

The weight of objects in Late Bronze Age hoards in Slovenia and possibilities for determining weight standards

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Izvleček

Predstavljeni so nekateri predmeti iz slovenskih depojev pozne bronaste dobe, ki izkazujejo pomenljive utežne pravilnosti. Na podlagi dvodelne votle krogle in perforirane jagode iz depoja Grabe ter kolesastih obeskov iz depoja Kanalski Vrh I je mogoče vzpostaviti jasno zaporedje utežnih enot, katerih osnova je 10,975 g in ki imajo številne analogije med utežnimi standardi v evropskem in sredozemskem prostoru. Nadalje so prikazane pomenljive pravilnosti v odnosu med utežnimi in številčnimi razmerji posamičnih skupin kolesastih obeskov iz depoja Kanalski Vrh I, ki nakazujejo, da ga ne moremo razumeti v smislu založne najdbe, temveč kot izraz neprofanih dejavnosti bronastodobnih prebivalcev, povezanih z njihovo komunikacijo z numinoznim.

Abstract

Presented are select objects from Slovene Late Bronze Age hoards, which evidence significant weight regularities. An intelligible sequence of weight units can be established on the basis of a two-piece hollow sphere and a perforated bead from the Grabe hoard and wheel-shaped pendants from the Kanalski Vrh I hoard; on the basis of their basic weight unit of 10.975 g, numerous analogies exist between these examples and weight standards throughout the European and Mediterranean area. In continuation, significant regularities in the relationship between weight and number ratios of individual groups of wheel-shaped pendants from the Kanalski Vrh I hoard are presented. They demonstrate that the objects should not be interpreted as profane finds, rather as an expression of the religious activities of the Bronze Age inhabitants corresponding with their communications with the sacred.

INTRODUCTION

Recent times demonstrate a strong intensification in the interest for researching the weights of metal objects and for determining potential weight systems during the Bronze Age. Attractive recent finds of stone weights from the Middle and Late Bronze Age contexts at Bordjoš in Vojvodina and at the Terremare settlements in northern Italy advance the initiative for ascertaining potential regularities in the weights of bronze objects or their fragments (Medović 1995; Cardarelli et al. 1997). At the same time, certain weight standards from the Greek and Roman ancient world, whose origins are from archaic and classical times, have long been known; while earlier, Late Bronze Age origins are also well justified for select examples.¹ In addition to undeniably recognizable stone weights, several finds evidencing standard

weights or their multiples are known from European Bronze Age contexts, e.g. Middle Bronze Age gold bracelets from the Carpathians, Late Bronze Age anthropomorphic bronze statuettes from the southern Scandinavian region and Late Bronze Age gold objects - their collective weight - from select western European hoards (Mozsolics 1973, 86 ff.; Malmer 1992; id. 1999; Spratling 1980).

On the basis of cited studies, uniform weights and the consequent weight systems in remote regions of Bronze Age Europe dictate select initiatory determinations:

1. At least since the Early Bronze Age onwards, inhabitants throughout Europe may be ascribed with the knowledge of designating precise values for bronze and gold according to weight systems. Such a determination is perhaps banal in itself, however it embodies a significant consequence: select types of

¹ E.g. Kos 1997, 247 ff.; regarding Mycenaean talents and their potential central European Bronze Age equivalents cf. Eiwanger 1989, with an extensive bibliography.

objects of the Bronze Age individual did not merely represent functional, symbolic or prestigious labels of value, rather also weight values. Therefore, the message that any given object relayed was, among others, also that of its weight value.

2. Certain basic units of weight are widely dispersed to very remote regions and, furthermore, are also of long standing in chronological terms. For instance, a weight of 11,228 g represents the basic unit of weight for gold bracelets within the Banat hoard from FÉREGYHÁZ (Firiteaz) in the Forró or Ópályi horizon, while at the same time also the basic unit of weight for the gold vessels in the Eberswalde hoard from Brandenburg (period 5 according to Montelius) (Mozsolics 1973, 194, Pl. 78-80; Mozsolics 1981; Hidde 1997; Eiwanger 1989, 447 ff., Fig. 4). J. Eiwanger determines that the weights of the above mentioned objects are multiples of these basic weight measurements (so called Eurobalcan gold standard II), and simultaneously also in distinct correlation with the Mycenaean talent.

3. If such far reaching analogies regarding congruities in the weights of prestigious gold objects chronologically and spatially hold true, then it follows that for our comprehension of various Bronze Age European communities and their mutual interaction, we must pose a series of questions regarding their consequence: were there uniform weight measurements throughout the wide region, which in this particular instance extends from the Aegean over the Carpathians all to southern Scandinavia?² Or was such a uniform measurement of weight limited to only gold objects (and for instance prestigious bronze statuettes)? Or contrarily, is it determinable also for the wider specter of bronze objects? Would the determination of various weight standards also procure answers to questions regarding the nature and intensity of communications between temporally and spatially remote European populations?

Resolving such questions would entail that the research of weights be expanded to include all types of metal objects. Today, several extensive studies regarding this theme are available, including weight analyses of individual types of material that are attributed to a particular narrow chronological period,³ as

well as attempts to determine potential integral weight standards through a longer chronological period (Peroni 1998).

Among the cited works, Peroni's recent study is certainly the most ambitious as concerns the extent of the embraced area between the Aegean and Scandinavia, as well as concerns the chronological span reaching from the Early Bronze Age to the Early Iron Age. The author classifies four weight systems that are essentially independent of each other; regarding the first two (A and B), he was able to establish a relatively clear correlation between the weights discovered in the Aegean settlement of Ayria Irini, in the southern Pannonian Bordjoš and in the northern Italian Terremare (Peroni 1998, 218 ff., Fig. 2-4). The basic units of these four weight systems are: 26-27 g (A), 62-63 g (B), 42-43 g (C) in 66-67 g (D). R. Peroni determines an extremely dense concentration of weights of objects in European hoards in the distribution of these weight units and their multiples. Surprisingly, the objects of such weights are, as a rule, broken; and copper and bronze semimanufactures (plano-convex ingots and fragments of various other forms of ingots) are frequently among them. It would seem evident that the Bronze Age users of these products deliberately broke these pieces in order to attain the desired weight. In view of the fact that precisely the strongly fragmented metal semimanufactures provide the main source of support to Peroni's thesis, it does not seem surprising that the tolerance span for classifying a particular object among one of the four weight systems is quite wide. Consequently, the data concerning the weights of objects from select Italian hoards, published by R. Peroni, demonstrates that they form the relevant concentrations of weight spans reaching up to 50 g (e.g. weights between 779 and 813 g (multiples of 12 of the unit B), between 967 and 1015 g (multiples of 16 of the unit B), between 659 and 690 g (multiples of 16 of the unit C) and between 540 and 571 g (multiples of 8 of the unit D), all for the Madriolo hoard).⁴ Such a wide span of potentially relevant weights of fragmented ingots, and even more so the disregard of all other weights from a certain complex (such as with the

² If we take into consideration the weight analyses of M. Malmer (1992, 382, Table 2) concerning Late Bronze Age southern Scandinavian bronze statuettes and gold rings, the weights of which tend to concentrate at 55 and 107-110 g, multiples of 5 and 10 of Eiwanger's basic gold weight units are clearly justifiable.

³ E.g. regarding Early Bronze Age ingots in the shape of necklaces ('Ringbarren') and bow shaped ingots ('Spangenbarren') (Moosleitner 1988, Lenerz-De-Wilde 1995), regarding Middle and Late Bronze Age knobbed sickles (Sommerfeld 1994, 37 ff.) and regarding Late Bronze Age oval and square ingots (Primas, Pernicka 1998, 52 ff.).

⁴ Peroni 1998, Fig. 7; with this example cf. the entire series of weights for the Madriolo hoard in Borgna 1992, 16 ff., 66 ff., Pl. 5-7, from which it is evident that in Madriolo, in addition to weights relevant for Peroni, there are also several other weights (e.g. 11 fragments weighing between 100 and 120 g, etc.), which R. Peroni disregards. It is also evident that, for instance the span of 540-571 g (D8) relevant to Peroni comprises of only three objects, 659-690 g (C16) includes only two objects, 779-813 g (B12) only four objects and 967-1015 g (B16) only three objects. The frequency of weights in Madriolo is clearly indicative of a strong dispersion and only rare less explicit concentrations.

Madriolo hoard) strongly relativizes Peroni's thesis. Likewise, Peroni's derivatives regarding the attributes of select groups of weights belonging to a particular weight unit are also debatable. Such is the case, for instance, with the group of weights among the Madriolo objects ranging between 263 and 275 g; the author of the study calculates the arithmetic mean of 266 g and classifies it as a multiple of 4 of the unit D (Peroni 1998, Fig. 7; cf. Borgna 1992, 16 ff., Pl. 6). E. Borgna's basic publication communicates that four objects are classified to this weight concentration; three of these weights are 263 g and one is 275 g. The correct and very distinct (hence significant) concentration is thus that of 263 g, which would sooner be a multiple of 10 of the unit A (26 g) than a multiple of 4 of the unit D (66-67 g). The rationality for Peroni's preference towards recognizing the unit D is, in this particular instance, probably to be sought in that multiples of 10 do not avail of his basic weight units. This may or may not hold true.⁵ This is precisely what warrants my conviction that his conclusions, which present two weight systems (A and B) in the area between the Aegean and Scandinavia during the Late Bronze Age, and which are exchanged for several regional systems only at the transition to the Iron Age (Peroni 1998, 223), should be viewed with some reserve. Furthermore, select recent analyses of the weights of objects from hoards (e.g. from Putakovec in Medimurje) do indeed indicate a confirmation of at least one of Peroni's weight units (unit A, that is 26 g and its multiples) (Hänsel 1999, 81 ff.).

In the effort to determine potential weight standards for metal objects from hoards in the southeastern Alpine region, the primary goal seems to be the discovery of possible referential weights of specific objects whose values would on the one hand correspond with those weight units that are already established in other regions, while on the other hand would also serve to explicate eventual regularities in the weights of other objects (whole as well as broken). Such referential weights have been determined in three examples.

GRABE - SREDIŠČE OB DRAVI

An extremely precise correlation presents itself amid two objects from the hoard discovered at Grabe (Središče ob Dravi) in Styria from horizon II of south-eastern Alpine hoards (Čerče, Šinkovec 1995, 170 ff.; Turk 1996, 108 ff.) (Fig. 1). The objects are a hollow bronze sphere composed of two hemispheres, and a bronze bead (Fig. 1: 7,8; Fig. 2).⁶ Their weights are as follows:

- Hollow bronze sphere composed of two hemispheres:
 - 55.8 g (K 1)
 - 32.0 g (K 2)
 - together: 87.8 g (K)
- Perforated bronze bead: 43.9 g (J)

That the weight of the lighter bronze bead is precisely half of the bronze sphere ($J = K/2$) is quite significant. The equation, which is precise to a tenth of a gram ($43.9 = 87.8/2$) substantiates that these two weights and their correlation are not just mere coincidence. Furthermore, as the larger bronze sphere is composed of two hemispheres of unequal weight (55.8 and 32 g), there is cause to seek a common denominator for the weights of all three objects. The weight ratio of the three objects K 2: J: K 1 is almost exactly 3: 4: 5, where the basic unit of weight is 10.975 g (the sum of all three weights is 131.7 g, divided by 12 units).⁷ As regards the determined correlation between the weights, it is expressly significant that the slightly flattened and perforated bronze bead (J, the one being a multiple of 4 of the basic weight unit) also has four embossments uniformly distributed along the widest circumference. It is possible, and even probable that the number of embossments denoted the precise multiple of the basic weight unit. The basic unit of weight attained as such is very similar to the so-called European gold weight standard (cf. above). Another point of interest is that the objects within the Grabe hoard have a sum total weight measuring 1107.2 g,⁸ which is a multiple of 100 of the basic weight unit (with a deviation of less than 1%).

The correspondence of the above stated objects from the Grabe hoard with weights and weight sys-

⁵ Peroni 1998, Fig. 7: the relevant multiples of the basic weight units are supposedly 2, 3, 4, 6, 8, 12, 16, 24, and 32. It is of significance that the weight of 263 g may also be interpreted quite precisely as a multiple of 24 of the weight unit from Grabe: $24 \times 10.975 = 263.4$ g (cf. below).

⁶ Čerče, Šinkovec 1995, 172, Pl. 70: 8,9; comp. also illustration in Smodič 1955, Pl. 4: 11, where an even more plastic appearance is depicted for both hemispheres of the larger object (cf. Fig. 1: 7 with Fig. 2). Bronze bead was found in the vicinity of other objects (cf. Klemenc, Saria 1936, 7).

⁷ The actual weights of both halves of the hollow bronze sphere deviates by 2.8% ($K2 = 32$ instead of 32.925 g) and 1.7% ($K1 = 55.8$ instead of 54.875 g) from the ideal multiple of 3 or 5 of the basic unit, while there is no deviation or 0% noted for the bronze bead. Likewise, the total weight of both halves of the bronze sphere (K) is exactly a multiple of 8 of the basic weight unit ($8 \times 10.975 \text{ g} = 87.8 \text{ g}$). Such deviations in weight analyses of prehistoric weight units up to date are designated as acceptable and even negligible (cf. e.g. Cardarelli et al. 1997).

⁸ The data is summarized from Čerče, Šinkovec 1995, 170 ff.; dr. Dieter Kramer (Landesmuseum Joanneum, Graz) mediated the information of the missing weight of the fragmented spear point to me (ib., 171, pl. 70: 5; the object weighs 22 g), for which I am also very grateful.

tems is thus reliable (cf. also with the Conclusion in the continuance). It also follows that an investigation of similar objects from other hoards, which might also demonstrate these or other weight standards, could prove to be revealing. These types of objects are infrequent in hoards between the Pannonian area and northern Italy. Bronze beads, or bi-conical spindle whorls from the hoards at Brodski Varoš and

Poljanci I and II in central Slavonia, as well as at Márok, Lengyeltóti IV and Velem I in western Hungary, are analogous to some degree.⁹ Unfortunately, a bi-conical spindle whorl made of 'white bronze' from the Poljanci II hoard, weighing 38 g, is the only weight available from among the above stated hoards. Corresponding to the weight system reflected in the weights from Grabe, this weight

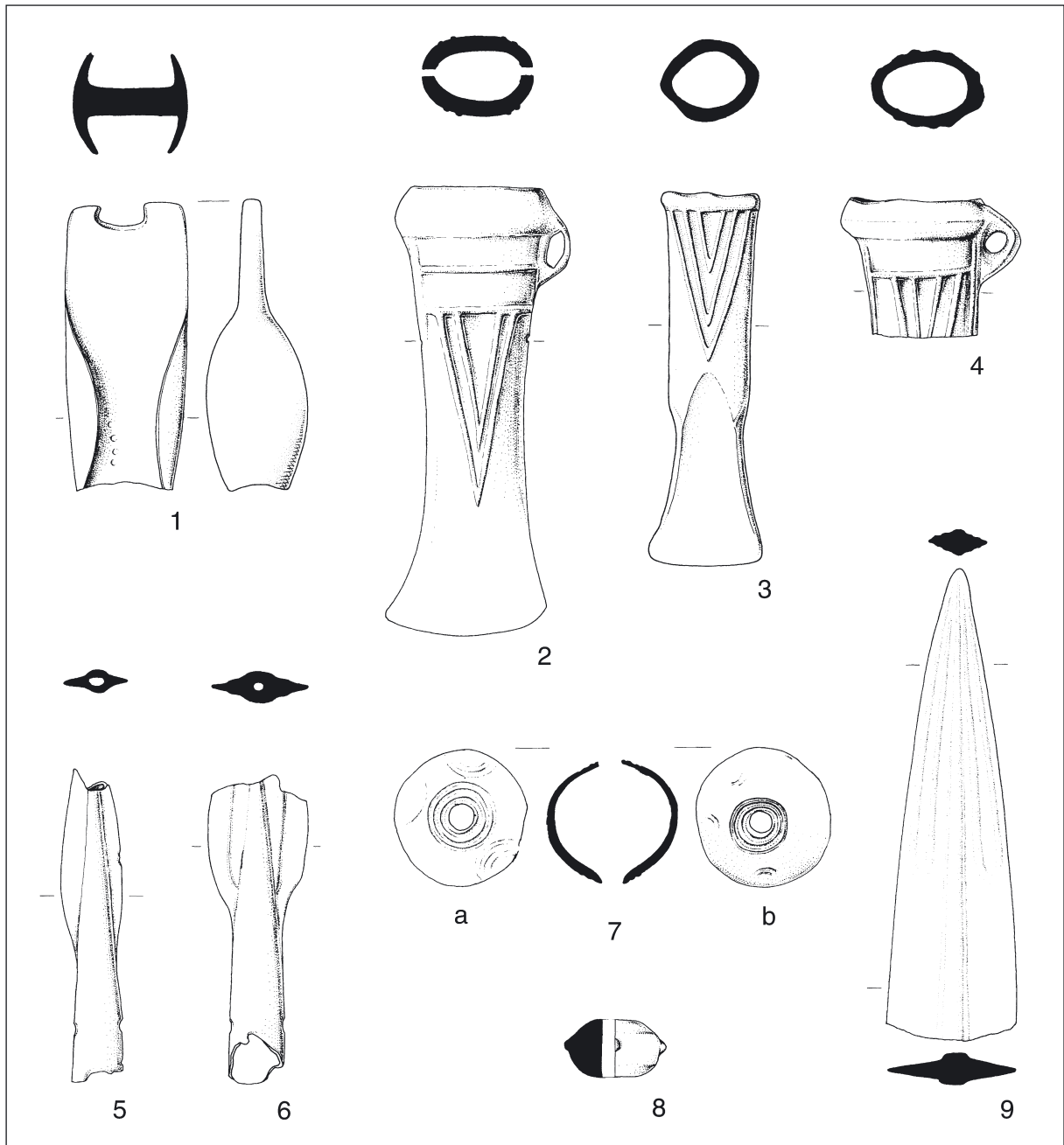


Fig. 1: Grabe - Središče ob Dravi hoard. Scale = 1:2 (according to Čerče, Šinkovec 1995, Pl. 70).

Sl. 1: Depo Grabe - Središče ob Dravi. M = 1:2 (po Čerče, Šinkovec 1995, t. 70).

⁹ Vinski Gasparini 1973, Pl. 48: 27-28; 53: 29-31; 56: 43,44; Bulat 1975, Pl. 13: 21, with this cf. Hansen 1994, 570 (weight), Pl. 33: 22; Mozsolics 1985, Pl. 92: 21; 110: 13 (with an eyelet); 230 A: 22,23; cf. also the bronze bead with four embossments from the Transylvanian hoard at Fizeșu Gherlii II, attributed to the period of the Late Urnfield Culture (Petrescu-Dîmbovița 1977, Pl. 346: 19).

would be a multiple of 3,5 of the basic weight unit with a deviation of 1%.¹⁰

The analogy from the eastern Romanian hoard Tătărași (Iconomu 1977, 217 ff., Fig. 19; 20) for the semicircular hemisphere from Grabe is quite interesting.¹¹ The hoard is contemporary with that from Grabe and attributed to the level Ha A1. The Romanian example is larger (its circumference measures 14 cm), although it weighs a surprising 131 g, which represents an exact multiple of 12 of the basic weight unit at Grabe, or the sum total of the two semicircular hemispheres and bead.¹²

KANALSKI VRH I

A second group of referential weights was determined among select groups of wheel-shaped pendants from the hoard at Kanalski Vrh I in horizon III. B. Žbona-Trkman and A. Bavdek published this hoard (1996). With regard to the site circumstances and especially the manner in which the hoard was acquired (it was discovered with the aid of a metal detector), it clearly represents one of the few larger hoard finds with a mixed composition, for which it can be reliably said that it was retrieved in its entirety. Regarding the

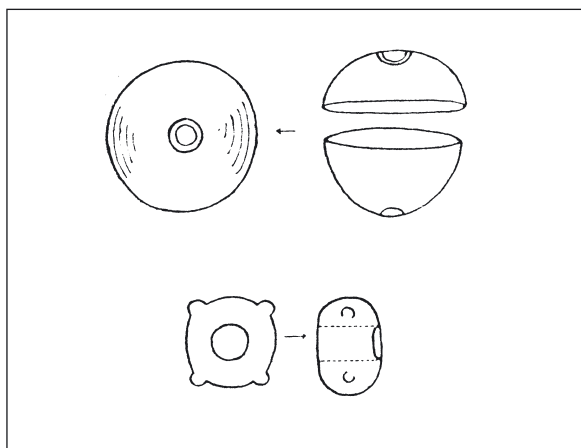


Fig. 2: Hollow sphere composed of two hemispheres (1) and a solid bead (2) from the Grabe hoard. Scale = 1:2 (according to Smodič 1955, Pl. 4: 11,12).

Sl. 2: Votla kroglja, sestavljena iz dveh hemisfer (1) in masivna jagoda (2) iz depoja Grabe. M = 1:2 (po Smodič 1955, t. 4:

examination of the entire collection of finds from the hoard, it should be noted that the published catalogue and illustrations do not include a selection of the finds, which have remained in private possession (Žbona-Trkman, Bavdek 1996, 32, fn. 7). These include the following bronze objects:¹³

1. Pendant in the shape of a wheel with four spokes and visible casting seams. Diameter = 64 mm; thickness = 3 mm; weight = 24.9 g; private possession. Fig. 3: 1.

2. Pendant in the shape of a wheel with eight spokes and visible casting seams. Diameter = 72 mm; thickness = 3 mm; weight = 27.3 g; private possession. Fig. 3: 2.

3. Pendant in the shape of a wheel with eight spokes and visible casting seams. Diameter = 72 mm; thickness = 3 mm; weight = 26.0 g; private possession. Fig. 3: 3.

4. Pendant with a triple cross, linked to the circular circumference, and visible casting seams. Diameter = 71 mm; thickness = 3 mm; weight = 30.7 g; private possession. Fig. 3: 4.

5. A ring with a semi-circular cross section. Traces of the polished casting seams are visible on the interior side. Diameter = 21 mm; thickness = 5 mm; weight = 3.4 g; private possession. Fig. 3: 5.

6. Tubulet, ornamented with 41 transversal incisions. Length = 51 mm; diameter = 4 mm; weight = 1.5 g; private possession. Fig. 3: 6.

7. Tubulet, ornamented with 39 transversal incisions. Length = 50 mm; diameter = 4 mm; weight = 1.9 g; private possession. Fig. 3: 7.

8. Tubulet, ornamented with 51 transversal incisions. Length = 61 mm; diameter = 4 mm; weight = 2.1 g; private possession. Fig. 3: 8.

9. Tubulet, ornamented with 49 transversal incisions. Length = 61 mm; diameter = 4 mm; weight = 2. g; private possession. Fig. 3: 9.

10. Fragment of an ingot with a trapezoidal cross section. The broken surfaces bear traces of usage. Length = 52 mm; width = 46 mm; thickness = 21 mm; weight = 310 g; private possession. Fig. 3: 10.

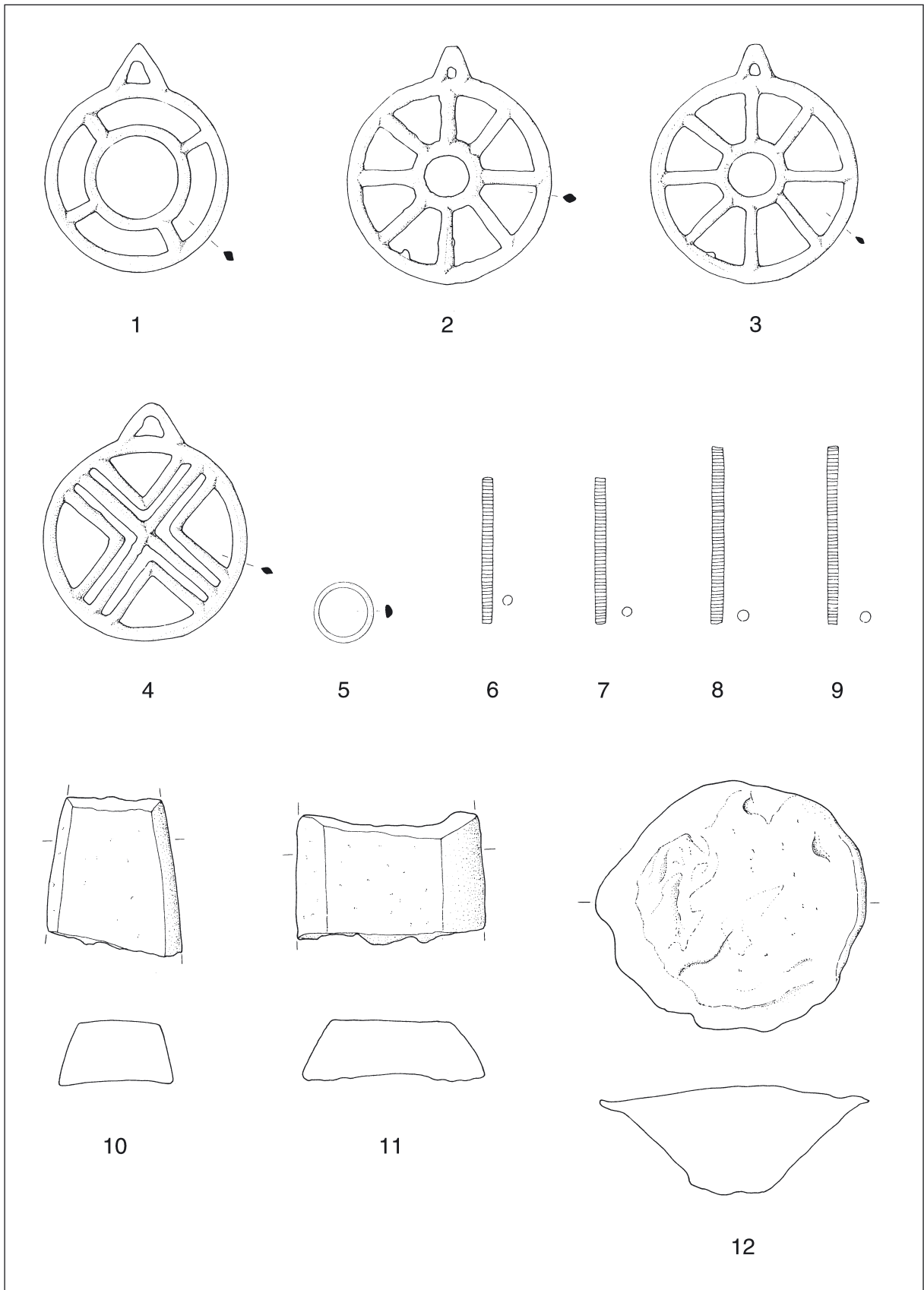
11. Fragment of an ingot with a trapezoidal cross section. The upper fragmented surface is old and worn; the lower surface is fresh and certainly recent.

¹⁰ S. Hansen (l.c.) cites only the weight in grams; so, 38 g could also mean 38.4 g more precisely, which would then be an exact multiple of 3.5 of the basic weight unit from Grabe.

¹¹ Primož Pavlin (Institute for Archaeology, Scientific Research Center at the Slovene Academy of Arts and Sciences) brought my attention to this object, for which I am most grateful.

¹² The hemisphere from the Tătărași hoard is somewhat damaged along its edges (cf. Iconomu 1977, Fig. 20), such that, were it preserved entirely, it would have evidently corresponded even better to being a precise multiple of 12 of the discussed weight unit (131.7 g).

¹³ Mr. Vincenc Mrak, Gradnikova 22, Kanal, preserves the objects marked 1-11, and the man who discovered the hoard, Mr. Branko Uršič, Gradnikova 22, Kanal, preserves the copper plano-convex ingot (no. 12). I would like to thank both for allowing me to examine these finds and for their documentation. I am also very grateful to dr. Dragan Božič (Institute for Archaeology, SRC at the Slovene Academy of Arts and Sciences), who arranged the loan of an acutely precise weighing instrument for the weight measurements of the above cited objects; it proved to be of essential importance, as is evident in the continuation.



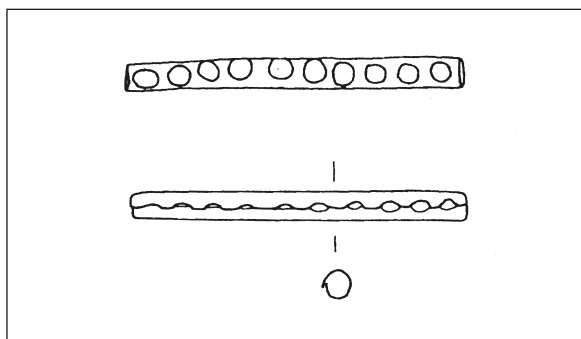
Length = 43 mm; width = 66 mm; thickness = 21 mm; weight = 347 g; private possession. *Fig. 3: 11.*

12. Plano-convex ingot. The object is preserved in its entirety. The upper surface is level for the most part and curves inwards in places along the edges. The cross section of the ingot is high and conical. Length = 94 mm; weight = 1020 g; private possession. *Fig. 3: 12.*

From among the above cited objects, it seems that finds similar to those in the already published part of the hoard (four wheel-shaped pendants, four tubulets, two fragments of ingots with trapezoidal cross sections) are predominant. Novelties, as regards those objects already published, are the ring and the copper plano-convex ingot. Of the finds that are in private possession, those objects that are more frequently represented shall be presented in greater detail in the continuation.¹⁴

Tubulets

A total of 41 tubulets were discovered in the hoard, among which the tubulet with a series of ten holes is somewhat particular (Žbena-Trkman, Bavdek 1996, 42, Pl. 107: 121; *Fig. 4*). A similarly perforated tube was discovered in the female grave 212 at the nearby cemetery in Tolmin, where it also is accompanied by an unornamented tubulet and two double spiral fibulas with figure 8 twists, three ringlets, a fragmented bracelet and two glass beads.¹⁵ The remaining tubulets from Kanalski Vrh are ornamented



Sl. 3: Depo Kanalski Vrh I, neobjavljeni predmeti. M = 1:2.

Fig. 4: Tubulet with a series of ten holes from the Kanalski Vrh I hoard. Scale = 1:1 (according to Žbena-Trkman, Bavdek 1996, Pl. 107: 121).

Sl. 4: Šivna cevčica z nizom desetih luknjic iz depoja Kanalski Vrh I. M = 1:1 (po Žbena-Trkman, Bavdek 1996, t. 107: 121).

¹⁴ Concerning a thorough analysis of the hoard, cf. Žbena-Trkman, Bavdek 1996; for winged axes from the hoard check also Turk 2000, 165 ff..

¹⁵ Svoljšak 1973, Pl. 3: 7-17. The combination of perforated and regular tubulets is present also within the Pannonian Pölöske hoard (Mozsolics 1985, Pl. 124: 7,8; 125: 8,9). The bone perforated short stick from the rich female grave 155 from Brežec, which is (probably similar to that from Kanalski Vrh) evidently a divider on an elaborate pectoral composed of saltaleoni and bone beads, is also of similar form (Ruaro Loseri et al. 1977, 91 (n. 2), Pl. 15: 37). A similar function can be anticipated among the bone and bronze perforated short sticks from Late Bronze Age contexts throughout the very wide area (cf. the Gualdo Taldino jewelry hoard (Umbria) from the 12th century BC (Peroni 1963, I 6: 59)).

¹⁶ The results from the investigations of tumulus 7 at Molnik in 1996 are currently in print. I would like to express my gratitude to the excavators Ivan Puš and Irena Šinkovec (City Museum of Ljubljana) for the information concerning the tubulets from graves 6 and 10.

with fine transversal incisions, their lengths varying between 49 and 62 mm, thus rendering the impression of a uniformly manufactured series. Tubulets are made of very thin, rectangular bronze sheet metal (up to a tenth of a millimeter thick), which the Bronze Age masters shaped into tubes such that the oblong connecting suture is still visible. Contrary to the similar saltaleoni, spiral coils of bronze wire, whose use can be traced throughout a very wide area and during the entire Bronze Age as well as the Early Iron Age, it seems that this particular type of tubulet is chronologically limited to the Late Bronze Age and the earlier horizon of the Early Iron Age. As concerns the function of both types of ornamental objects, it is obvious that they should both be interpreted as components of necklaces or pectorals. The example from the Blanot hoard in central France, of well preserved leather twine through which tubulets are threaded, is an indication of this (Thevenot 1991, 58 ff., 94 ff., *Fig. 56-65; 83*). This hoard find is analogous with that from Kanalski Vrh I, in terms of similar chronological attribution as well as in terms of the large number of tubulets. In addition to poorly preserved bronze manufactures of such tubulets, this hoard also incorporated several gold tubulets. Interestingly, the gold tubulets are threaded on the still partially preserved leather string of two necklaces. The remains of leather strings are also partially preserved within select bronze tubulets, thus clearly demonstrating that the function of this type of ornamental object certainly corresponds with necklaces, which were - based upon the better preserved leather strings within the gold tubulets - threaded on three or four strings. No hoard from the southern part of central Europe presented such a large number of tubulets, as did the Kanalski Vrh I hoard.

Bronze gilt tubulets are present in Early Iron Age graves in Slovenia and northeastern Italy as well. Such examples are known, for example, among the sporadic material finds from tumulus II of the excavations of the duchess of Mecklenburg in Stična (Wells 1981, 53, *Fig. 45: x, y*), as well as from the recently discovered graves at Molnik.¹⁶ The latter have thickened edges and are, due to the gold plating and thickened edges, analogous with the tubulets from richer female graves at Este, which are attributed to the 8th

to 7th centuries BC (Müller-Karpe 1959, 97 ff., 266, Pl. 97: 16-18; Peroni 1975, 171, Fig. 31: 3; Pl. 5A: 8-13; Frey 1969, 13 ff., Fig. 11; Pl. 13: 49).

Examples of extremely fragmented and somewhat wider tubulets (8 mm and more) perhaps represent the remains of hollow bracelets or necklaces; a possible example is that from grave 209 at Brežec, where the narrow tubulet (diameter of 4 mm) is found together with several thicker ones (with diameters up to 8 mm) (Ruaro Loseri et al. 1977, 101, Pl. 19: T. 209, 3). These could be the remains of a sort of scepter, or perhaps of hollow necklaces or bracelets, such as those, characteristic for the rich female graves of the Urnfield Culture cemeteries of the Ruše and Dobova group during the Ha B period (cf. Teržan 1990, 52, fn. 6). Indeed, the tubulets from the Brežec site are flat, despite the larger diameter (up to 10 mm), just as for example those from the Sadež cemetery in Črnomelj (cf. below); that is, they show no indications of being curved and consequently, are not directly comparable with the hollow bracelets known from graves such as the rich female grave II/1910 at Velika Gorica (Vinski-Gasparini 1973, Pl. 104: 12).

Usually, this type of bronze tubulet is represented singularly in large hoards with a mixed composition (Hočko Pohorje, Pustakovec, Topličica I, Pölöske, Nova Bingula, Stockheim, Pilsen-Jíkalka; and similarly also in graves at Gammertingen, Tolmin, Brežec, Most na Soči and Črnomelj),¹⁷ in pairs (Sipbachzell, Tallya, Veliko Nabrde, Donji Petrovci),¹⁸ or in groups of three or four examples at the most (Lazer, Čermožiše, Debeli vrh, Brodski Varoš, Esztergom, Thunau am Kamp, Arbedo-Castione; also in select graves dating to the beginning of the Urnfield Culture period in eastern France, such as at Monéteau and Marolles-sur-Seine).¹⁹ Other examples of the presence of larger numbers of tubulets are known to me only in the Vénat hoard in western France and the Sarospatak and Pećinci I hoards in eastern Pannonia; there are also a number of examples from graves, e.g. in the Bavarian grave I at Grünwald, which includes five (albeit smaller) tubulets (Coffyn et al. 1981, Pl. 27:

76-80; Hellebrandt 1986, Fig. 4: 14-16; 20; 21; Milošević 1960, Pl. 11: 18-22; Müller-Karpe 1959, Pl. 183: 12). Ten tubulets that were strongly damaged in a fire are known from the female grave 32 at the Ljubljana cemetery in the SAZU courtyard.²⁰ A larger number - fourteen - of (gilt) tubulets are found among the cited sporadic finds from the tumulus II at Stična, where their attribution to the same grave is not reliable.

During the Late Bronze Age and the beginning of the Iron Age, tubulets were dispersed throughout the extremely wide area between western Europe or the Urnfield Culture groups in the Rhineland and Switzerland on the one hand, and the Pannonian region on the other. On the basis of grave inventories, tubulets may be classified as a characteristic grave good in female graves (the two graves at Grünwald and Gammertingen are in this regard only partially telling, as the presence of weapons on the one hand and extensive sets of jewelry on the other hand, both graves quite evidently consisted of multiple burials)²¹ and they may be interpreted as such also within the framework of the large Pannonian hoards of mixed composition from the Early Urnfield Culture period. At the same time, the presence of a larger number of tubulets in a hoard is exceptional, such as in the instance of the Kanalski Vrh and Blanot hoards. Obviously, the tubulets in each of these hoards were components forming an entire necklace set. If it is possible to demonstrate that the objects incorporated in the 'classical' large hoards of mixed composition from the Pannonian world during the Early Urnfield Culture are (also as regards their being broken) only *pars pro toto* (Turk 2000, 177 ff.), then likewise may be inferred of their tubulets that they represent only a part of an entire necklace set. A more complete conception of the appearance of such a necklace set is elucidated primarily by jewelry hoards such as that at Kanalski Vrh I in western Slovenia, Blanot in central France, as well as Arbedo-Castione in the southern and Lazer in the western Alps. According to the represented characteristics, the hoard Kanalski Vrh I corresponds

¹⁷ Čerče, Šinkovec 1995, 192, Pl. 84: 172; Hänsel 1999, 90, Abb. 6: 10; Vinski-Gasparini 1973, Pl. 76: 20; Mozsolics 1985, 178, Pl. 124: 7,8 (in combination with a perforated tubulet); Ostave 1975, 40, Pl. 39: 17; Müller-Karpe 1959, Pl. 157: 37; 209: 5; Müller-Karpe 1980, Pl. 387 E: 10; Svoljšak 1973, Pl. 3: 17; Ruaro Loseri et al. 1977, Pl. 19: T. 209, 3,11, perhaps also Pl. 12: T. 150, 17; Pl. 17: T. 183, 4; Teržan et al. 1984-1985, Pl. 181: A7, cf. also Marchesetti 1885, Pl. 8: 22; Dular 1979, Pl. 13: 4.

¹⁸ Höglinger 1996, 137, Pl. 24: 420,421; Mozsolics 1985, 201, Pl. 165: 4,5; Vinski-Gasparini 1973, Pl. 44: 21,22; Ostave 1994, 25 ff., Pl. 26: 6,7.

¹⁹ Müller 1991, 127; Čerče, Šinkovec 1995, 145, 166, Pl. 48: 72-74; 66: 65; Vinski-Gasparini 1973, Pl. 57: 39,61; Mozsolics 1985, 117, Pl. 138: 20,23; Lochner 1998-1999, Abb. 2: 1-4 (four tubulets are present together with four wheel-shaped pendants in the Lower Austrian hoard at Thunau - cf. below); Wyss 1971, Abb. 24 (in addition to four tubulets in the Arbedo-Castione hoard there are also more than 20 saltaleoni, which together constitute an entire necklace set); Müller-Karpe 1980, 878, Pl. 466 M, 468 A.

²⁰ Stare 1954, Pl. 27: 3. The grave was discovered in the grave area classified to the Ljubljana level I (cf. Gabrovec 1973, Sl. 5).

²¹ The grave from Gammertingen (Baden-Württemberg) is evidently an example of a double inhumation grave attributed to the middle Urnfield Culture period, i.e. Ha A2-B1 (cf. Müller-Karpe 1959, 314; also Schauer 1984, 221 ff., Abb. 7).

closely with the western Alpine and Rhineland Urnfield Culture groups.²²

Bracelet with spiral terminals

The kidney shaped bracelet from the hoard (*Fig. 5*) has relatively similar comparisons in the pendants and bracelets from a selection of Pannonian hoards attributed to the Early Urnfield Culture period, e.g. Peterd, Bingula-Divoš, Malička, Salaš Nočajski, Dobrinci, Donji Petrovci and Čerčeš.²³ The first four are characteristic examples of large hoards with mixed compositions (Turk 2000, 133 ff.), while the composition of the Transylvanian hoard is expressly

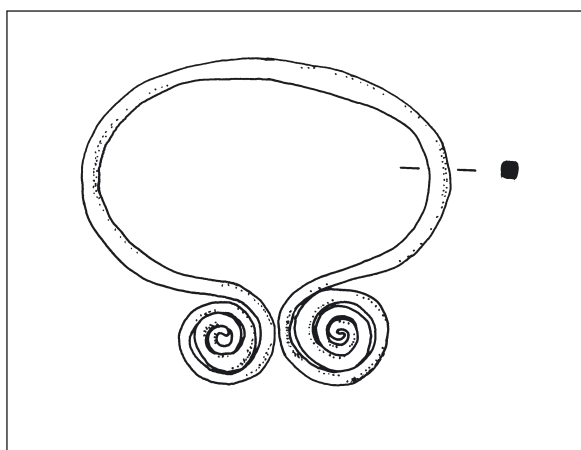


Fig. 5: Bracelet with spiral terminals from the Kanalski Vrh I hoard. Scale = 1:1 (according to Žbona-Trkman, Bavdek 1996, Pl. 99: 20). *Sl. 5:* Zapestnica s spiralnima zaključkoma iz depoja Kanalski Vrh I. M = 1:1 (po Žbona-Trkman, Bavdek 1996, t. 99: 20).

jewelry. Perhaps the origins of this type of pendant should be sought already in the Early and Middle Bronze Age, as is indicated by the pendant, or miniature bracelet from the Swiss settlement of Arbon (Müller-Karpe 1980, 870, Pl. 313: 34). If in comparing the miniature bracelet from the Kanalski Vrh I hoard we more or less disregard the formal characteristics and focus more attention upon the structural characteristics of the finds discovered as entities, where similar objects are discovered together with objects known from the first Kanalski Vrh hoard, surprising determinations are disclosed: dispersed from eastern France to Pannonia, rich female graves of the Early and Middle Urnfield Culture period incorporate small torqued bracelets with spiral terminals together with tubulets, wheel-shaped pendants, several necklaces or pendants with antithetically positioned bird heads (as is the case in grave 6 at the La Colombine cemetery in the upper river basin of the Seine, in the graves at Grünwald and Gammertingen, as well as in grave 305 at Dobova).²⁴ These graves presumably demonstrate the standard grave inventories of rich females of a specific, perhaps ceremonial status, primarily during the Middle and the beginning of the Late Urnfield Culture period (Ha A2-B1).²⁵ This type of grave evidently has its alter ego in hoard inventories such as that at Kanalski Vrh I, with tubulets, wheel-shaped pendants, necklaces and miniature spiral bracelets, and likewise holds true for the hoard from Arbedo-Castione in southern Switzerland.²⁶ Similar miniature bracelets are known also in hoards of the Early Urnfield Culture period in southern Pannonia, e.g. Poljanci I, Brodski Varoš, Pričac and Mačkovac.²⁷

²² Interestingly, an entire series of hoards are known of in the French Alps, whose compositions are also well comparable with the Kanalski Vrh I hoard. Consequently, for instance, the necklace with a wire plait from Kanalski Vrh has excellent analogies with, in addition to the known grave from Dobova, also two similar examples from the jewelry hoard from Réallon (Žbona-Trkman, Bavdek 1996, 62 ff., Pl. 97: 10; Müller 1991, 117 ff.). This type of hoard is usually attributed to the Late Urnfield Culture period (ib., 121 ff.). Regarding western Alpine hoards with fragmented bi-conical ingots, cf. Bocquet, Lebascle 1983, 48 ff., Fig. 6: 2,3,8.

²³ Žbona-Trkman, Bavdek 1996, 35, Pl. 99: 20; Mozsolics 1985, Pl. 61: 12; Vinski-Gasparini 1973, Pl. 85: 12; Balen-Letunić 1985, Pl. 2: 6; Popović 1964, Pl. 2: 3-5; Ostave 1994, Pl. 18: 4,8; 22: 9; Petrescu-Dîmbovița 1977, 88, Pl. 127: 25, for chronological classification cf. also Mozsolics 1973, 145.

²⁴ Müller-Karpe 1980, 876 ff., Pl. 466 C; Müller-Karpe 1959, Pl. 183: 2-4,12,18,19,29-40; 209: 5,10,23,24,27-36; Stare 1975, Pl. 44: 2, 3,8,9; the example from the Ostrožnik cemetery near Mokronog is also noteworthy (Gabrovec 1973, Pl. 5: 2), where the grave inventory remains unknown. There are still a few objects from this cemetery, which are attributable to at least the early segment of Ha B (such as e.g. torqued necklaces, wheel-shaped pendants and hair-rings (ib., Pl. 2: 3: 1-3; 5: 1,19-26; cf. with e.g. Stare 1975, Pl. 8: gr. 17; 26: gr. 186; 27: gr. 194; 41: 7,8, etc.).

²⁵ The female grave 98 from Pobrežje, incorporating tubulets, wheel-shaped pendants and a torqued necklace, also certainly belongs to this same context (Pahič 1972, Pl. 20: gr. 98; cf. also Teržan 1987, 68 ff.), as well as graves such as grave no. 12 from the Korošci - St. Barbara cemetery and graves 155 and Sn 3 from the Brežec near Škocjan cemetery (Montagnari Kokelj 1996, 36, Pl. 2: 12; Ruaro Loseri et al. 1977, Pl. 13-15; 27).

²⁶ Wyss 1971, Abb. 24: the hoard includes 23 examples of miniature bracelets. In terms of form, they have meeting butt ends and are most analogous with the necklaces with spiral terminals, although their size (diam. = 28-44 mm) corresponds best with the example from Kanalski Vrh I (diam. = 43 mm).

²⁷ Vinski-Gasparini 1973, Pl. 49: 5; 55: 30; 71: 34,35; 73: 27. An approximate comparison for this type of bracelet is perhaps also the somewhat larger bracelet with inward curving spiral coils from the hoard in the region of Großbörner in central Germany, composed of jewelry and bronze vessels (A. and B. Hänsel 1997, 64, Abb. 8: 6).

Pendants in the shape of (sun) wheels

The hoard includes 41 wheel-shaped pendants (Žbona-Trkman, Bavdek 1996, 63 ff., Pl. 100-102; 103: 58, Fig. 5; Fig. 3: 1-4). These objects are discussed appropriately already in the basic publication of the hoard, especially as concerns their chronological and distributional analysis. This type of pendant is dispersed throughout the wide area ranging from central and southern Europe from the Middle Bronze Age onwards. They are particularly frequent during the period of the Urnfield Culture, and then they continue into the Early Iron Age as a component of tradition.²⁸ A noteworthy fact is that these wheel-shaped pendants are represented during the Late Bronze Age almost exclusively within the context of female graves, just as their precursors - pins with heads in the shape of wheel-shaped pendants from central European Tumuli Culture - most probably were.²⁹ In view of select later examples of Iron Age grave inventories with similar pendants, from the Santa Lucia group, that is from the same area as the origins of the Kanalski Vrh I hoard, a similar situation is encountered: at the Tolmin cemetery, only the rich female grave 103 includes a wheel-shaped pendant.³⁰ Similar pendants are among the inventories of rich female graves at Most na Soči primarily during the Santa Lucia Ic level (Teržan et al. 1984-1985, Pl. 20 A: 1; 24 A: 12; 36 E: 6; 122 C: 4; 157 A: 5; Marchesetti 1893, 19, Pl. 11: 4; Teržan, Trampuž 1973, 424 ff.). In addition to pendants, these graves frequently incorporate ring shaped jewelry (bracelets and fully cast rings and necklaces), rings and miniature ringlets as well as several fibulae. All these examples are from the graves of females, who were evidently attributed especial status within the society of the Santa Lucia group;³¹ while at the same time, the grave structures, with their abundance of ring shaped jewelry, also reminisce of select elements in the Kanalski Vrh I hoard. That graves with wheel-shaped pendants were exceptional within the framework of the given cemeteries is demonstrated by the

examples from more remote areas of the Late Urnfield Culture period, such as grave 98 from Pobrežje, grave 17 from Dobova, graves 155 and Sn 3 from Brežec, as well as sporadic finds of pendants from destroyed graves in Maribor, Mokronog and at Hajdina (Pahič 1972, 56, Pl. 20: 8,9; Stare 1975, 28, Pl. 8: 6; Ruaro Loseri et al. 1977, Pl. 15: 38; 27: 8; Gabrovec 1973, Pl. 5: 1; Müller-Karpe 1959, Pl. 116: 26; 118: 22). It is apparent that only one or at the most two graves incorporating a wheel-shaped pendant were present at each of these cemeteries. Somewhat different, and yet also exceptional is the discovery of a wheel-shaped pendant from Brezje in the Dolenjska region, in the Iron Age male grave XIII/14 (Kromer 1959, Pl. 41: 8). A similar pendant, an individual find lacking any grave inventory, is known from the site context of Šmarjeta (Stare 1973, 35, Pl. 33: 14). In a generalized recapitulation, grave inventories incorporating wheel-shaped pendants denote the group of females, who at least within the framework of one generation, if not through several generations within a given community, are exceptional. B. Teržan conjectures that a particular class of females, who played an important role in ceremonial services in individual communities, is buried in these graves (Teržan 1987, 69 ff.).

Similar pendants in the hoards from the southern part of central Europe and in northern Italy, contrary to those in the western part of central Europe where they are frequent components of grave inventories or hoard finds already from the Middle Bronze Age onwards, usually make their appearance as late as the beginning of the Late Urnfield Culture period.³² Congruous with grave finds, pendants from hoards are most frequently represented either individually or in pairs at the most. Such hoard compositions are for instance Oggau, Lengyeltóti III, Gyermely, Ivanec Bistranski, Mušja jama and S. Francesco, and in more remote regions also e.g. Hódmezővásárhely in eastern Pannonia, Capriano-Renate in Lombardy and Coste del Marano in central Italy (Pittioni 1941, Pl. 13: 1;

²⁸ Their distribution is illustrated also in Bándi, Fekete 1977-1978, Abb. 25.

²⁹ Wels-Weyrauch 1991, 52 ff.; Kubach 1977, 129 ff., especially 132. Similar pins are known also in later context of the Celldömök I hoard (Mozsolics 1973-1974, 84, Pl. 1: 1,4). It is unusual that they are not the usual cast pins; in fact, they are pendants (or the heads of pins) that are made in the same mould and only subsequently added on to the bodies of pins.

³⁰ Numerous strongly damaged ringlets made of bronze wire, and an amber bead (the sole one at the cemetery), are also included in the grave along with the pendant. I would like to extend my gratitude to Drago Svoljšak (National Museum of Slovenia, Ljubljana) and Ana Pogačnik for allowing me to examine the grave.

³¹ Last but not least, it is significant that among the more than 2400 graves resulting from Szombathy's excavations, only five incorporated this type of material find.

³² Here it must be ascertained that the early forms of wheel-shaped pendants (e.g. round plates with spokes depicted in relief) were of course frequent already among Middle Bronze Age (and earlier) hoards also in the central Danubian region (cf. e.g. Mozsolics 1967, Pl. 23: 4,5; 24: 4-16; 26: 10; 29: 1,2,24-27; 46: 5-9, etc.). On the basis of these finds, as well as on the contemporaneous plastic depictions such as that upon the Dupljaja handcart, G. Kossack inferred the origins of the motif of the wheel-shaped pendant as being in the region of southeastern Pannonia (Kossack 1954, 20 ff.). This motif in the form of a pendant with a long loop is just as frequent during the Early Urnfield Culture period (cf. e.g. Vinski-Gasparini 1973, Pl. 48: 30; 53: 7; 56: 34; 86: 13, etc.).

Mozsolics 1985, Pl. 108: 22; 241: 7,8, 256: 5,6; Vinski-Gasparini 1973, Pl. 113: 15,16; Szombathy 1912, 157 ff., Fig. 134; 135; Zannoni 1888, Pl. 44: 74,75; De Marinis 1971-1972, Pl. 3 A; Peroni 1961a, Pl. I 1 (6) 31-35). The finds from the San Francesco hoard in Bologna and Mušja jama near Škocjan are particularly surprising in view of the common characteristics among the above cited hoards (they are hoards of long continuity). These two hoards likewise incorporate only two wheel-shaped pendants, both examples representing a pair of unmatched size and clearly the result of a single deposition. The Coste del Marano hoard from Lazio, including five wheel-shaped pendants and a specific composition (a jewelry combination of fibulae, pins, ringlets and pendants), draws very near to the group of finds represented by Kanalski Vrh I here in Slovenia, as well as by other hoards such as Velem IV in Pannonia and Villetieri in central France, and graves such as those at Grünwald and Gammertingen in southern Germany.³³ The total number of wheel-shaped pendants is reflective at these sites, as is also the relationship between the unusual regularities of their sub-types, to which we shall yet return.

Recent contributions present interesting novelties to the comprehension of the function of wheel-shaped pendants on the basis of chemical analyses of their composition. The pendants from Kanalski Vrh I as well as those from Villetieri have demonstrated a surprisingly high portion of tin; the part of tin in the former hoard exceeds 10% as a rule and is most frequently between 12 and 20%, while in the latter hoard the portion falls in the range between 20 and 26% (Trampuž-Orel 1996, 188, 196 ff., Tab. 9; Fig. 3; Mordant et al. 1976, 212 ff., Fig. 185). It follows that wheel-shaped pendants are the type of object, in both hoards, with the largest portion of tin (together with ringlets at Kanalski Vrh I, while at Villetieri bracelets are the next type of object with a high portion of tin, ranging between 12 and 22%). So, what is the reason for such high parts of tin in objects that are interpreted as ornamental amulets and consequently cannot substantiate narrow functional motives?³⁴ N.

Trampuž-Orel links the large amounts of tin (and lead) in the pendants with their shimmering silvery-gray surface, which is apparently resistant to oxidation (so-called “white metal”). Hence, it is plausible that the excessive admixture of tin to the alloy used for wheel-shaped pendants corresponds with the desire for a high-quality product bearing no patina. The authors of the publication of a French hoard conjectured similarly: the intentional admixture of large amounts of tin to jewelry objects is perhaps a matter of aesthetics, as the objects are thus rendered a silvery appearance. At the same time, the alloying of tin achieves increased fluidity, thus leading to the improved quality of the cast object. Select wheel-shaped pendants (as well as rings and ring-shaped beads) from Swiss pile-dwelling settlements even demonstrated a predominance of tin, exceeding even 50% (Primas 1985, 556 ff., Fig. 1). Corresponding to select unusual site circumstances,³⁵ this brought M. Primas to some fascinating and less conventional conclusions: “In what sense are form and association meaningful? Among the broad classification of ‘ornaments’, rings and ringbeads are considered the basic forms. Certain specific modifications, for instance the wheel-shaped items, were treated by Kossack (1954: 15 ff.) in connection with the general concept of *Symbolgut* as objects of symbolic value. It may be asked whether or not the material itself might have been of symbolic value as well. Following this line of inquiry we come to consider the probability of alchemic thought in prehistory (...) The prehistoric material evidence is obviously not sufficient to prove earliest stages of alchemic thought and practice; yet rational anomalies in the use of certain metals can be shown. Let us consider the case of tin ...” and then in conclusion: “The production as well as the separation of the different ‘white’, or rather silvery, metals in circulation must have been easily possible only for persons with an adequate knowledge of properties such as the specific gravity of each metal. We presume that the combinations of form and material are not fortuitous but rather indicate the spread of certain proto-alchemic behavior in Bronze Age Europe”

³³ Bándi, Fekete 1977-1978; Mordant et al. 1976, 169s, Fig. 144-154; Müller-Karpe 1959, Pl. 183: 20,29-40; Pl. 209: 27-36. Regarding numerous Bavarian and Baden-Württemberg graves, in which there are fewer examples of wheel-shaped pendants (the number varying between one and four), cf. Wels-Weyrauch 1978, 67 ff.; ead. 1991, 54 ff.

³⁴ It is plausible that the high portion of tin in the pendants should be linked with the specific type of distribution of tin. In this instance, the pendants would represent a particular type of semi-manufacture, as B. Teržan conjectures (1996a, 251).

³⁵ A semicircular tin pendant from the Late Bronze Age island settlement of Grosser Hafner on the Zurich Lake was discovered within a wooden casket together with beads of jade, glass, amber, ‘white bronze’, as well as two cardium shells. The find is dated to the period around the year 1000 BC (Primas 1985, 556, 558; cf. also Primas 1990, 84). Interestingly, a knuckled tinned belt buckle, analogous with the sole object found together with 13 wheel-shaped pendants in the Velem IV hoard (Primas 1990, Abb. 8: 1; Bándi, Fekete 1977-1978, Abb. 20; 23 (distribution), was at the same site. The cited distribution map of G. Bándi and M. Fekete is in need of some modifications: objects, such as the knuckled pendants from the hoards at Čermožiše, Brodski Varoš, Pričac and Lengyeltóti II (Čerče, Šinkovec 1995, Pl. 48: 66; Vinski-Gasparini 1973, Pl. 56: 37,38; 72: 23; Mozsolics 1985, Pl. 107: 21), should not be equated with knuckled belt buckles, whose origins certainly lie within the region of the Swiss Jura. Consequently, the buckle from the Velem IV hoard is quite evidently western import.

(Primas 1985, 558, 560). M. Primas thus explicitly repudiates the explanation of the high percentage of tin in wheel-shaped pendants as being the result of the need for an improvement in the casting quality of these objects³⁶ and intervenes with, at first glance a highly contentious notion, the introduction of the controversial concept of the 'proto-alchemic behavior' of Bronze Age inhabitants of Europe.

Here, it is noteworthy as to what the established explanations are for the motif represented by wheel-shaped pendants. G. Kossack, in view of the material finds such as the plastic idols from southeastern Pannonia attributed to the period of transition between the Early and Middle Bronze Age, connects the meaning with the symbolism of the sun disc and indirectly (in combination with the motif of yoked water birds) with a symbolic representation of the passing over of life and vegetational cycles, as if a confrontation and exchange with the principle of life (the sun) and death (water) (Kossack 1954, 10 ff.). Even if we accept the thesis that the motif originates from within the circle of high cultures from the southeastern Danubian region, it still remains feasible that its dispersion throughout the entire area of central Europe during the Middle and Late Bronze Ages merely represents the adoption of the motif itself and not necessarily the above stated symbolism (ib., 21). As regards wheel-shaped pendants with variously shaped derivations, the fact remains that this type of amulet should in no instance be interpreted as the random result of a temporary formation of fashion, rather as an essential accessory or means of expression in cult activities (cf. Kossack 1990, 98). Ultimately, this is also confirmed by the significant site circumstances corresponding to the discovered wheel-shaped pendants within the specific group of female graves within the wide region extending from southern Germany to Slovenia during the periods of the Late Bronze Age and the early stages of the Iron Age.

In continuance of the discussion regarding the wheel-shaped pendants from Kanalski Vrh, let us first take into consideration the interesting ratios between the individual types or groups represented (*Fig. 6*):

1. Pendant with incised cross (1 example: Žbona-Trkman, Bavdek 1996, Pl. 100: 22)
2. Pendant with four forked spokes (1 example: ib., Pl. 100: 24)
3. Pendant with four spokes and an internal circle (2 examples: ib., Pl. 100: 23, *Fig. 3: 1*)
4. Pendant with five spokes and an internal circle (3 examples: ib., Pl. 100: 29-31)

5. Pendant with a triple cross (5 examples: ib., Pl. 100: 25-28, *Fig. 3: 4*)

6. Pendant with six spokes and an internal circle (7 examples: ib., Pl. 100: 32,33; 101: 34-37,39)

7. Pendant with eight spokes and an internal circle (22 examples: ib., Pl. 101: 38,40-45; 102: 46-57; 103: 58; *Fig. 3: 2,3*)

It follows that the hoard comprises of 41 wheel-shaped pendants with a mutual ratio between its independent types being 1:1:2:3:5:7:22. It seems significant that the hoard also comprises of the exact same number of tubulets (cf. above, *Fig. 3: 6-9*, Žbona-Trkman, Bavdek 1996, Pl. 107: 121-157), and decidedly astounding that the Villedhiery hoard in France also comprises of exactly 41 wheel-shaped pendants, only that these are exclusively of the type with six spokes and an internal circle.³⁷ So, how many wheel-shaped pendants and their individual types are there within the other contexts with several such objects? The Velem IV hoard consists of, together with the knuckled belt buckle, 13 wheel-shaped pendants, and the ratio between the individual types (different to some degree from those in the Kanalski Vrh hoard) is 1:1:2:3:3:3 (Bánda, Fekete 1977-1978, *Fig. 20-22*). Grave 1 at Grünwald comprises of 15 wheel-shaped pendants with a mutual ratio in the individual types being 1:2:5:7.³⁸ The double inhumation grave at Gammertingen consists of 11 wheel-shaped pendants of a uniform type - those with four spokes and an internal circle (Müller-Karpe 1959, Pl. 209: 27-36; cf. Wels-Weyrauch 1978, 73 ff.). The Kanalski Vrh I hoard and the Velem IV hoard, as well as grave 1 at Grünwald correspond also in that the simple pendant with engraved cross (group 1) is represented by a sole example in each of these three places.

Thus it may be determined that the ratio combinations of the individual types of wheel-shaped pendants, at otherwise spatially very remote sites, are similar. The individual types are most frequently represented by odd numbers of examples (1, 3, 5, 7, 11). Interestingly, only two types of pendants are represented in an even number (2): those with two spokes and an internal circle (Velem IV) and those with four spokes and an internal circle (Kanalski Vrh I, Grünwald). A significant number is obviously also 41, as this is the total number of pendants found at Kanalski Vrh I as well as at Villedhiery, while at the same time it represents the total number of tubulets at Kanalski Vrh I. The (unusually) high number (22) of pendants of the 7th group, those with eight spokes and an internal circle, represents the only deviation from

³⁶ "... nor the sometimes presumed casting qualities can convince this critical reviewer." (Primas 1985, 560).

³⁷ Mordant et al. 1976, 169. Out of regard for the truth, it should be added that the hoard also comprises of a fragment of another pendant. The authors of the Villedhiery hoard publication thus cite the number of pendants as 41+1.

³⁸ H. Müller-Karpe (1959, Pl. 183) cites only 13 pendants; for a more complete review cf. Wels-Weyrauch 1991, 54 ff.

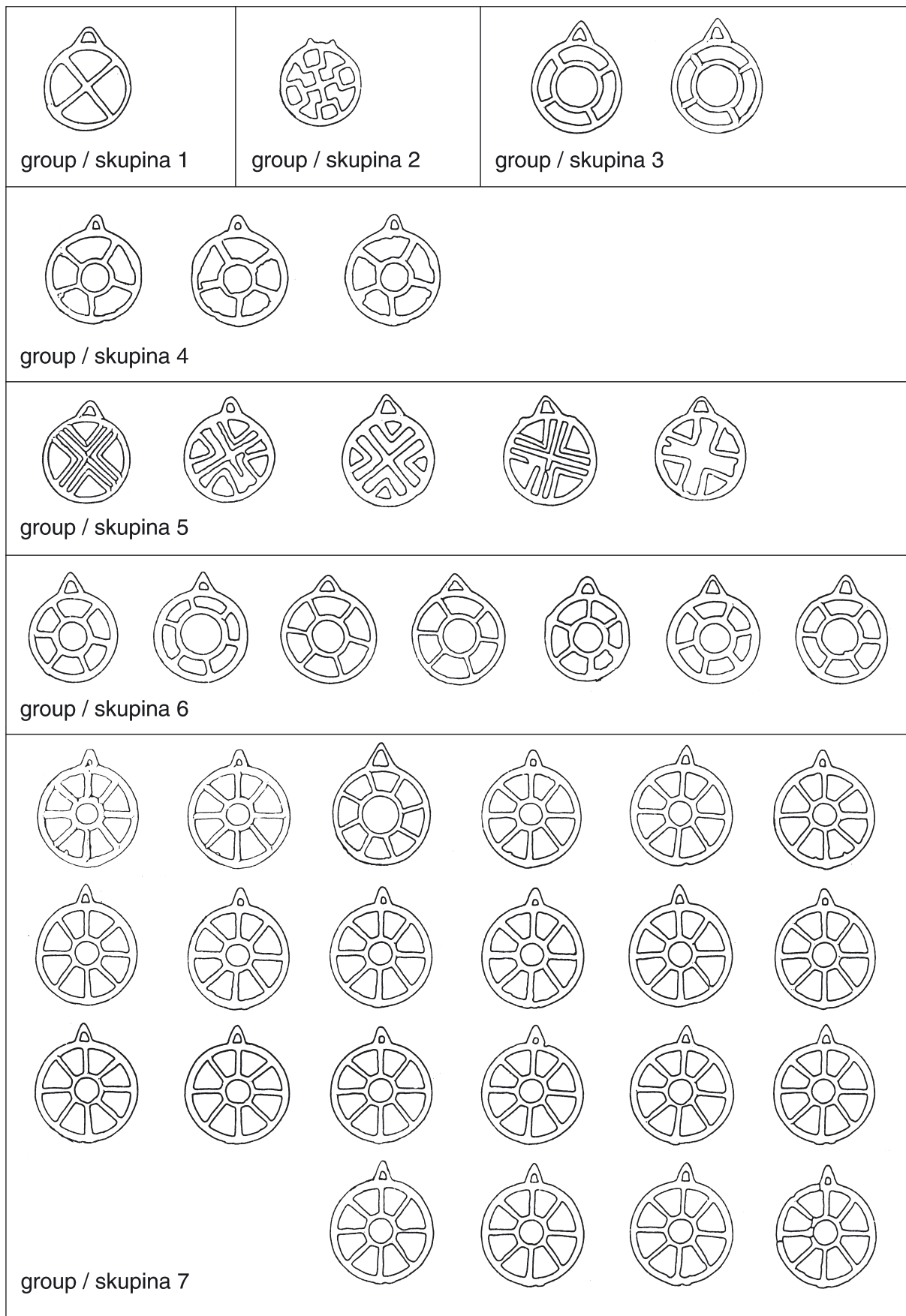


Fig. 6: Numerical relationship between the individual groups of wheel-shaped pendants from the Kanalski Vrh I hoard.
 Sl. 6: Številčna razmerja med posamičnimi skupinami kolesastih obeskov iz depoja Kanalski Vrh I.

the likeness portrayed as a whole.³⁹ Already N. Trampuž-Orel established that this 7th group consists of three sub-groups correlative to chemical composition.⁴⁰ This same group may also be further divided on the basis of weight (*Fig. 7*). With regard to this variable, two groups of pendants clearly reveal themselves, whose weights are concentrated between 26 and 27.5 g in the first group and between 32.7 and 34.5 g in the second. Two pendants, with intermediary weights of 29.7 and 31.5 g, represent an exception. The correlation between the weight and content of lead (*Fig. 8* and *9*) is quite surprising in groups established as such, as it is clearly evident that the lighter pendants from group 7 (sub-group 7.1) contain much more lead (between 6.51 and 16.44%) than do the heavier pendants (sub-group 7.2: between 1.02 and 1.97%).

Regarding the incomparably larger specific weight of lead than the one of copper as well as of tin, it is quite evident that the pendants with eight spokes from group 7.2 (those without lead) are much more voluminous. Precisely the lack of lead in the two 'problematic' pendants, which may classify to either of the two groups according to their weights, is what dictates their conditional classification to group 7.2 (cf. *Fig. 9*). These two pendants adeptly substantiate the interdependence of two mutually independent types of measurement (weight and chemical), after all, they are nonconformists in terms of their chemical composition as well: the first has an extremely high portion of tin (almost 20%) and an extremely low portion of lead (0.55%), while the second has an extremely low (3.53%) portion of tin (cf. also *Fig. 7; 8* and *10* - the

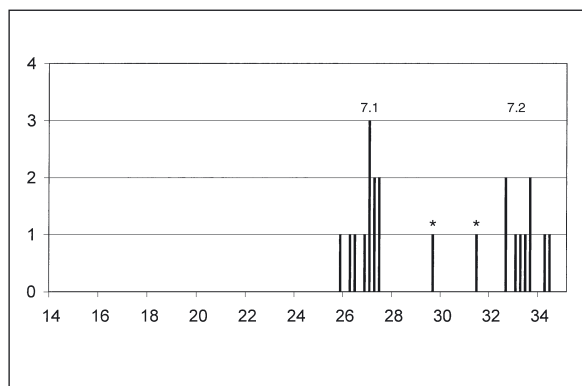


Fig. 7: Kanalski Vrh I, the weights of the wheel-shaped pendants with eight spokes and an internal circle (group 7).

Sl. 7: Kanalski Vrh I, teže kolesastih obeskov z osmimi prečkami in notranjim krogom (7. skupina).

pendants are designated by an *). The general determination regarding the interdependency of chemical analyses and weight measurements is thus as follows: the high portion of lead in the pendants of group 7 is expressly anti-proportionate with their weight. Consequently, two explicit sub-groups may easily be established for the pendants from group 7: lighter pendants with ample amounts of lead (7.1) and heavier pendants with small amounts of lead (7.2). Regarding the suppositions of N. Trampuž-Orel claiming the same alloy for a particular group of pendants, which also implicates simultaneous manufacture, it may be established unequivocally that at least eight (probably nine) pendants in sub-group 7.2 were made of the same alloy (cf. *Fig. 10*), while this is more difficult to substantiate for the other two groups professed (Trampuž-Orel 1996, 197). However, the simultaneous casting of pendants in sub-group 7.1 may be indirectly demonstrated on the basis of irregularities in the casting mould, which is traceable - in the form of a small protrusion - on the lower part of the interior side of the outer wheel on seven pendants (*Fig. 9*: column - Mould error).

If only the weights of those pendants, which were not chemically analyzed (that is four pendants: Žbona-Trkman, Bavdek 1996, Pl. 101: 41,42 and two in private possession, presented here in *Fig. 3*: 2,3)⁴¹ were taken as a determinative criterion, then group 7 of wheel-shaped pendants from Kanalski Vrh I, with its 22 objects, would, according to all expectations, fall into two numerically equal groups consisting of 11 pendants. And why according to all expectations? Simply because the number 11 is that,

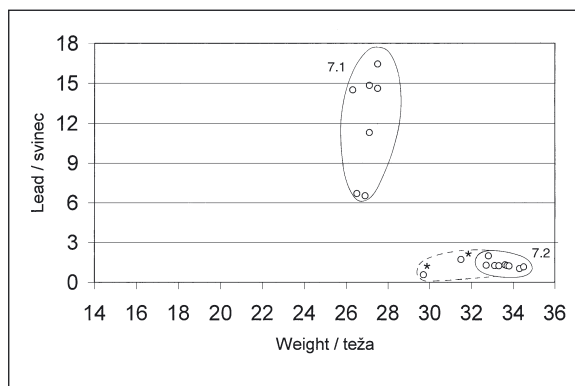


Fig. 8: Kanalski Vrh I, the weight ratios (in grams) and the content of lead (in %) in wheel-shaped pendants from group 7.

Sl. 8: Kanalski Vrh I, razmerje tež (v gramih) in vsebnosti svinca (v %) pri kolesastih obeskih 7. skupine.

³⁹ As a point of interest let us also mention the number of fibulae in the Villedhierry hoard: 22 (Mordant et al. 1976, 20, Pl. 3).

⁴⁰ Trampuž-Orel 1996, 197. The first includes nine pendants with eight spokes, the second includes two and the third includes four. For the purpose at hand, these analyses are suitable only in part as only 18 of the 22 pendants with eight spokes were analyzed.

⁴¹ Their weights are 26.0, 27.2, 27.3 and 27.4 g. As concerns the illustrated interdependency of the weights of the pendants and their chemical compositions, it may certainly be anticipated that their chemical analysis would demonstrate a portion of lead measuring between 6 and 17% as well as of tin between 12 and 18%.

which corresponds to the presuppositions concerning the anticipated numerical combinations of individual types of wheel-shaped pendants in the cited contexts: indeed, this number is analogous with the number of pendants in the grave at Gammertingen. The mutual ratio of individual types of wheel-shaped pendants from Kanalski Vrh is thus in fact 1:1:2:3:5:7:11:11. If the two nonconformists among the heavier wheel-shaped pendants with eight spokes in sub-group 7.2 discussed above (cf. *Fig. 7-10*, where designated by an *) were excluded, the mutual numerical ratio between the individual groups of wheel-shaped pendants would be 1:1:2*:2:3:5:7:9:11 (cf. this also with fn. 47 below).

Table Tabla	Group Skupina	Tin Kositer	Lead Svinec	Weight Teža	Mould error Napaka v kalupu
Fig. 3: 3	7.1	?	?	26.0	+
102: 48	7.1	14.21	14.50	26.3	
102: 51	7.1	16.74	6.68	26.5	
102: 57	7.1	17.10	6.51	26.9	+
102: 55	7.1	15.55	11.30	27.1	
102: 46	7.1	12.93	14.84	27.1	+
101: 41	7.1	?	?	27.2	+
Fig. 3: 2	7.1	?	?	27.3	+
101: 42	7.1	?	?	27.4	
101: 43	7.1	12.87	16.44	27.5	+
101: 45	7.1	12.59	14.61	27.5	+
101: 38	7.2*	19.38	0.55	29.7	
102: 56	7.2*	3.53	1.70	31.5	
101: 40	7.2	12.52	1.27	32.7	
101: 44	7.2	12.34	1.97	32.8	
102: 49	7.2	11.89	1.24	33.1	
103: 58	7.2	12.23	1.22	33.3	
102: 47	7.2	12.66	1.30	33.6	
102: 50	7.2	12.26	1.24	33.7	
102: 53	7.2	12.73	1.21	33.8	
102: 52	7.2	10.46	1.02	34.3	
102: 54	7.2	11.91	1.14	34.5	

Fig. 9: Kanalski Vrh I - the portion of tin and lead as well as the weights of wheel-shaped pendants from group 7 (the data regarding tin and lead (in %) is summarized according to Trampuž-Orel 1996, Supplement A (225), and that regarding the weights (in g) and tables are according to Žbona-Trkman, Bavdek 1996, 36 ff.; concerning the two pendants in private possession cf. above).

Sl. 9: Kanalski Vrh I - delež kositra in svinca ter teža pri kolesastih obeskih 7. skupine (podatki o deležih kositra in svinca (v %) so povzeti po Trampuž-Orel 1996, Priloga A (225), tisti o težah (v g) in tablah pa po Žbona-Trkman, Bavdek 1996, 36 ss.; za obeska v privatni lasti prim. tu zgoraj).

Interesting determinations also arise from the ratios of weights between select remaining groups of wheel-shaped pendants. Following analysis of these variables among all 41 wheel-shaped pendants weighing 14.9 g, the exceptionally low weight of the sole pendant with four forked spokes (group 2; Žbona-Trkman, Bavdek 1996, 35, Pl. 100: 24) is particularly striking.⁴² The pendant is partially damaged (a loop is broken off), such that its initial weight was presumably 1-2 g heavier. Consequently, if its initial weight is estimated to approximately 16-17 g, this proves to be precisely half of the arithmetic mean of the weights (33.6 g, with a small standard deviation of 0.6) of those nine pendants in sub-group 7.2, which undoubtedly belong here (cf. the last nine pendants listed in *Fig. 9*). That such a derivation is not lacking of validity is indicated by two arguments:

1. The chemical composition of the pendant with forked spokes, which contains a high portion of tin (14.75%) and an exceptionally low portion of lead (0.39%), is very similar to the compositions of those pendants in sub-group 7.2 (cf. *Fig. 11*);⁴³

2. The form of the pendant is such that each of the four central spokes then divides into two peripheral ones. Presumably, the division of the four central spokes into eight, which are fastened to the outer wheel, simply indicates the half (in terms of weight) value of the discussed pendant.

Thus, it is presumable that the specific form of the individual groups of wheel-shaped pendants might have communicated certain information to their carriers. The least that may be envisaged concerning the

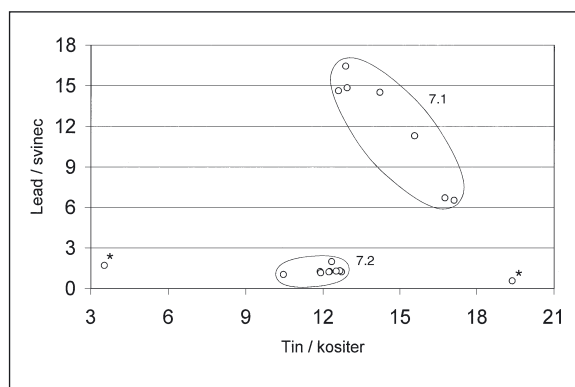


Fig. 10: Kanalski Vrh I - the proportions of tin and lead content (in %) in wheel-shaped pendants from group 7.

Sl. 10: Kanalski Vrh I - razmerje vsebnosti kositra in svinca (v %) pri kolesastih obeskih 7. skupine.

⁴² B. Žbona-Trkman and A. Bavdek (1996, 63 ff., Fig. 5) found analogies for this type of pendant at the Po valley site of Fontanella di Casalromano and in the hoard Ivanec Bistranski near Zagreb. In addition to these, similar pendants are also known of in central Italy from the Coste del Marano hoard, as well as at select southern Italian settlements together with Late Mycenaean pottery (Peroni 1961a, I 1: 33; Harding 1984, 143, Fig. 40), and formatively the same motifs with forked spokes are also found upon stamped pendants in Greek graves dating to the Mycenaean times of Mycenae, Argos and Tiryns (Kilian-Dirlmeier 1979, Pl. 110: 6-8) as well as in the Geometric Age temples at Perachora and Olympia (ib., 30 ff., Pl. 10: 155-157).

⁴³ Trampuž-Orel 1996, Supplement A (225, no. anal. 511), regarding group 7.2, cf. above.

example of pendants from group 7.2 on the one hand, and that from group 2 on the other hand, is that such a chemical, weight and form composition carries with it a message of some mutual relationship, which is significant in itself. May similar regularities be determined for the remaining groups of pendants? May typological differences in wheel-shaped pendants (e.g. the number of spokes, the presence or absence of the internal wheel, etc.) thus be interpreted as information regarding their weight (and/or chemical) characteristics?

Analysis of the weight measurements of objects and the answer to this question is inevitably segmentary at this point, quite simply because the extensive corpora of Late Bronze Age finds proffer their relative weights only exceptionally.⁴⁴ Thus, only a review of wheel-shaped pendants from Kanalski Vrh I shall be presented here, as the weights of the objects are unfortunately not submitted in the publications of the relevant hoards (Velem IV, Villethierry) and graves (Gammertingen, Grünwald).

The basic information regarding the content of tin and lead, as well as the weight of wheel-shaped pendants from groups 1 to 6, is presented in *Fig. 11*. As concerns a comparison of the information regarding the basic chemical composition, only groups 5 and 6, with either four or seven analyses, proved relevant. Pendants with triple crosses (group 5) regularly have a composition similar to those from group 7.2 (the portion of tin is between 11 and 17%, the portion of lead is minimal, up to 1%). One pendant deviates from this regularity (Žbona-Trkman, Bavdek 1996, Pl. 100: 25), although, according to its weight, it corresponds well with the remaining pendants from group 5. Pendants with six spokes (group 6) divide clearly into two groups on the basis of the content of tin and lead: the smaller group consists of two examples (*ibid.*, Pl. 100: 32; 101: 34), which lack any tin and a poor 3% of lead. This particular composition establishes their exceptionality among all wheel-shaped pendants at Kanalski Vrh, at the same time nearing them, in terms of their chemical composition, to the ingots from Kanalski Vrh; especially in view of their extremely high portions of arsenic (4-5%), nickel (2-3%) and antimony (4-5%) (Trampuž-Orel 1996, Supplement A, 225 (no. anal. 491 and 504), cf. with *ibid.*, 193 ff., 227 ff.). The remaining five wheel-shaped pendants with six spokes have high levels of

tin (9-19%) and negligible amounts of lead, thus nearing them to the majority of pendants from group 5 and those from group 7.2.

The chemical compositions of the remaining pendants within the individual groups are not of as such uncompounded significance as for example those pendants with eight spokes (group 7). In recapitulation, the majority of pendants from groups 1, 2, 3, 5 and 6 correspond to the compositions demonstrated by pendants from group 7.2. In view of this, what information may a comparison of weights relay? Their arithmetic means form the following corresponding to their groups (cf. also *Fig. 12* and *13*):

Group 1: 19.3 g (1 example).

Group 2: 14.9 g (1 example, for a commentary cf. above).

Table	Group	Sn	Pb	Weight
100: 22	1	10.60	0.69	19.3
100: 24	2	14.75	0.39	14.9
100: 23	3	9.92	0.90	23.3
Fig. 3: 1	3	?	?	24.9
100: 31	4	3.56	6.42	29.5
100: 29	4	?	?	32.1
100: 30	4	?	?	32.4
100: 28	5	12.68	1.10	24.4
100: 27	5	11.65	0.60	27.0
100: 25	5	7.34	4.33	28.2
100: 26	5	16.66	0.34	28.3
Fig. 3: 4	5	?	?	30.7
101: 37	6	15.57	0.62	19.7
101: 39	6	17.84	0.35	22.7
101: 36	6	9.67	0.33	23.4
101: 34	6	0.22	2.80	23.6
100: 33	6	13.99	0.22	23.9
101: 35	6	18.21	0.60	24.2
100: 32	6	1.09	2.99	28.3

Fig. 11: Kanalski Vrh I - the portion of tin and lead as well as the weights of wheel-shaped pendants from groups 1-6 (the data regarding the portions of tin and lead (in %) is summarized according to Trampuž-Orel 1996, Supplement A (225), and that concerning the weights (in g) and tables is according to Žbona-Trkman, Bavdek 1996, 36ff.; concerning the two pendants in private possession cf. above).

Sl. 11: Kanalski Vrh I - delež kositra in svinca ter teža pri kolesastih obeskih 1.-6. skupine (podatki o deležih kositra in svinca (v %) so povzeti po Trampuž-Orel 1996, Priloga A (225), tisti o težah (v g) in tabelah pa po Žbona-Trkman, Bavdek 1996, 36ss; za obeska v privatni lasti prim. tu zgoraj).

⁴⁴ The situation improves somewhat only with the most recent publications. Weights are cited most completely in the recent publications of hoard finds from Slovenia and Romania (Čerče, Šinkovec 1995; T. Soroceanu (ed.), *Bronzefunde aus Rumänien*. PAS 10 (Berlin 1995); cf. e.g. also the exhibition catalogue for Bronze Age hoards *Gaben an die Götter* (hrbg. A. and B. Hänsel), Berlin 1997, as well as e.g. sporadically in Hansen 1994, 409 ff.). Similarly stands for the rarely cited weights in the fundamental series of publications of bronze objects, *Prähistorische Bronzefunde* (cf. e.g. Mayer 1977). Symptomatic is also, for instance, the fragmentary specification of weights in the publications of select Italian hoards in the series *Inventaria Archaeologica* (Peroni 1961b, 1967). The weights of all objects in the Ardea hoard are cited systematically; otherwise, only all raw materials and ingots in fragmented form and no whole objects. The author is evidently of the opinion that only the weights of broken objects are relevant (cf. Peroni 1966; 1998).

Group 3: 24.1 g (2 examples).

Group 4: 31.3 g (3 examples; the standard deviation is 1.6).

Group 5: 28.5 g⁴⁵ (4 examples; the standard deviation is 1.5).

Group 6: 23.7 g (7 examples; the standard deviation is 2.5). Within this group, with its lowest weight of 19.7 g and its highest weight of 28.3 g, two pendants deviate strongly (Žbona-Trkman, Bavdek 1996, Pl. 100: 32, 101: 37). If disregarded in these statistics, then the arithmetic mean of pendants from group 6 would be 23.6 g (5 examples; the standard deviation would in this instance be, much more acceptably, 0.6).

Group 7.1: 27 g (11 examples; the standard deviation is 0.5).

Group 7.2: 33 g (11 examples; the standard deviation is 1.4). The two pendants already discussed above deviate from this group on account of their somewhat lower weight (Žbona-Trkman, Bavdek 1996, Pl. 101: 38, 102: 56). If disregarded in these statistics, then the arithmetic mean of pendants from this group would be 33.5 g (9 examples; the standard deviation is 0.6).

Interpretations of these data can be very diversified. At first glance, the fact that the weight of those objects with six spokes (23.6 g) is expressly lower than those with five spokes (31.3 g) proves quite surprising. This does not correspond to only the calculated arithmetic mean, rather to all pendants from groups 4 and 6 (cf. Fig. 13): all pendants with five spokes are distinctly heavier than those with six spokes. The weight ratio between pendants from group 7.2 and

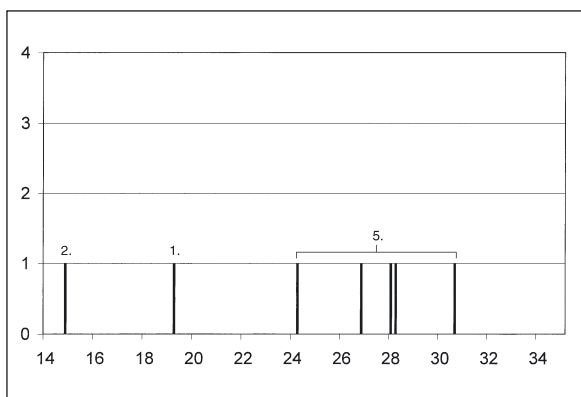


Fig. 12: Kanalski Vrh I - the weights of wheel-shaped pendants from group 1 (pendant with inscribed cross), group 2 (pendant with four forked spokes) and group 5 (pendants with triple crosses).

Sl. 12: Kanalski Vrh I - teže kolesastih obeskov 1. skupine (obesek z vpisanim križem), 2. skupine (obesek s štirimi viličastimi prečkami) in 5. skupine (obeski z vpisanim trojnimi križem).

those from group 2 has already been determined as 2:1. Further calculations are also possible corresponding to the cited data. The calculated mean values of pendants from groups 7.1 and 7.2 are particularly significant in this sense, as their sample is sufficiently extensive (between 9 and 11 examples), and their calculated standard deviation is very low (between 0.5 and 0.6). The arithmetic means of 27 g and 33.5 g have a mutual ratio of 5:6, where the basic unit is between 5.4 and 5.58 g. In other words, presuming that casters intentionally cast the pendants from Kanalski Vrh attributed to groups 7.1 and 7.2 in this particular weight ratio then, they erred by 3%. Such a negligible deviation undoubtedly confirms that the weight difference between both groups of wheel-shaped pendants with eight spokes is not coincidental. The pendants from group 6 (pendants with six spokes) may also, to some degree, be incorporated in a system of weight relationships established as such. Presenting five examples, the standard deviation is likewise very low: 0.6. Within the established ratio, the 6th group of pendants, with its arithmetic mean of 23.6 g, sets itself such that the ratio of 23.6 g : 27 g : 33.5 g is very close to the basic relation of 4:5:6; the basic unit though is more heterogeneous (5.9 g, 5.4 g and 5.58 g) and thus the error is consecutively between 5 and 8%. The final determination follows from the presented derivations: the weight ratio between wheel-shaped pendants of groups 2, 6, 7.1 and 7.2 from Kanalski Vrh is 3:4:5:6.

In conclusion, what may be summarized from the presented analyses? The numerical ratios of individual groups of wheel-shaped pendants in hoards, and espe-

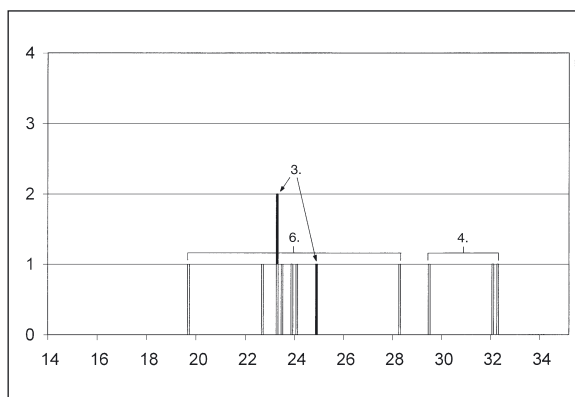


Fig. 13: Kanalski Vrh I - the weights of wheel-shaped pendants from group 3 (pendants with four spokes and an internal circle), group 4 (pendants with five spokes and an internal circle) and group 6 (pendants with six spokes and an internal circle).

Sl. 13: Kanalski Vrh I - teže kolesastih obeskov 3. skupine (obeska s štirimi prečkami in notranjim krogom), 4. skupine (obeski s petimi prečkami in notranjim krogom) in 6. skupine (obeski s šestimi prečkami in notranjim krogom).







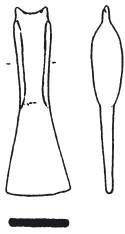







⁴⁵ One pendant is excluded from this discussion (Žbona-Trkman, Bavdek 1996, Pl. 100: 28) due to the fact that its entire central cross is broken off.

cially their analogousness with select grave and hoard finds, do not advocate a mercantile character of the hoard.⁴⁶ Nonetheless, it is true that select represented groups of pendants (probably also axes and ringlets) in hoards are objects of serial manufacture, although not all of them. The suggestive number combinations in which the pendants are found (1+1+2+2+3+5+7+9+11)⁴⁷ are particularly significant, and as a partial pendant, they may even be set within a numerical ratio to the remaining objects in the hoard: 1 miniature bracelet with spiral terminals + 1 ring + a triangular pendant with two terminals in the forms of bird heads + 3 winged axes + 5 ornamental plates + 7 necklaces (Fig. 14). Furthermore, the same number of wheel-shaped pendants and tubulets is also significant - 41.⁴⁸ It is similarly intriguing that the sum of pendants, tubulets and ringlets from the hoard (41 + 41 + 63 = 145) almost corresponds with the sum total of ingots and plano-convex ingots in the hoard (144) (cf. Žbona-Trkman, Bavdek 1996, 44 ff., Pl. 108-114A, and here Fig. 3: 10-12). The hoard thus comprises a complete set (or many sets?) of accessories, which are otherwise found in fragmentary form, primarily as components of exceptional female graves attributed to the Late Bronze Age as well as the Early Iron Age throughout a very extensive area. It has already been established that these objects are not an expression of momentary fashion trends, rather that they are the carriers of symbolic messages to their users and that they are a means of communication with the numinous.

Here, the question follows as to whether the presented analyses of the material finds, wheel-shaped pendants from Kanalski Vrh in particular, in any way add to the general comprehension of the issue regarding the 'irrational viewpoints of metallurgic activities', as M. Primas already attempted to establish correlative to tin pendants. Is her contention concerning the proto-alchemical approach of Bronze Age European inhabitants a credible model, which might prove worthy of more thorough consideration? Certainly, alchemy is a concept comprehended by modern man as something ambivalent, if not even as something pejorative. In short, alchemy is usually

Fig. 14: Kanalski Vrh I - the numerical relationships among select types of objects in the hoard.

Sl. 14: Kanalski Vrh I - številčna razmerja nekaterih vrst predmetov v depozju.

1 x		1 x	
1 x		1 x	
1 x		2 x	
3 x		3 x	
5 x		5 x	
7 x		7 x	
41 x		41 x	

⁴⁶ N. Trampuž-Orel hypothesizes as much on the basis of the distinctly visible casting seams and the unused axes in the hoard, as well as because of the number of pendants that represent a serial manufacture, and thus reflect their origins from the same workshop (1996, 197).

⁴⁷ It is noteworthy that the hollows upon the enigmatic ceramic plates in the votive hoard upon the Capitoline in Rome are represented in the following numbers: 1, 3, 5, 7, 9, 11, 23, 30, 32, 60 (Gjerstad 1960, 195, Fig. 125: 1-10; cf. also Turk 2000, 179 ff.). The remains of two bronze ringlets were preserved within two hollows upon the largest plate (the one with 60 hollows).

⁴⁸ Four tubulets are also present alongside four wheel-shaped pendants in the newly published hoard at Thunau in Lower Austria (Lochner 1998-99, Abb. 2 and 4).

denoted as a complex of knowledge and activity, affinities and inconsistencies of various matter, which among others also represented one of the Roman and medieval bases for modern chemistry. But alchemy was not only this. It's significance, particularly meaningful during the Roman period and the Middle Ages in the fields of philosophy and especially religion, was usually neglected. Numerology and its correspondence with the religious sphere represented an important preoccupation of alchemists.⁴⁹ Moreover, taking things a step further, the transitions - in alchemistic preoccupations - from chaos to order, from disarray to tidiness, from life to death and vice versa, imply also a very diverse selection of explanations for the symbolism of the wheel-shaped motif. In addition to the established conception in terms of the sun and its life giving energy, there are also symbolisms representing perfection, the course of time, the unification of the divine and the principle of profanity. Interestingly, the wheel-shaped motif initially represented the lunar symbol.⁵⁰ Is it thus possible to perceive, within the context of the unusual characteristics of the material finds from Kanalski Vrh I cited above, the prehistoric expression of activities, whose carriers were evidently females - priestesses; that is, activities, which were connected with the symbolic organization of relationships within the community, and between the community and the outside world?⁵¹ On the one hand, such theories prove speculative, especially when applied to material finds and populations from the depths of prehistory. On the other hand, it remains true that all theories, which apply notions lacking any reflection, such as merchant and trade (and which carry, although never expressed and nevertheless taken for granted, a modern connotation), upon the depths of prehistory, are also just as speculative.

DRAGOMELJ I

Ch. Pare recently published a comprehensive analysis of Bronze Age weights from central Europe (Pare 1999). His determinations regarding bi-conical ingots from the hoard horizon III here are significant for our analysis (Turk 1996, 112 ff.), as they present the multiple of Cyprian weight measurements with a basic unit of approximately 475 g (Pare 1999, 496 ff.).

The only completely preserved such ingot from Slovenia - that from the Dragomelj I hoard (Turk 1997, 50 ff., Fig. 1) - weighs 2844 g, which represents almost exactly a multiple of 6 of the basic unit. According to the author, bi-conical ingots, together with select other objects - weights from northern Italy, in the region of Caput Adriae and from Pannonia - during the time from the 12th century onwards, denote the appearance of new eastern Mediterranean and Cyprian weight standards (Pare 1999, 507 ff.). These supposedly exchanged the former weight standards, which in central Europe during the Middle and Late Bronze Age primarily originated from Aegean Mycenaean weight standards (regarding these derivations cf. below).

CONCLUSION

Are the weights of pendants from Kanalski Vrh I in any way comparable with the determined weight standards, as is demonstrated by the analysis of objects from the Grabe hoard? The results from the comparisons are depicted in *Fig. 15*. Only the weights of the heaviest pendants from group 7.2 (33.5 g) as well as the multiple of 3 of the Grabe basic unit of weight (32.9 g), where the deviation measures 1.8%, are directly analogous. At the same time, the weights of wheel-shaped pendants from groups 1, 6, 7.1 and 7.2 can be elegantly set corresponding to the ratio 3:4:5:6 into the system of weight units from Grabe as multiples of 1.5, 2, 2.5 and 3 of the basic units of weight. Deviations appearing among the wheel-shaped pendants from the cited groups in relation to the ideal multiples of the basic units of weight presumably can be interpreted as conceivable variations that evolved during the procedure of casting the final bronze products.⁵²

Likewise, *Fig. 15* depicts the relationships between the standard unit of weight determined here, as well as its multiples, and the remaining weight units (or weights) presented already in the cited publications. At first glance, it is discernible that multiples of 4 and 5 of the unit of weight at Grabe appear in mass numbers in the very wide area ranging from the eastern Mediterranean (the shipwreck near the Gelidonya cape), across the Aegean (Late Mycenaean weight

⁴⁹ Summarized according to Jung 1983, 253 ff. Characteristic, for instance, is the mysterious *Leitmotiv*, which appears in alchemistic documents from the Greek and Roman ancient period onwards: "One becomes two, two become three and out of the third comes the one as the fourth" (ibid, 272 ff.).

⁵⁰ Cf. Chevalier, Gheerbrant 1993, 237 ff., 337 ff.

⁵¹ Cf. with this the similar derivations of B. Teržan (1996b, 529) regarding the role of females in Iron Age eastern Hallstatt societies.

⁵² Again, it should be emphasized that the cited weights of Kanalski Vrh I wheel-shaped pendants from groups 1, 6, 7.1 and 7.2 represent only their arithmetic means; and despite the clear differences in weight among the individual groups, the weights of the pendants within these groups vary between a range of 1-2 g (cf. *Fig. 7* and *13*).

units), northern Italy (Terremare) and Pannonia (Bordjoš, Féregyháza) to Scandinavia (bronze anthropomorphic figurines from southern Sweden). It is especially significant that the bronze bead from Grabe (43.9 g) corresponds almost exactly, in terms of weight, to the Late Mycenaean weight unit P 2 (43.7 g) as well as to one of the weights from the shipwreck off the Gelidonya cape along the southern Anatolian coast (43.8 g), and partly also to one of the weights from Terremare (43.2 g). I believe that the comparisons presented provide sufficient argumentation for a functional classification of the bead from Grabe as being a weight. Thus, evidently, at least select weight units can be referred to as regards their pan-European distribution and consequently, it is indeed possible to

reason the theory of a pan-European metallurgical Koiné at the beginning of the Late Bronze Age from a metrological perspective as well.⁵³

The impressive collection of 60 stone and bronze weights from the shipwreck of a merchant ship off the Gelidonya cape during the second half of the 13th century BC is, on the other hand, a good indicator of how numerous and complicated contemporary weight systems actually were (Bass 1967, 135 ff.). The weights from this site demonstrate the exceptional heterogeneity of weight systems incorporating the so-called Phoenician standard (7.3 g with multiples),⁵⁴ the Egyptian standard (9.32 g or 1 qedet with multiples), the Syrian, Cyprian and Cretan qedet (9.5 g with multiples), the Palestinian nesef (10.3 or 10.5 g with mul-

Weight units of Grabe objects / utežne enote predmetov iz Grab	1/2 WU 5.5 g	1 WU 10.975 g	3/2 WU 16.5 g	2 WU 21.9 g	5/2 WU 27.4 g	3 WU 32.9 g	4 WU 43.9 g	5 WU 54.9 g	6 WU 65.8 g	7 WU 76.8 g	8 WU 87.8 g	9 WU 98.8 g	10 WU 109.7 g	WU 12 131.7 g
Grabe		*				K 2 32 g	J 43.9 g	K 1 55.8 g			K 87.8 g			
Kanalski Vrh I - wheel pendants / kolesasti obeski	*		group 2 cca. 16.5 g	group 6 23.6 g	group 7.1 27 g	group 7.2 33.5 g								
Bordjoš - weights / uteži (Medović 1995)			*					**			*			
Terremare - weights / uteži (Cardarelli et al. 1997)							*	*						
Scand. bronze figurines / skand. bron. figure (Malmer 1992)							*						*+	**
Féregyháza - golden bracelets / zlate zapestn. (Mozsolics 1973)						*		*+						
European weight units / evropske utežne enote (after / po Peroni 1998)					A 1 (rec.) 26 g		C 1 (rec.) 42.5 g		B 1 (rec.) 63 g, D 1 (rec.) 66.7 g					
Late Mycenaean weight units / poznomikenske utežne enote (Chadwick 1980, 157 s)				P 1 21.8 g			P 2 43.7 g		P 3 65.5 g					
Cape Gelidonya weights / uteži z rta Gelidonya (Bass 1967, 135 s)		*					*	**	*+	*		*	*	
		10.5 g					43.8 g	54.2 g, 55.5 g	65.5- 66.5 g	76.7 g		99.6 g	109.5 g	

Fig. 15: Relation of the Grabe weight units to some European Middle and Late Bronze Age units.

Legend:
rec.: reconstructed weight unit **: object is present in two examples
WU: weight unit *+ : object is present in many examples
*: object is present in one example

Sl. 15: Primerjava utežnih enot iz Grab in nekaterih evropskih srednje- in poznobronastodobnih enot.

Legenda:
rek.: rekonstruirana utežna enota **: predmet je prisoten v dveh primerih
WU: utežna enota *+ : predmet je prisoten v več primerih
*: predmet je prisoten v enem primeru

⁵³ The unit weighing 43.9 g could also be attributed, conditionally, to Peroni's unit C, which is not so precisely defined (it varies between 41 and 44 g) - cf. Peroni 1998, 223, Abb. 7; for analogous weight systems between the Aegean and Scandinavia cf. also Malmer 1999, and especially Pare 1999.

⁵⁴ Where G. F. Bass (1967, 139) cites several weights from Near Eastern settlements, among others also the weight with its multiple of six (e.g. 43.75 g) from Gezer in Palestine (cf. above regarding weight units from Grabe!). Interestingly, grave 30 from the same site incorporated in addition to a Mycenaean cross-shaped sword, also a bronze hook such as those known in Slovenia from Mušja jama, as well as among several hoard and grave finds in the southern part of central Europe during the Late Bronze Age and the transition to the Iron Age (Müller-Karpe 1980, Pl. 122 D: 2; Szombathy 1912, Fig. 132).

tuples), the Hebrew shekel (11.5 g with multiples), the Crete-Egyptian gold standard (12.3 g with multiples) and the Babylonian mina (502 g). Presumably, these extremely diverse weights must be interpreted, from their highly unusual context, in the sense of specific exchange activities of the crew upon a merchant ship. Likewise, it has already been demonstrated that the group of eight weights from Bordjoš in Vojvodina, which were discovered in a settlement pit together with a simple balance, corresponds to at least two different weight systems (A1 and B1 according to Peroni); and these two systems have a mutual weight ratio of 5 : 12 (Medović 1995, 209 ff., Fig. 2-4; Peroni 1998, 219, Fig. 2). Quite likely, the weighing of objects during the Late Bronze Age represented a complex activity, which

was never designated by any single or predominant weight system. To a large degree, this prevents examination of the determined weight systems for bronze objects. I do believe that in order to verify certain weight units it is methodologically much more pertinent to examine the weights of whole finished bronze products than those of fragmented semi-manufactures, where the attainment of particular weights, for practical reasons, could not have been very precise. Consequently, for the benefit of future studies of weight systems among Bronze Age metal objects, it will be necessary to research in greater detail which types of objects, in addition to wheel-shaped pendants or specific objects such as bronze bead or sphere from Grabe and bi-conical ingots, demonstrate regularities in their weights.⁵⁵

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⁵⁵ I am very grateful to Vesna Svetličič for her drawings and rearrangement of illustrations in Fig. 2-6 and 14 and to Rachel Novšak for the translation of the text.

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Teže predmetov v depojih pozne bronaste dobe iz Slovenije in možnosti ugotavljanja utežnih standardov

Prevod

UVOD

V novejšem času je opazen močan porast zanimanja za raziskave tež kovinskih predmetov in ugotavljanje morebitnih utežnih sistemov v bronasti dobi. Inicijativno za ugotavljanje mogočih regularnosti v težah bronastih predmetov oz. njihovih fragmentov predstavljajo atraktivne novejšje najdbe kamnitih uteži iz srednje- in poznobronastodobnih kontekstov iz Bordjoša v Vojvodini in iz terremarskih naselbin v severni Italiji (Medović 1995; Cardarelli et al. 1997). Hkrati so že dolgo poznani nekateri utežni standardi iz antičnega sveta, ki izvirajo iz arhajskega in klasičnega časa, za nekatere pa so dobro utemeljeni starejši, poznobronastodobni viri.¹ Poleg jasno prepoznavnih kamnitih uteži so iz evropskih bronastodobnih kontekstov poznane številne najdbe, ki izkazujejo standardne teže oz. njihove mnogokratnike, tako npr. srednjebronastodobne zlate zapetnice karpatskega prostora, poznobronastodobne antropomorfne bronaste statuete iz južnega skandinavskega prostora in poznobronastodobne skupne teže zlatih predmetov iz nekaterih zahodnoevropskih depojev (Mozsolics 1973, 86 ss; Malmer 1992; id. 1999; Spratling 1980).

Enotne teže in posledično utežni sistemi v oddaljenih regijah bronastodobne Evrope nam glede na navedene študije narekujejo nekaj uvodnih ugotovitev:

1. Vsaj od zgodnje bronaste dobe naprej lahko prebivalcem širom Evrope pripišemo poznavanje natančnega označevanja vrednosti bronca in zlata z utežnimi sistemi. Ta ugotovitev je sama po sebi lahko banalna, vključuje pa pomembno posledico: določene vrste predmetov bronastodobnemu človeku niso predstavljale le funkcionalne, simbolne ali prestižne označevalne vrednosti, temveč tudi (u)težno vrednost. Sporočilo, ki ga je torej določil predmet nosil s seboj, je med drugim določeno tudi z njegovo težno vrednostjo.

2. Nekatero osnovno utežno enoto so razširjene v zelo oddaljenih regijah in so tudi časovno dolgotrajne. Tako predstavlja npr. teža 11,228 g osnovno utežno enoto za zlate zapetnice iz banatskega depoja Féregyháza (Firiteaz) horizonta Forró oz. Ópályi, hkrati pa tudi osnovno utežno enoto zlatih posod iz poznobronastodobnega brandenburškega depoja Eberswalde (Monteliusova 5. perioda) (Mozsolics 1973, 194, t. 78-80; Mozsolics 1981; Hidde 1997; Eiwanger 1989, 447 ss, sl. 4). J. Eiwanger ugotavlja, da so teže navedenih predmetov mnogokratniki te osnovne utežne mere (t. i. evrobalkanski zlati standard II), hkrati pa v jasnem odnosu tudi z mikenskim talentom.

3. Če časovno in prostorsko tako daljnosežne analogije v razmerjih tež prestižnih zlatih predmetov držijo, si moramo zlasti vrsto vprašanj glede njihovih posledic za naše razumevanje različnih bronastodobnih evropskih skupnosti in njihovih medsebojnih povezav: ali so torej obstajale enotne utežne mere na širokem prostoru, ki se v konkretnem primeru razteza od Egeje preko karpatskega prostora vse do južne Skandinavije?² Ali je bila taka enotna utežna mera omejena le na zlate predmete (in npr. prestižne bronaste kipce), ali pa je, nasprotno, ugotovljiva tudi pri širšem spektru bronastih predmetov? Ali nam ugotavljanje različnih utežnih standardov lahko nudi odgovore na vprašanja o naravi in intenzivnosti stikov med časovno in prostorsko oddaljenimi evropskimi populacijami?

Za odgovore na taka vprašanja je potrebno raziskave tež razširiti tudi na ostale vrste kovinskih predmetov. Danes razpolagamo s številnimi obširnimi študijami na to temo, tako z utežnimi analizami posamičnih vrst gradiva iz določenega ožjega časovnega obdobja,³ kot tudi s poskusi ugotavljanja morebitnih integralnih utežnih standardov skozi daljše časovno obdobje (Peroni 1998).

Peronijeva novejša študija je med citiranimi deli tako glede obsega zaobjetega prostora med Egejo in Skandinavijo kot glede časovnega razpona med zgodnjo bronasto dobo in starejšo železno dobo gotovo najambicioznejša. Avtor je ugotovil štiri v osnovi med seboj neodvisne utežne sisteme, pri katerih je lahko za prva dva (A in B) vzpostavil tudi dokaj jasno korelacijo z utežmi, odkritimi v egejski naselbini Ayia Irini, v južnopanonskem Bordjošu in v severnoitalijanskih Terremarah. (Peroni 1998, 218 ss, sl. 2-4). Osnovne enote teh štirih utežnih sistemov so 26-27 g (A), 62-63 g (B), 42-43 g (C) in 66-67 g (D). R. Peroni je ugotovil izredno pogosto koncentriranje tež predmetov v evropskih depojih v razponu teh utežnih enot in njihovih mnogokratnikov. Presenetljivo je, da so predmeti s takimi težami praviloma razlomljeni, zelo pogosto pa med njimi nastopajo bakreni in bronasti polizdelki (surovci in fragmenti raznih oblik ingotov). Iz tega bi izhajalo, da so bronastodobni uporabniki te izdelke namerno razbijali tako, da so dobili predmete zelene teže. Ob dejstvu, da predstavljajo glavno podporo Peronijevi tezi prav močno fragmentirani kovinski polizdelki, ne preseneča, da je tolerančni razpon za uvrstitev določenega predmeta v enega od štirih utežnih sistemov zelo širok. Tako je mogoče iz podatkov o težah predmetov iz izbranih italijanskih depojev, ki jih objavlja R. Peroni, razbrati, da mu predstavljajo relevantne koncentracije tež razponi vse do 50 g (npr. teže med 779 in

¹ Npr. Kos 1997, 247 ss; za mikenski talent in njegove možne srednjeevropske bronastodobne ekvivalente prim. Eiwanger 1989, z obširno literaturo.

² Če upoštevamo tudi rezultate utežnih analiz M. Malmerja (1992, 382, tab. 2) za poznobronastodobne južnoskandinavske bronaste kipce in zlate obroče, katerih teže se koncentrirajo okrog 55 in 107-110 g, lahko tudi zanje jasno ugotovimo 5- in 10-kratnik osnovne Eiwangerjeve zlate utežne enote.

³ Npr. za zgodnjebronastodobne ingote v obliki ovratic in sponkaste ingote (Moosleitner 1988, Lenerz-De-Wilde 1995), za srednje- in poznobronastodobne gumbaste srpe (Sommerfeld 1994, 37 ss) in za poznobronastodobne ovalne in kvadraste ingote (Primas, Pernicka 1998, 52 ss).

813 g (12-kratnik enote B), med 967 in 1015 g (16-kratnik enote B), med 659 in 690 g (16-kratnik enote C) in med 540 in 571 g (8-kratnik enote D), vse za depo Madriolo).⁴ Tako širok razpon potencialno relevantnih tež fragmentiranih ingotov, še bolj pa neupoštevanje vseh tež iz določenega kompleksa (kot je to primer pri depolu iz Madriola) močno relativizira Peronijeve teze. Prav tako so včasih diskutabilne Peronijeve izpeljave glede atribucije nekaterih skupin tež k določeni utežni enoti. Tako je npr. s skupino tež med 263 in 275 g pri predmetih iz Madriola, ki jim avtor študije ob srednji vrednosti 266 g prisodi vrednost 4-kratnika enote D (Peroni 1998, sl. 7; k temu prim. Borgna 1992, 16 ss, tab. 6). Iz temeljne objave depoja E. Borgne je moč razbrati, da so v tej utežni koncentraciji štiri predmeti, katerih teže so trikrat po 263 g in le enkrat 275 g. Prava in zelo izrazita (hkrati pa pomenljiva) koncentracija je torej tista pri 263 g, ki pa je prej 10-kratnik enote A (26 g) kot pa 4-kratnik enote D (66-67 g). Razlog Peronijevega preferiranja utežne enote D je v tem konkretnem primeru verjetno v tem, da se z 10-kratniki osnovnih utežnih enot ne okorišča, kar lahko drži, lahko pa tudi ne.⁵ Menim, da je prav zato potrebno njegove zaključke, ki predpostavljajo dva utežna sistema (A in B) med Egejo in Skandinavijo v pozni bronasti dobi, ki ju šele na prehodu v železno dobo zamenjajo številnejši regionalni sistemi (Peroni 1998, 223), jemati z rezervno. Potrebno pa je dodati, da nekatere najnovejše analize tež predmetov iz depojev (npr. iz Pustakovca v Međimurju) nakazujejo potrditev vsaj ene od Peronijevih utežnih enot (enote A, t. j. 26 g, in njenih večkratnikov) (Hänsel 1999, 81 ss).

Pri ugotavljanju morebitnih utežnih standardov pri kovinskih predmetih iz depojev na jugovzhodnoalpskem območju se torej kot primarni cilj zastavlja odkritje mogočih referenčnih tež specifičnih predmetov, katerih vrednosti bi po eni strani lahko ustrezale že ugotovljenim utežnim enotam v drugih regijah, po drugi pa bi z njimi lahko razložili morebitne pravilnosti v težah tudi pri drugih (tako celih kot razlomljenih) predmetih. Take referenčne teže so bile ugotovljene v treh primerih.

GRABE - SREDIŠČE OB DRAVI

Izredno natančna korelacija se nakazuje pri dveh predmetih iz depoja Grabe (Središče ob Dravi) na Štajerskem iz horizonta II jugovzhodnoalpskih depojev (Čerče, Šinkovec 1995, 170 ss; Turk 1996, 108 ss) (sl. 1). Gre za votlo bronasto kroglo, sestavljeno iz dveh polkrožnih hemisfer, ter bronasto jagodo (sl. 1: 7a,b, 8; sl. 2).⁶ Njune teže so naslednje:

- votla bronasta krogla, sestavljena iz dveh polkrogel:
 - 55,8 g (K 1)
 - 32,0 g (K 2)
 - skupaj: 87,8 g (K)
- perforirana bronasta jagoda:
 - 43,9 g (J)

Pomenljivo je, da predstavlja teža lažje bronaste jagode natančno polovico teže bronaste krogle ($J = K/2$). Da ti teži in formula njune korelacije niso naključne, dokazuje do desetinke grama natančen izračun ($43,9 = 87,8/2$). Glede na to, da je večja bronasta krogla sestavljena iz dveh hemisfer neenake teže (55,8 oz. 32 g), je nadalje mogoče poiskati skupni imenovalac za teže vseh treh predmetov. Utežno razmerje treh predmetov $K 2 : J : K 1$ je torej skoraj natančno 3:4:5, pri čemer je osnovna utežna enota 10,975 g (seštevek vseh treh tež 131,7 g, deljen z 12 enotami).⁷ V zvezi s tako ugotovljenimi utežnimi razmerji je še posebej pomenljivo, da ima rahlo sploščena preluknjana bronasta jagoda (J, torej tista, ki je 4-kratnik osnovne utežne enote) na najširšem obodu enakomerno razporejene štiri izbokline. Mogoče in celo verjetno je, da je število izboklin uporabnikom označevalo točno določen mnogokratnik osnovne utežne enote. Tako dobljena osnovna utežna enota je zelo podobna t. i. evropskemu zlatemu utežnemu standardu (prim. tu zgoraj). Nadalje je zanimivo, da je skupna teža predmetov v depolu iz Grab 1107,2 g,⁸ kar je 100-kratnik osnovne utežne enote (z manj kot 1 % odstopanja).

Navezava navedenih predmetov iz Grab na uteži in utežne sisteme je torej zanesljiva (prim. tudi tu Zaključek). Ob tem se velja vprašati po podobnih predmetih v drugih depojih, ki bi prav tako lahko predstavljali take ali drugačne utežne standarde. Tovrstni predmeti v depojih med Panonskim prostorom in severno Italijo niso pogosti. Do neke mere primerljive so bronaste jagode oz. vijčki bikonične oblike iz depojev Brodski Varoš ter Poljanci I in II v osrednji Slavoniji ter Márok, Lengyeltóti IV in Velem I na zahodnem Madžarskem.⁹ Med njimi na žalost razpolagamo le s težo bikoničnega vretenca, izdelanega iz t. i. belega bronca, iz depoja Poljanci II, ki znaša 38 g. Ob navezavi na utežni sistem, ki ga odražajo uteži iz Grab, bi ta teža ob 1 % odstopanja pomenila 3,5-kratnik osnovne utežne enote.¹⁰ Zanimiva je analogija za polkrožni hemisferi iz Grab iz vzhodnoromunskega depoja Tătărăni (Iconomu 1977, 217 ss, sl. 19; 20).¹¹ Depo je sočasen s tistim iz Grab, saj sodi v Ha A1. Romunski primerek je sicer večji (njegov premer je 14 cm), vendar je njegova teža presenetljivo 131 g, kar predstavlja natančen 12-kratnik osnovne utežne enote iz Grab oz. seštevek tež tamkajšnjih dveh polkrogel in jagode.¹²

⁴ Peroni 1998, sl. 7; k temu prim. celotno serijo tež za depo Madriolo v Borgna 1992, 16 ss, 66 ss, tab. 5-7, iz katere je razvidno, da v Madriolu poleg Peroniju relevantnih nastopajo še številne druge teže (npr. 11 fragmentov s težami med 100 in 120 g, idr.), ki jih R. Peroni ne upošteva. Razvidno je tudi, da npr. Peroniju relevanten razpon 540-571 g (D8) zajema le 3 predmete, 659-690 g (C16) le 2 predmeta, 779-813 g (B12) le 4 predmete in 967-1015 g (B16) le 3 predmete. Frekvenca tež v Madriolu jasno nakazuje močno razpršenost in le redke manj izrazite koncentracije.

⁵ Peroni 1998, sl. 7: relevantni večkratniki osnovnih utežnih enot naj bi tako bili 2, 3, 4, 6, 8, 12, 16, 24, in 32. Ob tem je pomenljivo, da si lahko teže 263 g razlagamo tudi kot zelo natančen 24-kratnik utežne enote iz Grab: $24 \times 10,975 = 263,4$ g (prim. tu spodaj).

⁶ Čerče, Šinkovec 1995, 172, t. 70: 8,9; ilustracija v Smodič 1955, t. 4: 11, še bolj plastično nakazuje videz obeh polkrogel večjega predmeta (prim. sl. 1: 7 s sl. 2). Bronasta jagoda (sl. 1: 8) je bila najdena v bližini ostalih predmetov (prim. Klemenc, Saria 1936, 7).

⁷ Pri obeh polovicah votle bronaste krogle dejanska teža odstopa za 2,8 % ($K 2 = 32$ namesto 32,925 g) oz. 1,7 % ($K 1 = 55,8$ namesto 54,875 g) od idealnega 3- oziroma 5-kratnika osnovne enote, pri bronasti jagodi pa odstopanja ni oz. je 0 %. Prav tako je skupna teža obeh polovic bronaste krogle (K) natančen 8-kratnik osnovne utežne enote ($8 \times 10,975$ g = 87,8 g). Taka odstopanja so v dosedanjih utežnih analizah prazgodovinskih utežnih enot označena kot popolnoma sprejemljiva oz. kot zanemarljiva (prim. npr. Cardarelli et al. 1997).

⁸ Podatki so povzeti po Čerče, Šinkovec 1995, 170 ss; podatek o tam manjkajoči teži fragmentirane sul. osti (ib., 171, t. 70: 5; predmet tehta 22 g) mi je posredoval dr. Dieter Kramer (Landesmuseum Joanneum, Graz), za kar se mu najlepše zahvaljujem.

⁹ Vinski Gasparini 1973, t. 48: 27,28; 53: 29-31; 56: 43,44; Bulat 1975, t. 13: 21, k temu prim. Hansen 1994, 570 (teža), t. 33: 22; Mozsolics 1985, t. 92: 21; 110: 13 (z zanko); 230 A: 22,23; prim. tudi bronasto jagodo s štirimi izboklinami iz transilvanskega depoja Fizeșu Gherlii II iz mlajše KŽG (Petrescu-Dîmbovița 1977, Pl. 346: 19).

¹⁰ S. Hansen (l. c.) navaja le težo v gramih, tako da 38 g lahko pomeni tudi 38,4 g, kar bi bil natančen 3,5-kratnik osnovne teže iz Grab.

¹¹ Na predmet me je opozoril Primož Pavlin (Inštitut za arheologijo ZRC SAZU), za kar se mu najlepše zahvaljujem.

¹² Polkrogla iz depoja Tătărăni je ob robovih nekoliko poškodovana (prim. Iconomu 1977, sl. 20), tako da bi v celoti ohranjena očitno še bolj ustrezala natančnemu 12-kratniku obravnavane utežne enote (131,7 g).

KANALSKI VRH I

Šivne cevčice

Druga skupina referenčnih tež je ugotovljena pri nekaterih skupinah kolesastih obeskov v depoju Kanalski Vrh I horizonta III. Depo sta objavili B. Žbona-Trkman in A. Bavdek (1996). Glede na najdiščne okoliščine, predvsem pa glede na način pridobitve (depo so najditelji pridobili s pomočjo detektorja kovin) je očitno, da gre za enega redkih večjih depojev mešane sestave, za katerega lahko zanesljivo računamo, da je pridobljen v celoti. V zvezi z upoštevanjem celote najdb iz depoja je potrebno dodati, da v objavljenem katalogu in ilustracijah niso predstavljeni nekateri predmeti, ki so ostali v privatni lasti (Žbona-Trkman, Bavdek 1996, 32, op. 7). Gre za naslednje bronaste predmete:¹³

1. Obesek v obliki kolesa s štirimi prečkami in z vidnimi livnimi robovi. Pr. = 64 mm; deb. = 3 mm; t = 24,9 g; privatna last. Sl. 3: 1.

2. Obesek v obliki kolesa z osmimi prečkami in z vidnimi livnimi robovi. Pr. = 72 mm; deb. = 3 mm; t = 27,3 g; privatna last. Sl. 3: 2.

3. Obesek v obliki kolesa z osmimi prečkami in z vidnimi livnimi robovi. Pr. = 72 mm; deb. = 3 mm; t = 26,0 g; privatna last. Sl. 3: 3.

4. Obesek z vpisanim trojnim križem, vpetim v križni obod, in z vidnimi livnimi robovi. Pr. = 71 mm; deb. = 3 mm; t = 30,7 g; privatna last. Sl. 3: 4.

5. Prstan polkrožnega preseka. Na notranji strani so vidni sledovi obrušenega livnega roba. Pr. = 21 mm; deb. = 5 mm; t = 3,4 g; privatna last. Sl. 3: 5.

6. Šivna cevčica, okrašena z 41 prečnimi vrezji. D = 51 mm; pr = 4 mm; t = 1,5 g; privatna last. Sl. 3: 6.

7. Šivna cevčica, okrašena z 39 prečnimi vrezji. D = 50 mm; pr = 4 mm; t = 1,9 g; privatna last. Sl. 3: 7.

8. Šivna cevčica, okrašena z 51 prečnimi vrezji. D = 61 mm; pr = 4 mm; t = 2,1 g; privatna last. Sl. 3: 8.

9. Šivna cevčica, okrašena z 49 prečnimi vrezji. D = 61 mm; pr = 4 mm; t = 2,1 g; privatna last. Sl. 3: 9.

10. Fragment ingota trapezastega preseka. Odlomljene površine so obrabljene. D = 52 mm; š = 46 mm; deb. = 21 mm; t = 310 g; privatna last. Sl. 3: 10.

11. Fragment ingota trapezastega preseka. Zgornja odlomljena površina je stara in obrabljena, spodnja pa sveža in nedvomno recentna. D = 43 mm; š = 66 mm; deb. = 21 mm; t = 347 g; privatna last. Sl. 3: 11.

12. Pogača. Predmet je ohranjen v celoti. Zgornja površina je pretežno ravna in ob robovih mestoma zavihana navznoter. Presek pogače je visok in koničen. D = 94 mm; t = 1020 g; privatna last. Sl. 3: 12.

Med navedenimi predmeti torej prevladujejo najdbe, podobne tistim v že objavljenem delu depoja (štirje obeski v obliki kolesa, štiri šivne cevčice, dva fragmenta ingotov trapezastega preseka). Glede na že objavljene predmete predstavljata novost prstan in bakrena pogača. V nadaljnjem besedilu bodo natančneje predstavljeni tisti predmeti, ki so pogosteje zastopani med najdbami v privatni lasti.¹⁴

Skupno število šivnih cevčic v depoju je torej 41, od katerih nekoliko izstopa cevčica z nizom desetih luknjic (Žbona-Trkman, Bavdek 1996, 42, t. 107: 121; sl. 4). Podobno perforirana cevčica je v ženskem grobu 212 iz bližnjega grobišča v Tolminu, kjer prav tako nastopa skupaj z neokrašeno cevčico ter z dvema očalastima fibulama, tremi obročki, fragmentirano zapetnico in dvema steklenima jagodama.¹⁵ Ostale cevčice iz Kanalskega Vrha so okrašene z drobnimi prečnimi vrezji, njihova dolžina variira med 49 in 62 mm, in dajejo vtis enotno izdelane serije. Šivne cevčice so izdelane iz zelo tanke pravokotne bronaste pločevine (debele do nekaj desetink milimetra), ki so jo bronastodobni mojstri oblikovali v cevasto obliko tako, da je mesto podolžnega spoja - šiva še dobro vidno. Za tovrstne cevčice se zdi, da so časovno omejene na pozno bronasto dobo in na starejše horizonte starejše železne dobe, drugače kot tem podobni saltaleoni - v spiralno cevko oblikovani predmeti iz bronaste žice, ki jim lahko na zelo širokem območju sledimo skozi celotno bronasto dobo ter še v starejši železni dobi. Glede funkcije obeh zvrsti nakitnih predmetov je očitno, da jih moramo razumeti kot sestavne dele ogrlic oz. prsnih pektorarov. Na to kažejo dobro ohranjene usnjene vrvice, skozi katere so vdele cevčice iz depoja Blanut v osrednji Franciji (Thevenot 1991, 58 ss, 94 ss, sl. 56-65, 83). Depo je primerljiv s tistim iz Kanalskega Vrha I tako glede podobne datacije kot po velikem številu šivnih cevčic. Poleg slabo ohranjenih bronastih izvedb so se v tem depoju nahajale tudi številne zlate cevčice. Zanimivo je, da so zlate cevčice nanizane na še delno ohranjene usnjene vrvice v dve ogrlici. Ostanke usnjene vrvice so delno ohranjeni tudi v nekaterih bronastih cevčicah, kar jasno nakazuje, da je funkcija te zvrsti nakita očitno v zvezi z ogrlici-cami, ki so bile - sodeč po bolj ohranjenih usnjenih vrvicah za primer zlatih cevčic - nanizane v več, treh oz. štirih nizih. Med depoji v južnem delu srednje Evrope ni nobenega, ki bi izkazoval tako veliko število cevčic kot Kanalski Vrh I.

Pozlačene bronaste šivne cevčice se pojavljajo tudi v starejše-železnodobnih grobovih v Sloveniji in severovzhodni Italiji. Taki primeri so zastopani npr. med sporadičnimi najdbami gomile II z izkopavanj vojvodinje Mecklenburške v Stični (Wells 1981, 53, sl. 45: x,y), izhajajo pa tudi iz novoodkritih grobov na Molniku.¹⁶ Slednje imajo odebeljene robove in so tako zaradi pozlate kot zaradi robov dobro primerljive s cevčicami iz bogatih ženskih grobov iz Est v 8.-7. st. pr. n. š. (Müller-Karpe 1959, 97 ss, 266, t. 97: 16-18; Peroni 1975, 171, sl. 31: 3; t. 5A: 8-13; Frey 1969, 13 ss, sl. 11; t. 13: 49).

Za primere močno fragmentiranih in nekoliko širših šivnih cevčic (8 mm in več) je možno, da predstavljajo ostanke votlih zapetnic oz. ovratnic, kot je to mogoče primer v grobu 209 iz Brežca, kjer se ozka šivna cevčica (premera 4 mm) pojavlja skupaj s številnimi debelejšimi (premera do 8 mm) (Ruaro Loseri et al. 1977, 101, t. 19: gr. 209, 3). Te so lahko ostanek nekakšnega sceptra, mogoče pa votlih ovratnic ali zapetnic, kakršne so značilne za bogate ženske grobove žarnogrobiščne ruške in dobovske skupine v času Ha B (prim. Teržan 1990, 52, op. 6). Res pa je, da so cevčice izpod Brežca, kot tudi npr. tiste iz grobišča Sadež v Črnomlju (prim. spodaj) kljub večjemu premeru (tudi do 10 mm) ravne - ne kažejo torej znakov ukrivljenosti in jih po tej plati ne velja nep-

¹³ Predmete, označene z 1-11, hrani g. Vincenc Mrak, Gradnikova 22, Kanal, bakreno pogačo (št. 12) pa najditelj depoja g. Branko Uršič, Gradnikova 22, Kanal. Obema se za vpogled v najdbe in njihovo dokumentiranje najlepše zahvaljujem. Dr. Dragan Božič (Inštitut za arheologijo ZRC SAZU) mi je omogočil izposojlo natančne tehnicne za utežne izmere navedenih predmetov, ki so se, kot je to razvidno iz nadaljnega besedila, izkazale za zelo pomembne. Za to se mu na tem mestu najlepše zahvaljujem.

¹⁴ Za siceršnjo temeljito analizo depoja prim. Žbona-Trkman, Bavdek 1996; za plavutaste sekire iz depoja tudi Turk 2000, 165 ss.

¹⁵ Svoltjšak 1973, t. 3: 7-17. Kombinacija perforirane in običajne cevčice nastopa tudi v panonskem depoju Pölske (Mozsolics 1985, t. 124: 7,8; 125: 8,9). Podobne oblike je koščena perforirana paličica iz bogate ženske groba 155 iz Brežca, ki je (verjetno podobno kot tista iz Kanalskega Vrha) očitno razdelilni element bogatega pektorala, sestavljenega iz saltaleonov in koščenih jagod (Ruaro Loseri et al. 1977, 91 (op. 2), t. 15: 37). Podobno funkcijo lahko predvidevamo pri koščenih in bronastih perforiranih paličicah iz poznobronastodobnih kontekstov na zelo širokem območju (prim. nakitni depo Gualdo Taldino (Umbrija) iz 12. st. pr. n. š. (Peroni 1963, 16: 59)).

¹⁶ Rezultati raziskav gomile 7 na Molniku iz l. 1996 so v pripravi za objavo. Za informacijo o šivnih cevčicah iz grobov 6 in 10 se na tem mestu najlepše zahvaljujem izkopavalcema Ivanu Pušu in Ireni Šinkovec (Mestni muzej, Ljubljana).

osredno primerjati z votlimi zapestnicami, kakršne so v grobovih, kot je npr. bogat ženski grob II/1910 iz Velike Gorice (Vinski-Gasparini 1973, t. 104: 12).

Običajno se tovrstne bronaste cevčice v velikih depojih mešane sestave pojavljajo posamično (Hočko Pohorje, Pustakovec, Topličica I, Pölsške, Nova Bingula, Stockheim, Pilsen-Jikalka; podobno v grobovih iz Gammertingena, Tolmina, Brežca, Mosta na Soči in Čromlja),¹⁷ v paru (Sipbachzell, Tallya, Veliko Nabrde, Donji Petrovci)¹⁸ oz. največ v treh do štirih primerkih (Lazer, Čermožiše, Debeli vrh, Brodski Varoš, Esztergom, Thunau am Kamp, Arbedo-Castione; tudi v nekaterih grobovih z začetka KŽG v vzhodni Franciji, npr. Monéteau in Marolles-sur-Seine).¹⁹ V večjem številu so mi šivne cevčice znane le še iz depojev Vénat v zahodni Franciji ter Sarospatak in Pećinci I iz vzhodne Panonije, večkrat pa iz nekaterih grobov, npr. v bavarskem grobu I iz Grünwalda, v katerem je pet (sicer manjših) cevčic (Coffyn et al. 1981, t. 27: 76-80; Hellebrandt 1986, sl. 4: 14-16,20,21; Milošević 1960, t. 11: 18-22; Müller-Karpe 1959, t. 183: 12). Deset v ognju močno poškodovanih cevčic je bilo v ženskem grobu 32 iz ljubljanskega grobišča na dvorišču SAZU.²⁰ Večje število - štirinajst - (pozlačenih) cevčic je med citiranimi sporadičnimi najdbami gomile II iz Stične, pri katerih pa pripadnost istemu grobu ni zanesljiva.

Šivne cevčice so v pozni bronasti dobi in začetni železni dobi razširjene na izredno širokem območju med zahodno Evropo oz. porenskimi in švicarskimi skupinami kulture žarnih grobišč na eni ter panonskim prostorom na drugi strani. Glede na grobne najdbe jih lahko opredelimo kot značilno ženski pridelek (grobova iz Grünwalda in Gammertingena sta v tem smislu le delno povedna, saj sta na podlagi orožja na eni in obsežnih nakitnih setov na drugi strani očitno grobova z več pokopi)²¹ in jih je mogoče kot take razumeti tudi v okolju velikih panonskih depojev mešane sestave iz starejše KŽG. Hkrati se v depojih le izjemoma pojavlja večje število šivnih cevčic, kot je to primer v Kanalskem Vrhu in v depoju Blanot. V obeh primerih je očitno, da so njune šivne cevčice tvorile kompletno ovratno garnituro. Če je za 'klasične' velike depoje mešane sestave iz panonskega sveta v starejši KŽG možno pokazati, da so njihovi predmeti (tudi zaradi razlomljenosti) le *pars pro toto* neke celote (Turk 2000, 177 ss), lahko podobno tudi pri

njihovih šivnih cevčicah sklepamo, da predstavljajo le del neke celovite ovratne garniture. Popolnejšo predstavo o tem, kakšna je bila taka garnitura, nakazujejo pretežno nakitni depoji, kakršni so Kanalski Vrh I v zahodni Sloveniji, Blanot v osrednji Franciji, pa tudi Arbedo-Castione v južnih in Lazer v zahodnih Alpah. Po tej značilnosti se torej depo iz Kanalskega Vrha I tesno navezuje na zahodnoalpske in porenske skupine KŽG.²²

Zapestnica s spiralnima zaključkoma

Ledvičasto oblikovana zapestnica iz depoja (sl. 5) ima dokaj sorodne primerjave v obeskih oz. zapestnicah iz nekaterih panonskih depojev starejše KŽG, npr. Peterd, Bingula-Divoš, Malička, Salaš Nočajski, Dobrinici, Donji Petrovci in Chergeş.²³ Prvi štirje so značilni predstavniki velikih depojev mešane sestave (Turk 2000, 133 ss), sestava transilvanskega depoja pa je izrazito nakitna. Verjetno moramo iskati izvor tovrstnih obeskov že v zgodnji in srednji bronasti dobi, kot to nakazuje obeska oz. miniaturni zapestnici iz švicarske naselbine Arbon (Müller-Karpe 1980, 870, t. 313: 34). Če se ob primerjavah za miniaturno zapestnico iz Kanalskega Vrha I ne oziramo toliko na formalne, temveč bolj na strukturne značilnosti najdbnih celot, v katerih se podobni predmeti pojavljajo skupaj s takšnimi, ki so sicer zastopani v prvem depoju iz Kanalskega Vrha, pridemo do presenetljivih ugotovitev: v bogatih ženskih grobovih starejše in srednje KŽG se namreč od vzhodne Francije do Panonije pojavljajo drobne tordirane zapestnice s spiralnimi zaključki skupaj tako s šivnimi cevčicami, kolesastimi obeski, številnimi ovratnicami ali z obeski z antitetično postavljenimi ptičjimi glavicami (tako v grobu 6 grobišča La Colombine v zgornjem porečju Seine, v že navedenih grobovih iz Grünwalda in Gammertingena ter v grobu 305 iz Dobove).²⁴ V teh grobovih verjetno lahko vidimo standardne inventarje bogatih žen s specifičnim, morda obrednim statusom predvsem v času srednje in začetka mlajše KŽG (Ha A2-B1).²⁵ Tovrstni grobovi imajo očitno svoj alter ego v depojskih garniturah, kakršna je tista iz Kanalskega Vrha I s šivnimi cevčicami, kolesastimi obeski, ovratnicami in miniaturno spiralno zapestnico, prav tako pa tista iz depoja Arbedo-Castione v južni Švici.²⁶ Podobne drobne zapestnice se pojavljajo v

¹⁷ Čerče, Šinkovec 1995, 192, t. 84: 172; Hänsel 1999, 90, sl. 6: 10; Vinski-Gasparini 1973, t. 76: 20; Mozsolics 1985, 178, t. 124: 7,8 (v kombinaciji s perforirano cevčico); Ostave 1975, 40, t. 39: 17; Müller-Karpe 1959, t. 157: 37; 209: 5; Müller-Karpe 1980, t. 387E: 10; Svoljšak 1973, t. 3: 17; Ruaro Loseri et al. 1977, t. 19: gr. 209, 3,11; morda tudi t. 12: gr. 150, 17; t. 17: gr. 183, 4; Teržan et al. 1984-1985, t. 181: A7, prim. tudi Marchesetti 1885, t. 8: 22; Dular 1979, t. 13: 4.

¹⁸ Höglinger 1996, 137, t. 24: 420,421; Mozsolics 1985, 201, t. 165: 4,5; Vinski-Gasparini 1973, t. 44: 21,22; Ostave 1994, 25 s, t. 26: 6,7.

¹⁹ Müller 1991, 127; Čerče, Šinkovec 1995, 145, 166, t. 48: 72-74; 66: 65; Vinski-Gasparini 1973, t. 57: 39,61; Mozsolics 1985, 117, t. 138: 20,23; Lochner 1998-1999, sl. 2: 1-4 (v spodnjeavstrijskem depoju Thunau se ob štirih cevčicah pojavljajo tudi štirje kolesasti obeski - prim. tu spodaj); Wyss 1971, sl. 24 (v depoju Arbedo-Castione se poleg 4 cevčic nahaja še preko 20 saltaleonov, ki skupaj tvorijo celovito ovratno garnituro); Müller-Karpe 1980, 878, t. 466 M, 468 A.

²⁰ Stare 1954, t. 27: 3. Grob je bil odkrit v okolju grobov ljubljanske stopnje I (prim. Gabrovec 1973, sl. 5).

²¹ Pri grobu iz Gammertingena (Baden-Württemberg) gre očitno za dvojni skeletni grob iz srednje KŽG oz. Ha A2-B1 (prim. Müller-Karpe 1959, 314; tudi Schauer 1984, 221 ss, sl. 7).

²² V zvezi s tem je zanimivo, da se v francoskih Alpah pojavlja cela vrsta depojev, katerih sestava je tudi sicer dobro primerljiva z depojem iz Kanalskega Vrha I. Tako ima npr. ovratnica z žičnim prepletom iz Kanalskega Vrha poleg znanega groba iz Dobove najboljšo primerjavo v dveh podobnih iz nakitnega depoja Réallon (Žbona-Trkman, Bavdek 1996, 62 ss, t. 97: 10; Müller 1991, 117 ss). Tovrstni depoji so običajno datirani v mlajšo KŽG (ib., 121 ss). Za zahodnoalpske depoje s fragmentiranimi bikoničnimi ingotji prim. Bocquet, Lebasclé 1983, 48 ss, sl. 6: 2,3,8.

²³ Žbona-Trkman, Bavdek 1996, 35, t. 99: 20; Mozsolics 1985, t. 61: 12; Vinski-Gasparini 1973, t. 85: 12; Balen-Letunić 1985, t. 2: 6; Popović 1964, t. 2: 3-5; Ostave 1994, t. 18: 4,8; 22: 9; Petrescu-Dîmbovița 1977, 88, t. 127: 25, za datacijo prim. tudi Mozsolics 1973, 145.

²⁴ Müller-Karpe 1980, 876 ss, t. 466 C; Müller-Karpe 1959, t. 183: 2-4,12,18,19,29-40; 209: 5,10,23,24,27-36; Stare 1975, t. 44: 2,3,8,9; omeniti velja tudi primer iz grobišča Ostrožnik pri Mokronogu (Gabrovec 1973, t. 5: 2), pri katerem pa grobna celota ni znana. Na tem grobišču je še nekaj predmetov, ki bi sodili vsaj v zgodnji segment Ha B (tako npr. tordirane ovratnice, kolesasti obesk in obsežni obročki (ib., t. 2: 3: 1-3; 5: 1,19-26; prim. z npr. Stare 1975, t. 8: gr. 17; 26: gr. 186; 27: gr. 194; 41: 7,8, itd.).

²⁵ V to okolje nedvomno sodi tudi ženski grob 98 s šivnimi cevčicami, kolesastima obeskom in tordirano ovratnico iz Pobrežja (Pahič 1972, t. 20: gr. 98; prim. tudi Teržan 1987, 68 ss), ter grobovi, kot so gr. 12 iz grobišča Korošci - Sv. Barbara pod Jelarji ter grobova 155 in Sn 3 iz grobišča Brežec pri Škocjanu (Montagnari Kokelj 1996, 36, t. 2: 12; Ruaro Loseri et al. 1977, t. 13-15; 27).

²⁶ Wyss 1971, sl. 24: drobne zapestnice so v depoju zastopane kar s 23 primerki. Po obliki so sicer neskljenjene in so najbolj podobne ovratnicam s spiralnimi zaključki, vendar njihova velikost (pr. = 28-44 mm) ustreza primerku iz Kanalskega Vrha I (pr. = 43 mm).

južnopanonskih depojih starejše KŽG Poljanci I, Brodski Varoš, Pričac in Mačkovic.²⁷

Obeski v obliki (sončnih) koles

V depoju je skupaj 41 kolesastih obeskov (Žbona-Trkman, Bavdek 1996, 63 ss, t. 100-102; 103: 58; sl. 5; sl. 3: 1-4). V temeljni objavi depoja so bili ti predmeti že deležni ustrezne obravnave, predvsem kar zadeva njihovo kronološko in distribucijsko analizo. Tovrstni obeski so razširjeni na širokem prostoru srednje in južne Evrope od srednje bronaste dobe naprej. Zlasti pogosti so v času KŽG, kot tradicija pa se obdržijo tudi še v starejši železni dobi.²⁸ Na tem mestu velja opozoriti na dejstvo, da se kolesasti obeski v pozni bronasti dobi pojavljajo skoraj izključno v ženskih grobovih, prav tako kot njihove najverjetnejše predhodnice - igle z glavo v obliki kolesastega obeska iz srednjeevropske kulture grobnih gomil.²⁹ Če se ozremo po nekaterih kasnejših, železnodobnih grobnih najdbah, so podobni obeski tudi v svetolucijski skupini, torej na območju, iz katerega izhajajo tudi depo iz Kanalskega Vrha I. Na tolminskem grobišču se kolesasti obesek nahaja le v bogatem ženskem grobu 103.³⁰ Podobni obeski so pridatek v bogatih ženskih grobovih v Mostu na Soči predvsem v času stopnje Sv. Lucija Ic (Teržan et al. 1984-1985, t. 20A: 1; 24A: 12; 36E: 6; 122C: 4; 157A: 5; Marchesetti 1893, 19, t. 11: 4; Teržan, Trampuž 1973, 424 ss). Poleg obeskov so v teh grobovih pogosti dodatki obročasti nakit (zapestnice oz. polno liti obroči in ovratnice), prstani in drobni obročki ter številne fibule. V vseh primerih gre torej za grobove žen, ki so imele v svetolucijski družbi očitno izpostavljeno mesto,³¹ hkrati pa struktura grobov ob številnem obročastem nakitu tudi sicer spominja na nekatere sestavne elemente depoja Kanalski Vrh I. Da so bili grobovi s kolesastimi obeski izjemni v okviru danih grobišč, dokazujejo tudi primerki iz bolj oddaljenih področij mlajše KŽG, kot so grob 98 iz Pobrežja, grob 17 iz Dobove, grobova 155 in Sn 3 iz Brežca, pa tudi sporadične najdbe obeskov iz uničenih grobišč v Mariboru, Mokronogu in na Hajdini (Pahič 1972, 56, t. 20: 8-9; Stare 1975, 28, t. 8: 6; Ruaro Loseri et al. 1977, t. 15: 38; 27: 8; Gabrovec 1973, t. 5: 1; Müller-Karpe 1959, t. 116: 26; 118: 22). Na vseh teh grobiščih sta bila očitno le po eden ali največ dva grobova s kolesastim obeskom. Nekoliko drugačna, vendar spet izjemna je najdba kolesastega obeska iz Brezja na Dolenskem, kjer se pojavi v železnodobnem moškem grobu XIII/14 (Kromer 1959, t. 41: 8). Podoben obesek je kot najdba brez znane grobne celote v najdiščnem sklopu Šmarjete (Stare 1973, 35, t. 33: 14). V splošnem lahko povzamem, da grobne najdbe kolesastih obeskov označujejo tisto skupino žensk, ki so vsaj v okviru ene generacije, če ne celo v več

generacijah znotraj dane skupnosti izjemne. B. Teržan predpostavlja, da je lahko v takih grobovih pokopan določen stan žensk, ki je igral pomembno vlogo pri obrednih opravilih v posameznih srenjah (Teržan 1987, 69 ss).

Tudi v depojih v južnem delu srednje Evrope in v severni Italiji se podobni obeski, drugače kot v zahodnem delu srednje Evrope, kjer so kot grobne ali depojske najdbe pogosti že od srednje bronaste dobe naprej, običajno pojavljajo šele z začetkom mlajše KŽG.³² Podobno kot pri grobnih najdbah so obeski v depojih najpogosteje prisotni posamično ali največ v paru. Taki depoji so npr. Oggau, Lengyeltóti III, Gyermely, Ivanec Bistranski, Mušja jama in S. Francesco, v bolj oddaljenih regijah pa tudi npr. Hódmezővásárhely v vzhodni Panoniji, Capriano-Renate v Lombardiji in Coste del Marano v srednji Italiji (Pittioni 1941, t. 13: 1; Mozsolics 1985, t. 108: 22; 241: 7,8; 256: 5,6; Vinski-Gasparini 1973, t. 113: 15,16; Szombathy 1912, 157 ss, Fig. 134,135; Zannoni 1888, t. 44: 74,75; De Marinis 1971-1972, t. 3: A; Peroni 1961a, t. 11 (6) 31-35). Med navedenimi depoji sta zaradi siceršnjih značilnosti (gre za depoja dolgega trajanja) posebej presenetljivi najdbi iz San Francesca v Bologni in Mušje jame pri Škocjanu. Tudi v teh dveh depojih se namreč pojavljata le po dva kolesasta obeska, ki v obeh primerih predstavljata par neenake velikosti in sta očitno rezultat enega deponiranja. Depo Coste del Marano iz Lacija se s petimi kolesastimi obeski in specifično sestavo (nakitna kombinacija sponk, igel, obročev in obeskov) že močno približuje tisti skupini najdb, ki jo pri nas zastopa Kanalski Vrh I, sicer pa tudi depoji, kot sta Velem IV v Panoniji in Villethierry v osrednji Franciji ter grobovi, kot sta tista iz Grünwalda in Gemmertenga v južni Nemčiji.³³ V teh najdiščih izkazuje tako skupno število kolesastih obeskov kot razmerje med njihovimi podtipi nenavadne pravilnosti, h katerim se bomo še vrnili.

V novejšem času so k razumevanju funkcije kolesastih obeskov prispevale zanimive novosti kemične analize njihove sestave. Za obeske iz Kanalskega Vrha I in za tiste iz Villethierryja se je izkazalo, da vsebujejo presenetljivo visok delež kositra: ta v prvem primeru praviloma presega 10 % in je najpogostejši med 12 in 20 %, v drugem pa je še višji, med 20 in 26 % (Trampuž-Orel 1996, 188, 196 ss, tab. 9; sl. 3; Mordant et al. 1976, 212 ss, sl. 185). Tako predstavljajo kolesasti obeski v obeh depojih zvrst predmetov z največjim deležem kositra (v Kanalskem Vrhu I skupaj z obroči, v Villethierryu pa imajo zapestnice kot naslednja zvrst predmeta z obilnim kositrom nekoliko nižji delež, med 12 in 22 % kositra). Kaj so razlogi za tako visok delež kositra v predmetih, ki jih razumemo kot okrasne amulete, in torej ne morejo imeti ozko funkcionalnih vzrokov?³⁴ N. Trampuž-Orel povezuje veliko količino kositra (in svinca) v obeskih z njihovo svetlečo srebrnosivo površino, ki je očitno odporna proti oksidaciji (t. i. beli bron). Mogoče je, da je

²⁷ Vinski-Gasparini 1973, t. 49: 5; 55: 30; 71: 34,35; 73: 27. Približna primerjava za tovrstne zapestnice je lahko tudi nekoliko večja zapestnica z navznoter zavrtima spiralama iz depoja z nakitom in bronastim posodjem iz območja Großörner v osrednji Nemčiji (A. in B. Hänsel 1997, 64, sl. 8: 6).

²⁸ Razprostranjenost je prikazana tudi v Bándi, Fekete 1977-1978, sl. 25.

²⁹ Wels-Weyrauch 1991, 52 ss; Kubach 1977, 129 ss, posebej 132. Podobni igle se pojavljajo tudi v mnogo mlajšem kontekstu depoja I iz Celldömölka (Mozsolics 1973-1974, 84, t. 1: 1,4). Nenavadno je, da to nista običajno liti igli, saj sta obeska (oz. glavi igle) izdelana v istem kalupu in šele naknadno nataknjena na telesi igel.

³⁰ V grobu se poleg obeska nahajajo številni močno fragmentirani obročki iz bronaste žice in jantarna jagoda (edina na grobišču). Oglad groba sta mi omogočila Drago Svoljšak (Narodni muzej Slovenije) in Ana Pogačnik, za kar se jima najlepše zahvaljujem.

³¹ Ne nazadnje je pomenljivo, da se med preko 2400 grobovi Szombathyevih izkopavanj le v petih pojavljajo tovrstni predmeti.

³² Na tem mestu je potrebno ugotoviti, da so zgodnje oblike kolesastih obeskov (npr. okrogle ploščice z reliefno upodobljenimi prečkami) seveda pogoste že v srednjebronastodobnih (in starejših) depojih tudi v osrednjem Podonavju (prim. npr. Mozsolics 1967, t. 23: 4,5; 24: 4-16; 26: 10; 29: 1,2,24-27; 46: 5-9, itd.). Na podlagi teh najdb, kot tudi ob sočasnih plastičnih upodobitvah, kot je duplajski voziček, je G. Kossack sklepal na izvor motiva kolesastega obeska prav na prostoru JV Panonije (Kossack 1954, 20 ss). V starejši KŽG je ta motiv v obliki obeskov z dolgo zanko prav tako pogost (prim. npr. Vinski-Gasparini 1973, t. 48: 30; 53: 7; 56: 34; 86: 13, itd.).

³³ Bándi, Fekete 1977-1978; Mordant et al. 1976, 169 ss, sl. 144-154; Müller-Karpe 1959, t. 183: 20,29-40; 209: 27-36. Za številne bavarske in baden-württemberške grobove, v katerih se pojavlja manj kolesastih obeskov (število variira med 1 in 4), prim. Wels-Weyrauch 1978, 67 ss in ead. 1991, 54 ss.

³⁴ Možno je, da je visok delež kositra v obeskih potrebno povezati s specifično obliko distribucije kositra. V tem primeru bi obeski predstavljali neke vrste polizdelkov, kot to domneva B. Teržan (1996a, 251).

torej obilno dodajanje kositra v litino za kolesaste obeske povezano z željo po kvalitetnem izdelku brez patine. Podobno predpostavljajo tudi avtorji objave francoskega depoja: namerno dodajanje veliki-količin kositra v nakitne predmete ima lahko estetske razloge, saj predmeti tako dobijo srebrn videz. Hkrati pa se z dodajanjem kositra dosega večja fluidnost litine, kar vodi k mnogo kvalitetnejšim odlitkom. Za nekatere kolesaste obeske (kot tudi za obroče in obročkaste jagode) iz švicarskih koliščarskih naselbin je celo ugotovljen prevladujoč - preko 50 % delež kositra (Primas 1985, 556 ss, sl. 1). To je M. Primas v zvezi z nekaterimi nenavadnimi najdiščnimi okoliščinami³⁵ napeljal na nadvse zanimive in manj konvencionalne zaključke: "V kakšnem smislu sta oblika in najdiščni kontekst pomenljiva? V okviru široke tipologije nakitnih predmetov predstavljajo osnovne forme prav obroči in jagode. Določene specifične oblike, kot so kolesasti obeski, so bile obravnavane v povezavi s splošnim konceptom *Symbolgut*, torej kot predmeti simbolične vrednosti. Vprašamo se lahko, je imela morda tudi njihova litina prav tako simbolno vrednost. Če sledimo tej smeri raziskave, se lahko vprašamo o možnostih alkimističnega razmišljanja v prazgodovini (...) Prazgodovinski materialni viri očitno ne zadoščajo kot dokaz za zgodnje stopnje alkimističnega razmišljanja in prakse; kljub temu pa je mogoče pokazati na racionalne anomalije pri uporabi določenih kovin, kot je to primer prekomerne uporabe kositra za nakitne predmete ...", in nato v zaključku: "Izdelavo in razločevanje med različnimi 'belimi', ali boljše srebrnobarvnimi kovinami (t. j., med pretežno kositrnimi predmeti in litinami) so lahko izvajale te tiste osebe, ki so imele ustrezno znanje o lastnostih, kot je specifična teža posamične kovine. Sklepamo, da kombinacija oblike in materiala ni slučajna, temveč da nakazuje razširjenost določenega proto-alkimističnega obnašanja v bronastodobni Evropi" (Primas 1985, 558, 560). Primasova torej izrecno zavrže razlago visokega deleža kositra v kolesastih obeskih kot posledico potrebe po izboljšanju livne kvalitete teh predmetov³⁶ in posega v vpeljavo kontroverznega pojma 'proto-alkimističnega obnašanja' bronastodobnih prebivalcev Evrope v na prvi pogled zelo sporno območje.

Ob tem se velja spomniti, kakšne so ustaljene razlage motiva, ki ga izražajo kolesasti obeski. G. Kossack ga ob najdbah, kakršne so plastični idoli jugovzhodne Panonije iz časa prehoda zgodnje v srednjo bronasto dobo, povezuje s simboliko sončnega diska in posredno (v kombinaciji z motivom vpreženih vodnih ptic) kot simbolno upodobitev prehajanja življenjskih in vegetacijskih ciklov, kot soočanje in izmenjavanje principa življenja (sonce) in smrti (voda) (Kossack 1954, 10 ss). Tudi če se strinjamo s tezo, da motiv izhaja iz kroga visokih kultur jugovzhodnega Podonavja, je možno, da je njegova razširitev po celotni srednji Evropi v času srednje in pozne bronaste dobe pomenila le adopcijski motiva, ne pa nujno tudi navedeno simboliko (ib., 21). Pri kolesastih obeskih z raznovrstnimi oblikovnimi izpeljavami pa vendarle ostaja dejstvo, da tovrstne amulete v nobenem primeru ne moremo razumeti kot naključne rezultate trenutnega modnega oblikovanja, temveč kot nujen pripomoček oz. izrazno sredstvo pri kulturnih dejavnostih (prim. Kossack 1990, 98). To navsezadnje potrjujejo prikazane pomen-

ljive najdiščne okoliščine s pojavljanjem kolesastih obeskov v specifični skupini ženskih grobov na širokem prostoru od južne Nemčije do Slovenije v času pozne bronaste dobe in starejših stopenj železne dobe.

Naj ob nadaljnji obravnavi kolesastih obeskov iz Kanalskega Vrha najprej opozorim na zanimiva številčna razmerja med njihovimi posamičnimi tipi oz. skupinami (sl. 6):

1. obesek z vpisanim križem (1 primer: Žbona-Trkman, Bavdek 1996, t. 100: 22);
2. obesek s štirimi viličastimi prečkami (1 primer: ib., t. 100: 24);
3. obesek s štirimi prečkami in notranjim krogom (2 primeri: ib., t. 100: 23; sl. 3: 1);
4. obesek s petimi prečkami in notranjim krogom (3 primeri: ib., t. 100: 29-31);
5. obesek z vpisanim trojnim križem (5 primerov: ib., t. 100: 25-28; sl. 3: 4);
6. obesek s šestimi prečkami in notranjim krogom (7 primerov: ib., t. 100: 32-33, 101: 34-37, 39);
7. obesek z osmimi prečkami in notranjim krogom (22 primerov: ib., t. 101: 38, 40-45; 102: 46-57; 103: 58; sl. 3: 2, 3).

V depou je torej 41 kolesastih obeskov z medsebojnim razmerjem njihovih posamičnih tipov 1:1:2:3:5:7:22. Zanimivo je, da se v depou nahaja identično število šivnih cevčic (prim. zgoraj, sl. 3: 6-9, Žbona-Trkman, Bavdek 1996, t. 107: 121-157), naravnost presenetljivo pa, da je tudi v depou iz Villethierrya v Franciji 41 kolesastih obeskov, le da so ti izključno tipa s šestimi prečkami in notranjim krogom.³⁷ Kakšno je torej število kolesastih obeskov oz. njihovih posamičnih tipov v ostalih kontekstih s številnimi tovrstnimi predmeti? V depou Velem IV se skupaj ob členjeni pasni sponi nahaja 13 kolesastih obeskov, razmerje med posamičnimi tipi (do neke mere različnimi od tistih iz Kanalskega Vrha) pa je 1:1:2:3:3:3 (Bándi, Fekete 1977-1978, sl. 20-22). V grobu I iz Grünwalda se skupaj nahaja 15 kolesastih obeskov z medsebojnim razmerjem posamičnih tipov 1:2:5:7.³⁸ V dvojnem skeletnem grobu iz Gammertingena je 11 kolesastih obeskov enotnega tipa - tistih s štirimi prečkami in notranjim krogom (Müller-Karpe 1959, t. 209: 27-36; prim. Wels-Weyrauch 1978, 73 ss). Depoja Kanalski Vrh I in Velem IV ter grob I iz Grünwalda družijo tudi to, da se enostavni obesek z vpisanim križem (skupina 1) v vseh treh primerih pojavlja le po enkrat.

Ugotoviti je torej mogoče, da so številčne kombinacije posamičnih tipov kolesastih obeskov v prostorsko sicer zelo oddaljenih najdiščih podobne. Najpogosteje so posamični tipi zastopani z lihim številom primerkov (1, 3, 5, 7, 11). Zanimivo je, da v sodem številu (2) nastopata le dva tipa obeska: tisti z dvema prečkama in notranjim krogom (Velem IV) in tisti s štirimi prečkami in notranjim krogom (Kanalski Vrh I, Grünwald). Pomenljivo število je očitno tudi 41, saj je to skupno število obeskov tako v Kanalskem Vrhu I kot v Villethierryu, hkrati pa tudi število šivnih cevčic v prvem depou. Od celotne podobe odstopa le (nenavadno) visoko število (22) obeskov 7. skupine, tistih z osmimi prečkami in notranjim krogom.³⁹ Zanje je že N. Trampuž-Orel ugotovila, da glede na

³⁵ Polkrožni kositrni obesek iz poznobronastodobne otoške naselbine Grosser Hafner na züriškem jezeru je bil odkrit v leseni skrinjici skupaj z jagodami iz žada, stekla, jantarja in belega bronu ter z dvema školjkama *cardium*. Najdba je datirana v čas okrog l. 1000 pr. n. š. (Primas 1985, 556, 558; prim. tudi Primas 1990, 84). Zanimivo je, da iz iste naselbine izhaja členjena pločevinasta pasna spona, kakršna se pojavlja kot edini predmet ob 13 kolesastih obeskih v depou Velem IV (Primas 1990, sl. 8: 1; Bándi, Fekete 1977-1978, sl. 20; 23 (razprostranjenost)). Navedeno karto razprostranjenosti G. Bándija in M. Fekete je potrebno korigirati: predmetov, kot so členjeni obeski iz depojev Černožiše, Brodski Varoš, Pričac in Lengyelóti II (Čerče, Šinkovec 1995, t. 48: 66; Vinski-Gasparini 1973, t. 56: 37, 38; 72: 23; Mozsolics 1985, t. 107: 21), ne smemo enačiti s členjenimi pasnimi sponami, katerih izvor je nedvomno potrebno iskati na območju švicarske Jure. Na ta način se spona iz depoja Velem IV kaže kot očiten zahodni import.

³⁶ "... nor the sometimes presumed casting qualities can convince this critical reviewer." (Primas 1985, 560).

³⁷ Mordant et al. 1976, 169. Resnici na ljubo je potrebno dodati, da se v depou nahaja fragment še enega obeska, tako da avtorji objave depoja Villethierry število obeskov podajajo kot 41+1.

³⁸ H. Müller-Karpe (1959, t. 183) podaja le 13 obeskov, za popolni pregled prim. Wels-Weyrauch 1991, 54 ss.

³⁹ Kot zanimivost naj navedem število fibul v depou Villethierry: 22 (Mordant et al. 1976, 20, t. 3).

kemično sestavo tvorijo tri skupine,⁴⁰ ločiti pa jih je mogoče tudi glede na težo (sl. 7). Ob upoštevanju te spremenljivke se jasno nakazujejo dve skupini obeskov, katerih teže se koncentrirajo med 26 in 27,5 g pri prvi ter med 32,7 in 34,5 g pri drugi skupini. Izjemo predstavljata dva obeska, ki izkazujejo vmesno težo (29,7 oz. 31,5 g). Pri tako vzpostavljenih skupinah je presenetljiva korelacija med težo in vsebnostjo svinca (sl. 8 in 9), saj je očitno, da imajo lažji obeski 7. skupine (podskupina 7.1) mnogo več svinca (med 6,51 in 16,44 %) kot pa težji (podskupina 7.2: med 1,02 in 1,97 %).

Glede na neprimerno večjo specifično težo svinca kot jo imata baker in kositer, je očitno, da so obeski z osmimi prečkami skupine 7.2 (tisti brez svinca) mnogo bolj voluminozni. Prav zaradi odsotnosti svinca pri dveh problematičnih obeskkih, ki se po teži uvrščata med obe skupini, sem ju pogojno uvrstil v skupino 7.2 (prim. sl. 9). Ta dva obeska dobro potrjujeta soodvisnost dveh med seboj neodvisnih vrst meritev (utežne in kemične), saj sta tudi glede kemične sestave posebneža: prvi z ekstremno visokim deležem kositra (skoraj 20 %) in ekstremno nizkim deležem svinca (0,55 %), drugi pa z ekstremno nizkim (3,53 %) deležem kositra (prim. tudi sl. 7; 8 in 10 - obeska sta označena z *). Splošna ugotovitev glede soodvisnosti kemičnih analiz in utežnih meritev je torej naslednja: visok delež svinca v obeskkih 7. skupine je izrazilo obratnosorazmeren z njihovo težo. Na ta način je mogoče vzpostaviti dve jasni podskupini obeskov 7. skupine: lažji obeski z obilnim svincom (7.1) in težji obeski z malo svinca (7.2). Glede na predpostavke N. Trampuž-Orel o isti litini za določene skupine obeskov, kar implicira tudi istočasno izdelavo, lahko nedvomno potrdimo, da je vsaj 8 (verjetno 9) obeskov skupine 7.2 izdelanih iz iste litine (prim. sl. 10), težje pa je to potrditi za drugi dve predpostavljene skupini (Trampuž-Orel 1996, 197). Posredno pa lahko na istočasno vlijanje obeskov skupine 7.1 pokažemo na podlagi očitne nepravilnosti livnega kalupa, ki je v obliki majhne izbokline razvidna na spodnjem delu notranje strani zunanjšega kolesa pri sedmih obeskkih (sl. 9: kolona Napaka v kalupu).

Če pri tistih obeskkih 7. skupine, ki niso bili kemično analizirani (to so 4 obeski: Žbona-Trkman, Bavdek 1996, t. 101: 41,42 in dva v privatni lasti, tu na sl. 3: 2,3),⁴¹ kot kriterij določite vzamemo le njihovo težo, 7. skupina kolesastih obeskov iz Kanalskega Vrha I z 22 predmeti po pričakovanih razpade na dve številčno enaki skupini po 11 obeskov. Zakaj po pričakovanih? Enostavno zato, ker je število 11 tisto, ki ustreza predpostavkam o pričakovanih številčnih kombinacijah posamičnih tipov kolesastih obeskov v naštetih kontekstih: konkretno je to število primerljivo s številom obeskov iz groba v Gammertingenu. Medsebojno razmerje posamičnih tipov kolesastih obeskov v Kanalskem Vrhu je dejansko torej 1:1:2:3:5:7:11:11. Če pa že obravnavana posebneža med težjimi kolesastimi obeskki z osmimi prečkami skupine 7.2 (prim. sl. 7-10, kjer sta označena z *) izločimo, so medsebojna številčna razmerja med posamičnimi skupinami kolesastih obeskov naslednja: 1:1:2*:2:3:5:7:9:11 (k temu prim. tudi spodaj op. 47).

Zanimive ugotovitve izhajajo tudi iz razmerij tež med nekaterimi preostalimi skupinami kolesastih obeskov. Ob analizi te spremenljivke pri vseh 41 kolesastih obeskkih s 14,9 g takoj pade v oči izrazito nizka teža edinega obeska s štirimi viličastimi prečkami (2. skupina; Žbona-Trkman, Bavdek 1996, 35, t. 100: 24).⁴² Obesek je delno poškodovan (odlomljena zanka), tako da lahko predvidevamo, da je bil prvotno 1-2 g težji. Če torej njegovo prvotno težo ocenimo na pribl. 16-17 g, se izkaže, da je to točno polovica od aritmetične sredine tež (33,5 g, z majhno standardno deviacijo 0,6) tistih devetih obeskov skupine 7.2, ki nedvomno sodijo vanjo (prim. zadnjih 9 obeskov, predstavljenih na sl. 9). Da taka izpeljava ni brez vrednosti, nakazujejo dva argumenta:

1. kemična sestava obeska z viličastimi prečkami je z visokim deležem kositra (14,75 %) in izredno nizkim deležem svinca (0,39 %) zelo podobna sestavi obeskov skupine 7.2 (prim. sl. 11);⁴³

2. oblika obeska je taka, da se vsaka od štirih osrednjih prečk razdeli v dve periferni. Verjetno je, da razdelitev štirih osrednjih prečk na osem tistih, ki se vpenjajo na zunanje kolo, enostavno nakazuje polovično (utežno) vrednost obravnavanega obeska.

Mogoče je torej predpostaviti, da je specifična oblika posamičnih skupin kolesastih obeskov njihovim uporabnikom posredovala določene informacije. Najmanj, kar je možno predvidevati v konkretnem primeru obeskov skupine 7.2 na eni in tistega skupine 2 na drugi strani je, da tako kemična sestava in teža kot njihova oblika s seboj nosijo sporočilo o nekem medsebojnem odnosu, ki je pomenljiv. Ali lahko tudi za ostale skupine obeskov ugotovimo podobne pravilnosti? Ali si je torej tipološke razlike pri kolesastih obeskkih (npr. število prečk, prisotnost oz. odsotnost notranjega kolesa itd.) mogoče razložiti kot informacije o njihovih utežnih (ali/in kemičnih) lastnostih?

Analiza utežnih meritev predmetov in odgovor na to vprašanje je na tem mestu nujno segmentaren, enostavno zato, ker so v obsežnih korpusih poznobronastodobnih najdb teže podane le izjemoma.⁴⁴ Na tem mestu se bom torej omejil le na pregled kolesastih obeskov iz Kanalskega Vrha I, saj teže predmetov ob objavah relevantnih depojev (Velem IV, Villethierry) in grobov (Gammertingen, Grünwald) na žalost niso podane.

Na sl. 11 so podani osnovni podatki o vsebnosti kositra in svinca ter o teži kolesastih obeskov skupin od 1 do 6. Glede primerjave podatkov o osnovni kemični sestavi sta relevantni le skupini 5 in 6 s po štirimi oz. sedmimi analizami. Obeski z vpisanim trojnim križem (5. skupina) imajo praviloma sestavo, podobno tisti pri skupini 7.2 (delež kositra med 11 in 17 %, delež svinca pa minimalen, do 1 %). Od tega pravila odstopa en obesek (Žbona-Trkman, Bavdek 1996, t. 100: 25), ki pa se po teži dobro vključuje med ostale v skupini 5. Obeski s šestimi prečkami (6. skupina) se glede na vsebnost kositra in svinca jasno ločijo na dve skupini: manjša je sestavljena iz dveh primerkov (ib., t. 100: 32, 101: 34), ki sta brez kositra, imata pa slabe 3 % svinca. Ob taki sestavi sta izjemna med vsemi kolesastimi obeskki v Kanalskem Vrhu in se

⁴⁰ Trampuž-Orel 1996, 197. V prvi je devet obeskov z osmimi prečkami, v drugi sta dva, v tretji pa štirje. Za tukajšnje namene so te analize le delno ustrezne, saj je bilo analiziranih 18 od 22 obeskov z osmimi prečkami.

⁴¹ Njihove teže so 26,0, 27,2, 27,3 in 27,4 g. Glede na prikazano soodvisnost teže obeskov in kemične sestave, lahko z gotovostjo pričakujemo, da bi njihova kemična analiza pokazala delež svinca med 6 in 17 % ter delež kositra med 12 in 18 %.

⁴² Analogije temu tipu obeskov B. Žbona-Trkman in A. Bavdek (1996, 63 ss, sl. 5) ugotavljata v padskem najdišču Fontanella di Casalromano in v depoju Ivanec Bistranski pri Zagrebu. Poleg teh se podobni obeski pojavljajo še v srednji Italiji, v depoju Coste del Marano, ter v nekaterih južnoitalskih naselbinah skupaj s poznomicensko keramiko (Peroni 1961a, I 1: 33; Harding 1984, 143, sl. 40), oblikovno enaki motivi z viličastimi prečkami pa tudi na pečatnih obeskkih v grških grobovih mikenskega časa v Mikenah, Argosu in Tirynsu (Kilian-Dirlmeier 1979, t. 110: 6-8) ter v geometrijskodobnih svetiščih v Perachori in Olimpiji (ib., 30 ss, t. 10: 155-157).

⁴³ Trampuž-Orel 1996, Priloga A (225, št. anal. 511), za skupino 7.2 prim. tu zgoraj.

⁴⁴ Situacija se do neke mere izboljšuje šele z najnovjšimi objavami. Najpopolneje so teže podane v nedavnih objavah depojskih najdb iz Slovenije in Romunije (Čerče, Šinkovec 1995; T. Sorocanu (ed.) *Bronzefunde aus Rumänien*, Prähistorische Archäologie in Südosteuropa 10 (1995); prim. npr. tudi katalog k razstavi bronastodobnih depojev A. in B. Hänsel (eds), *Gaben an die Götter*, Bestandskataloge 4, 1997, ter npr. sporadično v Hansen 1994, 409 ss). Podobno so le redko podane teže v temeljni seriji objav bronastih predmetov *Prähistorische Bronzefunde* (prim. npr. Mayer 1977). Simptomatično je npr. segmentarno podajanje tež ob objavi nekaterih italijanskih depojev v seriji *Inventaria Archaeologica* (Peroni 1961b, 1967). Sistematično so podane teže vseh predmetov iz depoja Ardea, sicer pa le še vsi fragmentirani surovci in ingoti, ne pa celi predmeti. Avtor objave pač meni, da so relevantne le teže razbitih predmetov (prim. Peroni 1966, 1998).

mного bolj približujeta kemični sestavi tamkajšnjih ingotov, posebej zato, ker je pri njej delež arzena (4-5 %), niklja (2-3 %) in antimona (4-5 %) izredno visok (Trampuž-Orel 1996, Priloga A, 225 (št. anal. 491 in 504), prim. z ib., 193 ss, 227 ss). Preostalih pet kolesastih obeskov s šestimi prečkami se po visokem deležu kositra (9-19 %) in neznatnem deležu svinca približuje večini obeskov 5. skupine in tistim skupine 7.2.

Kemična sestava preostalih obeskov znotraj posamičnih skupin torej ni tako enoznačna, kot je primer pri obeskkih z osmimi prečkami (7. skupina). Povzamem pa lahko, da se pretežno navezuje na sestavo, kakršno izkazujejo obeski skupine 7.2, tako večina obeskov skupin 1, 2, 3, 5 in 6. Kaj nam v zvezi s tem povedo primerjave tež? Njihove aritmetične sredine se po skupinah oblikujejo takole (prim. tudi *sl. 12 in 13*):

1. skupina: 19,3 g (1 primerek);
2. skupina: 14,9 g (1 primerek, za komentar prim. zgoraj);
3. skupina: 24,1 g (2 primerka);
4. skupina: 31,3 g (3 primerki; standardna deviacija je 1,6);
5. skupina: 28,5 g⁴⁵ (4 primerki; standardna deviacija je 1,5);
6. skupina: 23,7 g (7 primerkov; standardna deviacija je 2,5).

Pri tej skupini z najnižjo težo 19,7 g in najvišjo težo 28,3 g močno odstopata dva obeska (Žbona-Trkman, Bavdek 1996, t. 100: 32; 101: 37). Če ju v tej statistiki ne upoštevam, je aritmetična sredina obeskov 6. skupine 23,6 g (5 primerkov; standardna deviacija je v tem primeru mnogo sprejemljivejših slabih 0,6).

7.1. skupina: 27 g (11 primerkov; standardna deviacija je 0,5);

7.2. skupina: 33 g (11 primerkov; standardna deviacija je 1,4). Pri tej skupini z nekoliko nižjo težo odstopata že obravnavana obeska (Žbona-Trkman, Bavdek 1996, t. 101: 38; 102: 56). Če ju v statistiki ne upoštevam, je aritmetična sredina obeskov te skupine 33,5 g (9 primerkov; standardna deviacija je 0,6).

Interpretacija teh podatkov je lahko zelo raznolika. Na prvi pogled pa pade v oči presenetljivo dejstvo, da je teža obeskov s šestimi prečkami (23,6 g) izrazito nižja od tistih s petimi prečkami (31,3 g). To se ne nanaša le na izračunano aritmetično sredino, temveč na vse obeske 4. oz. 6. skupine (prim. *sl. 13*): vsi obeski s petimi prečkami so izrazito težji od tistih s šestimi prečkami. Utežno razmerje med obeski skupine 7.2 in tistim 2. skupine v razmerju 2:1 je že bilo ugotovljeno. Ob navedenih podatkih je mogoče izvesti še nadaljnje izračune. V tem smislu so pomenljive predvsem izračunane sredinske vrednosti obeskov skupin 7.1 in 7.2, saj je po eni strani njihov vzorec dovolj velik (9 oz. 11 primerkov), po drugi strani pa je njihova izračunana standardna deviacija zelo nizka (med 0,5 in 0,6). Aritmetični sredini 27 g in 33,5 g sta v medsebojnem razmerju 5:6, pri čemer je osnovna enota 5,4 oz. 5,58 g. Z drugimi besedami, če predpostavimo, da so livarji predmetov iz Kanalskega Vrha namenoma vlivali obeske skupin 7.1 in 7.2 v takem utežnem razmerju, potem so se zmotili za 3 %. Tako nezumno odstopanje je nedvomno dokaz, da utežna razlika med obema skupinama kolesastih obeskov z osmimi prečkami ni naključna. Do neke mere lahko v tako vzpostavljen sistem utežnih odnosov pritegnem še obeske 6. skupine (obeski s šestimi prečkami). Njihov vzorec šteje 5 primerkov, standardna deviacija pa je prav tako zelo nizka: 0,6. V vzpostavljeno razmerje se 6. skupina obeskov z aritmetično sredino 23,6 g vmešča tako, da je odnos 23,6 g : 27 g :

3,5 g zelo blizu osnovni relaciji 4:5:6, pri čemer je osnovna enota bolj raznolika (5,9 g, 5,4 g oz. 5,58 g) in je napaka posledično 5 oz. 8 %. Iz predstavljenih izvajanj torej sledi končna ugotovitev: utežni odnos med kolesastimi obeski 2., 6., 7.1. in 7.2. skupine s Kanalskega Vrha je 3:4:5:6.

Kaj lahko v zaključku povzamem iz predstavljenih analiz? Številčna razmerja posamičnih skupin kolesastih obeskov v depouju, predvsem pa njihova primerljivost z nekaterimi grobnimi in depojskimi najdbami ne govori v prid trgovskemu značaju depoja.⁴⁶ Res je sicer, da so nekatere predstavljene skupine obeskov (verjetno tudi sekire in obroči) v depouju izdelane serijsko, niso pa vse. Predvsem so pomenljiva sugestivna števila, v katerih se pojavljajo obeski (1+1+2+2+3+5+7+9+11),⁴⁷ ki jim lahko celo kot delni pendant postavimo številčna razmerja ostalih predmetov v depouju: 1 miniaturna zapestnica s spiralnimi zaključki + 1 prstan + trikotni obesek z 2 zaključkoma v obliki ptičjih glav + 3 plavutaste sekire + 5 okrasnih plošč + 7 ovratic (*sl. 14*). Nadalje je pomenljivo enako število kolesastih obeskov in šivnih cevčic - 41.⁴⁸ Prav tako je zanimivo, da seštevek obeskov, šivnih cevčic in obročev iz depoja (41 + 41 + 63 = 145) skoraj ustreza skupnemu številu ingotov in pogač iz depoja (144) (Prim. Žbona-Trkman, Bavdek 1996, 44 ss, t. 108-114A, in tu *sl. 3*: 10-12). V depouju je torej prisotna popolna garnitura (več garnitur?) predmetov, ki jih sicer segmentarno ugotavljamo predvsem v izjemnih ženskih grobovih tako pozne bronaste dobe kot starejše železne dobe na izredno širokem območju. Za te predmete je že bilo pokazano, da niso odraz trenutnih modnih trendov, temveč so nosilci simbolnih sporočil uporabnikom oz. sredstvo obračanja k numinoznemu.

Na tem mestu se velja vprašati, ali lahko predstavljene analize gradiva, posebej kolesastih obeskov iz Kanalskega Vrha karkoli pridodajo k splošnemu razumevanju problema 'neracionalnih vidiki žez metalurških dejavnosti', kot je to v zvezi s kositrnimi obeski že poskušala M. Primas. Ali je lahko njena teza o protoalkimističnem obnašanju bronastodobnih prebivalcev Evrope kredibilen model, o katerem bi veljalo bolj poglobljeno razmisliti? Nedvomno je alkimija pojem, ki ga moderni človek dojema kot nekaj ambivalentnega, če ne celo peyorativnega. V kratkem se alkimijo običajno označuje kot sklop znanj o delovanju, sorodnosti in spremenljivosti raznih snovi, ki je mdr. predstavljala eno od antičnih in srednjeveških podlag sodobne kemije. Ni pa bila alkimija samo to. Običajno se zanemarija pomen, ki ga je v antiki in srednjem veku igrala na filozofskem in predvsem religioznem območju. Ena od pomembnih preokupacij alkimistov je bila tudi numerologija in njene navezave na religiozno sfero.⁴⁹ Nadalje se, če v tej smeri stopim še korak dlje, v alkimističnih preokupacijah prehodov iz kaosa v red, iz neurejenosti v urejenost, iz življenja v smrt in obratno, nakazujejo tudi zelo raznovrstne razlage simbolike kolesastega motiva. Med njimi se poleg ustaljenega razumevanja v smislu prikaza sonca in njegove življenje podeljujoče energije pojavljajo tudi simbolike popolnosti, poteka časa, združevanje božanskega in profanega principa. Zanimivo je tudi, da je kolesasti motiv prvotno predstavljal lunarni simbol.⁵⁰ Je možno v navedenih nenavadnih značilnostih gradiva iz Kanalskega Vrha I videti prazgodovinski izraz dejavnosti, katerih nosilke so bile očitno ženske - svečenice, dejavnosti torej, povezanih s simbolnim urejanjem odnosov v skupnosti, med skupnostjo in svetom okoli nje?⁵¹ Po eni

⁴⁵ Iz tukajšnje obravnave izključujem en obesek (Žbona-Trkman, Bavdek 1996, t. 100: 28), ker ima odmljen celoten osrednji križ.

⁴⁶ Tako tezo je zaradi izrazitih livnih šivov in neuporabljenih sekir v depouju, kot tudi zaradi dejstva, da so bili številni obeski izdelani naenkrat in torej izhajajo iz iste delavnice, postavila N. Trampuž-Orel (1996, 197).

⁴⁷ Omeniti velja, da se vdolbine na enigmatičnih keramičnih ploščah v votivnem depouju na Kapitolu v Rimu pojavljajo v naslednjem številu: 1, 3, 5, 7, 9, 11, 23, 30, 32, 60 (Gjerstad 1960, 195, sl. 125: 1-10; prim. tudi Turk 2000, 179 ss). V dveh vdolbinah pri največji plošči (tisti s 60 vdolbinami) sta bila ohranjena ostanka dveh bronastih obročev).

⁴⁸ Tudi v novoobjavljenem depouju Thunau na Spodnjem Avstrijskem se ob štirih kolesastih obeskkih pojavljajo štiri šivne cevčice (Lochner 1998-1999, sl. 2 in 4).

⁴⁹ Povzeto po Jung 1983, 253 ss. Značilen je npr. zagoneten *Leitmotiv*, ki se v alkimističnih spisih pojavlja od antičnega obdobja dalje: "Eden postaneta dva, dva postanejo trije in iz tretjega pride eden kot četrti." (ib., 272 ss).

⁵⁰ Prim. Chevalier, Gheerbrant 1993, 237 ss, 337 ss.

strani drži, da so tovrstne teze špekulativne, posebej če jih poskušamo aplicirati na gradivo in populacije iz globoke prazgodovine. Po drugi strani pa se moramo zavedati, da so tudi vse teze, ki brez kakršnekolikoli refleksije aplicirajo pojme, kot so trgovec in trgovina (in ki nosijo s seboj nikoli izrečeno, a kljub temu samo po sebi umevno sodobno konotacijo) na globoko prazgodovino, prav tako špekulativne.

DRAGOMELJ I

Nedavno je Ch. Pare objavil obširno analizo bronastodobnih uteži v Srednji Evropi (Pare 1999). Za tukajšnjo analizo je pomembna njegova ugotovitev, da bikonični ingoti iz tukajšnjega depojskega horizonta III (Turk 1996, 112 ss) predstavljajo mnogokratnik ciprske utežne mere z osnovno enoto pribl. 475 g (Pare 1999, 496 ss). Edini v celoti ohranjeni tovrstni ingot iz Slovenije - tisti iz depoja Dragomelj I (Turk 1997, 50 ss, sl. 1) - tehtal 2844 g, kar predstavlja skoraj natančen šestkratnik osnovne enote. Bikonični ingoti po avtorjevem mnenju skupaj z nekaterimi drugimi predmeti - utežmi v severni Italiji, na prostoru Caput Adriae in v Panoniji v času od 12. st. pr. n. š. naprej označujejo nastop novih, vzhodnomediterranskih oz. ciprskih utežnih standardov (Pare 1999, 507 ss). Ti naj bi zamenjali predhodne, ki v srednji Evropi v času srednje in na začetku pozne bronaste dobe pretežno izhajajo iz egejskih mikenskodobnih utežnih standardov (za tukajšnje izpeljave prim. spodaj).

ZAKLJUČEK

Ali so teže obeskov iz Kanalskega Vrha I kakorkoli primerljive z ugotovljenim utežnim standardom, kot se kaže ob analizi predmetov iz Grab? Rezultati primerjave so prikazani na *sl. 15*. Neposredno primerljivi sta le teži najtežjih obeskov skupine 7.2 (33,5 g) ter 3-kratnika osnovne utežne enote (32,9 g) oz. uteži K 2, pri katerih je odstopanje oz. napaka 1,8 %. Hkrati je mogoče teže kolesastih obeskov skupin 1, 6, 7.1 in 7.2 v razmerju 3:4:5:6 elegantno umestiti v sistem utežnih enot iz Grab kot 1,5-kratnik, 2-kratnik, 2,5-kratnik in 3-kratnik osnovne utežne enote. Odstopanja oz. napake, ki nastopajo pri kolesastih obeskkih navedenih skupin v odnosu do idealnih večkratnikov osnovne utežne enote, si je verjetno potrebno razložiti kot razumljive variacije, ki nastopajo ob postopkih vlijanja končnih bronastih izdelkov.⁵²

Na *sl. 15* so prav tako prikazani odnosi med tu ugotovljeno standardno utežno enoto oz. njenimi večkratniki in v citiranih delih

že predstavljenimi preostalimi utežnimi enotami (oz. utežmi). Na prvi pogled je razvidno, da 4- in 5-kratnik utežne enote iz Grab množično nastopata na zelo širokem prostoru med vzhodnim Mediteranom (brodolom pri rtu Gelidonya), prek Egeje (poznomicenske utežne enote), severne Italije (Terremare) in Panonije (Bordjoš, Fèregháza) do Skandinavije (bronaste antropomorfnе figurice iz južne Švedske). Posebej je pomenljivo, da bronasta jagoda iz Grab (43,9 g) po teži skoraj popolnoma ustreza tako poznomicenski utežni enoti P 2 (43,7 g) kot eni od uteži iz brodoloma pri rtu Gelidonya ob južni anatolski obali (43,8 g), delno pa tudi eni od uteži iz Terremar (43,2 g). Menim, da so predstavljene primerjave dovolj dober argument za funkcionalno opredelitev jagode iz Grab kot utež. Očitno je torej, da lahko vsaj pri nekaterih utežnih enotah pokažemo na njihovo vseevropsko razširjenost in je torej dejansko mogoče tezo o vseevropski metalurški koiné ob začetkih pozne bronaste dobe argumentirati tudi z metrološkega vidika.⁵³

Impresivna zbirka šestdesetih kamnitih in bronastih uteži iz brodoloma trgovske ladje pri rtu Gelidonya iz druge polovice 13. st. pr. n. š. je po drugi strani dober pokazatelj za to, kako številni in zapleteni so lahko bili sočasni utežni sistemi (Bass 1967, 135 ss). Tamkajšnje uteži namreč nakazujejo izredno raznovrstnost utežnih sistemov, ki vključujejo t. i. feničanski standard (7,3 g z mnogokratniki),⁵⁴ egipčanski standard (9,32 g oz. 1 qedet z mnogokratniki), sirske, ciprske in kretske qedete (9,5 g z mnogokratniki), palestinski nese (10,3 oz. 10,5 g z mnogokratniki), hebrejski šekel (11,5 g z mnogokratniki), kretske-egipčanski zlati standard (12,3 g z mnogokratniki) in babilonsko mino (502 g). Verjetno si je potrebno izredno raznolike uteži iz tako neobičajnega konteksta razlagati v smislu specifičnih izmenjalnih potreb posadke na trgovski ladji. Prav tako je že bilo pokazano, da skupina osmih uteži iz Bordjoša v Vojvodini, ki so bile odkrite v naselbinski jami skupaj z ročno tehtnico, pripada vsaj dvema različnima utežnim sistemoma (A1 in B1 po Peroniju), ki pa sta v medsebojnem utežnem razmerju 5:12 (Medović 1995, 209 ss, sl. 2-4; Peroni 1998, 219, sl. 2). Zelo verjetno si torej smemo tehtanje dobrin v pozni bronasti dobi predstavljati kot kompleksno dejavnost, ki je nikoli ni označeval le en sam ali prevladujoči utežni sistem. To v veliki meri onemogoča preverjanje ugotovljenih utežnih enot na bronastih predmetih. Menim pa, da je za verifikacijo določenih utežnih enot metodološko mnogo ustrežnejše preverjati teže celih končnih bronastih izdelkov kot pa fragmentiranih polizdelkov, pri katerih doseganje določene teže iz praktičnih razlogov ni moglo biti zelo natančno. Za bodoče študije utežnih sistemov v bronastodobnem kovinskem gradivu bo torej potrebno natančneje raziskati, katere zvrsti predmetov poleg kolesastih obeskov ali specifičnih predmetov, kakršni so jagoda in kroglica iz Grab ter bikonični ingoti, izkazujejo pravilnosti v težah.⁵⁵

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⁵¹ K temu prim. podobne izpeljave B. Teržan (1996b, 529) o vlogi žensk v železnodobnih vzhodnoahštatskih družbah.

⁵² Ponovno je potrebno poudariti, da navedene teže skupin 1, 6, 7.1 in 7.2 kolesastih obeskov iz Kanalskega Vrha I predstavljajo le njihovo aritmetično sredino in da kljub jasni utežni razliki med posamičnimi skupinami znotraj teh teže obeskov variirajo v obsegu 1-2 g (prim. *sl. 7* in *13*).

⁵³ Enoti z vrednostjo 43,9 g bi lahko pogojno pripisali tudi Peronijevo enoto C, ki pa ni tako natančno definirana (variira med 41 in 44 g) - prim. Peroni 1998, 223, sl. 7; za dobro primerljive utežne sisteme med Egejo in Skandinavijo prim. tudi Malmer 1999, predvsem pa Pare 1999.

⁵⁴ Ob katerem G. F. Bass (1967, 139) citira številne uteži iz bližnjevzhodnih naselbin, mdr. tudi utež z njegovim 6-kratnikom (t. j. 43,75 g) iz Gezerja v Palestini (prim. tu zgoraj utežne enote iz Grab!). Zanimivo je, da je v grobu 30 iz istega najdišča poleg mikenskega križnega meča dokumentiran tudi bronasti kavelj, kakršni se pri nas pojavljajo v Mušji jami, pa tudi v številnih depojskih in grobnih najdbah južnega dela srednje Evrope iz pozne bronaste dobe in prehoda v železno dobo (Müller-Karpe 1980, t. 122D: 2; Szombathy 1912, sl. 132).

⁵⁵ Risbe predmetov na *sl. 2-6* in *14* je narisala oz. priredila Vesna Svetličič, tekst pa je prevedla Rachel Novšak, za kar se jima najlepše zahvaljujem.