional attributes rather that symbolic elements of a rite. However, this criterion alone is insufficient if in a funeral tradition of a culture a principle "pars pro toto" is common.

4. Foundry tools. When considering the tools themselves, the condition of objects and traces of use are of great importance. Good preservation of objects, the presence of slagging, firing, traces of use on foundry molds, etc., may indicate that things were placed in a burial in order to serve the foundry worker in the afterlife. The function of fragmented artifacts is unclear although, as already noted, they may be explained by the principle "pars pro toto". Finds of foundry tools with clear signs of secondary use, not related to their productive purpose, obviously should be excluded when identifying the burials of "metalworkers".

Based on this approach to the problem of recognizing the burials of metalworkers, it is possible to compare contexts of the finds of metal casting equipment in the burials of metalworkers in Europe and to define specificity of different regions and chronological periods from the perspective of the geography of the finds, their cultural attribution, age and gender of the buried, qualitative and qualitative analyses of the funerary equipment (along with foundry implements).

Metal casting implements in the burials of the Late Aeneolithic and Early Bronze Ages

Eighteen finds of casting implements refer to the time of the beginning of spreading of metal casting technology in Europe. They were discovered in the territory of France, Germany, Austria, the Czech Republic, Slovakia, Ukraine and European Russia (Fig. 2).

The burial complexes belong to Aeneolithic Post-Mariupol culture group, Iamnaia (Pitgrave), Novotitorovka, Kemi-Oba, Fat'ianovo, Bell-beaker pottery, Únětice, Otomani, Tumulus Armorican cultures, and Unterwolbing cultural group (Fig. 3: *1*). Overall, the number of burials is few (1–2 burials in each culture); however, 4 burials are known in Únětice culture. Concerning the distribution of metal moulding tools at this stage, a broad

Fig. 2. Finds of metal casting equipment in the Early Bronze Age in Europe: 1 — Kervellerin en Cleguer; 2 — Nienhagen; 3 — Erfurt-Gispersleben; 4 — Haid, grave 80; 5 — Franzhausen Burial ground II, grave 1057; 6 — Gemeinlebar — Maisgasse, grave 532; 7 — Ludéřov, complex 98; 8 — Matúškovo, grave 50; 9 — Nitra; 10 — Nizna Mysla, grave 280; 11 — Nizna Mysla, grave 133; 12 — Verkhniaia Maevka, mound group XII, barrow 2, grave 10; 13 — Sokolovo, mound 1, grave 6; 14 — "Golden grave"; 15 — Lebedi, mound group I, mound 3, grave 10; 16 — Volosovo-Danilovskii, grave 21 (1964); 17 — Churachikskii, mound 2; 18 — Pershin mound 1, grave 4. Illustration by A. V. Batasova

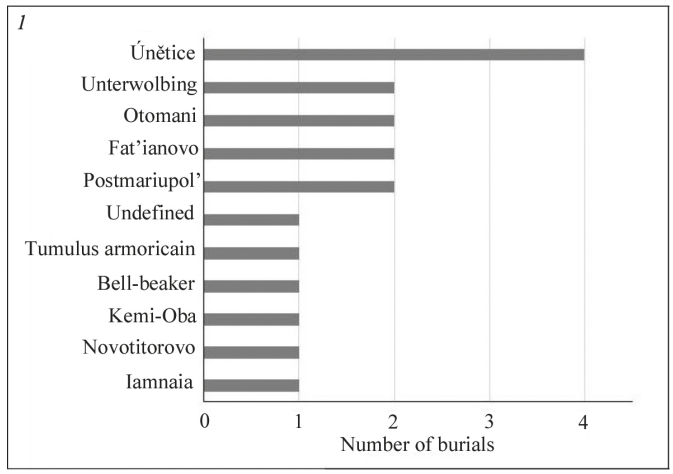
geography of finds, the absence of concentration zones, and high dispersion should be pointed out.

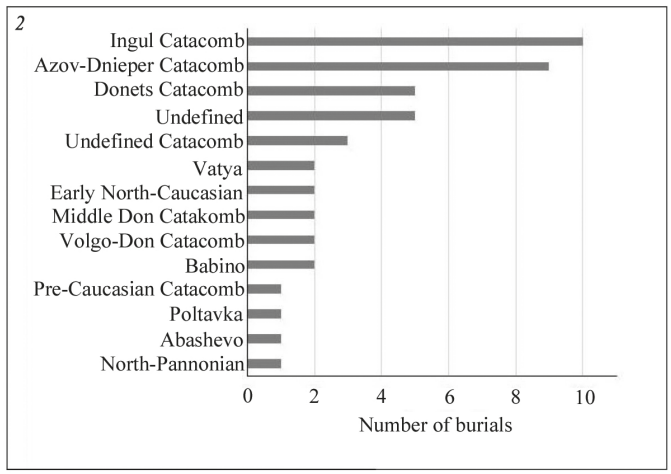
As for the context of the finds, most of them were revealed in burial chambers. An origin of just one find (Nienhagen) is unclear[17]. In other 5 cases the location of the equipment is indefinite due to the incompleteness of the archaeological documentation. Anthropologic evaluations are noteworthy as they indicate that female burials are absent in both regions. However, there is one burial of a juvenile[18]. The rest of the burials belong to the adults, in some cases identified as males (Fig. 4: *1*). Most of the complexes are individual burials, although remains of three adults were found in the grave 10 mound 2 of the mound group XII in Verkhniaia Maevka[19].

[17] *Jockenhövel A.* Alteuropäische… P. 300, 303.

[18] *Chernykh Ye. N., Kuzminich S. V., Lebedeva Ye. Yu., Lun'kov V. Yu.* Issledovanie kurgannogo mogil'nika u s. Pershin // Arkheologicheskie pamiatniki Orenburzh'ia. Vol. 4. Orenburg, 2000. P. 65–66.

[19] *Kovaleva I. F., Volkoboi S. S., Marina Z. P., Likhachev V. A., Poptsov V. A.* Issledovanie kurgannykh mogil'nikov u s. Verkhniaia Maevka v stepnom mezhdurech'e rek Oreli i Samary // Kurgannye drevnosti stepnogo Podneprov'ia III–I tys. do n. e. Dnepropetrovsk, 1977. P. 20–22.





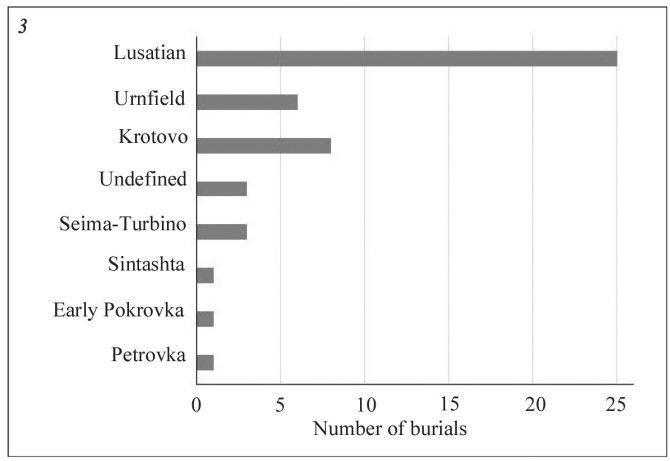
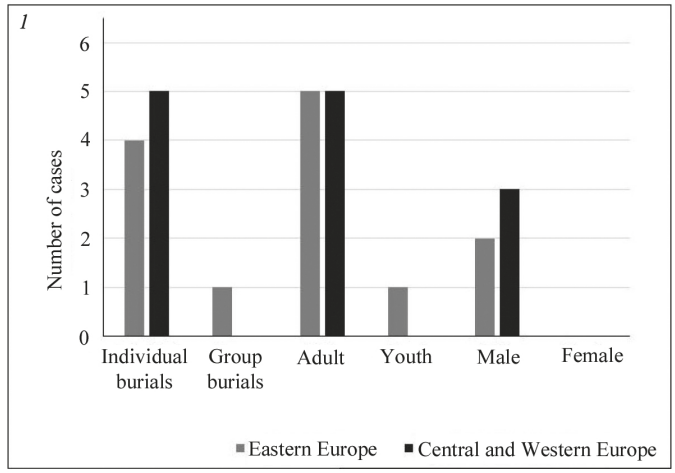
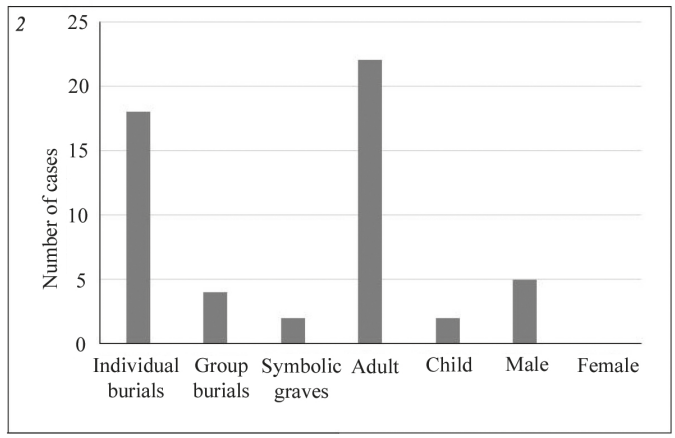


Fig. 3. Cultural attribution of the burials with the metal casting equipment: *1* — Early Bronze Age; *2* — Middle Bronze Age; *3* — Late Bronze Age. Illustration by A. V. Batasova





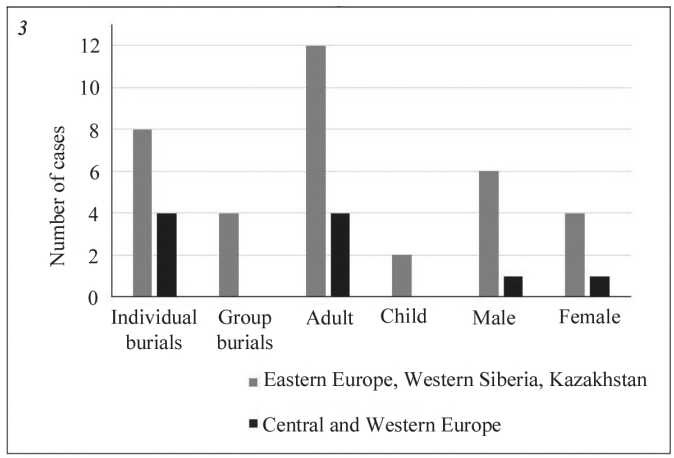


Fig. 4. Types of burials, age and gender distribution of the complexes with metal casting equipment: *1* — Early Bronze Age; *2* — Middle Bronze Age; *3* — Late Bronze Age. Illustration by A. V. Batasova

Funerary equipment in these complexes is quite uniformed. Along with the casting tools in half of the eastern as well as central and western burials, auxiliary production tools were found (anvils, hammers, abrasives, flint tools etc.) Besides professional attributes, clothes accessories, ornaments, vessels, and, sporadically, small metal artefacts and bones of animals could be placed in the burials. Burial equipment in the complexes shares characteristics common in the cultures they belong to. The only specific trait observed is a presence of metal casting implements. In addition, mostly complete forms of foundry implements, frequently bearing traces of usage, were found. All this enables to suppose that in the Early Bronze age in Eastern as well as in Central and Western Europe foundry equipment was put in burials as an element of professional identification of the buried. Despite similarities in function of the metal casting tools in burials, certain essential differences between the finds from Eastern Europe, on the one hand, and Central and Western Europe, on the other hand, may be observed. They are traced in the categories and types of the metal casting equipment. In Eastern European burials, casting moulds prevail, crucibles are rarer, and the tuyers are completely absent. All casting moulds were made of clay and designated for casting shaft-hole axes. Foundry tools from the Western European burials is less uniformed. Tuyers here is the most frequently met category of equipment (82 % burials), casting moulds are found in about half of the burials, while crucibles are comparatively rare (18 %). Unlike Eastern European counterparts, all casting moulds found in Central and Western Europe were made of stone and intended for casting different artefacts (pins, ingots, flat axes etc.).

Thus, the burials with casting tools appear in Eastern as well as in Central and Western Europe in Late Aeneolithic Age[20]. These burials may be interpreted with a high degree of probability as those of metalworkers. If this is true, it points to a quite early specialization in the sphere of metal production. Scarcity and dispersion of such burials might testify to a small number of metalworkers overall. However, essential differences between Eastern Europe, on the one hand, and Central and Western, on the other hand, are observed. Mainly they are reflected in the categories and types of casting equipment. From this perspective, it is possible to note a significant unity of the Eastern European burials of metalworkers that, perhaps, testifies to the unity of the origin of this funeral rite as well as to the types of metal casting implements. Burial complexes from Central and Western Europe are more various in the forms of equipment, however, casting moulds made of stone unite them with regard to a technological aspect.

Burials with foundry equipment in the Middle Bronze Age

The number of burials with metal casting implements significantly increased in the Middle Bronze Age (Fig. 5). Most of them are known in the territory of Eastern Europe and belong to the Catacomb cultures as well as Poltavka, Babino, Abashevo and, perhaps, Early North Caucasian cultures (Fig. 3: *2*). In most cases, metal casting equipment was placed directly in or by the chamber. Only six finds of casting implements are known in Central and Western Europe at that time. However, three of them originate from the unclear con-

[20] In addition to the above-mentioned complexes, "crucibles" were found in the burials of Tizsapolgar culture of the Early Aeneolithic Age in Hungary. See: *Bognár-Kutzián I.* The Early copper age tiszapolgár culture in the Carpathian basin. Budapest, 1972. P. 164. — However, there is no convincing evidence that these vessels were used as crucibles and thus these cases were not included in the review.

text or have no reference to the burials. Another case, traditionally interpreted as a burial of a metalworker is doubtful. It is a burial complex found near Sachsenburg at the beginning of the XIX century. The destroyed grave of Tumulus culture contained a short sword, a dagger, silexite arrowheads, stone axes and about 300 whole and fragmented tuyeres[21]. Such a large number of tuyeres found in a burial is an extraordinary trait by itself. Another peculiarity concerns the shape of these artefacts, which enables to suggest that they are not tuyeres at all. Firstly, the air-duct tunnel in none of them narrows. However, the narrowing tunnel is an essential feature of tuyeres as this raises pressure and forces the air stream. Secondly, all these "tuyeres" are slightly bent and have conical funnel-shapes deepening on the bottom. These features are not typical of tuyeres on the whole and are useless for their functioning. Finally, these artefacts carried no traces of burn, although one might expect them on the surface of such tools. Given these observations, it can be hypothesized that these artefacts had another function (funnels?). Thus, among the central and western European burials only two originating from Hungary (Környe 15[22] and Dunaújváros-Dunadüllö 1029 (960)[23]), may be considered burials of metalworkers.

There are also burial complexes in Eastern Europe with metal casting implements that are most probably were not those of metalworkers. In several burials of the Donetsk Catacomb culture, located on the northern shore of the Gulf of Taganrog, semi-spherical shallow crucibles were found. Some of them (Korotaevo[24], Lakedemonovka III/1.4[25], Styla 1.12[26]) originate from destroyed graves, thus their context is unclear. In other 4 burials (Varenovka 4.5[27], Mukhin I/3.5[28], Berdanosovka 4.22[29] and "Krasnyi Metallist"[30]) crucibles were used as incense-burners, which is ascertained by the presence of small pieces of coal and ochre in them[31]. It is worth mentioning that the number of complexes where such crucibles were used in their secondary function is quite significant and constitutes 30 %. Based on this, it can be suggested that in the given funeral tradition crucibles were placed in the burials not as personal professional attributes but as symbolic items. Consequently, all complexes with such crucibles should be excluded from the list of burials of metalworkers.

The overall number of Eastern European burials of supposedly metalworkers is therefore 31. While in the Middle Bronze Age of Central and Western Europe there were few burials of metalworkers, only the Eastern European ones will be considered in order to define similarities and differences among them.

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[21] *Müller D. W.* Die späte Aunjetitzer Kultur des Saalegebietes im Spannungsfeld des Südostens Europas // Jahresschrift für mitteldeutsche Vorgeschichte. 1982. Bd. 65. P. 107–127.

[22] *Jockenhövel A.* Alteuropäische… P. 300

[23] Ibid. P. 233.

[24] *Vlaskin N. M.* Pogrebenie "metallurga" epokhi srednei bronzy // Donskaia arkheologiia. 1999. No. 2 (3). P. 67.

[25] *Il'iukov L. S.* Pogrebeniia… P. 227.

[26] *Berezanskaia S. S., Kravets D. P.* O metallurgicheskom remesle plemen Donetskoi katakombnoi kul'tury // Pervobytnaia arkheologiia. Materialy i issledovaniia (sbornik nauchnykh trudov). Kiev, 1989. P. 166.

[27] *Il'iukov L. S.* Pogrebeniia… P. 227–228.

[28] *Vlaskin N. M.* Pogrebenie "metallurga"… P. 65.

[29] *Bespalyi E. I.* Raskopki Novocherkasskoi ekspedicii v 1990–1991 gg. // Aksaiskie drevnosti. Rostov-na-Donu, 2002. P. 111–188.

[30] *Vlaskin N. M.* Pogrebenie "metallurga"… P. 67.

[31] *Il'iukov L. S.* Pogrebeniia… P. 227–228; *Vlaskin N. M.* Pogrebenie "metallurga"… P. 65, 67.

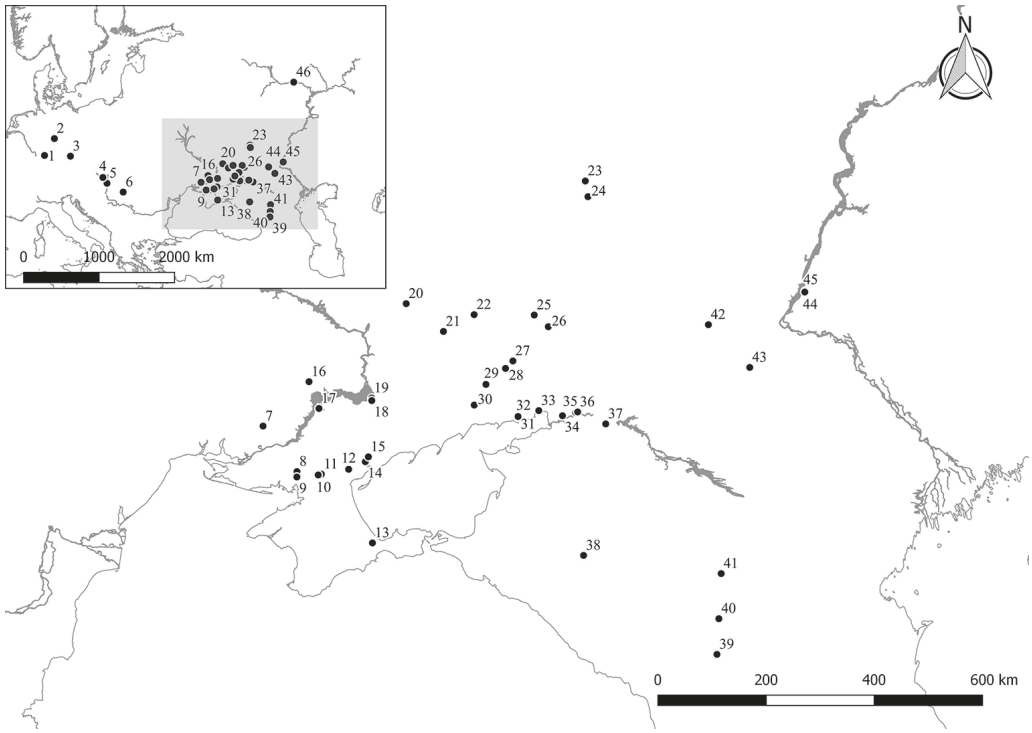

Fig. 5. Finds of metal casting equipment in the Middle Bronze Age in Europe: 1 — Wenkheim, mound 1; 2 — Sachsenburg, barrow 3; 3 — Žákava, mound 1; 4 — Környe, grave 15; 5 — Dunaújváros-Dunadüllö, grave 1029 (960); 6 — Cruceni; 7 — Pavlovka, mound 27, grave 20; 8 — Novoe; 9 — Kairy, mound 1, grave 11; 10 — Gromovka, mound 1, grave 7; 11 — Voskresenka, mound 3, grave 3; 12 — Kalinovka, mound 1, grave 4; 13 — Krasnovka, mound 36, grave 20; 14 — Davydovka, mound 1, grave 5; 15 — Malaia Ternovka, mound 2, grave 7; 16 — Kamenka, mound 2, grave 7; 17 — Pervomaevka, mound group I, mound 2, grave 1; 18 — Vasil'ievka, mound 1, grave 20; 19 — Verkhniaia Krinitsa, mound 4, grave 7; 20 — Kopani, mound group II, barrow 1, grave 1; 21 — Novokrivorozhskii GZK; 22 — Kramatorsk; 23 — Losevo, mound 3, grave 5; 24 — Pavlovskii, mound 38, grave 3; 25 — Prishib, mound 1, grave 9; 26 — Voroshilovgrad, mound 3, grave 16; 27 — Shakhtersk, mound 2, grave 5; 28 — Pokrovka, mound 4, grave 3; 29 — Styla, mound 1, grave 12; 30 — Novoalekseevka, mound 1, grave 6; 31 — Lakedemonovka, mound group I, mound 1, grave 12; 32 — Lakedemonovka, mound group III, mound 1, grave 4; 33 — Varenovka, barrow 4, grave 5; 34 — Korotaevo; 35 — Mukhin, mound group I, mound 3, grave 5; 36 — Berdanosovka, mound 4, grave 22; 37 — Koldyri, mound 3, grave 3; 38 — Chernyshevskii, mound group I, mound 15, gave 35; 39 — Azhlama; 40 — Skachki; 41 — Veselaia Roshcha, mound group I, mound 3, grave 3; 42 — Kalinovka (Surovikino); 43 — Zhutovo, mound 1, grave 3; 44 — Kalinovka, mound 8, grave 42; 45 — Kalinovka, mound 55, grave 13; 46 — Pepkinskii, barrow 1. Illustration by A. V. Batasova

First, compared to the previous period, the number of burials with metal casting equipment in Eastern Europe drastically increased. Then, similarly to the Early Bronze Age, there were no female burials, but among those of adults, several were identified as males. Two individual burials of children are also worth mentioning (Fig. 4: *2*). In the Middle Bronze Age, distinctions in funeral rites in groups of burials of metalworkers observed were caused by cultural and, perhaps, local traditions of the societies they belonged to.

Such distinctions are evident in the shapes of tombs; orientation and position of the bodies; composition and specific items of funerary equipment and types of metal casting tools. For example, in the burials of the Ingul Catacomb culture this specificity is represented by stone arrowheads; in the Donetsk Catacomb cultures — by incense-burners ("zharovni") and animals' bones; in Pre-Caucasian Catacomb culture — by legged vessels ("kuriltitsy") etc. Unlike the burials of metalworkers of the Early Bronze Age, the tool kit of the ones of the Middle Bronze Age could include three categories of implements: casting moulds, crucibles and tuyers of different shapes. However, the unifying element in the complexes of different archaeological cultures of this time is a type of casting moulds. One-sided clay casting moulds for ingots and two-part casting moulds for shaft-hole axes were found in the burials. Both the material of the moulds and types of the negatives are indicative of the origins of the tradition from the Late Aeneolithic — Early Bronze Age. This is supported by two clay casting moulds found in the Prishib 1.9[32] and in the destroyed burial from Kramatorsk[33], both being attributed to the Donetsk Catacomb culture. Casting moulds from these burials have an open sprue along the belly, which was also a specific trait of the moulds found in the burials of antecedent period.

Summarizing the review of the burials of metalworkers in the Middle Bronze Age, it is necessary to point out a fundamental difference between Central and Western Europe, on the one hand, and Eastern Europe, on the other. In the first case, the tradition, first attested in the Late Aeneolithic Age, ceased to exist. Only scarce finds originate from the territory of modern Hungary, which may testify to its continuation in quite limited areas. In Eastern Europe, in contrast, this tradition evolved. The number of burials of metalworkers increased, and the cultural differences among them enhanced. However, there was a unifying trait reflected in the material, forms and negatives of the clay casting moulds. This observation allows tracing development of this tradition from the Late-Aeneolithic — Early Bronze Age to the Middle Bronze Age.

Metal casting equipment in the burials of the Late Bronze Age

The number of finds of metal casting equipment in the burials of the Late Bronze Age as well as their geographical distribution enables to suggest drastic changes that occurred both in the western and in the eastern parts of Europe in the final period of the Middle Bronze Age.

Thus, in Babino culture that emerged on the basis of preceding Catacomb cultures, the funerary equipment in complexes dramatically decreased. Isolated metal casting implements were found only in the burials of the early stage of this culture. With time, the tendency of reducing the amount of burial equipment continued. As a consequence, burials with metal casting equipment are almost absent in Eastern Europe in the Late Bronze Age, which constitutes a significant contrast with the Middle Bronze Age. It is possible to mention only one casting mould belonging to this period that was found in Eastern Europe (Kievka, mound 2)[34]. Around the same time, metal casting tools emerged in the burials of

[32] *Bratchenko S. N.* Donetska katakombna kul′tura rann′ogo etapu. Lugansk, 2001.

[33] *Shaposhnikova O. G.* Do pitannia pro metalloobrabotku u plemen donets′koi katakombnoi kul′turi // Arkheologiia. 1971. Vol. 1. P. 22–26.

[34] *Tallgren A. M.* La Pontide préscythique après l'introduction des métaux. Gelsingfors, 1926. P. 70–72. (Eurasia Septentrionalis Antiqua. Vol. 2).

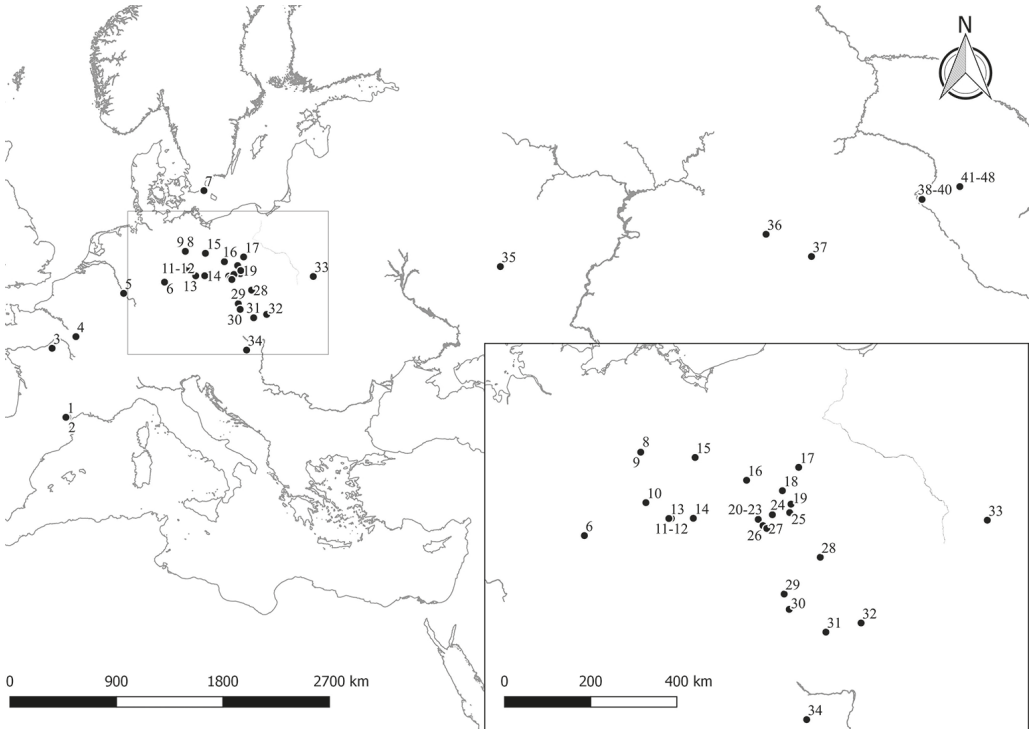

Fig. 6. Finds of metal casting equipment in the Late Bronze Age in Europe, Transural and Western Siberia: 1 — Pépieux «Las Fados»; 2 — Mailhac, deposit 356; 3 — Billy; 4 — Migennes, grave 233; 5 — Kobern-Gondorf, grave 2; 6 — Wandersleben; 7 — Löderup; 8 — Butzow; 9 — Radewege Bei «Schwarzen Berg»; 10 — Battaune, grave 1; 11 — Gävernitz «Grosses Grab», mound 1; 12 — Gävernitz, section 36; 13 — Löbsal (1902); 14 — Klein Jauer, findplace 34, grave 215; 15 — Falkenberg (bei Furstenwalde); 16 — Bojadła; 17 — Czarne Piątkowo; 18 — Karzec, grave 89; 19 — Sulow «Windmuhlenberg»; 20 — Legnica Grave 5; 21 — Legnica Grave 153; 22–23 — Legnica, undocumented grave; 24 — Mojęcice; 25 — Masłów «Toppelberg»; 26 — Mierczyce, findplace 15, grave 3; 27 — Piekary, grave 73; 28 — Gogolin-Strzebniów, grave 24; 29 — Moravičany; 30 — Určice «Kumberky», grave 177; 31 — Ilava, grave 221; 32 — Vyšný Kublin; 33 — Siedliszcze, findplace 2; 34 — Németbánya-Felsőerdő, mound III/4, grave 2; 35 — Kievka, grave 2; 36 — Solntse Mound, group II, mound 5, grave 1; 37 — Bestamak, grave 7; 38 — Rostovka, grave 24; 39 — Rostovka, grave 4; 40 — Rostovka, grave 21; 41 — Sopka-2, grave 282; 42 — Sopka-2, grave 464; 43 — Sopka-2, grave 427; 44 — Sopka-2, grave 54; 45 — Sopka-2, grave 55; 46 — Sopka-2, grave 64; 47 — Sopka-2, grave 91; 48 — Sopka-2, grave 122. Illustration by A. V. Batasova

Transurals, West Siberia and Kazakhstan (Fig. 6). These implements were discovered in 14 burials of Seima-Turbino, Sintashta, Krotovo and Petrovka cultures (Fig. 3: *3*).

In Central and Western Europe in the Late Bronze Age, in contrast, the number of finds of foundry implements in the burial context increased. Mostly these are casting moulds originating from the burial grounds of the Urnfield culture and, especially, of the Lusatian culture. However, many of these finds are not related to the burials. Only in 9 of 34 cases the implements were placed in or by the urns, whereas in the burials from Eastern Europe, Western Siberia and Kazakhstan the metal casting equipement was mostly locat-

ed in a chamber, by the buried person. In several other cases, it was placed on the covering of the chamber or near it.

According to the age and gender estimations, the buried mostly were adult men. However, it is remarkable that several female burials (individual as well as together with men and children) were discovered. Female burials with metal casting implements that emerged in the Late Bronze Age constitute a very new trait that was absent in the burials of the Early and Middle Bronze Ages (Fig. 4: *3*).

Funerary equipemnt of the eastern complexes is very diverse. In addition to vessels, animal bones, ornaments, common in the burials of preceding periods, new groups of items were placed in the graves. Most of them were probably of non-utilitarian use: fragments of rock crystal, jasper, flint flakes[35]. It is also worth mentioning elements of equestrian equipment (horse cheekpieces) in the burial 7 from Bestamak[36]. Overall, the Transural and West Siberian burials with metal casting implements seem to have been richer compared with Eastern European counterparts of the preceding time. Their funerary equipment includes metal artefacts and implements that must have been expensive at that time (knives, awls, axe-adze, socketed axes and chisels).

Funerary equipment of nine Central and Western European burials with metal casting tools, in contrast, is quite modest and uniformed. Vessels are the most common items, however, in individual cases, auxiliary production tools (Karzec 89)[37], small metal ornaments and details of garment (Kobern-Gondorf 2, Migennes 233)[38] are also present.

A specific feature of the Late Bronze Age is frequent finds of incomplete and fragmented casting moulds. In the graves of the Late Aeneolithic, Early and Middle Bronze Age mostly complete casting moulds with traces of usage were found. However, in the burials from Western Siberia and Kazakhstan about half of the burials contained only small fragments of casting moulds. In Central and Western Europe, complete casting moulds were placed in urns, excluding one destroyed burial (Németbánya-Felsőerdő III/4.2)[39]. Moulds found as deposits on the burial grounds were frequently fragmented.

Thus, the Late Bronze Age burials with metal casting equipment are characterized by specificity not observed in burials of the Early and Middle Bronze Ages. Firstly, in the western regions, mainly in the area of the Lusatian culture, a tradition of depositing foundry tools (casting moulds and their fragments) on the burial grounds not related to the burials emerged. Such finds are more frequent than those placed in or by the urns. This proportion (9 to 25) allows suggesting that in the Late Bronze Age the function of metal casting tools in the funeral rite changed or was further diversified. At that time, it might have served not only as a personal professional attribute, but also as a symbol. In the burials with metal casting implements from Western Siberia and Kazakhstan new elements of burial rite may be traced as well: emergence of female burials, diversification of the funerary equipment, frequent placement of metal implements and fragmented

[35] *Matiushchenko V. I., Sinitsyna G. V.* Mogil'nik u derevni Rostovka vblizi Omska. Tomsk, 1988. P. 10, 30–36. About the sacral function of the flint flakes in the Late Bronze Age see: *Razumov S. N.* Kremen' v obriadovoi praktike plemen bronzovogo veka (postanovka voprosa) // Problemy arkheologii i arkhitektury. Vol. 1. Donetsk; Makeevka, 2001. P. 29.

[36] *Kalieva S. S., Logvin V. N.* Mogil'nik u poseleniia Bestamak (predvariteľnoe soobshchenie) // Vestnik arkheologii, antropologii i etnografii. 2008. No. 9. P. 43–46.

[37] *Jockenhövel A.* Alteuropäische… P. 250.

[38] Ibid. P. 239.

[39] Ibid.

moulds in the graves[40]. Overall, the character of several of these burials provides reason for considering them the burials of aristocracy rather than those of metalworkers.

Furthermore, the fundamental difference between the Western and the Eastern finds disappears at this stage. As has been mentioned before, clay casting moulds were typical of burials in the Late Aeneolithic, Early and Middle Bronze Age in Eastern European, while in central and western Europe — the ones made of stone. In the Late Bronze Age, clay and stone casting moulds are found in both regions. Moreover, they are more varied in forms of negatives, among which there are those intended for casting ingots, spearheads, socketed axes, knives, razors, hangers.

Thus, significant changes are noted in the Late Bronze Age burials with regard to foundry implements. Burials of metalworkers ceased to exist in Eastern Europe in the final Middle Bronze Age. Around the same time, metal casting equipment appeared in the burials in Transural, West Siberia and Kazakhstan. Some of them might have belonged to the persons of high social status. As for Central and Western Europe, after a period of discontinuance in the Middle Bronze Age, such finds emerged again. However, they mostly do not relate to the burials. Compared with the Early and Middle Bronze Age burials where the metal casting equipment was mainly a personal attribute of the buried, in the Late Bronze Age it seems to have changed or extended its function.

Conclusions

A panoramic review of the finds of foundry implements in the burials from Eastern, Central and Western Europe in the Bronze Age revealed several important aspects of this phenomenon. Firstly, all considered burials might be referred to archaeological cultures. on the basis of elements of funeral rite Consequently, the people buried together with metal casting equipment must have been members of these societies rather than of separated professional groups. Secondly, burials with metal casting tools emerged independently in Eastern Europe, on the one hand, and in Central and Western Europe, on the other. The earliest cases are known in the Late Aeneolithic Age, at the initial stage of development of metal production. This observation points towards the very early professional specialization in this field.

Further development of this phenomenon does not coincide in the eastern and western European regions. In Eastern Europe, where a genetic continuity between the cultures of the Late Aeneolithic — Early and Middle Bronze Age can be traced[41], the tradition of placing metal casting tools in the burials of metalworkers existed until the final period of the Middle Bronze Age. Technological continuity between the Late Aeneolithic — Early and Middle Bronze Age finds is discernible in the materials, types and negatives of the moulds. In the final of the Middle Bronze Age this tradition faded. The latest burials with metal casting tools are associated with the early stage of Babino culture. In the Late Bronze Age, Eastern Europe was occupied by the population of Timbergrave (Srubnaia) culture, whose origin is being related to the Volgo-Ural center of culture genesis[42]. However, the

[40] The last, for sure may be related with the principle "pars pro toto".

[41] *Bratchenko S. N.* Do problemi rann′obronzovoi itdustrii Skhidnoi Evropi // Drevnie kul′tury Vostochnoi Ukrainy. Lugansk, 1996. P. 54–55.

[42] *Bochkarev V. S.* Volgo-ural′skii ochag kul′turogeneza epokhi pozdnei bronzy // Bochkarev V. S. Kul′turogenez i drevnee metalloproizvodstvo Vostochnoi Evropy. St. Petersburg, 2010. P. 52.

burials with metal casting equipment emerged at that time beyond the borders of Eastern Europe, in Transural, Western Siberia and Kazakhstan. These complexes are also of Volgo-Ural origin, but belong to the cultures where the elements of chiefdoms are evident. For such societies, a leading role of chariot aristocracy in organization and development of artisan production activity is typical[43]. With regard to a range of traits, these burials are drastically different from those widespread in Eastern Europe in the Early and Middle Bronze Age.

In Central and Western Europe, the earliest burials of metalworkers date to the Late Aeneolithic time and the Early Bronze Age. The start of the Middle Bronze Age in Central and Western Europe was associated with a turn of archaeological cultures and corresponded to various changes in funeral customs, types of settlement and settlement system on the whole[44]. In addition, the tradition of burials with metal casting equipment vanished. The only isolated cases are known in Hungary, where the influence of the Tumulus culture was less meaningful[45]. In the Late Bronze Age, this phenomenon emerged in a new fashion in the Urnfield culture, and, in particular, in the Lusatian culture, being different in many aspects from the burials of metalworkers of the Aeneolithic and Early Bronze Age. Apparently, as in the Trans-Ural burials, the foundry implements at this stage lost its function of professional identification of the buried and acquired a new symbolic meaning in the funeral context.

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