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Finds decorated with garnets from Early Avar contexts in the light of their cell techniques

Summary

The present contribution concerns the Early Avar (late 6th and first half of the 7th century AD) metal objects ornamented with garnets from the perspective of the inlay techniques employed. Such inlays occur exclusively on objects made of precious metals, indicating the high value placed on these stones. Besides standard cloisonné, it has been possible to identify techniques such as soldered band settings of single and multiple cells and open-work cellwork (pseudo cloisonné, champlevé à jour) as well as sunken settings (cast cavities) of single and multiple cells (standard champlevé). Their specific characteristics identify them as representing diverse workshop traditions and the finds assemblages can be sub-divided into three groups: a group that suggests links with the Merovingian-Germanic cultural sphere, and two sub-groups that can be traced back to Late Roman and early Byzantine traditions. Future research may establish whether this division into groups reflects alternative distribution networks for the procurement of garnets.

Keywords: Avar period; goldsmith techniques; inlay techniques; cloisonné; champlevé; early medieval garnets.

Der vorliegende Beitrag beschäftigt sich mit den frühawarenzeitlichen (Ende des 6. und erste Hälfte des 7. Jahrhunderts), mit Granat verzierten Metallobjekten aus der Sicht ihrer Einlagetechniken. Einlagen dieser Art kommen ausschließlich auf Edelmetallobjekten vor; dies verweist auf die Wertschätzung dieses Steines. Neben standard cloisonné konnten ein- und mehrzellige angelötete Kastenfassungen und durchbrochene Fassungen (pseudo cloisonné, champlevé á jour) sowie ein- und mehrzellige eingetiefte Fassungen (standard champlevé) unterschieden werden. Sie stehen im Einzelnen für unterschiedliche Werkstatttraditionen und ermöglichen es, das Fundmaterial in drei Gruppen zu unterteilen: Es kommen eine Gruppe von Funden vor, die merowingisch-germanische Beziehungen andeuten, sowie zwei Gruppen, die auf spätantik-byzantinische Traditionen zurückzuführen sind. Künftige

Barbara Armbruster, Heidemarie Eilbracht, Oliver Hahn, Orsolya Heinrich-Tamáska (eds.) | Verborgenes Wissen: Innovation und Transformation feinschmiedetechnischer Entwicklungen im diachronen Vergleich | Berlin Studies of the Ancient World 35 (ISBN 978-3-9816751-5-3; URN urn:nbn:de:kobv:188-fudocsdocument0000000024684-8) | www.edition-topoi.de

Forschungen könnten zeigen, ob diese Unterteilung auch auch mehrere, voneinander abweichende Distributionskreise der Granatversorgung widerspiegelt.

Keywords: Awarenzeit; Feinschmiedetechnik; Einlagetechniken; Cloisonné; Champlevé; frühmittelalterliches Granat.

1 Introduction

The middle Danube region is considered to be one of the centres of the polychromic style, which reached its zenith in the form of the cloisonné cellwork of the Apahida type that flourished around the second half of the 5th century AD.[1] Artefacts using garnet ornamentation are also attested in the 6th century AD, especially in Langobard-Pannonian assemblages.[2] But a distinct reduction in the use of garnets is noticeable among the so-called Early Avar finds from the end of the 6th to the end of the first third of the 7th century.[3] What caused such a regression cannot yet be answered conclusively, but it does not seem to be a regional development; the trend can also be followed in Merovingian contexts outside the Carpathian Basin. This decline may be connected with a general drop in the availability of garnets, i. e. with a lack of raw material, as suggested by Uta von Freeden who linked it to the disruption of trade routes following the collapse of the Sassanid empire.[4] However, it may also be related to changes in distribution networks, assuming that the stones were worked and then disseminated from centralised workshops.[5]

The inlay techniques employed, and the type and provenance of the garnets used, must be determined if we are to understand the phenomenon of the objects decorated with garnets of the Avar period. On this basis, an attempt to discuss and reconstruct local traditions or imported innovations in goldsmith work jewellery as well as the opportunities to acquire the stones can be made. Given the lack of relevant scientific analyses of the stone inlays themselves,[6] the present contribution focuses specifically on the technical

1 Adams 2000 and E. Horváth 2013 offer an overview of developments in the Carpathian Basin.

2 E. Horváth 2006; E. Horváth 2012.

3 Heinrich-Tamáska 2006a.

4 Freeden 2000.

5 See Drauschke 2011, 37–48 for South-West Germany. See also Rupp 1937, 16–38 and Roth 1980.

6 An international project was initiated in 2014 under the direction of the Römisch-Germanisches Zentralmuseum Mainz (RGZM), in which the 7th-century garnets from the regions neighbouring the Frankish kingdoms will be examined, including those from Early Avar contexts. I am grateful to Dr Susanne Greiff, Dr Dieter Quast and Dr Eszter Horváth for this information. As part of my doctoral dissertation between 2000 and 2003, I commissioned some XRFS (X Ray Fluorescence Spectrometry) analyses carried out at the Rathgen Research Laboratory

characteristics and stylistic attributes of the inlay techniques. This should help ascertain which artefacts of the first half of the 7th century actually made use of garnets and the repertoire of inlay techniques employed.

2 Analyses of goldsmithing techniques and 'hidden knowledge': general remarks

In terms of the 'hidden knowledge' conference theme, the chronological, spatial and internal significance of a find or of an assemblage should lead to an appreciation and interpretation of the results of the analysis of the goldsmithing techniques used. The three spheres of interaction of an object thus addressed, i. e. time, space and meaning or importance, should, among other things, bring insights into past and present opportunities of access to the material. Yesterday's creator and today's interpreter have a different relationship to space, which itself has varying impacts on them.[7] In a contemporary context the interpreter has priorities for inference that are quite different from the aspects that were essential to the artisan and the recipient at the time of the manufacture of the product.[8] This interaction is determined by the discrepancy between the past significance and the current rating of an object's attributes.[9] It is in this sense that André Grabar distinguishes between the "pre-history" and the "post-history" of an artefact. He defines "pre-history" as all that belongs to the time before and during the creation of an artefact: "[I]t includes its techniques of manufacture, the social and cultural contexts which affected it, the practices and aims of its artists, the ambitions and resources of its patron, the model it used, and the identification of its time and place."[10] The "post-history" of an artefact begins "with the first reaction of the first person to see or to use it" and lasts, with constant changes, until the present.[11]

The analysis of the goldsmith's techniques embodied in a particular find should thus address aspects relevant to content, time and space. First, the material provides

in Berlin (led by Prof Josef Riederer), which confirm the microscopic identification of the stones as garnets (Heinrich-Tamáska 2007; XRFS analyses: Keszthely-Fenéki út, Grave 2, pendant A, 2 samples, Kunbábony, Grave 1, buckle tongue, Vörs, Grave 21, S-fibula); however, they do not give any indications as to the types defined by Calligaro et al. 2008 and Gilg, Gast, and Calligaro 2010.

7 See Eggert 2001, 146–149.

8 The question of intention has been picked up as a central theme by the post-structuralist movement in archaeology in particular. Against Ian Hodder's contention that material culture can be read as a text, it has been pointed out that the past is largely subservient to the interests of the present (for a summary, see Bernbeck 1997, 289).

9 Space and time determine the relationship to significance. This is an approach that has been used in Classical Archaeology for the interpretation of Greek form structures. Both concepts are important in cultural archaeology but their differently perceived understanding has led to many misunderstandings in interpretation (Borbein 1972, 295).

10 Grabar 1994, 397. See also Veit 2003, 102.

11 Veit 2003, 102.

information on the raw material(s) used, their possible origin, the composition of the alloys, and their interaction with the manufacturing techniques employed. The appropriate scientific analyses can become part of the classification process and contribute to the resulting culture-historical interpretation.[12] The material can also be interrogated in terms of the contextual information it provides: the raw material may be valued differently depending on the chronological, spatial and cultural circumstances surrounding it. Hence varying roles are ascribed to the individual materials in different chronological contexts, depending on whether they served to display material prosperity or social status, or whether they were valued for their provenance.[13] At the same time, the attributes of the material itself, such as colour, hardness or shape may give clues as to the object's semiotic or symbolic significance.[14] Aspects relating to manufacture can also be articulated in terms of the technical attributes of the artefacts, which can then be incorporated into their classification. However, considerations relating to workmanship are only rarely appropriate for constructing typological sequences, given that several manufacturing techniques were employed over a period that cannot be subdivided in time and/or over areas that cannot be delimited in space. But if changes occur, then understanding the technical innovations, their provenance, and the way they were transmitted are fundamental elements of an interpretation.[15] On the other hand, the techniques of manufacture embody social and individual values through the workmanship of an object's creator. This can manifest itself either in the form of qualitative differences or in the choice of manufacturing techniques, or again according to the position occupied by the producer within an individual community.[16]

Material and manufacturing techniques are important typological elements within a classification. Their examination serves mainly to establish the function of an artefact, as well as the area of provenance of the raw material, its suppliers and the sphere of influence of the workshops. A related question concerns the genesis of innovations, whether they were local or brought in from outside. The manner in which such a transfer of technology takes place first manifests itself in the geographic origin of the new element, itself bound to the forms the process took. How was extraneous technical knowledge acquired and internalised? Was it the producer or merely the know-how that were imported? In the latter case, the next question relates to how this expertise was transmitted.[17] In general the notion of a 'technology transfer' can be taken to represent an exchange in which

12 For example Bachmann 1998; Riederer 1988, 14–19; Raub 1985.

13 For example Theophilus Presbyter distinguishes between several types of gold depending on their provenance and evaluates them differentially (Brepohl 1987, 46–49).

14 Carr 1995, 188 considers such characteristics as examples of an 'absolute physical visibility' ('AP visibility'). For gold see e. g. Behr 2012; for garnets Arrhenius 1969.

15 See note 12.

16 See Lemmonnier 1992, 79–81.

17 See e. g. Werner 1970, 65–92; Claude 1981.

at least one of the parties involved gains from the new knowledge.[18] Such exchange can take many forms and can occur both in a specific manner and in a much broader and organised fashion.[19] Cultural anthropology aims to examine the processes involved, in terms of the people concerned and in view of the fact that an object takes on an active role within the social structure.

The transmission of such knowledge and forms within archaeological assemblages can be apprehended in classification, where renewals, as against the handing down of technical know-how, can be defined. The continuation of a tradition is likely when no change is detected, but if innovations appear, then we are dealing with reception. The terms 'tradition' and 'reception' conceal questions concerning the form and reason for such processes.[20] Until the handing down of knowledge follows a sustained and continuous course, innovations tend to be temporary, to be taken up or rejected, i. e. they are being selected.

Research into the objects of the Early Avar period ornamented with garnets lends itself particularly well to discussion of the questions outlined here. On the one hand it offers the possibility to analyse which objects were actually inlaid with such stones and whether prestige or symbolism played a role,[21] and on the other hand it provides the opportunity to examine the inlay techniques used from a technical and ornamental viewpoint.

3 Objects ornamented with garnets of the Avar period: method

The analyses presented here are based on examinations under light optical microscope,[22] their purpose being to identify the inlay techniques of the artefacts ornamented with garnets and thus the underlying goldsmithing traditions and structures. Besides garnets, there are a few rare examples of other stone inlays in this regional context and period, and beyond that it is mainly glass inlays that are recorded. Only in a very few cases are these coloured red and therefore to be considered as imitations of garnets;[23] blue and

18 Voss 1998, 312 understands the transfer of technology to mean, in its currently used sense, a planned 'contractually agreed transmission of technical knowledge', which, for the period studied by Voss, is not without its problems. For innovations, see Burmeister 1999, 241–243.

19 Werner 1970.

20 Biehl and Gleser 2003, 152.

21 Arrhenius 1969.

22 Apart from the finds from Kölked-Feketekapu, Kiskörős-Vágóhíd and Bócsa, which are on permanent display at the Hungarian National Museum in Budapest and for which I have so far not obtained permission for analysis, I have been able to examine microscopically all the other objects in my doctoral research between 2000 and 2003. To Bócsa see Heinrich-Tamáska and Voss (in press).

23 E.g. Gyen/64/2, KesztH/4/1, KesztH/5/10, Zam/1280/1 (Heinrich-Tamáska 2006a, 108–109, 120–124). In some cases there was no way of distinguishing between garnet and red glass e. g. KesztA/0/7; KiskV/A/8, Zam/924/1 (Heinrich-Tamáska 2006a, 118–119, 128–129, 178–179). In

green colour schemes are far more common.[24] Further, the red carnelians and agates found in Early Avar contexts represent a slight colour deviation from the red tone of the garnets.[25]

As mentioned, the origin of the garnets cannot be established through analyses provided by the natural sciences. But the studies so far conducted on the garnet inlays of the Merovingian period suggest that almandine and pyrope were used in the majority of cases. They can be sub-divided into five categories (A–E) on the basis of their geochemical characteristics, but their exact origins are still much debated.[26] In terms of chronology, the garnets from the Bavarian region examined to date show that different types of garnets were circulating between AD 500 and the middle of the 7th century: almandines (Clusters A and B: with Cr and with less Cr) were dominant in the 6th and early 7th century, whereas from the middle of the 7th century chromium-rich pyropes (Group E) are almost exclusively represented.[27] These results suggest that interesting outcomes should emerge from the examination of the Avar-period garnets,[28] as the objects which appear to exhibit different working traditions could surely also show different sources for the procurement of the garnets.

As also mentioned earlier, the present study focuses on examining the combination of the inlays with the metal framework. In this respect the construction, form and number of cells are just as important as the manner in which the inlays were set into the frame: were they fixed with or without bonding material (paste hereafter)?[29] Was there a foil underlay? If so, how was this foil treated?[30] Can differences among the foil underlays or in the composition of the paste be elicited? Birgit Arrhenius saw the acquisition of such information as the recovery of "manufacturing elements" which enabled her to construct a "manufacturing typology"[31] of the garnet inlays of the Merovingian period. She identified three variants for single settings and four basic types for cloisonné work.

Merovingian assemblages the infill consists, apart from garnets, of glass inlays of various colours. Distinguishing between stone and glass is mostly based on personal experience assisted by microscopic examination. The glass inlays are mainly characterised by a rough, blistered surface or by opaque to non-transparent material. Traces of corrosion are frequently recorded on ancient glass, with characteristic flaking of the exterior layers. Bubbles in the glass mass can provide important evidence, but they can be confused with flaws or inclusions in the stone. Particularly among red inlays, the question is whether they are imitations of garnets in similarly coloured glass and how these substitutes can be distinguished from garnets. See Greiff and Banerjee 1994; Quast and Schüssler 2000; Kazanski and Périn 2001.

24 Heinrich-Tamáska 2006a, 94–183.

25 Carnelian: Gyö/872/1, GyöM/489/1, Unb/o/3 (Heinrich-Tamáska 2006a, 108–111, 174–175); Agate: Keszt/o/7, KesztF/o/6 (Heinrich-Tamáska 2006a, 118–121)

26 Greiff 1998; Farges 1998; Quast and Schüssler 2000; Périn et al. 2007; Calligaro et al. 2008; Gilg, Gast, and Calligaro 2010.

27 Gilg, Gast, and Calligaro 2010, fig. 7. See also here (tab. 1) the clusters C (alamandine with Ca) and D (pyrope with less Cr).

28 See note 6.

29 Arrhenius 1985, 84–91.

30 Avent and Leigh 1977; Arrhenius 1985, 39–41.

31 Arrhenius 1985, 77. See also Arrhenius 1971, 78–101.

She singled out the construction of the cellwork and the composition of the paste under the inlays as particularly important criteria.[32]

The setting, respectively cellwork, represents the link between the metal and the inlay. Following Erhard Brepohl, the function of the framework is to hold the inlay and to enhance its effect. Generally a hard and resilient metal is needed to hold the inlays over the long term, but at the same time the metal has to be highly flexible to allow for the insertion of stone or glass inlays.[33]

Just as was the case in the analyses of Birgit Arrhenius,[34] it has been possible to distinguish between single and multiple cell settings (cloisonné work) in the Avar material; in addition, the morphology of the inlay – flat or concave – and the manufacture of the setting – cast or made from soldered sheet metal – have been incorporated into the classification. Only stones within settings were considered, and worn or loose examples were excluded (see Appendix).

Apart from technological aspects, the finds ornamented with garnets can also bring insights into the role garnets played when combined with their metal supports. In this respect, four groups of variants can be identified: those that constitute the shaping of the object, or cover its surface, or are part of the ornamental scheme, or finally are merely decorative elements.[35] All types of inlays where the shape of the stone inlay determines the outline of an object are considered as object-shaping. In most cases these are soldered band settings, where the inlay material selected is solely responsible for the effect created in relation to the enclosing metal background.

Surface-covering designs, on the other hand, are based on the cellwork, the latter exhibiting different compositional schemes. Such surface-covering inlays need not necessarily involve the entire upper surface of an object. They may cover just part of it, but in a way that it forms a self-contained design vis-à-vis the metal background. This configuration allows the metal to show clearly but the inlay remains the dominant element.

If the inlay is part of the ornamental scheme, then the individual settings or the partial cellwork form part of a common design stylistically connected with the metal surfaces. The latter may be part of the background but also comprise specific elements of the ornament. In this scheme the proportion of the metal background to the inlay is mostly well balanced. The last variant, i. e. cases where the inlay serves as a decorative element, the inlay appears independently of the shape and ornament of the object as a decorative element of the surface. In contrast to the first group, the shape of the inlay is unconnected to the form of the support, and the size of the metal surface is generally far greater than that of the inlay.

32 See note 31.
33 Brepohl 1980, 371–372.
34 Arrhenius 1985, 43–95.
35 This categorisation is based on the glass- and stone-ornamented objects themselves, see: Heinrich-Tamáska 2006a, 28–29.

Considered in technical and ornamental terms, several different inlay techniques can be observed in the Early Avar garnet-ornamented objects of the Carpathian Basin: apart from soldered cloisonné and open-work settings, cast cavities are also documented, both in cellwork and in single settings. Following the subdivision into these categories, their role will be discussed from a stylistic viewpoint, as outlined above.

4 Soldered settings

4.1 Standard cloisonné (*Engzelliges Zellenwerk*)[36]

This group comprises objects that consist of narrow-celled cellwork of gold or silver, in which thin and flat garnet platelets (generally around 1 mm thick) sit over a patterned foil underlay.[37] A paste was added to the cell framework made of thin metal plates, its purpose being to fill and stabilise the lower part of the cell wall in order to hold, among others, the foil and the stone.[38] A difference – between standard cloisonné, where the cell walls are soldered both to each other and to the metal base, and suspended cloisonné, where the whole frame is joined to the base but the cell walls are soldered to each other only[39] – is not always unequivocally discernible in the examples studied here.

Just two Avar-period sites, Keszthely-Fenéki Street and Kölked-Feketekapu, have produced garnet-ornamented artefacts of this type (see Appendix). From the former site, two pendants, which formed part of a necklace when found, possess a cloisonné pattern which covers the entire upper part and which represents a so-called ´visual puzzle´ (*Vexierbild*: Figs. 1, 1a; 2a);[40] they belong to the standard cloisonné[41] category. It is well worth taking a closer look at the inlays. The inlays of the larger pendant (KesztFe/2/1) – when still extant – are exclusively red (Figs. 1, 1a–g). But some are underlain by a waffle-patterned foil and others not, and hence lack the brightness that this underlay provides. This is the case of the circular and circular-oval settings (Figs. 1, 1c–e) which constitute the eyes of a mask and animals in the ´visual puzzle´.[42] From this, the two oval cells on the edge whose inlays are missing also probably did not originally possess a foil underlay. This is also the case of two cells lying centrally one above the other (Fig. 1, 1a) next to the 'eyes' and which served to articulate the visual puzzle with infilling or separating elements. It therefore appears that the stylistic design parameters determined the use or

36 E. Horváth 2012, 215 distinguishes between three variants of true cloisonné: standard, suspended and cloisonné à jour.

37 Arrhenius 1985, 79–84. Avent and Leigh 1977 and Adams 2006 provide a good overview of foil underlays.

38 Arrhenius 1985, 84–90.

39 Based on the Langobard material, cf. E. Horváth 2012, 215.

40 Heinrich-Tamáska 2004.

41 After E. Horváth 2012, 218–219.

42 Heinrich-Tamáska 2004, fig. 1,1.

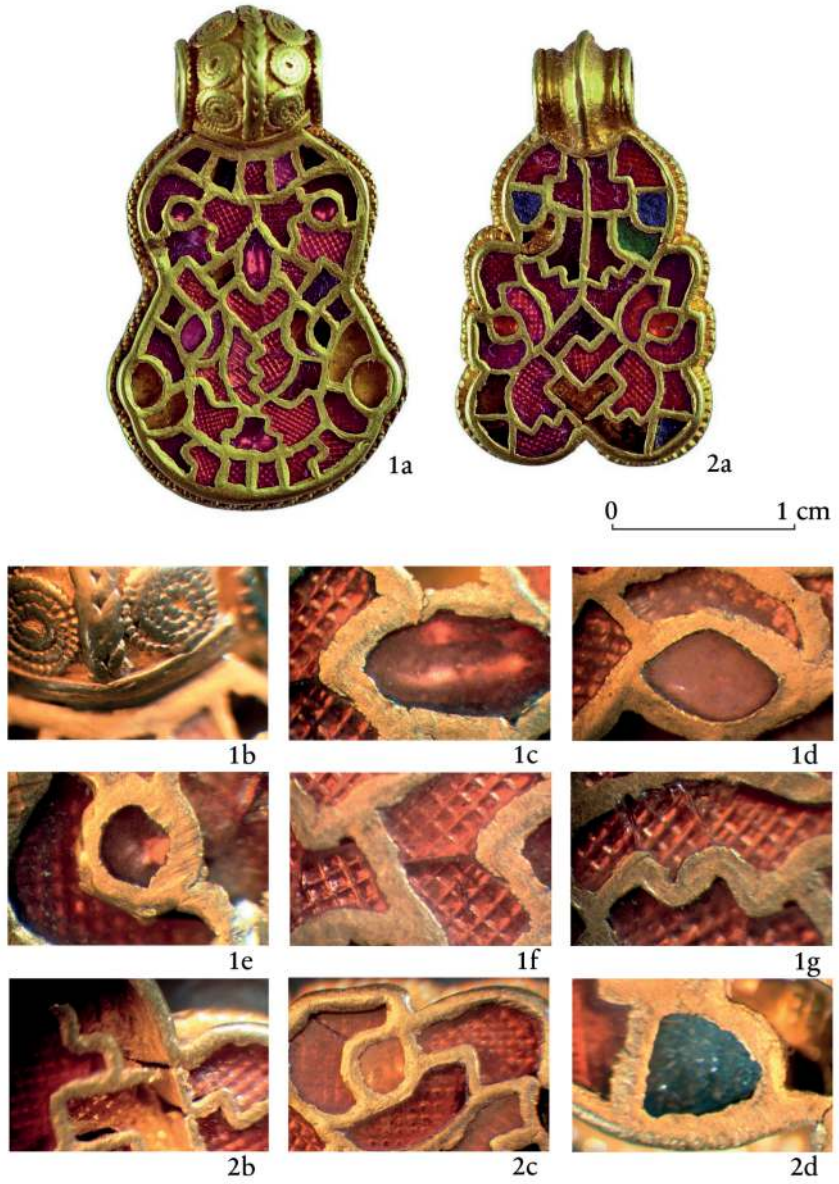

Fig. 1 Pendants from Keszthely-Fenéki Street, Grave 2: 1a the larger pendant (KesztFe/2/1); 1b loop of the larger pendant; 1c–g details of the surface of the larger pendant with garnets; the oval and round cells without wrapped foil and the others with them; 2a the smaller pendant (KesztFe/2/2); 2b–d the surface of the smaller pendant with garnet and glass inlays and the cell structure.

non-use of waffle-patterned foil. Two of the stones could unequivocally be identified as garnets thanks to XRFS analysis, but further identification to ascertain whether they are almandine, as initially assumed, needs to be carried out.[43] The microscopic examination appears to suggest that the other platelets also consist of garnets.

The smaller exemplar from Keszthely-Fenéki Street (KesztFe/2/2) also shows the interplay between settings with waffle-patterned underlay and those without, but in addition glass inlays are present. Apart from the red garnets set on top of waffle-patterned foils (Fig. 1, 2a–c), there were also blue (Figs. 1, 2d) and green glass platelets. Since the glass inlays partially lost their transparency through corrosion, it is only on the basis of a missing inlay – which would have been of green glass – that it can be assumed that the glass inlays were originally translucent and underlain by a patterned foil (Fig. 1, 2a–b). The two cells which are missing their foil underlay are circular-oval in the case of the larger pendant. Here, the kind of material used – the inlays having a slightly divergent lighter red tone (Fig. 1, 2a, c) – requires further examination.

The pendants from Keszthely-Fenéki Street are considered to be Merovingian imports.[44] However, since they are so far unique pieces, in the Avar context as well as in western Europe, the question of their provenance cannot be answered conclusively. The pendants from Fertőszentmiklós, Grave 9, which are brought into play in this connexion, are also considered by their excavator to be Frankish imports;[45] however they exhibit a much simpler cellwork construction. They do not have the stepped cell walls that are a characteristic of narrow-celled cloisonné work, and simpler geometric shapes like quatrefoils and semi-circles determine the composition. This is also the case of the pendants from Bratislava-Rusovce, Grave 53,[46] and Lužice, Grave 46,[47] or of the eagle-fibula of Bezenye, Grave 17,[48] which must be mentioned in this context. The latter examples also belong, according to Eszter Horváth, to the category of standard cloisonné, whereas for the pendants from Fertőszentmiklós there are indications that the work is to be categorised as suspended cloisonné work, which is predominantly represented by western-Frankish imports in Lombard Pannonia.[49]

43 The results of these analyses have been evaluated in an earlier publication: Heinrich-Tamáska 2007. However, in Susanne Greiff's opinion (RGZM, Mainz), the data acquired are insufficient for such identification. It is hoped to include these finds within the framework of the analytical project mentioned in note 6. We, i. e. the author with Eszter Horváth and Zsolt Bendő, propose to examine the entire metal assemblage from the Keszthely-Fenéki Street burial with X Ray Diffraction Scanning Electron Microscopy (SEM-XRD). See Heinrich-Tamáska and E. Horváth (in press).

44 Sági 1991, 128–130, 135; Müller 1994, 81.

45 Tomka 1980, 12–13. – See also E. Horváth 2012, 222–223 (as part of the Hegykő-Andernach group with suspended ´real cloisonné´). See also Koch 2013, 49–54, Abb. 21.

46 Schmidtova and Ruttkay 2007, fig. 8.

47 Zdeněk and Klanicová 2011, pl. 121, 6–8.

48 Bóna 1956, 211.

49 E. Horváth 2012, 217–224; Heinrich-Tamáska and E. Horváth (in press).

The disc brooch from Kölked-Feketekapu, Grave A279 (Köl/A279/1)[50] is also an import. This silver item possesses eleven trapezoidal cells which surround a central round setting like the petals of a flower. The central setting encloses a white inlay,[51] the further cells contain red inlays, which are likely to be garnets, underlain by waffle-patterned foil. The piece, whose distribution area is in the Trier area (Böhner III),[52] was deposited in the Kölked-Feketekapu grave most probably after prolonged use, as it had been reinforced with a secondary setting and was not used for its original purpose, given that it was found as part of a bead necklace.[53] The cellwork technique employed indicates that once again it belongs to the category of standard cloisonné, as is also the case of further Langobard-period disc brooches from Pannonia, as demonstrated by Eszter Horváth.[54]

Two exemplars from Grave B119 at Kölked-Feketekapu need to be mentioned in this context. Although common stylistic traits are assumed,[55] they differ from each other in terms of the manufacturing techniques employed. The bracelet (Köl/B119/2) consists of a fire-gilded support made of cast silver, which, apart from the garnet cloisonné surfaces, was also decorated with niello (Fig. 2a–b). The ring, on the other hand, is entirely made of gold. Garnet inlays combined with opaque white and dark (blue?) inlays[56] appear on both items (Figs. 2a–b; 3a–b). These provide a contrast with the red inlays, described as garnets,[57] which are underlain by waffle-patterned foils. The cloisonné surfaces of both pieces form part of the ornamental scheme.[58] On the bracelet, the parts of the surfaces sunk into the silver body were set with cellwork constructed out of sheet-gold. Thus the piece has affinities with the standard champlevé technique of pseudo-cloisonné work.[59] However, it was a complete cellwork made of soldered sheet-gold that characterises standard cloisonné work that was inserted into the sunken area.[60]

The 'mask between animal heads' motif (Fig. 2a) is a determinant element of the highly stylised animal-style design on the front of the bracelet.[61] Purely geometric designs feature on the back: the stepped cell walls here are typical of narrow-celled (*engzellig*) cloisonné work (Fig. 2b). The niello pattern also differs between the front and the

50 Kiss 1996, 200.

51 In this case no identification can be made without scientific analysis. Hilgner 2012 has conducted archaeometric analyses of some of the finds in the collections of the RGZM in Mainz, which enabled her to recognise a series of different materials, including shells, gypsum, bone/ivory, or a combination of several raw materials.

52 Kiss 1996, 200 note 61.

53 Kiss 1996, 81.

54 E. Horváth 2012, 217–224, pl. 1, figs. 1a–b.

55 Kiss 2001, vol. I, 291–292. – On a note of caution, the finger-ring does not show any animal style decoration like the bracelet.

56 For the white inlays, see note 51. The material used for the dark inlays is not given in the publication and could not be checked within the remit of this study.

57 In this case it was not possible to examine the piece microscopically (see note 22), and therefore the description given by Kiss 2001, vol. I, 54) has to suffice.

58 Heinrich-Tamáska 2006a, 44–45.

59 E. Horváth 2012, 215–216.

60 E. Horváth 2012, 233–234, also observes combinations of champlevé and cloisonné work in Langobard material.

61 Kiss 2001, vol. II, 283–289; Heinrich-Tamáska 2006a, 44; Heinrich-Tamáska 2006b, 515–521.

Fig. 2 The bracelet of Kölked-Feketekapu, Grave B119 (Köl/B119/2): a front view; b back view. Without scale.

back of the bracelet: while at the back rows of dog tooth motifs *(laufender Hund)* separate the decorated surfaces (Fig. 2b), rows of dots feature exclusively on the front (Fig. 2a).

The composition of the gold ring (Köl/B119/1) is more complex, consisting of several elements (Fig. 3a–b): quadrangular cellwork, round and U-shaped settings and chased sheet-gold were soldered onto a gold supporting plate. Seven quadrangular zones of cellwork feature on the front, each with a swastika motif, which are woven together into a braided pattern. Besides garnets, white inlays are used here, too (Fig. 3a). The back is characterised from a technical viewpoint by single soldered band settings with

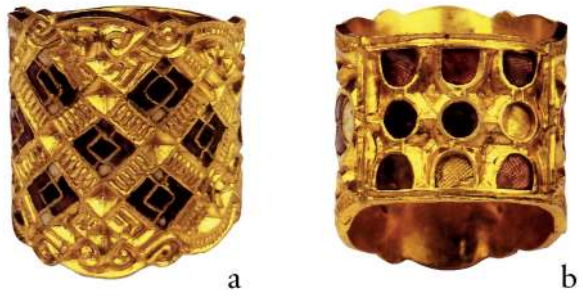

Fig. 3 The fingerring of Kölked-Feketekapu, B119 (Köl/B119/1): a front view; b back view. Without scale.

waffle-patterned foil underlays. These cells, together with the plastic composition of the surfaces in-between, imitate a disc-and-line motif (*Kreis-Linien-Motiv*: Fig. 3b). This kind of motif was regularly translated in a standard cloisonné technique, just as the work was executed on the bracelet from the same grave and on other Avar-period examples.[62]

To conclude, it is clear that standard cloisonné appears in the Early Avar period on artefacts that form part of a western, Merovingian tradition, and that some can even be considered imports with some certainty. This is supported by the use of the animal style and animal elements; it is further emphasised by the combination of fire-gilding and the contrasting niello silver surfaces in the case of the Kölked-Feketekapu B119 bracelet. In many cases the exemplars are unique pieces, both stylistically and in terms of the goldsmithing techniques employed.

4.2 Cellwork composed of single soldered band settings

The difference with the variants described above consists of the absence of a cloisonné cellwork. These simple designs can be seen as a combination of single band settings, each separately soldered onto the supporting plate and together forming a multiple-cell cellwork. No foil underlay was fitted under the flat-shaped stones.

All the finds of this group belong to the context of the so-called pseudo-belt buckle[63] horizon (Appendix). At Bócsa (Bó/o/1–2) garnets appear as elements of a sword: the inlays are set in circular settings and in a simple cellwork on the gold suspension loops of the sword. Garnets are entirely absent from the other objects that belong to the grave,

62 For further examples, see Heinrich-Tamáska 2006a, 42. – For the disc-and-line pattern, see also Nagy 1999, 380–381, 413–414.

63 For pseudo-belt buckles, their origin and significance in the Avar context, see Tóth and A. Horváth 1992, 97–117; Bálint 1995, 250–257; Garam 2005, 419–426, figs. 12–14; Heinrich-Tamáska and Voss (in press).

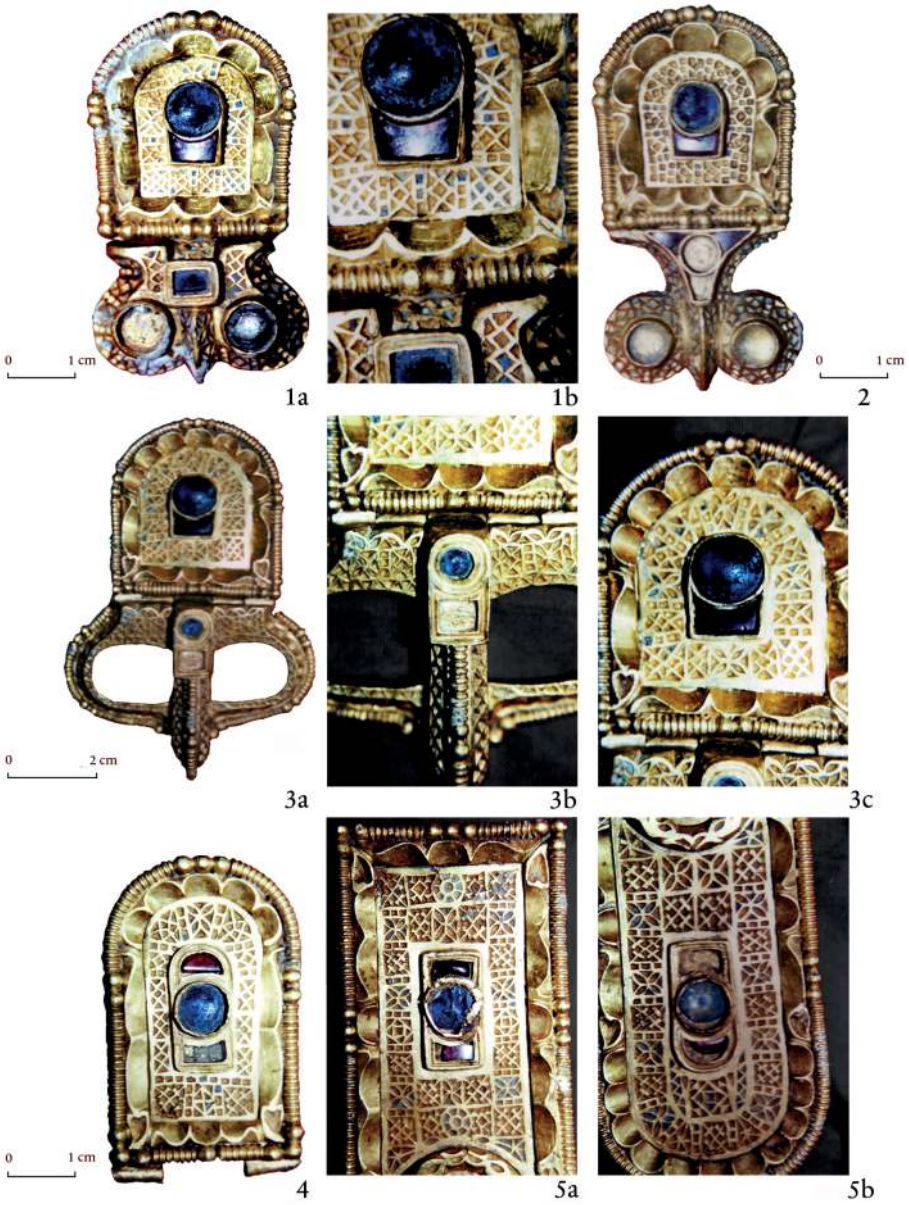

Fig. 4 Elements of the gold pseudo-buckle belt from Sremska Mitrovica/Sirmium: 1a pseudo-buckle (Sir/o/2); 1b detail of the surface of the front of the pseudo-buckles; 2 T-shaped belt plaque (Sir/o/11); 3a buckle (Sir/o/1); 3b–c details of the surface of the front of the buckle; 4 clasp from a belt plaque (front side: Sir/o/8); 5a–d details of the surface of the front of the large strap end (Sir/o/7).

although there are examples of garnet inlays on pseudo-belt buckles elsewhere.[64] They appear for example on the multiple-cell settings of Sremska Mitrovica/Sirmium: on the belt plaque and the belt mount of the pseudo-belt plaques (Sir/o/1–4, 11). Each was centrally fitted with a circular soldered band setting to which a quadrangular framework was attached so as together they formed a design in the shape of a shield that referred to the shape of the belt plaque (Figs. 4, 1a–b). The T-shaped belt mount additionally featured in its lower part a triangular setting around a circular cell, which thus formed a four-celled composition (Fig. 4, 2).

The examples briefly described here are closer to soldered band settings than to classic cloisonné cellwork in terms of their technical composition. On the suspension loop fittings of the Bócsa sword (Bó/o/1–2) single-framed triangular settings were soldered together so closely that they formed a unitary composition, the convergence of the individual cells creating double cell walls separating the garnets. On the back of one of the mounts, instead of cellwork, a metal plate was soldered on – presumably at a later stage – most probably to strengthen or improve the thin supporting plate.[65] The examples from Sirmium are also instances of a simple combination of two soldered band settings; in this case angular additions were fastened to the circular settings at their upper extremities.

The connection of such 'cellwork' with soldered band settings is also supported by the fact that there is no evidence for foil underlays, and this has contributed to the darker appearance of the stones. In general a paste was applied under the stones, to fix and raise them. This is clearly visible on the finds from Sirmium: today some of the inlays are loose within their frame, sunk within their settings, owing to the fact that the binding material is no longer preserved, and in other instances a shift in the position of the stone has rendered the adhesive visible (Fig. 4, 5a–b).

Together, the finds belonging to this group are indicative of a tradition of inlay techniques entirely different from that represented by the standard cloisonné, and, despite their 'multiple-cell attributes', they are more closely connected to individually-framed settings.

4.3 Soldered single settings: band setting

This group is numerically the best represented and its members are all made of gold, although they belong to typologically diverse categories. The greater part of the finds

64 E. g. the components of the pseudo-belt buckle from Bócsa (see Garam 1993, 53–55). On the other hand, they are present at Sirmium (Popović 1997, 64–71) and Kunbábony (Tóth and A. Horváth 1992, 28–29). For the results see Heinrich-Tamáska and Voss (in press).

65 Garam 1993, pl. 11,1.

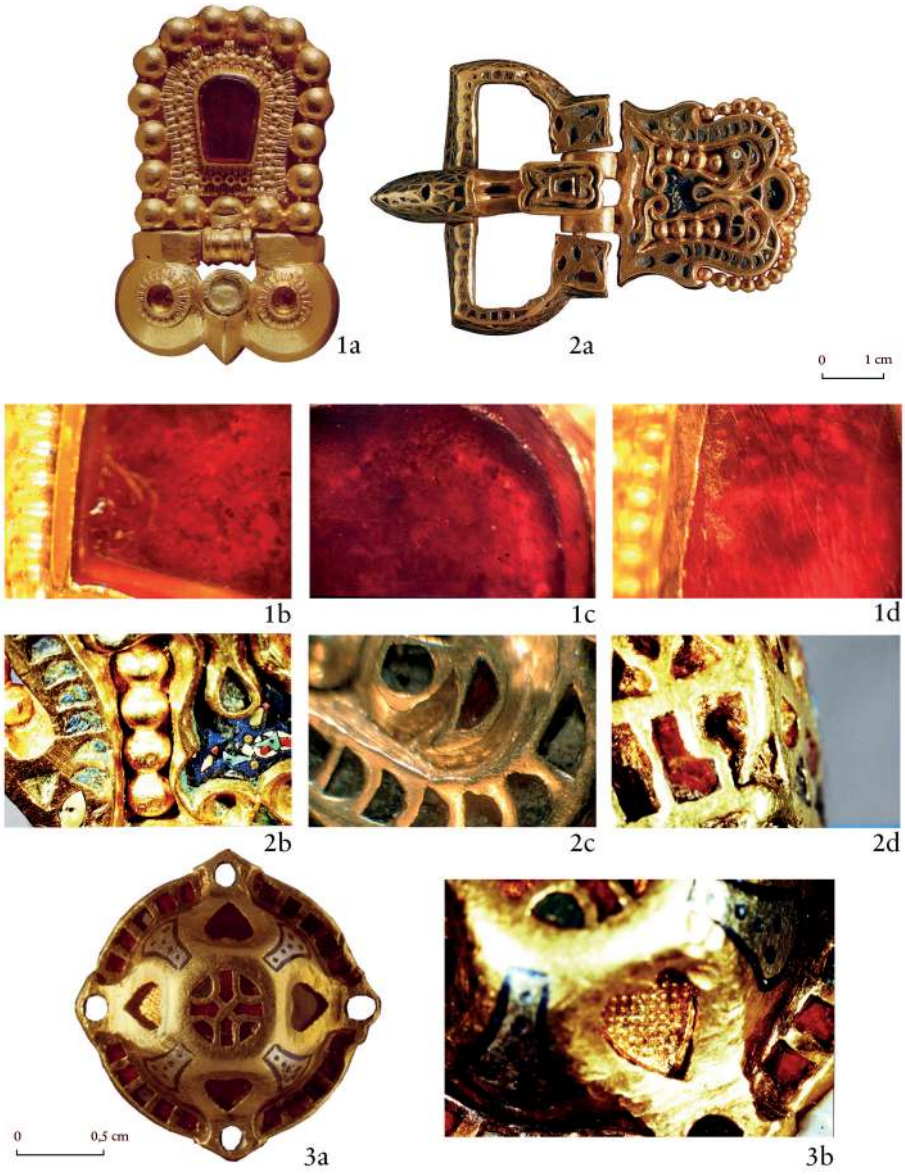

Fig. 5 Elements of the gold pseudo-buckle belt from Grave 1 at Kunbábony: 1a pseudo-buckle (Kunb/1/3); 1b-d details of the garnet inlays on the pseudo-buckle plaques; 2a buckle (Kunb/1/1); 2b mosaic, glass inlays and granulation on the plate of the buckle; 2c glass inlays on the plate of the buckle; 2d garnet inlays on the tongue of the buckle; 3a stud (element of dress ornament? - Kunb/1/2); 3b detail of the stud with a heart-shaped setting with wrapped foil and with a silver-niello inlay.

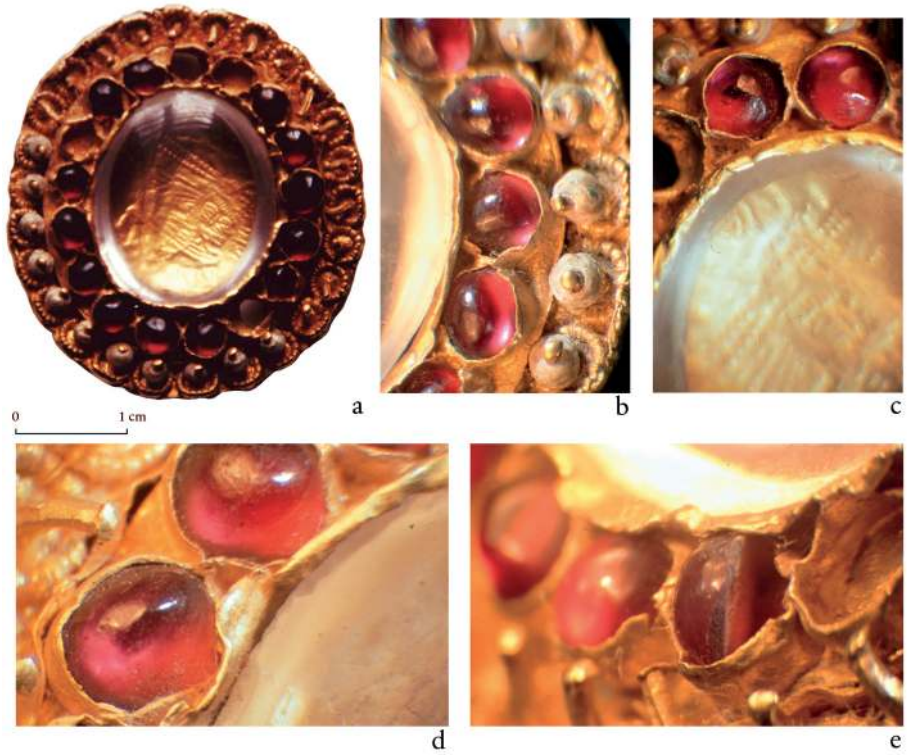

Fig. 6 a Disc fibula from Keszthely-Fenékpuszta, Horreum, Grave 8 (KesztH/8/2); b–e details of the garnet, rock crystal and pearls from this object.

in this group comes from to the pseudo-belt buckle horizon here, too; beyond that, examples are mainly found among the single finds from the so-called Keszthely culture[66] (Appendix). As a rule the cells are geometric in shape, being round, oval, shield-shaped or quadrangular and none possesses foil underlays. Stylistically the incrustations and inlays that gave the cells their shape are documented as variants of the ornamental scheme.

Among the pseudo-belt buckles, examples of the latter version are predominant. Apart from the belt components from Sirmium mentioned above, the belt fitting from Kunbábony (Kunb/1/3–6) is noteworthy. It has large facetted almandine[67] inlays (Fig. 5, 1b–d) set in a simple shield-shaped soldered band setting that conforms to the form of the belt plaque (Fig. 5, 1a–d). On the examples from Sirmium (Sir/o/2–4, 9, 11) the individual settings with garnet platelets are positioned on the root of the tongue. In each case they are quadrangular settings onto whose upper edge a grooved metal frame was

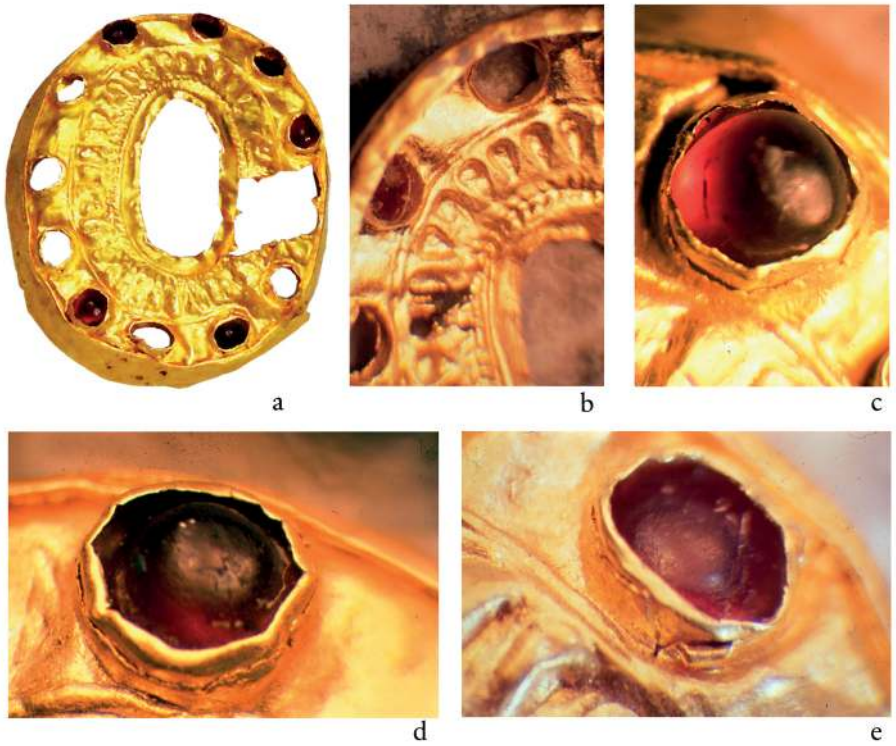

Fig. 7 Disc fibula from Nagykozár (Nagyko/o/1); b back side; c–e details of the garnet inlays from this object. Without scale.

additionally soldered (Fig. 4,1a-b). The remainder of the fittings' surfaces was decorated with enamel.[68]

Small concave garnet inlays with straight base are recorded on the disc brooches of Keszthely-Fenékpuszta/Horreum, and Nagykozár. The round cells of the Keszthely (KesztH/5/13) fibula were soldered individually onto the gold supporting plate (Fig. 6a–e); the stones were set over a paste composed, apart from wax, of lime, gypsum and quartz.[69] In the Nagykozár (Nagyko/o/1) example the pressed supporting plaque was carved out to accommodate the inlays, and subsequently the circular cell walls were inserted from behind (Fig. 7a–e). The entire back of this brooch would have originally been filled with a paste and sealed to its back plate.

66 For the Keszthely culture, see overview by Daim 2000 and Heinrich-Tamáska 2007–2008, 215–220.

67 See Tóth and A. Horváth 1992, 28 note 22 concerning the identification of the stones as almandine.

68 For these attributes, see Heinrich-Tamáska 2006a, 38–39; Heinrich-Tamáska and Voss (in press).

69 Heinrich-Tamáska 2007.

Fig. 8 1 Finger-ring from the burial at Ozora-Tótipuszta (Oz/o/1); 2 basket-shaped earrings from Kölked-Feketekapu, Grave B85 (Köl/B85/3). Without scale.

Concave inlays are further documented on the Byzantine-type finger-ring from Ozora-Tótipuszta (Oz/o/1);[70] the front face is surrounded by beaded wire (*Perldraht*). On the latter piece the inlay forms part of a more complex cellwork whose inlays did not survive (Fig. 8, 1). Concave garnets are documented on the straight terminal of a pair of gold basket-earrings from Kölked-Feketekapu (Köl/B85/3), combined in this case with filigree. The stone set on that example suggests that the paste raised the stone while also fixing it into position (Fig. 8, 2).

Finally garnets exist as shape-forming inlays on (necklace) pendants, discussed within a Byzantine context.[71] On the jewelled collar from Grave 5 at Keszthely-Fenékpuszta/Horreum (KesztH/5/1), they appear in combination with glass inlays of different colours[72] in triangular cells (Fig. 9, 1a) whose backs are decorated with granulation (Fig. 9, 1b). In one of the settings, a ring-stamped foil underlay is identifiable;[73] the latter appears in this form on the S-fibula of the Langobard-period cemetery of Vörs for example.[74]

The five oval, concave-shaped almandines from Kiskörös-Vágóhíd, Grave A (KiskV/A/7–11) are also interpreted as pendants from a jewelled collar, in the sense of an

70 Garam 2001, 84–87.

71 Garam 1991.

72 The collar consists of 14 triangular settings, eight of which still retain their inlays. Only one inlay is likely to be a garnet, the others are glass inlays, one of them coloured red. Beyond that, there are also small concave glass inlays set on both sides of the circular settings (Fig. 9,1e) which acted as pendants to each triangular element. See Heinrich-Tamáska 2006a, 218 figs. 65–66.

73 Heinrich-Tamáska 2006a, 218 fig. 63; Avent and Leigh 1977, fig. 1g.

74 Grave 33: Heinrich-Tamáska 2006a, 219 fig. 70.

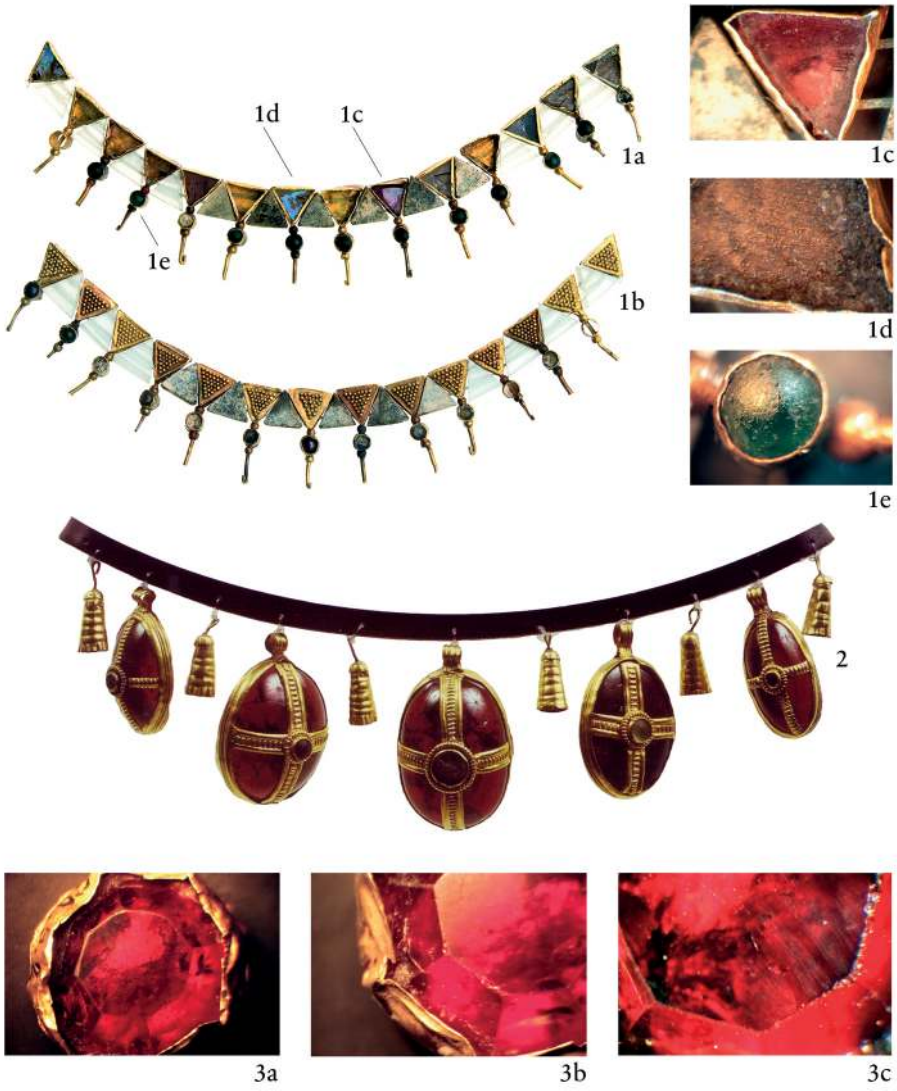

Fig. 9 1a–b jewelled collar from Keszthely-Fenékpuszta, Horreum, Grave 5 (front and back sides: KesztH/5/13); 1c garnet inlay from one frame from this object; 1d–e glass inlays from this object; 2 jewelled collar from Kiskörös-Vágóhíd, Grave A (5 garnets: KiskV/A/7–11); 3a–c Keszthely-Fenékpuszta, Horreum, Grave 9, facetted garnet in gold cell (KesztH/9/3). Without scale.

imitatio imperii.[75] Their size sets them apart as unique pieces (Fig. 9, 2), unparalleled in

75 Garam 1991, 167–168.

the material examined by Birgit Arrhenius who attributes a Sassanid origin to them.[76] They may have had various provenances, combined here into a composite piece of jewellery: one of the stones is facetted and the remainder's crescent-shaped sections appear quite variable.[77] From the perspective of the setting techniques they can however be ascribed to the category of soldered band settings only conditionally. Indeed they do not possess a back plate. The framing consists merely of a strip of gold, held on top by a loop, and two further gold strips crossing each other on the front of the pendant; sited at the junction of these two strips is a circular soldered band setting with inlay.[78]

The original function of the setting with one hexagonal facetted garnet from Keszthely-Fenékpuszta/Horreum (KesztH/9/3: Fig. 9, 3a–c) is unknown but it could have been threaded onto something or other, as suggested by the presence of small holes in the cell walls. There was also a concave garnet inlaid into the drop-shaped setting of the Kunmadaras (Kunm/0/1) pendant, encircled by three lines of beaded wire.

The finds presented here are without exception high-value items of jewellery made of gold from high-status burial complexes. Apart from the soldered band settings, decorative techniques involving enamelling, granulation and filigree were also employed, which emphasise the rarity and special status of these finds in the Avar context;[79] this horizon is often considered within the broader context of Byzantine influences, whether original products or imitations.

4.4 Open-work cellwork: champlevé à jour[80]

Eszter Horváth considers this technique as already part of the so-called pseudo-cloisonné techniques, to which the later sunken settings also belong.[81] Here they will however be treated in connexion with the soldered settings, since the soldering technique is at the basis of the work here, too. The principle is as follows: the space for the inlays is cut out of a 'capping plate' (open-work) to be mounted later on the upper side, and this is set on a structure made of back and side cell walls. As a result there is no real separation between the cells (hence pseudo-cloisonné), the inlays being held in position by the paste that fills the whole of the construction's hollow space. Among the finds assigned to this category feature some fairly complex items as well as some examples that show rather simpler solutions (Appendix).

The buckle of the Kunbábony (Kunb/1/1) pseudo-belt buckle shows a high-quality form of the champlevé à jour technique applied to the sides of the belt plaque: it repre-

76 Arrhenius 1985, 55.

77 Heinrich-Tamáska 2006a, 57.

78 According to Garam 1993, 82–83 the inlays consisted of a white, a dark, a green and a red glass inlay. The fifth inlay did not survive. She considers this framing to have been made in a local Avar context (Garam 1991, 168).

79 Heinrich-Tamáska 2002, 260–263.

80 E. Horváth 2012, 216.

81 E. Horváth 2012, 216.

sents two S-shaped animal figures, bent and looking towards the loop (Fig. 5, 2a–c).[82] The inlays have all but disappeared, only some green-blueish glass splinters remained preserved in the binding material. Garnets are still present in several examples on the tongue and the loop of the buckle (Fig. 5, 2c).[83]

The composition of the fittings on the guard of the Bócsa sword (Bó/o/33–34) is already simpler. The fittings belong to the same sword as the suspension loops discussed above (Bó/o/1–2). The front plate features cut-out cellwork (surface decoration) which is framed by a ribbed gold strip and which was soldered onto a gold lateral plate. The latter is also wrapped around the iron sword's guard.

The simplest form of execution can be observed on some components of the pseudo-belt buckle from Sirmium (Sir/o/7–8). Elongated shield-shaped and quadrangular settings are soldered and centrally placed as an ornamental element on the enamel-decorated front plate; the upper plate is centrally articulated around a circle and quadrangular and crescent-shaped elements flank this circle. The cell must originally have been filled with paste, the circular settings were occupied by blue glass inlays and the further cells held (re-used[84]) garnets. The margin of the open-work plates (like the band settings) of the belt fitting are articulated by grooves (Figs. 4, 5a–b).

The items presented here once again belong to the pseudo-belt buckle horizon and are an expression of the multiplicity of ornamental techniques used on these objects.

5 Cast cavities[85] (sunken settings): standard champlevé[86]

The defining characteristic of this inlay technique is that the space to be occupied by the inlay is already formed in the casting process and hence sunk into the support. Multiple- as well as single-celled versions exist, and examples with and without foil underlay have been recorded. Silver items, fire-gilded with gold in every case, are predominant in this group, but there are also objects made purely of gold.

The S-fibula of Várpalota 19 type from Keszthely-Fenékpuszta/Horreum, Grave 11 (KesztH/11/1) features single cells; the silver base material contained two circular and three triangular settings sunk into it (Fig. 10,1), underlain by a simple waffle-patterned foil made of gilded silver. It belongs to a type that is well documented in Langobard-period contexts.[87] A further S-fibula from the same cemetery (KesztH/17/1) exhibits cellwork along its outer contours representing two bent eagles' heads (Fig. 10,

82 Tóth and A. Horváth 1992, 27, 97–104.

83 A garnet and a white inlay (shell?) appear in the centre of the belt fitting.

84 Heinrich-Tamáska 2006a, 37–38; Heinrich-Tamáska and Voss (in press).

85 Arrhenius 1985, 78.

86 E. Horváth 2012, 216.

87 E. Horváth 2006, 53–54.

Fig. 10 1 S-shaped fibula from Keszthely-Fenékpuszta, Horreum, Grave 11 (KesztH/11/1); 2a S-shaped fibula from Keszthely-Fenékpuszta, Horreum, Grave 17 (KesztH/17/1); 2b–c details of the garnet inlays from this object; 3a trapeze-shaped plate from a stud belonging to a spatha baldric from Keszthely, Pusztaszentegyházi-dűlő, Grave A (KesztP/A/2); 3a detail of one of the garnet inlays from this object; 4 hair-pin from Kölked-Feketekapu, Grave B85 (Köl/B85/1); 5 tongue with damascening (*Tauschierung*) and garnet inlays from Kölked-Feketekapu, Grave B173 (Köl/B173/1).

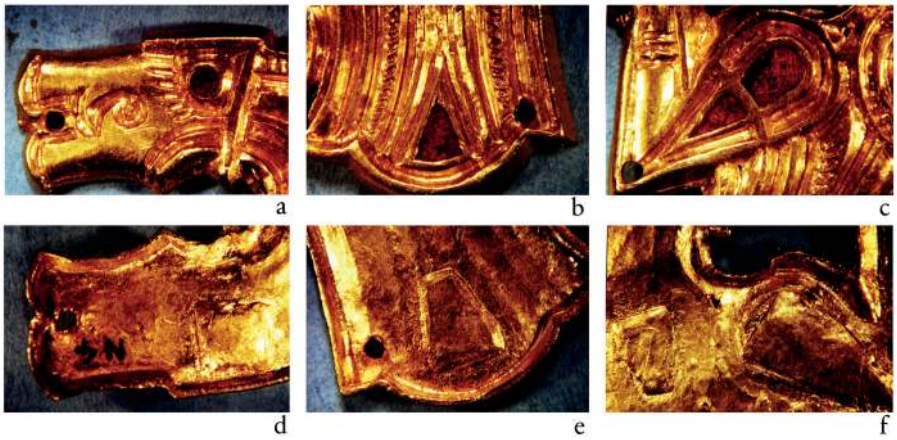

Fig. 11 Boar-shaped plate from the Jankovich Collection (JankG/o/1): a–c front side of the garnet inlays; d–f back side with gold plates (showing the location of the garnet inlays). Without scale.

2a).[88] The cells had already been fashioned individually in the casting mould (Figs. 10, 2b–c). Recently Eszter Horváth has drawn attention to a parallel from the nearby Langobard-period cemetery of Vörs.[89] In connexion with silver supports, the stud from the baldric from Keszthely-Pusztaszentegyházi dűlő (KesztP/A/2) also belongs to this context. Gilded like the fibula, this stud possesses garnet platelets[90] on all four sides of its trapezoidal fitting (Fig. 10, 3a), set in their cast cavities on top of an adhesive and a waffle-patterned foil underlay (Fig 10, 3b).

The terminal of a hair-pin from Kölked-Feketekapu (Köl/B85/1) was also cast in silver and fire-gilded. Its garnets, set in sunken settings,[91] accentuate the almond-shaped eyes and pointy ears of two animal heads that figure on the slightly raised front side (Fig. 10, 4).[92] The garnet inlays from a boar-shaped fitting in cast gold from the Jankovich Collection (JankG/o/1) also form part of an animal style in which the separate elements of an animal figure (eyes, upper limbs, etc.) were enhanced by garnets underlain by waffle-patterned foils (Fig. 11a–c).[93] Small quadrangular metal plates were soldered onto

88 Heinrich-Tamáska 2004, 171, fig. 7.

89 E. Horváth 2012, 224.

90 The piece was recently examined in detail as part of a study by Bendő, Heinrich-Tamáska, and E. Horváth 2014. This revealed that two different types of garnets were used: almandine of Type 'A' und pyrope-almandine of Group 'X.'

91 It was not possible to determine from the publication whether patterned foil underlays were under the garnets. According to the description given it appears that the right eye of the upper animal head was replaced by a green-whitish glass inlay (Kiss 2001, vol. I, 32).

92 For the motif, see Kiss 2001, vol. I, 266–268; Heinrich-Tamáska 2006b, 520.

93 On the subject of the ornamental scheme, see Heinrich-Tamáska 2006b, 522–523.

the back of the fitting (Fig. 11d–e) in the places the inlays occupy, no doubt to secure the underside of the inlay on a thin cast plaque.

A strap-end from Kölked-Fekekapu (Köl/B173/1) constitutes an exception in this group in terms of the material used for the support, i. e. iron.[94] However, here, too, the settings on the front were sunk – in accordance with the definition of standard champlevé – between the braids made by silver and brass metal-wire inlays (damascening = *Tauschierung*) and the settings were lined with gold (?) waffle-patterned foil to receive the garnet platelets (Fig. 10, 5). The strap-end is connected to the Group A damascening work of the Early Avar period which is interpreted as the expression of a local Pannonian-Germanic workshop tradition.[95]

Two further gold objects from Kunbábony belong to this category. A cone-shaped stud and the buckle mentioned above. The stud (Kunb/1/2), which has been interpreted as an element of dress ornament,[96] exhibits several specific technical attributes. Set along the cone-shaped outer surfaces, four heart-shaped single cast cavities, with waffle-patterned foil underlay and garnets alternate with axe-shaped silver inlays with niello decoration (Fig. 5, 3b). Waffle-patterned foil also underlays the champlevé cellwork that figures on the flattened head, in a form that represents a cross set within a circle. Finally five quadrangular settings appear on the lower edge of the stud between the holes that served to fasten the stud onto the cloth (Fig. 5, 3a). Apart from garnets, blue glass (?) inlays are also present. Furthermore, sunken settings are documented on the loop and tongue of the buckle from the same grave (Kunb/1/1), the inlays being held in position by a paste (Fig. 5, 2d).

The last two examples aside, the silver objects ornamented in the champlevé technique belong to a Germanic-Langobard workshop tradition, and the two S-fibulae from Keszthely-Fenékpuszta may even count as products of this phase, which were buried only after a long period of use. The two Kunbábony finds are unique pieces, not only from the point of view of their inlay techniques, but also in terms of their form. They are most likely to derive from a milieu that could draw on a widespread repertoire of goldsmithing techniques, suggesting an arena in which Late Roman-Byzantine workshops were influent.

94 Garnet inlays are also documented at Sommerein, Grave 19 (Som/16/1–5), but the set already belongs to the Late Avar period, around AD 700. For an overview, see Heinrich-Tamáska 2005, 33.

95 Heinrich-Tamáska 2005, 127.

96 Tóth and A. Horváth 1992, 28–29, 125–126.

6 Concluding remarks

The finds, subdivided here into categories according to the cell techniques employed, can largely be attributed to three large groupings on the basis of the working traditions they represent. Finds which show affiliations with Merovingian-Germanic prototypes constitute the first group. They comprise on the one hand artefacts that are representative of the standard cloisonné technique, and on the other hand (and in the majority of cases) objects exhibiting the standard champlevé technique. These artefacts predominantly made use of flat garnets with waffle-patterned foil underlays. Such a combination of traditions is also confirmed by the formal and stylistic characteristics of the finds, such as the animal style and S-fibulae.

The pseudo-belt buckle sets can be identified as forming a second grouping. Here single- and multiple-cell versions of gold soldered band settings are prevalent, besides champlevé á jour forms; waffle-patterned foil underlays have not been encountered. In addition, the finds from this group show the use of further decorative techniques that are rarely seen in the Avar period, such as granulation and enamelling, which suggests a sphere of influence of Late Roman-Byzantine workshops. The third group is made up of individual items of jewellery, stemming in the great majority of case but not exclusively from the Keszthely cultural sphere, that are also connected with a Byzantine tradition.

There are unique pieces in all three groups, for example the belt buckle from Kunbábony, the pendants from Kiskőrös-Vágóhíd or those from Keszthely-Fenékpuszta/Horreum; they highlight the individuality of the object on which garnets feature. Conversely the use of garnets emphasises and strengthens the material value of the objects. On the whole, however, the material assemblage that distinguishes the Early Avar period also confirms the overall image: garnet inlays were exclusively used on objects made of precious metals, each rated as prestige objects, as objects in themselves as well as within their specific context. Indeed the golden pseudo-belt buckles accompany the richest burials, as do the jewelled collars in Byzantine tradition and objects from the burial ground of Kölked-Feketekapu B. The garnets could thus have served as the means to project power and wealth.[97]

The investigation of garnet-decorated objects shows in an exemplary manner how technological observations can help reconstruct the 'pre-history' of this kind of artefacts, as described at the beginning of this article. The quality and origin of the raw material(s), the essential elements of manufacture and its details can provide important insights into the social and cultural background for production and use. Moreover the categories of cell techniques defined here indicate the different sources and traditions in use at the same time on the territory of Avaria. That should not mean local workshops alone,

97 As already suggested by Arrhenius 1969 for the Scandinavian material.

but rather the output of foreign craftsmen and/or import. Further technological details, like granulation, enamel and filigree are indications of strong external influences, from the West as well as from Byzantium. Moreover, the high prestige status that this kind of artefacts seems to have possessed, points to the importance of the transfer of metal technology for the local elites. Nevertheless the symbolical meaning of garnets must be stressed. The red colour and the shine of this stone alongside the combination with gold or gilded surfaces express prestige and wealth. Not everybody could have access to the sources of garnets: the distribution and the specialist knowledge needed to treat this material were only available to the high-ranking circles of early medieval societies. It is hoped that future research applying geochemical analytical techniques to identify garnets will give renewed impetus to the image projected here. The provenance of the stones that reached the Carpathian Basin remains to be verified, as is the possibility that alternative distribution networks for the procurement of garnets lay concealed behind the demonstrable differences among the cell techniques employed.

7 Appendix: Catalogue of finds decorated with garnets from the Early Avar contexts

In the appendix below, the listing of the finds within individual groups follows the catalogue numbering published by Heinrich-Tamáska in 2006,[98] where references to individual finds in the literature will be found. Many refer to several different inlay techniques. In this case they are listed under several categories and shown in italics.

98 Heinrich-Tamáska 2006a, 93–190.

Type	Code	Function	Base	Manufacturing technique	Surface/ decoration techniques	Other inlays/ cell techniques	Cell				Garnet		Fig.
							Base	Foil	Paste	Shape (no.)	Shape (no.[a])	Gem-cutting techn.[b]	
Standard cloisonné *(Einzelliges Zellenwerk)*	KesztFe/2/1	Pendant	Au	hammering	filigree		Au/ soldered	Au	x	stepped (43)	flat (37)	cutting	1,1a-g
	KesztFe/2/2	Pendant	Au	hammering	beaded wire	glass	Au/ soldered	Au	x	stepped (31)	flat (19)	cutting	1,2a-g
	Köl/A279/1	disc fibula	Ag/Fe	hammering/ forging	–	white inlay	Au/ soldered	Ag	x	trapeze (11)	flat (11)	cutting	–
	Köl/B119/2	bracelet	Ag	casting	fire-gilding/ niello	white-black inlays	Au/ soldered	Au	x	stepped/geometric shapes (207)	flat(189)	cutting	2a-b
	Köl/B119/1	finger-ring	Au	hammering	–	white inlays	Au/ soldered	Au	x?	geometric shapes (40)	flat (32)	cutting	3a-b
Cellwork of band settings	*Bó/0/1–2*	suspension loop fittings (a pair for a sword)	Au	hammering		band settings	Au/ soldered	–	x	triangle (2x5)	flat (2x5)	cutting	–
	Sir/0/1	buckle	Au	casting	enamel	band settings/ glass	Au/ soldered	–	x	rectangle (2)	facetted/ flat (1)	cutting	4,3a-c
	Sir/0/2–4	pseudo-buckles	Au	casting	enamel	band settings/ glass	Au/ soldered	–	x	rectangle (2)	facetted/ flat (1)	cutting	4,1a-b
	Sir/0/11	T-shaped belt plaque	Au	casting	enamel	band settings/ glass	Au/ soldered	–	x	geometric shapes (6)	flat (3)	cutting	4,2

Type	Code	Function	Base	Manufacturing technique	Surface/ decoration techniques	Other inlays/ cell techniques	Cell				Garnet		Fig.
							Base	Foil	Paste	Shape (no.)	Shape (no.[a])	Gem-cutting techn.[b]	
Band seetings	*Bó/0/1–2*	suspension loop fittings (a pair for a sword)	Au	hammering		cellwork of band settings	Au/ soldered	–	x	circle (2x3)	domed/ keeled (2x3)	cleav-ing	–
	KesztH/5/13	jewelled collar	Au	hammering		glass	Au/ soldered	x	x	triangle (14)	flat (2)	cutting	9,1a-c
	KesztH/8/2	disc fibula	Au	hammering/ pressing		pearls, rock crystal	Au/ soldered	–	x	circle (17)	domed/ keeled (15)	cleav-ing	6a-e
	KesztH/9/3	plaque	Au	hammering			Au/ soldered	–	–	circle (1)	facetted (1)	cutting	9,3a-c
	KiskV/A/7–11	jewelled collar	–	–		band setting/ glass	Au/ pressed	–	–	oval	domed/ keeled (5)	cleav-ing	9,2
	Köl/B85/3[c]	pair of basket earrings	Au	hammering	filigree		Au/sol-dered	–	?	circle (2x5)	domed/ keeled (2x1)	cleav-ing	8,2
	Kunb/1/3–6	pseudo-buckles/ belt plaques	Au	casting/ hammering	granulation/ beaded wire	glass	Au/ soldered (3)	–	?	U-shaped (1)	facetted	cutting	5,1a-d
	Kunm/0/1	plaque	Au	hammering	beaded wire		Au/ soldered	–	?	oval (1)	domed/ keeled (1)	cleav-ing	–
	Nagyko/0/1	disc fibula	Au	pressing			Au/ soldered	–	x	circle (12)	domed/ keeled (6)	cleav-ing	7a-e

Type	Code	Function	Base	Manufacturing technique	Surface/ decoration techniques	Other inlays/ cell techniques	Cell				Garnet		Fig.
							Base	Foil	Paste	Shape (no.)	Shape (no.[a])	Gem-cutting techn.[b]	
Band seetings	Oz/0/1	finger-ring	Au	hammering	beaded wire	cellwork of band settings (without inlays)	Au/ soldered	–	x	circle (1)	domed/ keeled (1)	cleav-ing	8,1
	Sir/0/2–4	pseudo-buckles	Au	casting	enamel	cellwork of band settings/glass	Au/ soldered	–	x	Rectangle (1)	flat (1)	cutting	4,1a-b
	Sir/0/9	belt plaque	Au	casting	enamel		Au/ soldered	–	x	U-shaped	flat	cutting	–
	Unb/0/16[d]	pendant	Au	hammering	beaded wire		Au/ soldered	–	?	bead-shaped (1)	domed/ keeled? (1)	cleav-ing?	–
Champlevé à jour	*Kunb/1/1*	buckle	Au	casting/ hammering	granulation	standard champlevé/ mosaic/ glass/ white inlay	Au/ soldered	–	x	various (37)	flat (1)	cutting	5,2a-c
	Bó/0/33–34	pair of fittings on the guard of a sword	Au	hammering			Au/ soldered	–	?	semi-circles (6)	flat (6?)	cut-ting?	
	Sir/0/7	large stap-end	Au	casting	enamel	framed setting/ glass	Au/ soldered	–	x	geometric shapes (6)	flat (2)	cutting	4,5a-b
	Sir/0/8	belt plaque	Au	casting	enamel	glass	Au/ soldered	–	x	geometric shapes (3)	flat (3)	cutting	4,4

Type	Code	Function	Base	Manufacturing technique	Surface/ decoration techniques	Other inlays/ cell techniques	Cell				Garnet		Fig.
							Base	Foil	Paste	Shape (no.)	Shape (no.[a])	Gem-cutting techn.[b]	
Standard *champlevé*	Kunb/1/2	stud (element of dress ornament?)	Au	casting	Ag/niello	glass	Au/ cast	Au (head)	?	head-shaped (4)/ geometric shapes (28)	flat (21)	cutting	5,3a-b
	Kunb/1/1	buckle	Au	casting/ hammering	granulation	champlevé à jour/mosaic/ glass/ white inlay	Au/ cast	–	x	geometric shapes[e]	flat	cutting	5,2a-c
	KesztH/ 17/1	S-Fibula	Ag	casting	fire-gilding/ beaded wire		Ag/ cast	Ag	?	geometric shapes (12)	flat (12)	cutting	10,2a-c
	KesztH/11/1	S-Fibula	Ag	casting	fire-gilding/ niello		Ag/ cast/	Ag/ gilded	?	geometric shapes (5)	flat (4)	cutting	10,1
	KesztP/A/2	baldric stud (for spatha)	Ag	casting	fire-gilding		Ag/ cast	Au	x	trapeze (4)	flat (4)	cutting	10,3a-b
	JankG/0/1	boar-shaped plaque	Au	casting			Au/ cast	Au	?	geometric shapes (4)	flat (4)	cutting	11a-f
	Köl/B85/1	hair-pin	Ag/Fe	casting/ forging	fire-gilding		Ag/ cast	–	x	geometric shapes (9)	flat (9)	cutting	10,4
	Köl/B173/1	stap-end	Fe	forging	Damscening (*Tauschierung*)		Au	Au	?	geometric shapes (11)	flat (10)	cutting	10,5

[a] Number of cells that contain garnets (still today).
[b] After Arrhenius 1985, 43–76.
[c] This find does not feature in Heinrich-Tamáska's catalogue (2006a) because the work does not incorporate earrings. For this find, see Kiss 2001, vol. 2, Pls. 29,1; 1,3–4.
[d] Heinrich-Tamáska (2006a, 174) also refers to a piece (Unb/0/3) with garnet inlay in a soldered band setting. It has been omitted because no reference to the type of material used – whether actually garnet – could be found.
[e] Without indication of the number of cells or the number of surviving garnets.

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