Archaeology and value: Prehistoric copper and bronze metalwork in the Caucasus

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Abstract: *Early metallurgy has long been an important aspect of accounts of prehistoric culture and society in the Caucasus. Interest has often focused on its economic importance and sources of raw materials, especially the tin needed to make bronze. While origins, economy, and sources are important to the study of prehistoric metallurgy, they do not satisfactorily explain the role of metalwork in burials or other ceremonial contexts, nor the lengths people went to in order to produce or acquire even a few metal objects. These are better approached from the perspective of the value people attached to objects and actions, which may be addressed in archaeology through correspondences between the ways in which groups of objects were made and used. This further relates to the choices and skill with which goals were met in production. This article examines evidence for early metal making practices in 3rd millennium BC metalwork from Velikent site in present day Republic of Daghestan, Russia. Patterns in metal making and metal use provide a basis for examining interactions in ancient Eurasia, in which metalwork articulated connections between individuals as well as local and distant groups.*

Rezumat: *Începutul metalurgiei a fost mult timp un aspect important în evaluarea culturii şi societăţii preistorice din zona Caucaz. Interesul a fost adesea concentrat pe importanţa economică a acesteia şi sursele de materii prime, în special asupra staniului necesar pentru realizarea bronzului. În timp ce originile, economia şi sursele sunt importante pentru studiul metalurgiei preistorice, acestea nu explica în mod satisfăcător rolul prelucrării metalelor în morminte şi alte contexte de ceremonial, nici distanţele la care oamenii mergeau pentru a produce sau dobândi chiar şi câteva obiecte de metal. Acestea sunt mai bine abordate din perspectiva valorii pe care oamenii o ataşau obiectelor şi acţiunilor, care poate fi analizată în arheologie prin corespondenţele dintre modalităţile în care grupe de obiecte erau realizate şi utilizate. Aceasta este în continuare în relaţie cu opţiunile şi îndemânarea cu care obiectivele au fost îndeplinite în producţie. Acest articol analizează evidenţele pentru practicile timpurii de realizare a metalului în metalurgia mileniului III BC din situl Velikent, astăzi în Republica Daghestan, Russia. Modelele în obţinerea şi utilizarea metalului oferă o bază pentru examinarea interacţiunilor în vechea Eurasie, în care prelucrarea metalelor a articulat conexiuni între indivizi, ca şi dintre grupuri locale şi îndepărtate.*

Keywords: *Archaeometallurgy, Bronze Age, Caucasus, Daghestan, technology, value.*
Cuvinte cheie: *arheometalurgie, epoca bronzului, Caucaz, Daghestan, tehnologie, valoare.*

◈ Metallurgy has long been a source of absorbing interest in Eurasian archaeology, especially in the later prehistory of the Eurasian steppes and the Caucasus (A.A. Iessen 1935; A.A. Iessen 1951; E.N. Chernykh 1992; P.L. Kohl 2007; L. Koryakova, A. Epimakhov 2007; B. Hanks, K. Linduff 2009). This interest has usually been expressed in terms of the economic importance of metals, the origin of technologies, sources of various materials (e.g., copper, tin, and iron), the scale of production, and flow of metals between regions and in different periods. Among the most explored questions in archaeometallurgy is the source of tin utilized in making the earliest bronze. Tin bronze in metal artifacts dating to the 3rd millennium BC from Velikent, Daghestan has been attributed through lead isotope analysis to the same source(s) used in making Early Bronze Age metalwork in Southwest Asia (P.L. Kohl 2002). The Velikent bronzes may date as early as 2900 BC, and the site itself is located in the Caspian littoral of the northeastern Caucasus, where metalworking had been practiced since at least the mid-4th millennium BC (fig. 1). These findings have prompted discussion of the significance of early metalwork in the northeastern Caucasus (D.L. Peterson 2003; D.L. Peterson *in press*). Should it be considered as the product of a technology derived from early centers of civilization to the south, as an indigenous development, or something in between? In addressing this question, I advocate an approach to metalwork that goes beyond sources of raw materials to a discussion of the production process, and of metalwork as a product not only of technological practice, but also local systems of value and social practice. Ancient copper and bronze metalwork provides a wealth of evidence for

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archaeological interpretations of value that may aid in better understanding the significance of prehistoric metalwork in the northeastern Caucasus and elsewhere. On the surface, a focus on value may seem to be a strictly interpretive concern, but adequate interpretation requires examination of the reflexive relationship between production, circulation, and consumption. Therefore, improvements in methodological approaches to metalwork and other forms of material culture are also needed in order to gather the data needed to address questions of value.

Velikent was occupied intermittently from 3500-1900 BC, or during the Late Chalcolithic through Middle Bronze Age periods in the northeastern Caucasus. The site's chronology is well understood as a result of the 21 radiocarbon dates that have been produced through excavations by the International Program for Archaeological Research in the Caucasus (IPARC), co-directed by Philip Kohl (Wellesley College), Rabadan Magomedov and the late Magomed Gadzhiev (both with Institute of History, Archaeology, and Ethnology, Makhachkala, Dagestan) (M.G. Gadzhiev *et alii* 1995; M.G. Gadzhiev *et alii* 1997; P.L. Kohl 2002; P.L. Kohl 2003). Velikent is situated on five natural clay mounds comprising two settlement areas and three catacomb cemeteries, altogether covering over 28 hectares (P.L. Kohl 2003). The settlement areas represent a small village with domestic and storage structures made of mud brick and undressed stones. The catacomb tombs in the cemetery areas each have an underground chamber connected by a *dromos* to a short, slanted entrance tunnel. The entrance to each tomb was sealed with an upright stone slab. Periodic reuse of these structures is indicated by the removable stone slabs that cover the entrances, collective burial rite, and signs of the reconstruction of some of the tombs.

R.M. Magomedov (2006) associates the site as a whole with a northeastern Caucasus variant of the Kura-Araxes culture-historical community, which he has dubbed the Velikent culture. According to Magomedov, the Velikent culture has four periods spanning 3500-1900 BC. The Chalcolithic and Early Bronze Age (EBA) occupations date from the mid of 4th to the early to mid 3rd millennium BC, or Magomedov's Periods 1 and 2. The Middle Bronze Age (MBA) phase dates to the later 3rd- to early 2nd millennium BC, or Periods 3 and 4. During the Chalcolithic to EBA, occupation was principally focused on the northern part of the site area. Over the course of the 3rd millennium BC, settlement shifted to the south (P.L. Kohl 2003, p. 16). The abandonment of the earlier habitation area to the north occurred at a time when the number of settlements in the Caucasus was beginning to diminish, possibly in relation to greater reliance on mobile pastoralism (P.L. Kohl 2007, p. 112). The construction and use of the tombs began during Period 2 or the later stage of the earliest settlement, and continued until the final abandonment of the site in Period 4. While the evidence does not necessarily indicate the uninterrupted use of the tombs from the early 3rd to early 2nd millennium BC, their dating spans this period and overlaps with the occupation of the principal settlement areas. Catacomb burials are rarely encountered elsewhere in the Kura-Araxes horizon (R.M. Magomedov 2006, p. 146).

Excavations in the earlier settlement area to the north (originally designated by the excavators as Mound II) uncovered the foundations of a circular mud brick dwelling 6,3 meters in diameter (P.L. Kohl 2002, p. 267). This structure was erected in Period 1 and reoccupied in Period II, and thus spans the Late Chalcolithic and EBA. In addition to plain wares and red and black burnished Kura-Araxes ceramics, 10% of the sherds from one of the operations in this area were of much finer quality, sand-tempered and high-fired, with "almost metallic hardness and resonance" (P.L. Kohl 2003, p. 17; M.F. Heinsch, P. Vandiver 2006). These "high-quality wares" are almost identical to those from Kura-Araxes related sites in Chechnya and Ingushetia (R.M. Munchaev 1975, p. 337-334, fig. 76). Many were decorated by rouletting, and in design recall stamped zigzags, wavy lines, and herringbone patterns on contemporary ceramics from the North Pontic steppes. There are two main building levels in the area of later occupation to the south. The earliest consists of deeply sunk, oval pit houses dated to the very end of the EBA. Overlying it is a level with a more complex, multi-roomed MBA structure that contained numerous large ceramic vessels. Metal objects from this building (a bronze medallion, flat axe, and awl) resemble those from the tombs (P.L. Kohl 2002, p. 170). The earlier settlement area to the north yielded a mold for casting shaft hole axes that is closely similar to an axe found in a tomb excavated in 1997 (P.L. Kohl 2002, p. 168). This is one of only a handful of such molds known from the Caucasus. In addition, a crucible and mold at the nearby Rodnikovyi site, which dates to the mid 4th through the beginning of the 3rd millennium BC (fig. 1), supports the early dating for at least some of the Velikent catacombs and their contents, and dating of the establishment of metal making in region to as early as the mid 4th millennium BC (P.L. Kohl 2002, p. 166-167). An unanalyzed ingot of copper or bronze was found in the EBA level in the southern occupation area, while prills of metal suggesting metalworking activities have been found in the settlement areas within or near hearths (M.G. Gadzhiev *et alii* 1997, p. 188, N. 12).

Tomb 1 is situated in the cemetery area the excavators originally designated as Mound III. The metalwork from the tomb is the most well studied assemblage at the site (M.G. Gadzhiev, S.N. Korenevskii 1984; M.G. Gadzhiev *et alii* 1995; D.L. Peterson 2003). Inside the tomb were found some 1500 copper, bronze, and silver grave goods accumulated in a series of interments of as many as 100 men and women (M.G. Gadzhiev *et alii* 1995, p. 141). One hundred ninety-five of these objects were the subject of arc Optical Emission Spectroscopy (OES) analysis by M.G. Gadzhiev and S.N. Korenevskii (1984). Dates of 2700 +/- 200 BC from Mound V, Tomb 1, and 2600 +/- 250 BC from Mound III, Tomb 11 support the dating of the tomb to the EBA period (P. L. Kohl 2003). Both supersede the previous synchronic dating of the tomb and its contents to the end of the 3rd millennium BC (E.N. Chernykh 1992, p. 222-224, fig. 43).

The assemblage from Tomb 1 may be broken down into three classes of objects: tools and weapons, rings and bracelets, and other ornaments (M.G. Gadzhiev, S.N. Korenevskii 1984; D.L. Peterson 2003). The tools and weapons include shaft-hole axes, hafted knives, chisels, flat axes, and awls; ornaments are represented by toggle dress pins, anchor-shaped pendants, medallions, tubular beads, spirals, and breast cups. While other the ornaments qualify as bodily adornments, and even tools and weapons may serve as such (particularly in the context of burials), the rings and bracelets were made of the greatest variety of materials in the assemblage and thus warrant designation as a special class of bodily adornments (fig. 2). The question of why more materials would have been used for these objects as opposed to the other items in the assemblage is related to the value attached to metalwork in the region during the 3rd millennium BC, which I will return to later.

With only three exceptions, the analyzed objects fall into three compositional groups: unalloyed copper, high arsenic copper (generally referred to as arsenical copper or arsenic bronze), and tin bronze (M.G. Gadzhiev, S.N. Korenevskii 1984, p. 19-25). The exceptions are one bracelet containing over 90% silver, and two other bracelets made of an alloy of 70% copper and 30% silver (M.G. Gadzhiev, S.N. Korenevskii 1984, tab. N. 29998, N. 30078, N. 30079). The arsenic bronzes are distinguished from unalloyed copper by the presence of arsenic in levels from about 1,5-20%. The concentration of arsenic in the artifacts relates very closely to the kind of object that was manufactured, and thus the artisans' conscious manipulation of form and media (fig. 3). Only one of the tools and weapons (a dagger) contains more than 1% arsenic, the level conventionally assumed to indicate an alloy. The metalworkers appear to have favored reserving arsenic bronze for ornaments and adornments, with concentrations of arsenic below 6% in the majority of the objects. Tin bronze occurred in 15 items or 8% of the sample: one dress pin, five rings, and nine bracelets. Four of these also had arsenic levels of over 1% and may be described as tin-arsenic bronze. However, there is no apparent distinction in the use of tin bronze and tin-arsenic bronze within the assemblage, so this may not have been a significant distinction to the artisans who made these objects.

Even without modern sourcing techniques, Gadzhiev and Korenevskii concluded that the objects were made with locally produced copper on the basis of consistent trace levels of antimony and bismuth detected in the analyzed objects, the high trace levels of arsenic in pieces made of unalloyed copper (over 0,1% As), and typological similarities to other EBA metalwork elsewhere in the northeastern Caucasus (M.G. Gadzhiev, S.N. Korenevskii 1984, p. 9-27). With the assistance of Peter Northover, Chris Salter, and Blanca Maldonado (Oxford Materials), I was able to examine eleven of the rings and bracelets using Electron Probe Microanalysis with Wavelength Dispersive Spectrometry (EPMA-WDS). All three of the principal metal groups were present (copper, arsenic bronze, and tin bronze). The tin bronzes contained approximately 7% to 9,5 % tin by weight (wt%). The arsenic bronzes are distinguished from objects made of unalloyed copper by the presence of arsenic concentrations in a range from about 1 to 3,25 wt% (D.L. Peterson 2007, p. 243). Lloyd Weeks performed EDS analysis on 21 of the objects, which largely agreed with the results of the previous arc OES analysis (P.L. Kohl 2002, p. 179-182). He also describes lead isotope analysis performed by Thermal Ionization Mass Spectrometry (TIMS) on 10 of these objects, which indicates that different source(s) were exploited for the tin bronze as opposed to arsenical copper. It is possible that the Velikent smiths may have utilized imported bronze, or prepared their alloy by mixing tin or bronze with local copper. The isotopic patterns for the tin bronzes parallel those of metalwork from a number of 3rd millennium BC sites in Western Asia. Weeks argues that the material reached Southwest Asia by seaborne trade with South Asia, in part by reference to cuneiform texts indicating trade in this direction in the 2nd millennium BC (L. Weeks 1999, p. 51). A circum-Caspian route is another possible vector for the early trade in tin originating in Central Asia (V. Pigott 1999, p. 4, 5). While there is little evidence for the circulation of tin or tin bronze north of the Caspian Sea in the early 3rd millennium BC, it is likely to have been underway by the end of the millennium, when trade in bronze and jade had been established between southern Central Asia and the Eurasian steppes (F. Hiebert, N. Di Cosmo 1996). Neither scenario extinguishes the possibility of overland trade south of the Caspian, or the use of tin from Anatolia (D.L. Peterson 2003, p. 23-26).

While it is possible that arsenical copper (or arsenic bronze) may have been produced inadvertently through the use of ores that were high in arsenic without the knowledge of those who made it (P.L. Kohl 2002, p. 182), this places a disproportionate amount of the analytical focus on smelting and alloying as opposed to metalworking activities through which the objects were fashioned. Metal making is an extended process that culminated in the creation of finished metalwork, and the actions of the metalworkers should also be factored into the interpretation. The evidence for the extended use of the tombs as detailed above, and the sheer quantity of objects in the assemblage strongly suggest that it was created through multiple episodes of production, and accumulated in the tomb as the result of several burial events. The selection of materials for particular kinds of objects was an essential part of the practices that led to the creation of the assemblage.

The metalworkers who fashioned the Velikent assemblage had developed a great facility for the manipulation of form and media, and had made the connections necessary to acquire silver and imported tin or tin bronze for rings and bracelets. A principle that guided their metalworking practices was the significance that people imparted to the metals and alloys used to make the objects and the objects themselves, as well as the uses to which materials and objects were put. Since *The Social Life of Things*, a great deal of emphasis has been placed on commodity exchange in material culture studies, especially in a 'biographical approach' in which exchange and going in and out of a commodity state are important vectors for change in the life history of an object, including its value (A. Appadurai 1986; I. Kopytoff 1986). However, as Kopytoff pointed out, there is more to the "biography of a thing" than exchange; another very basic and central question in teasing out the life history of an object is "Where does the thing come from and who made it?" (I. Kopytoff 1986, p. 66). This is a question that archaeological scientists have approached through physical evidence for what an artifact is made of, the source(s) of materials utilized to make it, and how it was fashioned, used, and disposed of (M. Tite 2008). Value and the cultural biography of an object are not the outcomes of exchange alone, but are also situated in production and use—in the case of the Velikent metalwork, in the actions of metalworkers and in the incorporation of the metalwork in burial practices. Anthropologists such as Nancy Munn and David Graeber have shown how value is closely tied to production as well as exchange (N. Munn 1977; N. Munn 1986). Graeber defines value in terms of the significance of actions, in which "human action… can only take place through some material medium and therefore can't be understood without taking the qualities of that medium into account" (D. Graeber 2001, p. 83). This is more congruent with the evidence from the Velikent assemblage than an approach to value focused principally on exchange. It also indicates the need for archaeometric analysis of how goods were made in the examination of their value.

Graeber's discussion of the interplay between material medium and value in a sense matches the ongoing interest in materiality in archaeology (T. Taylor 2008). While value "is never an inherent property of objects, but is a judgment made about them by subjects" (A. Appadurai 1986, p. 3), the properties of materials (color, form, hardness, durability …) and their potential, once fashioned into a particular form or worked in a particular way, are certainly factors in paths that materials are directed toward and may be kept on once the inclination for particular uses are established (for a discussion of paths in material culture and commodities, see A. Appadurai 1986, p. 85-89). Reserving particular metals and alloys to make certain kinds of objects was related to inclinations toward the use of metal and metalwork through which significance was imparted to material culture and practices. The materials and techniques that were combined to make specific forms became benchmarks for how things should be made, and how they should feel, look, and perform. These were expectations with which the Velikent metalworkers would have had to work in the combination of technical mastery and aesthetic sensibilities they applied in creating noteworthy examples of rings, bracelets and other objects. Characteristics such form, color, hardness, toughness, and heft would have been signs of the relative quality and value of individual examples. Artisans instilled the objects with these characteristics as they made them, but afterwards the significance of their actions endured as the value that remained attached to the objects. The inclination to utilize copper, bronze, and silver to make certain kinds of objects but not others suggests that different outcomes were sought for particular forms and associated uses.

Color seems to have been an important overall consideration and may have served as *qualisign* (C. Peirce 1955; N. Munn 1986, p. 17) in the evaluation of the Velikent metalwork. Color and brilliance are properties of material culture and the physical world that have recently been the subject of growing interest and critique in archaeology (A. Jones and G. MacGregor 2002; J.C. Chapman 2002; J.C. Chapman 2003; J.C. Chapman 2007; N. Saunders 2003). In the case of Kura-Araxes metalwork, Saunders' extensive research on brilliance as an aesthetic principle that guided Pre-Columbian goldworking and consumptive practices (N. Saunders 2003), and Chapman's similar research on brilliance and color in the Climax Copper Age in Southeast Europe (J.C. Chapman 2007), are especially intriguing. The production and consumption of copper and bronze markedly accelerated within the territory in which red and black burnished Kura-Araxes ceramics were distributed in the late 4th and 3rd millennium BC (E.N. Chernykh 1992, p. 57-67). One reason shiny metalwork and ceramics were both so popular with groups across the 'Kura-Araxes ecumene' arguably was a shared taste in shiny, brilliant objects, that may have originated in the transfer of an aesthetic that originated with metalwork to another domain of material culture production, that of ceramics.

The greatest variety and rarest of materials in the Velikent metal assemblage were reserved for simple rings and bracelets worn directly on the body. It is likely that the red color of copper, silvery tint of arsenic bronze, golden tint of tin bronze, and even the brighter color of silver alloys may have been ranked on an ascending scale in evaluating different rings and bracelets, a scale that corresponded to the rarity of the materials and the associations they evoked (fig. 4). Color may have served as an index of the relative scarcity of the materials, the efforts expended to get them, and membership into the networks through which they were acquired. The presence of an aesthetic of brilliance might further explain the interest in rarer and lighter colored alloys for bodily adornment. As bodily adornments, they would have been part of the "social skin" defined by Terrence Turner (1980), serving as vehicles for the inculcation of social values by their inscription on bodies in funeral ceremonies. Adornment served to demonstrate or make claims about the importance of the deceased and their survivors, in relation to the ability to create, command, and/or acquire the value attached to the objects. In this way, material culture processes and processes of value production were also a source of social inequality. It is unlikely that individuals involved in different stages of production, exchange, and consumption were rewarded equally for their efforts as the value created in fabricating metalwork was transferred to the objects themselves, and by association, those who came to control them.

During the early to mid-3rd millennium BC, metalworkers in the Caspian coastal plain of the northeastern Caucasus created value through their efforts to instill metalwork with characteristics that lent significance to the materials and objects alike. The utilization of these objects in bodily adornment would have had the effect of translating these distinctions in objects into distinctions between persons, and of inculcating social values related to control of the objects as well as the forces and relationships they represented. The tin bronze in the metalwork from the Velikent has garnered much attention since it was first identified by Gadzhiev and Korenevskii. However, an overriding focus on the tin bronze in the assemblage might create the misleading impression that the inhabitants of coastal Daghestan during this period were merely at the periphery of a larger network in the circulation of tin or tin bronze, and of a new alloy technology superior to the old. Bronze Age metal technologies in the greater Near East and Eurasian world were shared developments (P.L. Kohl 2007). Close examination of earlier and recent analyses of the assemblage shows that tin bronze was incorporated into a technology of copper and arsenic bronze metal making that predates the advent of tin bronze. This has important implications not only for ancient metal technology in the region, but for broader social practices and definitions of value with which this technology was associated. Future investigations of the relationship of metal technology and associated practices at Velikent, Rodnikovyi and related sites in the northeastern Caucasus and the broader region encompassed by the Kura-Araxes horizon will further elucidate the nature of the regional and interregional networks that joined the inhabitants of the Caspian littoral of Daghestan during the late 4th – early 3rd millennium BC with communities from the Eurasian steppes in the north to Iran in the south, and from the Caucasus eastward to the shores of the Mediterranean. Sufficient analysis of the broader evidence for these developments, including not only the chemistry but also microstructural evidence for how copper and bronze metalwork was fabricated, have the potential to uncover not only how and when specific materials and techniques were incorporated into the early metal technologies of the northeastern Caucasus, but also their relationship to technical and social developments in other regions.

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Fig. 1. Location of sites mentioned in the text.
Localizarea siturilor menţionate în text.

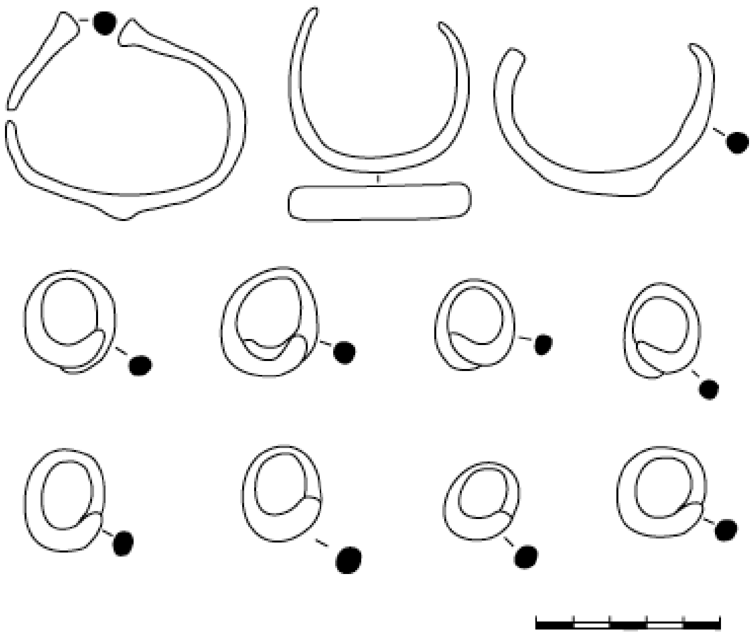

Fig. 2. Examples of copper and bronze rings and bracelets from the Velikent assemblage (after D.L. Peterson 2007, fig. 7. 76).
Exemple de inele şi brăţări de cupru şi bronz din inventarul de la Velikent (după D.L. Peterson 2007, fig. 7. 76).

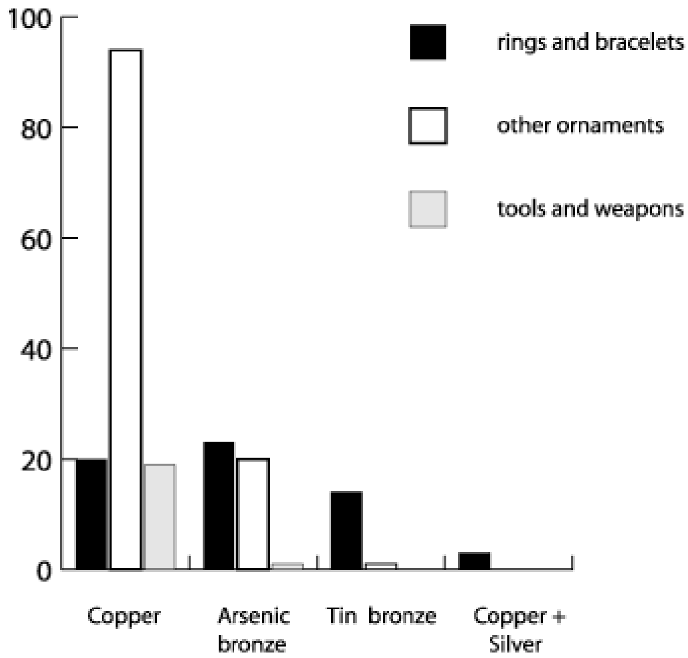

Fig. 3. Relationship between object class and material in the Velikent metal assemblage, based on results of arc OES analysis reported by M.G. Gadzhiev and S.N. Korenevskii (1984) (after D.L. Peterson 2007, fig. 5. 11).
Relaţia dintre tipurile de obiect şi de material din inventarul pieselor de metal de la Velikent pe baza rezultatelor analizei de arc OES publicate de M.G. Gadzhiev şi S.N. Korenevskii (1984) (după D.L. Peterson 2007, fig. 5. 11).

Fig. 4. Diagram of the inverse relationship between frequency of materials in the Velikent metal assemblage, lightness of color demonstrating the correspondence between relative scarcity of material and brilliance.
Diagrama relaţiei inverse dintre frecvenţa materialelor din inventarul pieselor de metal de la Velikent, luminozitatea culorii demonstrând corespondenţa dintre raritatea relativă a materialului şi strălucire.