

# THE STUDY OF GARNET INLAYS AND JEWELLERY TECHNIQUES ON SELECTED ORNAMENTS FROM THE MIGRATION PERIOD IN BOHEMIA<sup>1</sup>

ZDENĚK BENEŠ – VIKTORIA ČIŠŤAKOVÁ –  
ZUZANA ZLÁMALOVÁ CÍLOVÁ – ŠÁRKA MSALLAMOVÁ –  
LADISLAV LAPČÁK – DAVID DANĚČEK

The article addresses jewellery decorated with coloured stone inlays, in particular garnets, from the Migration Period in Bohemia. These artefacts are viewed as important evidence of the presence of elites and their involvement in supraregional contacts. The text presents new finds from the region of Central Bohemia and simultaneously analyses previously known artefacts held in museum collections. Using a typological-chronological analysis and a study of the origin of the garnet, the article explores the issues of the production, distribution, and social function of these artefacts. Attention is also paid to inlay techniques, and their development in the broader Danube Region. The article also focuses on decorative techniques such as gilding, niello and wire composition of metal components. The study shows that jewellery with garnet inlays was not only an aesthetic accessory, but also a carrier of symbolic meaning associated with identity, status, and regional ties. The results contribute to a deeper understanding of the social structure and cultural dynamics in Central Europe in the 5<sup>th</sup> and 6<sup>th</sup> c. The article also emphasises the importance of combining archaeological, archaeometric, and historical approaches in the study of artefacts from the Migration Period.

Keywords: Bohemia, Migration Period, garnet inlays, elite jewellery, trade.

## INTRODUCTION

One group of artefacts from the Migration Period that we can usually identify as evidence of the presence of elites are objects decorated with inlays of precious or semi-precious stones and other materials. In most cases these are garnets in various shades of red, which can be found isolated on jewellery, or in rarer cases, set into compartments using the cloisonné technique. Jewellery with stone inlays begins to appear in Central Europe very rarely already at the turn of the 4<sup>th</sup> and 5<sup>th</sup> c. (Čiřakova et al. 2022, 339–342; Horváth 2013, 282), then in greater quantities around the mid-5<sup>th</sup> c. (Quast/Schüssler 2000, 75, 76; Tejral 2015, 292; Tóth 2019, 189). When B. Svoboda's monumental monograph on the Migration Period in Bohemia was published, it was still possible to speak of a relatively small number of such decorated artefacts (Svoboda 1965). Their number has since increased somewhat thanks to research into a burial ground from the late phase of the Migration Period in Hostivice near Prague (e.g., Daněček/Korený/Perlík 2017) and the fantastic find of the 'royal jewels'

from Mšec in the Rakovník region (Blažková/Jiřík/Bezákova a kol. 2023). However, their number is slowly quietly growing, thanks in part to cooperation with metal detectorists who transfer their finds to museum collections or other authorised archaeological institutions.<sup>2</sup>

The first goal of the presented text is to publish new finds decorated with garnet inlays, usually obtained from central Bohemia (Fig. 1). However, the more important task is to analyse these inlays – not only from new finds, but also from older and well-known finds stored in museum collections – and determine their origin. By combining this with typochronological analysis of these artefacts, we attempt to trace the development and impact of transregional trade on local elites. We also try to shed additional light on the production chain (*chaîne opératoire*) of these artefacts and its significance in the search for elite settlements of the 5<sup>th</sup> and 6<sup>th</sup> c. in Central Bohemia. In the text, we use the currently applied chronology of the Migration Period found, for example, in the works of E. Droberjar (e.g., Droberjar 2008a, fig. 4; 2008b, tab. 1).

<sup>1</sup> This work was supported by Czech Science Foundation Grant No. 22-00828S and financially supported by the Ministry of Culture of the Czech Republic (DKRVO 2024–2028/ 17.I.c, National Museum, 00023272).

<sup>2</sup> At this point, we would like to thank the amateur collaborators, without whom this study would not have been possible: Miroslav Harušťák, Juraj Hríb, Tomáš Kilian, Karel Novotný, František Tyle and Jaroslav Štefl.

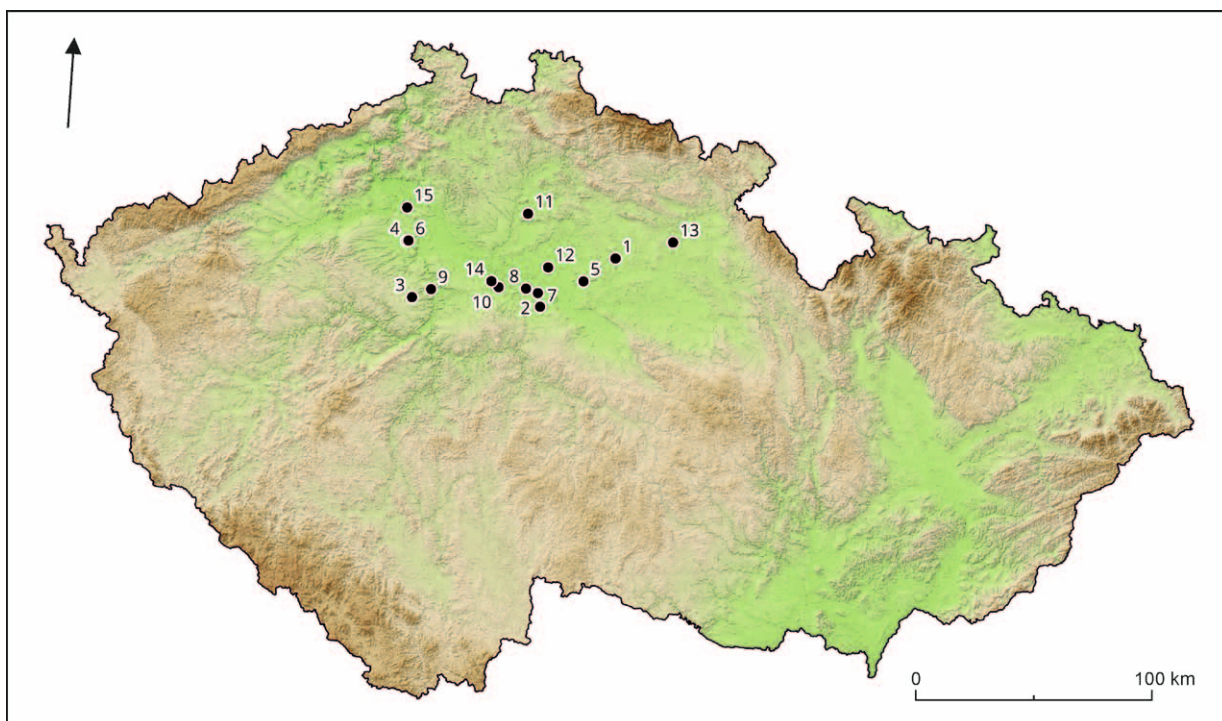


Fig. 1. Sites discussed in the text. 1 – Nový Bydžov; 2 – Plaňany; 3 – Hostivice; 4 – Dolní Kamenice; 5 – Žehuň; 6 – Budhostice; 7 – Velké Chvalovice; 8 – Třebestovice; 9 – Prague-Podbaba; 10 – Vyšehořovice; 11 – Řepov; 12 – Šlotava; 13 – Lochenice; 14 – Čelákovice-Záluží; 15 – Roudnice nad Labem-Hracholusky. Map J. Souček.

### SELECTION OF ARTEFACTS

The artefacts selected for this study can be divided into three categories based on the context of their discovery. The first context is burial grounds. Two artefacts represent the necropolis in Prague-Dejvice-Podbaba (previously usually referred to as Prague-Podbaba, which is the designation we use in this text for practical reasons), where graves from the entire period of the Migration Period are documented (Droberjar 2005, 821, 822; Svoboda 1965, 261–267). The first is a bird brooch from the disturbed graves, marked in the catalogue of this work as no. 4 (see Svoboda 1965, tab. LI: 5), the second is a brooch with bird heads (no. 16) from grave 12 (Svoboda 1965, 156, 262, tab. XLIV: 4). Another brooch with bird heads (no. 15) comes from grave 7 of the burial ground in Lochenice near Hradec Králové (Zeman 1990, 92, fig. 37: 23). Two ornaments come from the well-known burial ground in Čelákovice-Záluží. The first of these is a magnificent bow-shaped brooch with a semicircular headplate (no. 17) from grave 5/I (Svoboda 1965, 283, tab. LXXXVIII: 1), the next is a small kidney-shaped pendant (no. 19) from grave 16/XI

(Svoboda 1965, 285, tab. LXXXIX: 2).<sup>3</sup> One artefact – a small plate-shaped brooch with cloisonné-style decoration (no. 18) – represents a disturbed burial site in Roudnice nad Labem-Hracholusky (Svoboda 1965, 272, tab. LXXVII: 3).

Previously unpublished artefacts with red stone inlays come from the cemetery in Hostivice-Palouky on the western outskirts of Prague (Daněček/Korený/Perlík 2017; Daněček/Smíšek/Korený 2014). These are fragments of two S-shaped brooches, one plier-shaped brooch with a trapezoidal foot, and a total of three loose stones of roughly circular shape, which probably fell out during period grave robbing. Robbed grave H1762 (*adultus* II, sex undetermined) contained a fragment of an S-shaped brooch (no. 8) and a broken-off compartment of the opposing eye of the same brooch, still with a stone (no. 22). Robbed grave H1905 (individual without age or sex determination) contained an undamaged plier-shaped brooch (no. 14) in the pelvic area. Robbed grave H1932 (human remains were not recovered during the excavation) contained an S-shaped brooch (no. 9). Robbed grave H1946 (*maturus* I, probably a woman) contained one late S-shaped and one

<sup>3</sup> For the artefacts discussed in the text, we adhere to the numbering from the catalogue forming an appendix to this work. This is a more practical distinguishing mark than the long and disparate inventory numbers of museum collections. All essential data on the analysed artefacts are then listed in the catalogue of finds at the end of this text.

bird brooch (neither analysed in this text) as well as a dislodged coloured inlay (no. 23). Robbed grave H1951 (*adultus* I, female) contained a dislodged flat coloured inlay (no. 21) obtained during the wet-sieving of the fill.

A relatively large group of analysed objects are artefacts obtained from metal detector prospection at (usually) multicultural sites. Since we do not assume that these are shallow graves that have been ploughed up, we believe that these are settlement sites, the majority of which are located in the Central Bohemian Elbe region, specifically in its eastern part, due to the high density of archaeological sites in the Kolín and Nymburk districts and also the consistent attention authors have paid to this region for many years. Two representatives of bird brooches (nos. 1 and 24) represent the site in Velké Chvalovice in the Kolín region, which was already mentioned in the literature years ago (*Droberjar 2013a*, 288, 294, fig. 6: 4, 5). Just a few kilometres to the west is the very similar site in Třebestovice in the Nymburk region, from where one bird (no. 2) and one miniature Thuringian plier-shaped brooch (no. 12) come. On the contrary, in Plaňany south of Velké Chvalovice, there is a location for which it is still difficult to decide whether it is truly a settlement. The fragment of a Szarvas-type brooch (no. 7) comes from the same site where a fragment of a gold object, originally decorated with inlays, was found several years ago (*Volf et al. 2021*, 615, fig. 35: 6). According to archival information, it now appears that this is the same site where the long-published Groß-Umstadt-type brooch was once found (*Svoboda 1965*, 85, 256, tab. XX: 3).<sup>4</sup> North of the Elbe in the Nymburk district, a single artefact from the Migration Period was discovered at a multicultural site near Šlotava – a fragment of a brooch with a transversely grooved foot (no. 13). A remarkable site from the latest stage of the Migration Period is apparently located on the northern bank of the Cidlina near Žehuň (today beneath the surface of a pond), as evidenced by previously published S-shaped brooch no. 11 of the Schwechat-Pallersdorf type (*Droberjar 2013b*, 151, fig. 1: 9). Towards the upper course of the Cidlina River is the extraordinarily archaeologically potent region around Nový Bydžov, from where the recently published brooch with a bird head on the foot and head with beak-like protrusions (no. 6) comes (*Zlámalová Cílová et al. 2025*, 1181, fig. 1b). In recent years, an interesting variant of a bird brooch with a combination of flat inlays and a cabochon (no. 5) comes from the recently discov-

ered and intensively prospected multicultural site in Vyšehořovice. Although the Migration Period is also represented by multiple artefacts, their numbers are relatively negligible compared to artefacts from other periods.

Nothing more definite can be said at this time about the sites from Budihostice (no. 3) and Dolní Kamenice in the Kladno region. However, the two artefacts analysed here (S-shaped brooch no. 10 and buckle pin no. 20) from Dolní Kamenice indicate that these are not just isolated random finds. On the other hand, the fragment of a clasp or bird brooch from Řepov (no. 25) is probably a truly loose find, which is also the third and final find category based on the context of the find.

Although the artefacts described here do not represent the complete inventory of finds from the Migration Period with coloured stone inlays in Bohemia, they are finds that were accessible to the authors for documentation and further analysis, which is why the east Bohemian Elbe region is overrepresented in this work. Nevertheless, this is by far the largest collection of artefacts of this type analysed in the Czech Republic, because the jewellery with stone inlays known so far in Bohemia numbers only few dozen pieces.

## TYPOLICAL-CHRONOLOGICAL ANALYSIS OF ARTEFACTS

### Brooch with a bird head on foot

Although the exceptional brooch from Nový Bydžov (no. 6; Fig. 2: 1, 3: 14) was published recently (*Zlámalová Cílová et al. 2025*), the archaeometric focus of the previous publication, the lack of space for a thorough stylistic analysis, and finally also newly discovered facts mean that we must address it again here in greater depth.

This small brooch has a pair of beak-like protrusions on the sides of the head filled with flat garnet inlays. The semicircular protrusion on the upper edge was originally also filled with a flat inlay. It is not clear whether the central rectangular field on the brooch head was also filled with something, or whether it was only decorated by the central protrusion. It is noteworthy that there are also three small circular inlays in the form of a cabochon on the brooch bow. On the sides of the bow there are always two rows of five stamps in the shape of concentric semi-circles. The foot is then in the shape of a bird head turned sideways, with another circular

<sup>4</sup> This is an information found in part of the estate of Kolín archaeologist F. Dvořák, which was kept for years by the now deceased archaeologist V. Moucha. These materials are currently held in the Archive of the Institute of Archaeology of the Czech Academy of Sciences, from where they will eventually be transferred to the Regional Museum in Kolín.

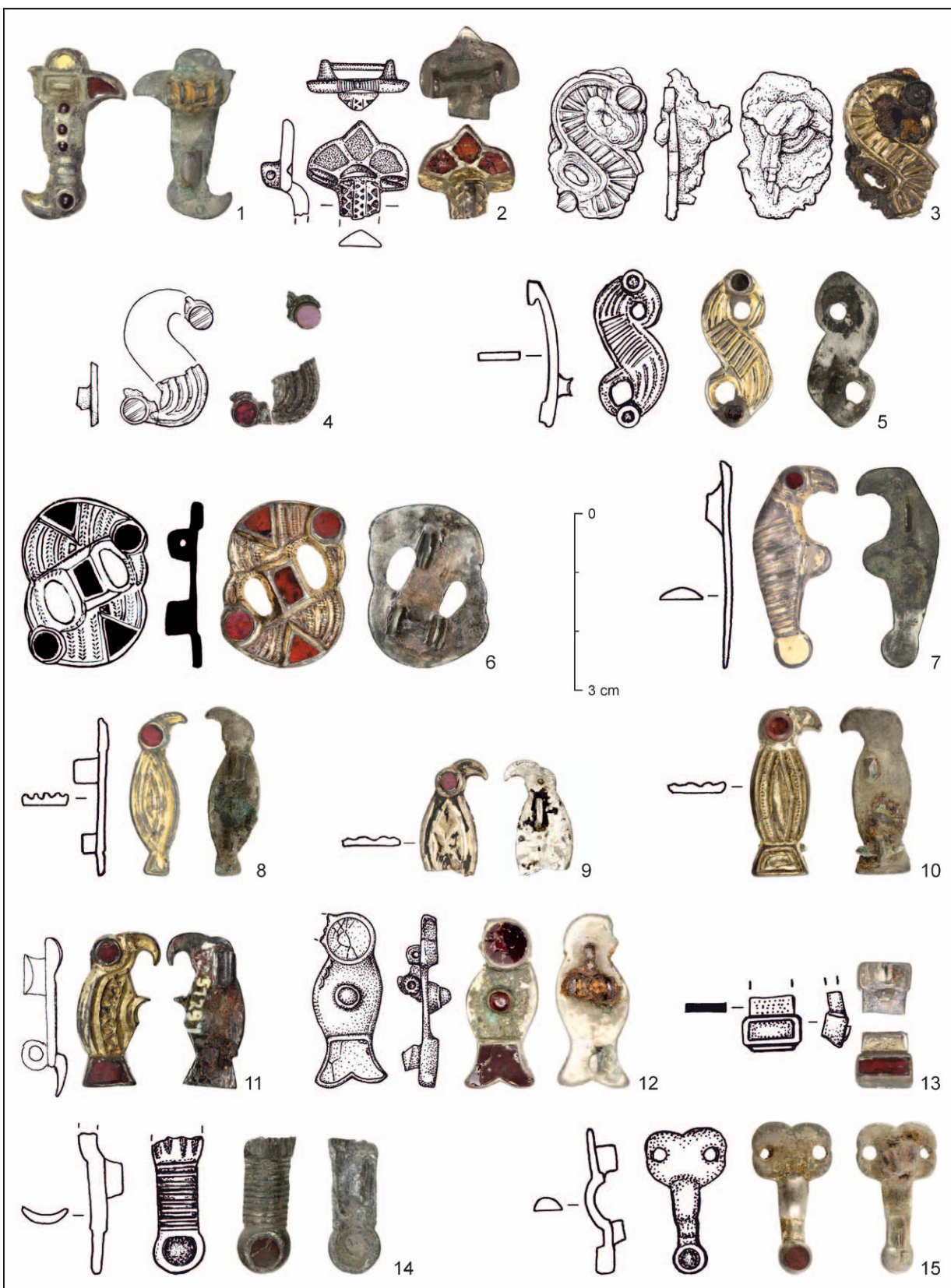


Fig. 2. 1 – Nový Bydžov (no. 6); 2 – Plaňany (no. 7); 3 – Hostivice-Palouky (no. 9); 4 – Hostivice-Palouky (no. 8); 5 – Dolní Kamenice (no. 10); 6 – Žehuň (no. 11); 7 – Budihostice (no. 3); 8 – Velké Chvalovice (no. 1); 9 – Velké Chvalovice (no. 24); 10 – Třebestovice (no. 2); 11 – Prague-Podbaba (no. 4); 12 – Vyšehořovice (no. 5); 13 – Řepov (no. 25); 14 – Šlotava (no. 13); 15 – Třebestovice (no. 12). Drawing M. Černý, I. Vajglová, A. Waldhauserová, photo J. Souček, 6 after Droberjar 2013b.

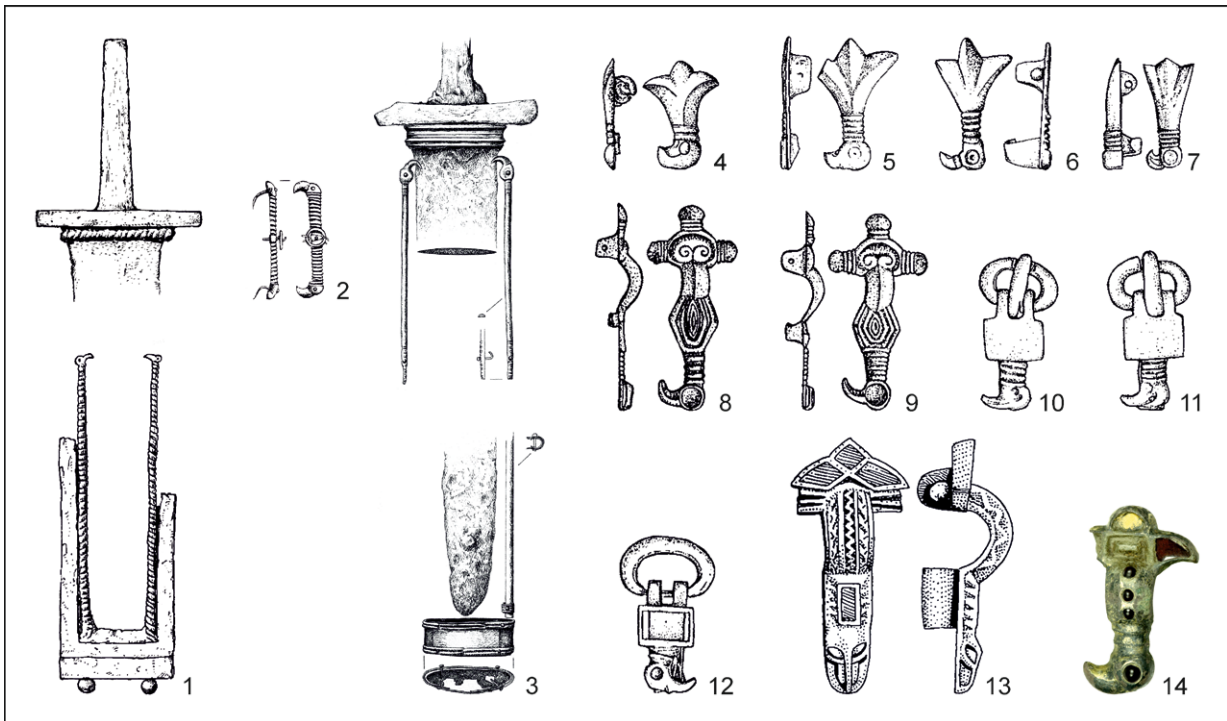


Fig. 3. Brooches and other artefacts with a decorative bird head element, or other analogous artefacts. 1–3 – Danubian swords with bird head applications (1 – Szirmabesenyő; 2 – Velika Bakta; 3 – Tarnaméra); 4–7 – cicada-shaped brooches with bird heads (4 – Drösing; 5–7 – Ringelsdorf); 8, 9 – Slimnic; 10–12 – Mözs-type buckles (10, 11 – Mözs-Icsei-dúló; 12 – Sály-Latorvár; 13 – Szarvas-type brooch (Bernhardtsthal); 14 – Nový Bydžov. Various scales (1–3 after *Tejral* 2017, fig. 12; 4–12 after *Tejral* 2015, fig. 15; 13 after *Tóth* 2019, fig. 1: 4).

cabochon representing the eye. Below the head, the neck is grooved.

Although an exact parallel to this artefact has not yet been found in Central Europe, we can nevertheless proceed by analysing individual stylistic elements. The semicircular concentric stamps on the sides of the bow are reminiscent of the rich stamped decoration of the Untersiebenbrunn-Sösdala-Coșoveni style, which is characteristic of stage D2 (*Kazanski/Mastykova* 2017; *Tejral* 2007, 57–60), though they are not themselves a very sensitive chronological indicator. Bird heads as accessories on larger brooches, such as bow-shaped fasteners, are widely known from the Merovingian period. Although the presence of these bird heads is often explained as influence from the East Germanic environment, these are relatively late products, usually from the first half of the 6<sup>th</sup> c. (*Koch* 1998, 92–96, pl. 13: 1–6; 2001, 194–196, fig. 87). More precise formal and contextual analogies are represented by brooches that have bird heads with a grooved neck set on the foot, as is the case with the brooch from Nový Bydžov. We know them from many types of Danube brooches, but also from buckles of the Mözs type (Fig. 3: 10–12; *Nagy* 2002, 364, fig. 1: 12–14; *Tejral* 2008, 262, fig. 10). Probably the closest analogies in terms of the

use of bird heads on the brooch foot are a pair of brooches from the Slimnic site in Romanian Transylvania (Fig. 3: 8, 9; *Harhoiu* 1997, 102, 103, 187, 188, pl. XC: E/4, 5), but there are also other analogies from the Carpathian Basin (e.g., *Bóna/Nagy* 2002, fig. 59: 2; *Csallány* 1961, 10, 42, pl. CIX: 10; *Nagy* 2002, fig. 1: 18). An interesting use of the motif of a bird head with a grooved neck is also represented by the fitting of a horse harness (*Akhmedov* 2007, fig. 1: 1, 2) or the lavish fittings of sword scabbards, the popularity of which gradually shifted from the East to Western Europe (Fig. 3: 1, 2; e.g., grave 68 from Charleville-Mézières; *Kazanski/Mastykova/Périn* 2002, fig. 10: 1, 4, 6; *Tejral* 2017, 118, fig. 12). These artefacts are usually also decorated with coloured inlays, and their first examples appear in the Danubian-Pontic region from the first half of the 5<sup>th</sup> c. in rich (Hunnish) graves. However, they are most often dated to the second third of the 5<sup>th</sup> c. (stage D2–D2/D3) and their origin can definitely be placed in the Carpathian Basin, or possibly the Lower Danube Region (*Nagy* 2002, 364, 365; *Tejral* 2007, 92–96, fig. 25: 3, 7–9, 13–15; 2015, 317, 318, fig. 15).

Another assessable feature on the brooch from Nový Bydžov is the shape of the headplate, which vaguely resembles the shape of a lily, and if we

look at the typical spectrum of Danube brooches, we can see a certain similarity with brooches of the Szarvas type (Fig. 3: 13), which are usually dated (albeit only on the basis of stylistic analysis, as none have yet been found in a datable context) to the turn of the 5<sup>th</sup> and the 6<sup>th</sup> c. (Tejral 2002, 331, fig. 11; 2008, 272, fig. 17: 1–3; 2011, 39, fig. 13: 1–3; Tóth 2019, fig. 1). In addition to the shape of the headplate, they usually also have transversely grooved foot necks with an animal head. Although we did not find a direct relationship with the brooch from Nový Bydžov in this case, our search in this direction is not completely futile. According to one theory, Szarvas-type brooches are perhaps based on the cicada-shaped brooches that were widespread in the Carpathian Basin in the 5<sup>th</sup> c. (Tejral 2002, 331; 2011, 39; 2015, fig. 12; Tóth 2019, 177). It is precisely the cicada-shaped brooches of the Ringelsdorf type with curved wings – products of Middle Danube workshops – that, according to J. Tejral, could have been the origin of the Szarvas-type brooches (Tejral 2002, fig. 2: 1–3; 2011, 39, fig. 13: 10, 11).<sup>5</sup> The curved wings of cicada-shaped brooches were probably also the prototype for the shape of the headplate of the brooch from Nový Bydžov. The apparent relationship between these artefacts is definitively demonstrated by cicada-shaped bird-head brooches with a grooved neck. Some time ago, this topic was summarised by J. Tejral, who noticed the concentration of these brooches in the Lower Austrian-Moravian area (Tejral 2015, 314, 315, fig. 15: 1–4; map 4).

It is therefore likely that the brooch from Nový Bydžov is a more luxurious variant of the cicada brooch, somewhat modified to the intention of the craftsman or the wishes of the customer. Stylistic analysis allows this brooch to be dated to stages D2–D3, and its origin can be assumed with relative certainty to be in the Middle Danube Region.

### Szarvas-type brooches

A relatively big surprise was the discovery of a fragment of this brooch (no. 7; Fig. 2: 2) in Plaňany in the Kolín region; it can undoubtedly be assigned to the Szarvas type, which was recently comprehensively studied by Á. B. Tóth (2019) and which

we already mentioned in the previous subchapter.<sup>6</sup> These are small brooches that were (hypothetically, since no pair was found in an undisturbed context) worn in pairs by women. The original find – unfortunately without a preserved context – probably comes from a disturbed Gepid burial site near the town of Szarvas in southeastern Hungary. A virtually identical artefact is saved in the Saint-Germain-en-Laye Museum and is thought to come from the La Rue-Saint-Pierre site in France (Koch 1998, 645, pl. 50: 16; Tóth 1999).<sup>7</sup> The third was found at the turn of the millennium during surface prospecting in Bernhardsthal in Lower Austria (Tejral 2002, 331, fig. 11: 2). In 2011, another Szarvas-type brooch was found at the well-known Uppåkra site in southern Sweden (Sundberg 2013; Tóth 2019, 193, fig. 1: 3).

Á. B. Tóth (1999) originally believed that Szarvas-type brooches can be classified under Thuringian brooches, while J. Tejral, based on the shape of the headplate, similar to the end of cicada-shaped brooches, saw their origin more in the Danube Region (Tejral 2002, 331). He maintained this theory in later studies and supplemented it with further observations on the influence of Danubian cicada-shaped brooches (especially the Ringelsdorf type) on Thuringian brooches, e.g., on small plier-shaped brooches with coloured inlays (Tejral 2008, 272–274, fig. 17; 2011, 39). Indeed, some of the decorative details that can be observed on the aforementioned Szarvas-type brooches are also found on a number of Thuringian brooches, as J. Bemmann (2008, 176, 177, fig. 30) has also clearly shown and as can be seen with Bohemian examples of Thuringian brooches with bird heads (see below). Nevertheless, the prevailing opinion today is that Szarvas-type brooches are more a Danubian product whose prototype was probably Krefeld-type brooches, widespread in the Alemannic, Frankish and Thuringian regions in the second half of the 5<sup>th</sup> c. The carefully executed coloured inlay on the Szarvas-type brooches is evidence of the significant influence of the polychrome style, the shape of the headplate of the heritage of Danubian cicada-shaped brooches. Á. B. Tóth dates these brooches to the final decades of the 5<sup>th</sup> c., possibly to the turn of the 6<sup>th</sup> c. (Tóth 2019, 176–186).

The rarity of these brooches and their wide distribution do not really allow us to trace any

<sup>5</sup> This is confirmed not only by the concentration of occurrence of these brooches (e.g., Tejral 2008, fig. 9), but also by the presence of a semi-product of this brooch in the collection from Steinmandl in Lower Austria, which is interpreted as an artisan's hoard deposited around the middle of the 5<sup>th</sup> c. AD (stages D2/D3; Szameit 1997, 240, pl. 5: 4; Tejral 2015, 312–314).

<sup>6</sup> Á. B. Tóth (2019) also contains a summary of all available literature, including a detailed catalogue of finds known to date. We do not duplicate this work done here.

<sup>7</sup> However, this localisation is not without problems, as Á. B. Tóth (2019, 192) points out and explains in note 120. In an earlier publication (Tóth 1999), the author believed that the brooch from Szarvas and the identical piece from the French museum were parts of a single find, which was only later sold to various entities.

concentration of their occurrence. The discovery of a fragment of this brooch in Plaňany in the Kolín region slightly thickens the density of their distribution map but does not contribute much to resolving the question of their origin. However, the extraordinary similarity to previously published artefacts is again surprising, at least in the area of the headplate with protrusions decorated with flat inlays and on the front side of the bow with a central rib. If we were to go into detail – and it is clear that with the artefact from Plaňany we are limited by its state of preservation – then this brooch most closely resembles the find from Bernhardsthal. It is not only about the decoration of the bow, i.e., the central rib decorated with hammered triangles filled with niello and the side chip-carved zigzag lines, but also about the shape of the inlays on the head. The shape of the middle one is the same in Plaňany and Bernhardsthal (rhombus). The lower edges of the headplate decorated with two parallel chip-carved lines (wing-like) are less incised on the Plaňany find. A detailed stylistic analysis of Szarvas-type brooches was carried out by Á. B. Tóth, who singled out a pair of brooches from Szarvas and La Rue-Saint-Pierre as the most similar to each other. She also placed the pair from Bernhardsthal and Uppåkra relatively close together (Tóth 2019, 169–171, fig. 1). Hence, it is very likely that the brooch from Plaňany also comes from the same production circuit, if not directly from the same workshop.

### S-shaped brooches

These are some of the most common fasteners at burial sites north of the Middle Danube in the late phase of the Migration Period. The heart of their expansion probably shifted further south over time, to the area of the Middle Danube region itself. They are part of the female costume and were usually worn in pairs on the chest or under the chin like a pair of small brooches. S-shaped brooches went out of fashion at a time when the popularity of women's

costumes with four brooches ended, sometime in the second half of the 6<sup>th</sup> c. (Droberjar 2013b; Losert/Pleterski 2003, 163–177; Milavec 2007; Tejral 2011, 54–60; Werner 1962, 75–78).

The discussed assemblage of brooches with coloured inlays contains a total of four representatives of S-shaped brooch variants, two of which come from the cemetery in Hostivice. The first of these (no. 9; Fig. 2: 3) from grave H1932 represents a nearly completely preserved brooch of the Stößen variant, which is characterised by heads facing right, a closed beak, and simple transverse chip-carved decoration on the obverse side of the plate (Droberjar 2013b, 147, 148; Losert/Pleterski 2003, 174–177). Brooches of this variant have been recorded thus far mainly in Bohemia and Central Germany.<sup>8</sup> They are closely related to the Záluží variant, which differs in the left-sided orientation of the heads and the open mouth (Tejral 2002, 335, 336).<sup>9</sup> These variants are also characteristic of the region of Central and Southwestern Germany and Bohemia.<sup>10</sup> J. Werner already believed that these were the earliest variants of S-shaped brooches, which can be dated back to stage E1 (Werner 1962, 77), and B. Schmidt (1961, 131, 132) also places them in his Central German IIb stage (turn of the 6<sup>th</sup> c.). Ch. M. Hansen (2004, 127–129, fig. 135) even lists them in her Central German phase 2, which is shifted even somewhat earlier (ca. 430/440–470/480 AD), but this will need to be confirmed. At the same time, they probably still occurred throughout the first half of the 6<sup>th</sup> c. (Bemmann 2008, 186; Korený/Kostka 2014, 524–527). The distribution of these early variants makes clear that their origin must be sought in the Elbe-Germanic environment of Central Europe. Traditionally, S-shaped brooches are generally associated with the Langobardi, but they are not a very ethnically significant part of the costume, as they are also found in territories attributed to other gentes, such as the Alemanni and Baiuvarii (Korený/Kostka 2014, 525–527; Losert/Pleterski 2003, 165).

From the perspective of the focus of this text, it is important to pay attention to the flat coloured inlays

<sup>8</sup> Catalogue of Bohemian finds: Klučov, grave 25 – Korený/Kudrnáč 2003, 434, fig. 13: 9; Mochov, grave 12 – Zeman 1958, 436, 437, fig. 14: 6. Two artefacts from Plzeň-Doudlevice, both of which are turned to the right, stand out somewhat in this investigation – Svoboda 1965, 257, tab. LXVI: 3, 4. Updated Central German finds: Niederroßla, grave III – Ostritz 2018, 315, 316, pl. 3: a; Obermöllern, grave 5 – Schmidt 1961, pl. 57: a; 1976, 103; Stößen, grave 25 – Schmidt 1961, pl. 53: g.

<sup>9</sup> Slightly different terms for these variants appear in the earlier work of J. Tejral (2002, 335, 336). The Stößen type corresponds to J. Tejral's Naumburg-Mochov variant, while the Záluží type corresponds to J. Tejral's Stößen-Záluží variant. This classification also appears e.g., in the work of T. Milavec (2007). In our classification, we ultimately opted for the simpler Stößen and Záluží variants, as they have been more common and less confusing in recent decades.

<sup>10</sup> Čelákovice-Záluží, grave 11 – Svoboda 1965, 284, tab. XC: 7; Čelákovice-Záluží, grave 34 – Svoboda 1965, 289, tab. XCIX: 8; Lochenice, grave 4 – Zeman 1990, 90, 96, fig. 35: 17; Prague-Hostivař – Korený/Kostka 2014, 519, fig. 2: 3, 4; Chleby, Nymburk district, surface find – Matoušková 2019, fig. 5: 6; Netřebice, Nymburk district, surface find, unpublished; Šakvice, grave 32 – Tejral 2002, fig. 14: 2; Stößen, grave 68 – Schmidt 1970, 32, pl. 27: 1e. A catalogue of finds also appears in Losert/Pleterski 2003, distribution map 21; list A163.1 and Bemmann 2008, fig. 41; list 16.

representing the eyes of the depicted animal. Early S-shaped brooches of the Záluží or Stößen variant only rarely contain these inlays – the artefact from Hostivice is, together with the brooches from Plzeň-Doudlevice, the only Bohemian example (it is also possible to mention Obermöllern, Saxony-Anhalt, which, however, is a variant similar to the brooch from Dolní Kamenice published in this work, see below). This is only about a fifth of the recorded brooches of these types. In the majority of cases, it is a Stößen variant. Given the presumed origin of these brooches in Central Germany and Bohemia, this is important evidence of a gradual increase in the trade in garnet inlays.

The second S-shaped brooch from Hostivice (no. 8, grave H1762) is unfortunately only a fragment consisting of part of the neck and the eye area with a flat coloured inlay (Fig. 2: 4). Nevertheless, it is possible to comment on it typologically: the head is turned to the right, the neck and head are somewhat more curved than the brooches of the Záluží or Stößen variants, and the front side of the neck is divided by lengthwise chip-carved decoration. It is therefore very likely that this is a Poysdorf-type brooch, a type defined by J. Werner (1962, 169, 170, pl. 70: 2) based, among other things, on the bronze model of this brooch from an artisan's grave in Lower Austrian Poysdorf (Daim/Mehofer/Tobias 2005; Werner 1962, tab. 38: 12). Poysdorf-type brooches are characterised by a central rectangular field with a meander motif and (usually) lengthwise ribs on the necks of the animals. This decoration is chip-carved. The mouths of animals are usually open. A large number of them are known, especially in the Middle Danube Region, and they are also relatively common in Bohemia itself (Droberjar 2013b, fig. 2; Losert/Pleterski 2003, distribution map 19; Milavec 2007, 336, 337; Tejral 2011, fig. 24).<sup>11</sup> B. Svoboda already believed that Poysdorf-type brooches are somewhat younger than the aforementioned variants, thanks to the somewhat more pronounced S-shaped body and the presence of ears on the animal heads (Svoboda 1965, 159, 160). J. Tejral considered them to be typical representatives of the so-called North Danubian phase (510/520–540/550), which corresponds to the early phase of stage E2 (Droberjar 2013b, tab. 1; Tejral 2011, 55–58). However, it is important to remember that the origin of Poysdorf-type brooches can be dated back to before the year 500, as evidenced by grave 432 and 1148 from Altenerding in Upper Bavaria (Losert/Pleterski 2003, 165).

However, the S-shaped brooch from Hostivice – probably of the Poysdorf type – cannot be evaluated

according to a more detailed typological classification due to its very fragmented state of preservation (e.g., von der Lohe 1994; Losert/Pleterski 2003). And yet it is interesting that the share of Poysdorf-type brooches with a garnet inlay instead of an ungilded convex eye with a central ring is significantly higher than in previous variants. In addition to the specimen from Hostivice mentioned here, there is also a brooch from grave 18 in Klučov (Korený/Kudrnáč 2003, 428, fig. 8: 2; tab. 1), a piece from Plzeň-Doudlevice (Svoboda 1965, 257, tab. LXVI: 5) and this certainly also applies to the specimen from Velešice, from which the inlays have fallen out (Matoušková 2016). Outside Bohemia, there is also a Moravian piece from Brno-Holásky (Novotný 1955, fig. 169) and a find from grave 31 in Stößen (Schmidt 1961, pl. 73). If it can be assumed that Poysdorf-type brooches are somewhat younger in terms of development and their workshops are concentrated further south than before, i.e., in the Middle Danube Region, this situation can be explained by the better availability of stone raw materials in a given area and at a given time.

The third S-shaped brooch with a flat garnet inlay instead of eyes is a surface find from Dolní Kamenice in the Kladno region (no. 10; Fig. 2: 5). This is a somewhat unusual type with heads turned to the right, a relatively narrow and unevenly thickened body, circularly twisted beaks, and a slightly protruding large eye with an inlay. The chip-carved decoration of the obverse side is divided into three fields: the necks with lengthwise chip-carving and the middle part with transverse chip-carving. It appears to be a derivative of the early Stößen S-shaped brooch variant, as indicated by the orientation of the heads, the curved beak, and the relatively simple decoration. H. Losert even commonly classifies such brooches as a Stößen variant (Losert/Pleterski 2003, 175, 176, distribution map 21.2). The common grave occurrence of a similar brooch and another S-shaped brooch of the Záluží variant at the Lajh cemetery in Slovenian Carniola is important (Milavec 2007, 336, 348, pl. 1: 1, 2). It is quite likely that in the case of this derivative, the centre of its occurrence can be found in the Alemanni region – as also shown by three specimens from grave 9 and 110 in the Pleidelsheim cemetery near Stuttgart (Koch 2001, 203, 204, fig. 76: 15–17; pl. 7: 3, 4; 44: 4) – but also in the Central German region, as shown by the brooch from grave 9 from Elstertrebnitz (Schmidt 1976, pl. 202: n), or the pair of brooches from grave 5 from Obermöllern (Schmidt 1961, pl. 57: a). While U. Koch finds several similar

<sup>11</sup> In addition to the already longer-known specimens listed in the inventory of E. Droberjar (2013b, 148), newly published specimens from Lipany in the Kolín region (Milítká et al. 2021, 52, 68, 69, fig. 2: 11, 10) and Velešice in the Jičín region can also be added (Matoušková 2016, fig. 2; 3).

specimens in the Merovingian environment, she sees the closest parallels for Pleidelsheim brooches in the Thuringian region (Koch 2001, 204), where they are also heavily concentrated (Losert/Pleterski 2003, distribution map 21: 2). It seems that in such a case, we should evaluate the brooch from Dolní Kamenice similarly to the Stößen variant brooches, both chronologically and culturally.

The last S-shaped brooch is represented by a rare find from Žehuň in the Kolín region (no. 11; Fig. 2: 6), which was already introduced into the literature by E. Droberjar (2013b, 151, 152, fig. 1: 9). Interestingly, it does not correspond exactly to the classical Schwechat-Pallersdorf type (Werner 1962, 76, pl. 1: 3, 4), but is rather a derivative of it. The original Schwechat-Pallersdorf type brooches are more S-shaped and have more heavily articulated beaks. In addition to the eye fill, they are also characterised by three other coloured inlays in the body of the brooch. While this is an isolated occurrence of this late type of S-shaped brooch in Bohemia,<sup>12</sup> many of them are known in the Middle Danube Region, and a bronze model for their production even comes from Mušov (Tejral 2002, fig. 20: 5; 21; 2011, fig. 26: 2). Among the Moravian sites, in addition to the Rovina location at Mušov (Tejral 2011, 61, fig. 26: 1), it is necessary to mention mainly Lužice near Hodonín (Klanica/Klanicová 2011, pl. 41: 27/2, 4; 48: 46/20; 55: 55/33; 57: 61/2; 70: 89/3; 76: 102/1). The variant from Šaratice is then somewhat different (Tejral 2002, fig. 20: 6; Werner 1962, pl. 37: 16). Brooches of this type are an important witness to the last remains associated with the culture of the Migration Period before the arrival of the Prague-type culture. In the Danube Region, it belongs to the latest layer, the so-called North Pannonian phase (the so-called North Danubian-Pannonian transitional phase), to the second third of the 6<sup>th</sup> c. (Tejral 2011, 58–63, 66–69), or phase E2b after E. Droberjar (2013b, 151, 152, tab. 1). These are therefore the latest brooches that we can encounter in this text, and their origin can certainly be sought in the Upper and Middle Danube Region (Losert/Pleterski 2003, 177).

### Bird brooches

Like S-shaped brooches, bird brooches are small fasteners on women's costumes that usually appear in pairs, together with a pair of larger brooches (Martin 2002). Bird brooches are generally considered a typical women's accessory in the western part of the Merovingian circle, while they are

usually absent among the east Germanic peoples (including the Langobardi – although originally Elbe-Germanic people – settled in Carpathian Basin) of the Migration Period (Haimperl 1998, fig. 1; Losert/Pleterski 2003, 154).

One of the typologically earliest of these brooches is an artefact from Budihostice (no. 3; Fig. 2: 7) characterised by shallow parallel grooves on the body, not yet classic chip-carved decoration. We can include a brooch from the eponymous Vinařice site in the same group from Bohemia, though the analogy is not entirely precise – the Vinařice bird brooch has its head turned to the left, does not have a coloured inlay for the eye and has a tail with a different shape (Svoboda 1965, tab. XXIV: 4). A completely new find, thought only fragmentary and also without stone inlay, comes from South Bohemia (John/Štěrbík 2024). According to G. Thiry's typology, it can be classified as type 323 (Thiry 1939, 43, 44, pl. 15: 323), which is very well represented by several pieces from graves 120 and 126 from the Swiss cemetery of Basel-Kleinhüningen (Giesler-Müller 1992, pl. 24: 2, 3; 128: 7, 8). The Budihostice brooch has by far the most formal similarities with the brooches from this burial site – it has the same semicircular shape of the talons and tail. However, the Swiss brooches are missing the coloured inlay in the eye. The brooches from Basel-Kleinhüningen can be dated to before the turn of the 6<sup>th</sup> c., perhaps even as early as 470/480 AD (Haimperl 1998, 97; Koch 2001, 268, 269; Losert/Pleterski 2003, 154). The vast majority of bird brooches from this early stage are known from Western Europe, and only isolated brooches of this type have been found further east (e.g., Brloh, Budihostice, and Vinařice). Based on women's costumes, M. Martin traces the close relationship between the areas of the north-central Danube and the Upper Rhine, especially in the second half of the 5<sup>th</sup> c., and interprets it as the shift of the last Suebian groups towards the west (Martin 2002, 215–219). The find from grave 485 from Altenerding also points to the Danube route (Losert/Pleterski 2003, 155, 159, fig. 21: 1). The Budihostice brooch can therefore be placed in the stage D3/E1–E1 range with an origin in the Upper Rhine to Bohemia.

We evaluate the three bird brooches from Velké Chvalovice (nos. 1 and 24; Fig. 2: 8, 9) and Třebestovice (no. 2; Fig. 2: 10) here in the same place, as they are similar in a number of basic features – in the oval (almond-shaped) shape of the body and the obverse side with chip-carved ribs concentrically aligned with the almond-shaped centre of the body. It creates a kind of central field without

<sup>12</sup> It can be added that relatively recent excavations by the Institute of Archaeological Monument Care of Northwest Bohemia yielded a related and previously unpublished piece from a grave in Droužkovice in the Chomutov district.

any inlay. The head of all these brooches is relatively small, and the eye with the inlay takes up nearly the entire space. The tail of both brooches on which it is preserved is trapezoidal in shape. However, there are also some individual differences between the brooches. The middle rib of the Třebestovice piece is decorated with fine cross-cutting. The beak has a similar shape, but on the Třebestovice brooch it has a slightly accentuated rim, while on both Velké Chvalovice brooches it is curved upwards to a greater extent. The lower trapezoidal end of the brooch, probably representing the tail, is also much smaller on the first Velké Chvalovice brooch. Although the second brooch from Velké Chvalovice has its lower part broken off, the almond-shaped central field of the body is divided into four fields by X-shaped chip-carving. In G. Thiry's work, all three described artefacts are chip-carved bird brooches and roughly correspond to type 330 from Westhofen (Thiry 1939, 44, 45, pl. 15: 330–332), even if the tail is shaped slightly differently. Only in the almond-shaped concentric arrangement of the obverse side of the body do they resemble the individuals from Marchélepot (Thiry 1939, pl. 15: 331, 332) or from Rositz in Thuringia (Schmidt 1976, 160, 161, pl. 199: 4/i, k). However, these are distinguished by their 'swallowtail' and the presence of lobe-like talons on the right side of the body. Related variants include brooches with virtually identical shapes (i.e., almond-shaped body, trapezoidal tail, absence of talons) with coloured inlays both on the tail and in the central field of the body, which can be dated with certainty to the first half of the 6<sup>th</sup> c. (Losert/Pleterski 2003, 160, fig. 22: 8, 9; Thiry 1939, 136, pl. 6: 45).<sup>13</sup> Chip-carved bird brooches usually fall into Central German phase 4, i.e., Transdanubian phase E2 (Hansen 2004, 49, 50). As for the origin of these brooches, while bird brooches are generally associated with the Merovingian circle in the narrower sense of the word, some of their chip-carved variants apparently developed at its far eastern edge, namely in the southern part of Central Germany (Schmidt 1961, 132, 133, pl. 41: n, t) and in Bohemia. This is evidenced by a number of newly discovered and published surface finds from settlements in the Central Bohemian Elbe region. Based on some brooches, E. Droberjar created a variant of chip-carved bird brooches with 'fins' in place of the tail called Weimar-Sokoleč/Thiry 390 (Droberjar 2008b, 246, fig. 12: 1–4). The brooches from Třebestovice and Velké Chvalovice presented here find their closest analogies precisely from sites that are

usually only a few kilometres apart, in a densely populated region south of the Elbe (Fig. 4) – in addition to the brooches mentioned above, there is the artefact published by E. Droberjar from the settlement in Tatce (Fig. 4: 4; Droberjar 2008b, fig. 12: 5) and the find from the settlement in Sokoleč, first presented here (Fig. 4: 5). These brooches are distinguished either by the presence or absence of a garnet inlay instead of eyes, or by small details (proportions of the head, beak, body, and tail, or the finely cross-cut rib of the chip-carving). It is therefore undoubtedly a locally produced variant, which we call the Tatce type based on the first published find.

Another bird brooch comes from disturbed graves of the well-known Prague-Podbaba cemetery (today Prague-Dejvice; no. 4; Fig. 2: 11; see Svoboda 1965, tab. LI: 5). It is a chip-carved brooch, with crescent-shaped talons carved out on the right side and two flat coloured inlays – one for the eye, the other filling in the trapezoidal tail. Its specific feature is a field filled with zigzag chip-carving between the longitudinal ribs of the chip-carved decoration in the abdominal area. As such, it is a hybrid between brooches decorated with cloisonné and chip-carved brooches, as G. Thiry once divided them. This researcher was already able to mark the brooch in question from Podbaba with its number 387 and she dated it, together with a wider group of chip-carved brooches, to the later 6<sup>th</sup> c. (Thiry 1939, 46, pl. 17: 387). However, if we look at the individual marks that can be identified on this brooch, we can say that the crescent-shaped talons are also a feature of some simple brooches with coloured inlays, e.g., G. Thiry 121–148 (Thiry 1939, pl. 10), but also of many others (though these are simple in the Rhineland, without chip-carved decoration and usually with wings on the back). If we stay with chip-carved brooches, we find links among them primarily for the use of zigzag chip-carving in the abdominal area (Thiry 1939, pl. 15: 336–343). Some of them have signs of talons, others are without wings or talons, and sometimes they have a coloured inlay not only for the eye, but also on the tail (Thiry 1939, pl. 15: 336–339). They are dated to the 6<sup>th</sup> c., from its beginning to the second half (Thiry 1939, 43, 44). U. Koch believes that sickle-shaped talons (germ. *Sichelfuß*, Code X22) are typical of her South German phase 4, i.e., ca. 510–530 AD, although they may also occur in the following phase (Koch 2001, 46, 74–77, fig. 14; 15). These are the reasons why E. Droberjar specifically lists this brooch as a representative of stage E2 (Droberjar 2008b, 241, pl. 8: 11). In terms of

<sup>13</sup> It is appropriate to mention here the hypothesis of a relationship between these brooches with a trapezoidal tail and an almond-shaped body without talons and the shape of a fish as a potential Christian motif (Losert/Pleterski 2003, 160; Odenweller 2017).

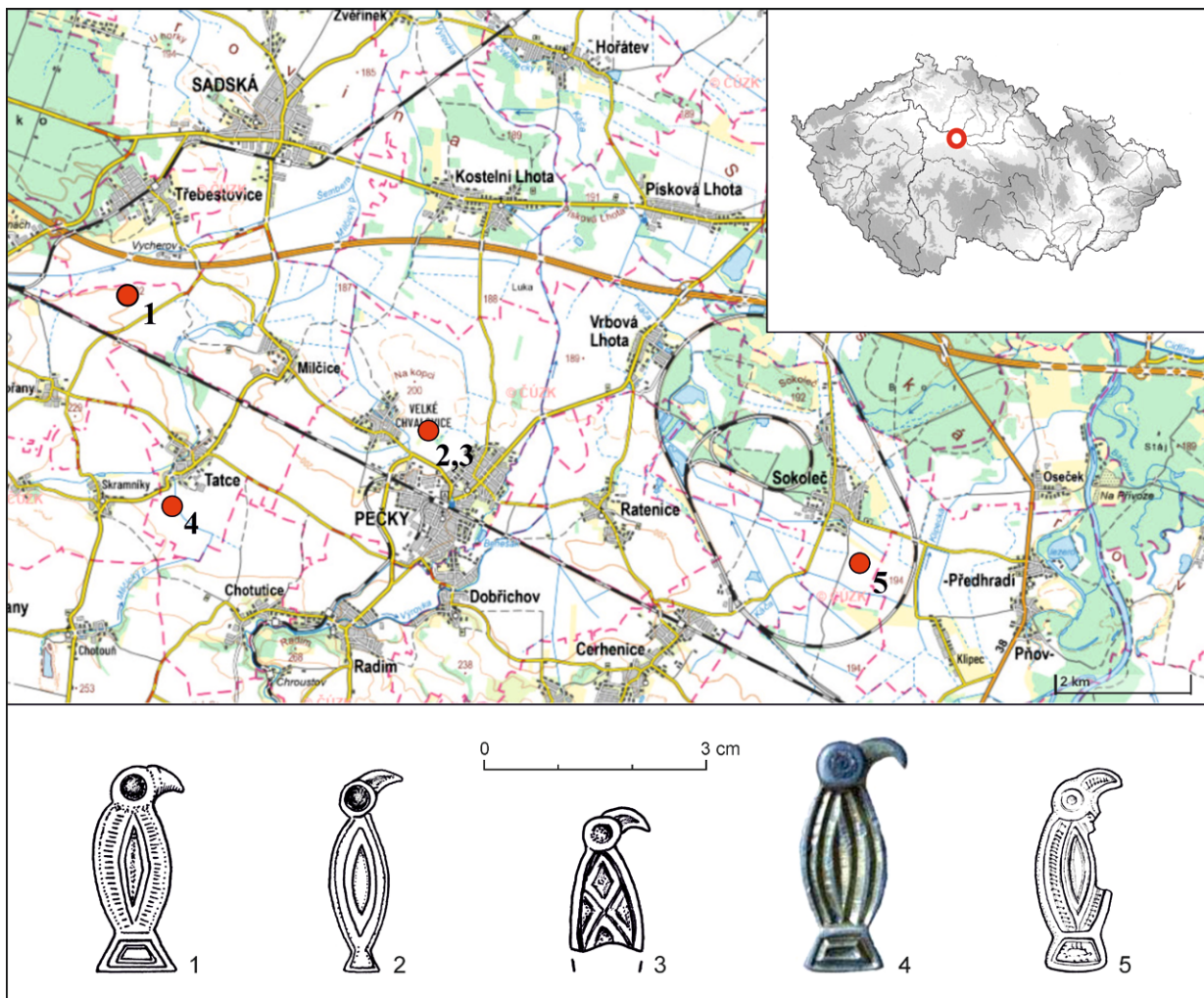


Fig. 4. Bird brooches of the Tatce type with a concentration in Central Bohemia. 1 – Třebestovice; 2–3 – Velké Chvalovice; 4 – Tatce (after Droberjar 2008b, fig. 12: 5); 5 – Sokoleč. Drawing I. Vajglová, A. Waldhauserová, map Z. Beneš.

its origin, the Alemannic-Frankish region can be mentioned first, which is the direction in which, e.g., the contents of another rich female grave (XIV) from the Podbaba cemetery also point (Urbanová/Kostka/Korený 2010).

The last bird brooch presented is one from a newly discovered site in Vyšehořovice (no. 5; Fig. 2: 12). This is a very unusual variant for which no corresponding analogy has yet been found. It is almost completely preserved (only the broken beak is missing). Its body is oval in shape and features a single central red cabochon. Although the artefact has not yet undergone conservation, it is evident that the remaining obverse surface of the body is hallmarked with small semicircles along the edges. The fin-shaped tail and large round head are completely filled with flat coloured inlays. In general, it could perhaps be classified among the bird brooches with cabochon decoration according to G. Thiry, which are dated relatively late, to the

second half of the 6<sup>th</sup> c. (Thiry 1939, 58, 59). However, the specimen from Vyšehořovice also bears a number of older features – the symmetrical oval body and the swallow-shaped (even fin-like) tail are reminiscent, for example, of the already mentioned Weimar-Sokoleč type brooches (Droberjar 2008b, 246, fig. 12: 1–4) or brooches from Aupitz (Schmidt 1970, pl. 1: 2/e). Another noteworthy partial analogy is the brooch from grave 72 from the Weimar-Nord cemetery, where the motif of a fin-shaped split foot filled with a stone inlay is used not only on the foot but also three times on the oblong headplate (Schmidt 1970, 85, pl. 94: 1/a). The large area covered with flat inlays may also indicate a relationship with the fully cloisonné-decorated brooches identified as Gruppe 4 at the Altenerding burial site. There, they represent the youngest bird brooches from the years 525–550 AD (Losert/Pleterski 2003, 155). The tendency to define a central field on the obverse side of the brooch

body appears both on these brooches in the cloisonné technique (Thiry 1939, pl. 6: 45–52; 8: 75), and on brooches with cabochons (Thiry 1939, pl. 21: 487–493). Decoration with semi-circular stamps is a phenomenon that we observe since the 5<sup>th</sup> c. and thus has no great chronological significance for us (Bitner-Wróblewska/Pesch/Przybyła 2020; Quast 2017). In our opinion, we can place this brooch in stages E1–2, though its area of origin is difficult to define, as it is still a unique product. However, based on some of the aforementioned features, we can assume that it is a product of some workshop in the East Merovingian circle, which also includes Bohemia.

Potentially the last piece of a bird brooch is a fragment from Řepov (no. 25; Fig. 2: 13). Although it was initially identified as the broken-off heel of a buckle pin, given the shape of the fracture's cross-section, it cannot be ruled out that it is a broken-off foot of a small bird brooch of the G. Thiry 86–160 type (Thiry 1939, pl. 9; 10).

#### **Late miniature brooches related to the Krefeld type and miniature Thuringian brooch**

The foot of the brooch from Šlotava (no. 13; Fig. 2: 14) is characterised by its shorter length, transverse ribbing, and a garnet inlay at the circular widening at its end. Based on the mentioned features, it may be a brooch from the Weimar/Arcy-Sainte-Resitue group (Koch 1998, 381, note. 1; Kühn 1965, 86). The brooches of this group are relatively small, only around 3 cm, have a semicircular headplate with three spherical buttons, a short bow and a short, transversely ribbed foot. Yet, the brooch from Šlotava is evidently of bigger proportions. The footplate ends in a round appendix, which can be decorated with polychrome inlays (Koch 1998, 381, 382; Kühn 1965, 86, fig. 9). The occurrence of the Weimar/Arcy-Sainte-Resitue group of brooches is linked to the territory of Central Germany, but they are also known from the Alemannic region and are represented in the Rhineland region. The height of the occurrence of these brooches was in the late 5<sup>th</sup> c. (stage E1) and in several regional variants they still appear in the first half of the 6<sup>th</sup> c. (Koch 1998, 388). Besides the basic variants, four other subtypes were identified, including miniature plier-shaped brooches (Koch 1998, 289–391, map 24). However, in the case of the foot fragment from Šlotava, it is not possible to determine which variant of the brooch from this wider group of brooches it specifically concerns.

The brooch from Třebestovice (no. 12; Fig. 2: 15) can be confidently attributed to miniature Thur-

ingian plier-shaped brooches; characterised by a smooth base plate with a semicircular cutout on both sides, the brooch has a short and smooth bow and an equally short foot decorated with a simple polychrome inlay. A formally similar find comes from grave 79 from the well-known Stößen necropolis (Schmidt 1961, 130, fig. 6: 3; pl. 38: b; 1970, 34, pl. 30: 1/h). B. Schmidt (1961) dated it to horizon IIb, i.e., to the period approximately between 480 and 525 AD. J. Bemmman dates the plier-shaped brooch from grave 10 at the Rathewitz cemetery between the second half of the 5<sup>th</sup> c. and the mid-6<sup>th</sup> c. (Bemmman 2008, 165, fig. 19: 7, 8). In contrast, J. Tejral (2002, 329) dates the same grave to approximately the last third of the 5<sup>th</sup> c. We can mention other finds of undecorated miniature plier-shaped brooches from Bernhardsthal and Ringelsdorf (both Lower Austria; Tejral 2002, 329, 330, fig. 10; 2008, 273, pl. 16: 6, 19). Miniature plier-shaped brooches with headplates with rich chip-carved decoration come from grave 201 from the Upper Bavarian Altenerding cemetery (Losert/Plesterski 2003, 113, fig. 12: 8, 9) and are similar in shape to classic plier-shaped brooches, albeit with a shorter foot decorated with transverse grooves. A miniature plier-shaped brooches with a smooth headplate and an undecorated bow also comes from the same burial site (grave 1108; Losert/Plesterski 2003, 117, fig. 12: 12).

Other finds of Thuringian miniature plier-shaped brooches are known from the territory of Bohemia and fall into stage E1. The brooch from Třebestovice is closest in shape to the find of a miniature plier-shaped brooch with a short narrow bow and a short foot from the settlement in Velké Chvalovice (Droberjar 2008a, fig. 5: 19), to the older find from Pnětluky (Droberjar 2008a, fig. 5: 7; Svoboda 1965, 153, fig. 56: 5) or to the brooch from grave 41 from Prague-Podbaba (Droberjar 2008a, fig. 5: 10; Svoboda 1965, tab. L: 9). The shape of the headplate is also very similar to the brooch from Lipany (Militká/Beneš/Šámal 2018, 670–672, fig. 8: 3). The mentioned brooches are characterised by a smooth plate with a semicircular cutout on both sides, a short and smooth bow, and an equally short foot. It is immediately apparent that these variants either lack decoration, or it is limited to simple, cross-ribbed feet, concentric rings, and linear engraved decoration. However, the mentioned analogies lack the polychrome inlay found on the brooch from Třebestovice. These brooches can be classified in the group of Thuringian miniature plier-shaped brooches of the Rathewitz-Burlandingen type, which F. Gall (2008, 85, fig. 8: 4, 5) dates to the last third of the 5<sup>th</sup> c. and the first third of the 6<sup>th</sup> c. According to J. Tejral,

they fall into stage E1, i.e., the years 480–510/20 AD (*Droberjar 2008a*, 137; *Tejral 1990*, 234, fig. 2; 2005, 123, fig. 10).

It is evident from a basic overview that concentrations of Rathewitz-Burlandingen-type brooches and miniature plier-shaped brooches of the Weimar/Arcy-Sainte-Restitue type is found in Thuringia, in the Upper and Middle Danube regions and in Bohemia, where in recent years there has been an increase in the number of finds of mainly undecorated variants. It is thus a typical artefact of the East Merovingian area (*Bemmann 2008*, 183, fig. 36; *Gall 2008*, 86; *Koch 1998*, 389–391, map 24; *Matoušková 2015*, fig. 6; *Tejral 2002*, 329–331, fig. 10).

### Thuringian bird-headed bow brooches

Among the fasteners characteristic of the Thuringian-Alemannic area in the later phase of the Migration Period are bow-shaped brooches with a headplate stylised in the shape of two bird heads depicted from the side. Two specimens are the subject of this study – the first from grave 12 at the Prague-Podbaba cemetery (no. 16; Fig. 5: 1; *Svoboda 1965*, 156, 262, tab. XLIV: 4) and the second from grave 7 at the Lochenice cemetery near Hradec Králové (no. 15; Fig. 5: 2; *Zeman 1990*, 92, 96, fig. 37: 23; tab. XXVIII: 7). Both of these graves probably belonged to women. The garnet inlays on both of these brooches are small circular flat pieces representing the birds' eyes. We also know other similar artefacts from Bohemia, namely an older find (most likely from a disturbed grave) from Radostice (*Svoboda 1965*, 156, 271, tab. LXXX: 1) and a new find from a surface survey at the Nová Ves I site near Kolín (*Droberjar 2008a*, fig. 7: 1).

Thuringian brooches were divided by B. Schmidt into four types at the time (*Schmidt 1961*, 128, 129, pl. 36; 37): a) bird brooches with heads facing upwards and b) bird brooches with heads turned downwards (the other two types include plier-shaped brooches, but we will not discuss them here). It was already evident in that work that in both cases these are brooches concentrated mainly in Central Germany (*Schmidt 1961*, fig. 55a). Of the Bohemian finds, only the brooch from Lochenice can be included in group 'a' – Gruppe A according to A. Koch (1998, 393–396, map 25), who adhered to B. Schmidt's system. We can then include the brooches from Prague-Podbaba, Radostice and

Nová Ves I in B. Schmidt's group 'b', or Gruppe B according to A. Koch (1998, 396–399, map 25).<sup>14</sup> As for the dating of both types, A. Koch imagined them to be roughly the same age, i.e., from the first half of the 6<sup>th</sup> c. (*Koch 1998*, 396, 399). Ch. M. Hansen dates Gruppe B brooches to Central German stage (MD) 3, which corresponds to Danubian stage E1 (*Hansen 2004*, 42, 43). On the other hand, Gruppe A brooches, which she calls the Eischleben type, are moved up to Central German stage 4 (corresponding to Danubian stage E2).<sup>15</sup> This undoubtedly reflects the influence of the work on South German brooches by H. Kühn, who also places the highpoint in the dating of these brooches in the first half of the 6<sup>th</sup> c. (as does *Bemmann 2008*, 175), but sees the Battle of the Unstrut River in 531 AD between the Frankish and Thuringian armies as an important impetus for the spread of these brooches further west and southwest (*Kühn 1974*, 817–827). E. Droberjar adopted the dating of these brooches to stage E2 without further discussion (*Droberjar 2008a*, 140), which we consider problematic. According to the latest comprehensive analysis of these brooches, it is clear that the Gruppe A brooches and their variants are distributed evenly, though not densely, in the East Merovingian area, as in addition to Central Germany they are also found more densely in the Upper Rhine and the Danube Region (*Bemmann 2008*, 175, fig. 27; 28; *Losert/Plesterski 2003*, 109, 110, fig. 12: 1, 2; distribution map 7).

Returning to the Gruppe B bird-head brooches according to A. Koch in Bohemia, it should be noted that only the brooches from Prague-Podbaba and Nová Ves I contain coloured inlays, while the brooch from Radostice has eyes only suggested by a concentric circle in place of the inlays. This group of brooches is also being divided today into a larger number of variants (*Bemmann 2008*, 176, 177, fig. 29; 30). From this point of view, the brooch from Prague-Podbaba belongs to the basic variant of these brooches, while the brooches from Radostice and Nová Ves I, thanks to the presence of a circular protrusion on the foot with a coloured inlay, rank alongside brooches from Central German sites such as Oberweimar and Stößen, grave 1 (*Bemmann 2008*, 176, fig. 30: 4; *Droberjar 2008a*, fig. 7). It therefore seems that although this group of brooches is widespread from the Rhineland to Hungary, the Bohemian finds undoubtedly have the closest relationship to those from Central Germany.

<sup>14</sup> The brooches from Radostice and Nová Ves I are also similar in that the end of the foot has an animal head, which in both cases is accompanied by a circular protrusion with a third coloured inlay.

<sup>15</sup> However, in the work of A. Koch, the Eischleben type represents only one of the Gruppe A brooch variants, although probably the most important one (*Koch 1998*, note 78; cf. *Bemmann 2008*, 175). It must be said that the brooch from Lochenice truly corresponds to the classic representative of the Eischleben variant.



Fig. 5. 1 – Prague-Podbaba (no. 16); 2 – Ločenice (no. 15); 3 – Hostivice-Palouky (no. 14); 4 – Čelákovice-Záluží (no. 17); 5 – Roudnice nad Labem-Hracholusky (no. 18); 6 – Dolní Kamenice (no. 20); 7 – Čelákovice-Záluží (no. 19). Drawing M. Černý, A. Waldhauserová, photo J. Souček, 2 after Zeman 1990.

### Plier-shaped bow brooch with trapezoidal foot

A remarkable plier-shaped brooch, previously unpublished elsewhere, comes from grave H1905 from the Hostivice cemetery (no. 14; Fig. 5: 3). It is characterised by the classic shape of the headplate and a longer trapezoidal foot, richly decorated with chip-carved decoration in the form of a simple zigzag braid. The lower end of the foot is then terminated with two round lobes (in the literature, the term 'swallowtail foot' is used for this shape of the foot end), each decorated with one circular garnet inlay. The bow is heavily damaged in the centre of the obverse, perhaps due to abrasion caused by long-term use, so that the longitudinal groove decoration is partially destroyed.

B. Schmidt included plier-shaped brooches in the broad group of 'c) Thuringian brooches' (Schmidt 1961, 128, 129, pl. 37–40). A. Koch classifies these types (group VII.3.1) as plier-shaped bowbrooches with a trapezoidal foot and also notes the zigzag braid motif on the foot, with roots in the West European environment (Alemannic-Frankish region; Koch 1998, 399–403). The brooches from grave 22 from Obermöllern (Saxony-Anhalt; Schmidt 1961, pl. 39: b; 1976, 107, pl. 186: 3: b) and Berlin-Rosenthal (Schmidt 1961, pl. 39: c) are closest to the Hostivice specimen, namely the chip-carved motifs on the headplate and foot, but also the shaping of the lower part of the foot with stone inlays. Also very similar is a brooch from Lavoye, Dép. Meuse, grave 189, in which bird beaks grow from round protrusions on the edge of the foot with inlays (Koch 1998, 400, pl. 50: 18; Schmidt 1961, pl. 39: d). Another common feature of the aforementioned brooches and the find from Hostivice is the bow decorated with longitudinal grooves (which is damaged in the middle part of the Hostivice artefact).

It is interesting that the shape of the brooch foot is reminiscent of older Wiesbaden-type brooches (Martin 2002, fig. 11), which could indicate the Elbe Region origin of this element. However, if we turn to the zigzag braid motif on the obverse side of the foot, we can repeat A. Koch's opinion that this motif comes from the Alemannic-Frankish environment (Koch 1998, 403) and examine it more closely. It is necessary to counter that we find this motif in the East Merovingian environment in a number of cases, usually in the context of a range of variants of plier-shaped brooches: for example, from grave 22/XVII and 15/X from Čelákovice-Záluží (Svoboda 1965, tab. XCIII: 12; LXXXIX: 4) and from grave 4 from Lochenice (Zeman 1990, 87–90, fig. 35: 13). From Central Germany, we can also mention Osendorf (Schmidt 1976, pl. 50: 5/b, c; 175: 1/b, c) and Streufdorf

(Schmidt 1970, 96, pl. 106: 2). However, this motif can also be found in Langobard cemeteries in the Middle Danube Region, e.g., in grave 28 from Borotice (Stuchlík 2011, pl. 11: 28/2), grave 95 from Holubice (Čižmář 2011, pl. 23: 95/1, 2) and graves 18 and 54 from Lužice near Hodonín (Klanica/Klanicová 2011, pl. 37: 18/2, 3; 52: 54/1, 2). In exceptional cases, we encounter this motif in the Western Baltic cultural circle – see grave 48 from the Tumiany (germ. Dau-men) cemetery, where similar Merovingian imports are further imitated by their own products (Hilberg 2009, 257, fig. 7.34).

We therefore agree with J. Bemmman's opinion that these variants of plier-shaped brooches with a swallowtail foot and protrusions come primarily from Central Germany or the marginal (southern and western) zones of the East Merovingian circle (Bemmman 2008, 179–182, fig. 33). As for dating, researchers have slightly different opinions. While A. Koch sees the height of their occurrence at the turn of the 6<sup>th</sup> c. and the first third of the 6<sup>th</sup> c. (Koch 1998, 399–403), Ch. M. Hansen dates them to Central German stage 4, i.e., the stage E2 used here (Hansen 2004, 41, 130–132, fig. 28). Apparently, their dating is somewhat broader, as H. Kühn also mentions (Kühn 1974, 840).

### Várpalota-Udine-Čelákovice-type brooch

Representatives of the latest stage of the Migration Period in Bohemia include a bow-shaped brooch from grave 5/I in Čelákovice-Záluží (no. 17; Fig. 5: 4; Svoboda 1965, 143–145, 283, tab. LXXXVIII: 1), an extraordinary piece of jewellery comparable to finds from only a few other sites. Moreover, it was deposited in the grave in practically unused condition. The four coloured stone inlays combine two flat stones and two cabochons (forming the eyes on the animal-shaped foot).

B. Svoboda considered this brooch to be a product of Middle Danubian or Pannonian workshops from the time of the Langobard rule in the territory. The closest parallel – mainly due to the decoration with relief tendrils on the semicircular headplate and sides of the bow, as well as the rectangular, coloured stone inlay between the bow and the foot – are the brooches from grave 5 in Várpalota, Hungary (Bóna 1956, 187, 207, pl. XXVIII: 1, 2; Werner 1962, pl. 2: 1, 2). Another close analogy is a pair of brooches from a cemetery in Udine (Werner 1962, pl. 24: 7, 8). These have in common with the Čelákovice brooch the tongue of the animal head, also inlaid with more intricately cut garnet inlays – in the case of the Udine site, the inlays are in two parts, separated by a partition. The aforementioned brooches are

so similar that they allowed the Várpalota-Udine-Čelákovice type to be distinguished (*Droberjar 2008a*, 141). Interestingly, the described brooches differ in the number of decorative buttons on the headplate: the brooches from Udine have eight, the brooch from Čelákovice has seven, and the brooches from Várpalota have six. As for the chip-carved decoration of the spirals, J. Werner mentions a pair of brooches from a female grave in Dresden-Nickern (albeit without garnet inlays) and Nordendorf (Bavarian Swabia; *Werner 1962*, 40, 41). From a typological perspective, we can base our evaluation on a number of characteristics. For example, the presence of a rectangular stone inlay between the bow and the foot is interesting. This is a feature found on Danubian brooches with a uniformly wide foot, specifically brooches with a semicircular headplate, such as the Eisleben-Stößen type dated to the turn of the 5<sup>th</sup> and the 6<sup>th</sup> c. (*Losert/Pleterski 2003*, 121, 122), but also on the aforementioned Szarvas type brooches. The garnet-inlaid tongue on the foot, as found on brooches from Udine and Čelákovice, can also be found on other types of Danubian brooches with a uniformly wide foot (*Werner 1962*, 41).

According to both J. Werner (1962, 40, 41) and J. Tejral (2002, 342), brooches of the Várpalota-Udine-Čelákovice type were manufactured north of the Middle Danube. According to J. Tejral, it belongs to the relatively early Danubian forms, though already those that have analogies in Northern Italy (*Tejral 2002*, 342, fig. 20: 7). The brooches from Udine would be among the oldest brooches brought to Italy by the Langobards. It is therefore possible to date them to J. Tejral's North Danubian-Pannonian phase, roughly corresponding to the younger phase of stage E2 (for synchronisation tables, see *Droberjar 2008b*, tab. 1; 2013b, tab. 1). The brooch from Čelákovice-Záluží is a product made at a high technological level.

### Discbrooch with cloisonné

An extraordinary example of a discbrooch with cloisonné comes from disturbed graves from Roudnice nad Labem-Hracholusky (no. 18; Fig. 5: 5; *Svoboda 1965*, 160, tab. LXXVII: 3). Specifically, it is a discbrooch with one central and five peripheral segments. The brooch can be classified in a large group of brooches with a central segment and four or more peripheral segments (ASFeinze after *Hansen 2004*, 53) or the 'Kleinfibeln' group after M. Martin (1995). These brooches are often found in women's graves and are located in the neck and chest area, where they can appear both in pairs and

individually. This costume element is documented by grave finds from the West Merovingian territory, as well as in Central Germany and in areas inhabited by the Langobards (*Bóna/Horváth 2009*, 193; *Korený 2024*, 74; *Martin 1995*, 633–636). In grave 95 in Holubice, Moravia, a pair of disc brooches with coloured inlays were found on the chest, complemented by a pair of silver plier-shaped Straß-type brooches (*Čížmář 2011*, 211, 212, pl. 23: 95/4, 5). These too were part of the West Merovingian costume, which are otherwise quite rare in the territory of the Czech Republic. Other examples come from e.g., Šakvice in Moravia (*Tejral 2005*, 148, 149; 2011, 33). If we view the brooch from Hracholusky as a representative of the West Merovingian costume, it can be assumed that it was accompanied in the original find inventory by other brooches, though these are unfortunately not preserved. The combination of one or two disc brooches with two other brooches in the pelvic area appears already at the turn of South German stages SD 3–4 and reaches its maximum in stage SD 5 (480/510–555 AD; *Koch 2001*, 72–77; *Korený 2024*, 74, 75, tab. 2). However, in the territory of Pannonia we also encounter the rare occurrence of discbrooches in graves, as can be seen e.g., in grave 2, 28 and 48 at the Szentendre-Pannóniatelep cemetery (*Bóna/Horváth 2009*, pl. 37: 2/1; 40: 28/2; 47: 48/1). It can therefore be assumed that jewellery of West Merovingian origin was also worn in the East Merovingian area according to local customs.

The development of discbrooches can be linked to the fashion for miniature brooches in the Merovingian environment, which begins in the mid-5<sup>th</sup> c. and continues until the end of the 6<sup>th</sup> c. In the case of discbrooches with coloured inlays, one can consider their gradual development, with an increase in the number of segments and greater compositional complexity (*Martin 2000*, 237). The most common types include circular brooches with four peripheral segments, such as those from grave 22 in Obermöllern (*Schmidt 1961*, pl. 41: x). In later brooches from the mid-6<sup>th</sup> c., we can observe an increase in segments to 11 and the addition of decoration in the form of granulation and filigree (*Martin 2000*, 237). Simple discbrooches with five to six segments are dated to the period of 485–555 AD in the Lower Rhineland. In Bavaria, their dating can be supported by their occurrence in the Schretzheim cemetery, where they are dated to its first phase, specifically to the section of 525/35–545/50 AD (*Hansen 2004*, 53, fig. 47). M. Friedrich came to a similar conclusion for South Germany and specified the main occurrence of this piece of jewellery in the years 520–560/580 AD, with some subtypes even remaining in the second half of the 6<sup>th</sup> c. (*Friedrich 2016*, 88–90, 136). Based

on the dating of South German finds, we can date the brooch from Hracholusky to Danubian stage E2 (*Droberjar 2008a*, 141). In the territory of Pannonia, discbrooches are dated to the first half of the 6<sup>th</sup> c. (*Friedrich 2002*, 181–185; *Horváth 2012*, 220). In the case of the discovery of discbrooches from the territory of Pannonia, it is possible to consider them as an import from the West Merovingian region, or possibly the northern Franks and the neighbouring Alemannic-Baiuvarii region to the south (*Quast 2008*, 366–372). The existence of local workshops in the Rhineland, e.g., in Cologne, Mainz and Trier, is being considered. Other smaller workshops may have operated in South Germany, where they very successfully adopted the Mediterranean jewellery tradition (*Arrhenius 1985*, 188–193, distribution map I; II; *Horváth 2012*, 217–221).

### **Buckle pins with a rectangular lug and garnet inlay**

Among the representatives of buckle pins with an oblong extension and inlays at the heel is the newly discovered pin from Dolní Kamenice presented here (no. 20; Fig. 5: 6). Unfortunately, the buckle frame itself was not found, and the hook, which was originally located on the underside of the foot of the pin, is also broken off. The rest of the pin is rather small, planoconvex in cross-section and slightly beak-like. Two flat, rectangular, dark red inlays were set into the compartment at the foot of the pin. It should be noted that this find has a direct analogy in the buckle pin from the disturbed graves from Radonice nad Ohří (*Svoboda 1965*, 113, 114, 270, 271, tab. LXXX: 5). The second Bohemian find is a complete buckle from the Prague-Podbaba cemetery, but the coloured inlay has fallen out of the compartment at the foot of the pin (*Svoboda 1965*, 114, tab. LXXIX: 1). A possible second such representative presented here for the first time is the fragment from Řepov (no. 25; Fig. 2: 13). However, upon closer inspection, a difference is apparent compared to the pin from Dolní Kamenice – at the point where the pin breaks, just behind the rectangular extension with a coloured inlay, the pin's cross-section is flat and rectangular, not planoconvex. It is therefore entirely possible that this is not a fragment of a buckle pin, but rather the broken-off foot of a small bird brooch of the G. Thiry 86–160 type (*Thiry 1939*, pl. 9; 10), or possibly of a completely different artefact.

However, as far as buckle pins with a 'box-shaped' foot are concerned, this is a well-known type of artefact from the Early Merovingian cultural circle. Some specific products can be directly

linked to Mediterranean workshops, while others are at least derived from them (*Tejral 2015*, 331). Luxury variants (undoubtedly made in the Mediterranean) are already known to us thanks to the find from Mšec (*Blažková/Jiřík/Bezákova a kol. 2023*, 224). While other simpler variants were demonstrably produced in the Middle Danube Region, their distribution is so wide (from Western Europe to the Caucasus) that there must have been many more workshops involved in their production (*Tejral 2015*, 331–333, fig. 24). The small size of some of the pins suggests that they were part of shoe buckles, which is probably the case with the new finds presented here. As buckles with coloured inlaid pins usually appear in wealthy warrior graves, there is no doubt about their elite representational function. Based on the datable units, it can be concluded that these buckles were produced mainly around the middle of the 5<sup>th</sup> c., and also in the late 460s (*Tejral 2015*, 333).

### **Kidney-shaped pendant**

A small kidney-shaped pendant comes from grave 16/XI at the Čelákovice-Záluží cemetery (no. 19; Fig. 5: 7; *Svoboda 1965*, tab. LXXXIX: 2). The closest in shape to it is the gold pendant from Hostivice-Palouky (grave H1980), whose surface is divided into three small fields, framed around the outer perimeter with small beaded wire (*Daněček/Korený/Perlík 2017*, fig. 1). The main difference between the compared finds is the material used, as the pendant from Záluží is silver, while the piece of jewellery from Hostivice is made of gold. The use of stones is specific – in the case of the pendant from Hostivice-Palouky, all are almandines (*Daněček/Korený/Perlík 2017*, 519), while in the case of the pendant from Záluží, the central stone was identified as apatite. As for kidney-shaped pendants decorated with the cloisonné technique, we can mention another (now lost) find from Prague-Šárka on which the obverse surface was divided into nine simple, mostly trap-ezoidal, compartments inlaid with garnets (*Korený/Janíková 2011*, 937, fig. 1: 1). Kidney-shaped pendants can be dated from the mid-5<sup>th</sup> c. to the first third of the 6<sup>th</sup> c. (*Daněček/Korený/Perlík 2017*; *Korený/Janíková 2011*). For the sake of completeness, we should also mention formally similar crescent-shaped pendants. The first comes from grave 80 from Strachotín in South Moravia (*Čižmář/Geislerová/Rakovský 1985*, fig. 5: 11; tab. 1), the second from grave HXXX at the aforementioned cemetery in Hostivice (*Daněček/Korený/Perlík 2017*, fig. 1; 3: a). The crescent-shaped pendants have a long history dating back deep into the Hellenistic period. Later, the crescent shape was

adopted even in barbarian Europe. The distribution and dating of these finds are quite broad and it is not possible to link this type of jewellery with a specific production area. One example is a simple, gold, crescent-shaped pendant from Kerch, which is dated to the 5<sup>th</sup> c. (*Menghin/Springer/Wamers Hrsg.* 1987, 97, 110, pl. 1, I, 16.b). A gold necklace from a tomb in Dunapataj-Bödpuszta (*Bóna* 1991, 293, pl. XXIX) dated to the second half of the 5<sup>th</sup> c. is decorated with seven crescent-shaped pendants. Another example of crescent-shaped pendants comes from grave 14 from Mühlhausen, where they are part of a rich necklace and are decorated using the cloisonné technique. Like the Bohemian finds, they feature beaded wire around the perimeter (*Schmidt* 1961, pl. 43: b; 1976, 148, pl. 115: 7/a).

## ARCHAEOLOGICAL SURVEY OF JEWELLERY AND COLOURED INLAYS

### Methodology

Due to their diversity and different technological processing, the artefacts evaluated in this study were first thoroughly studied using optical microscopy, i.e., an Olympus SZX9 stereo microscope. The varying quality of stone processing and the overall design of the jewellery were documented.

To determine the chemical composition of the garnets, a non-destructive method was employed using an Orbis PC Micro-EDXRF ( $\mu$ -XRF) elemental analyser (EDAX, Germany) with a Rh X-ray tube and sample operated in a vacuum. The use of micro-XRF provides several advantages, especially in the case of valuable historical objects. It is a non-destructive method, and the sample can be measured 'as it' (the analysed spots on the artefact have only been cleaned to remove corrosion products and secondary contamination). The Orbis is equipped with poly-capillary optics enabling the production of a focused 30  $\mu$ m X-ray spot. The measurement conditions were set as follows: accelerating voltage at 50 kV and analysis time of 100 s. Data quantification/control was realised primarily using pyrope and almandine from the SPI 02753-AB mineral standard (SPI Supplies). For a smaller set of garnets (8), scanning X-ray fluorescence microanalysis was used (equipment constructed at the Department of Dosimetry and Application of Ionizing Radiation; CTU Prague). It consists of a semiconductor Si-PiN detector (Amptek, 6 mm<sup>2</sup>  $\times$  0.5 mm) and a molybdenum X-ray tube equipped with polycapillary focusing optics (XOS, X-Beam: Powerflux PF). The X-ray device was operated at a maximum voltage of

50 kV and a maximum current of 1 mA. The lateral resolution of this system is approximately 20  $\mu$ m. However, measurements performed with this instrument do not provide reliable values for Mg and Al; therefore, these elements are not included in the table. Due to the short loan period, only Raman spectroscopy was used at object 23/13347. The comparison of both measurements was conducted on the same selected stones, with the conclusion that the results of both methods are compatible for comparison.

The results of chemical analyses were complemented by molecular structural data obtained from Raman microspectroscopic analyses. Raman spectra were measured with a Thermo Scientific Raman dispersive spectrometer – DXR microscope model equipped with an Olympus confocal microscope. The excitation source was a 532 nm Nd:YAG laser with an input power of 10 mW, utilising a grid of 900 notches/mm. A multichannel thermoelectrically cooled CCD camera was applied as a detector. The samples were measured at 50 $\times$  magnification with a measurement footprint of ca. 1  $\mu$ m<sup>2</sup> through an aperture of a 50  $\mu$ m pinhole. Finally, Omnic 9 (Thermo Scientific) was used to process the obtained spectra. The determined peak positions were evaluated using the Miragem software (created by Prof. Bersani's group) for the quantitative evaluation of the garnets.

A Tescan Vega 3 scanning electron microscope (SEM) with an Oxford Instruments INCA 350 LMU energy dispersive analyser (SEM/EDS) was used to determine the chemical composition of the metals and decoration technique as niello. The following analytical condition were employed: 20 kV accelerating voltage, 1 nA beam current, 100 nm beam size and 100 s measurement time. The XRF method was also used to confirm mercury or amalgam gilding on the objects. An Axios XRF spectrometer (PANalytical, Holland) was used for the analysis. Characterisation: Rh lamp, 4 kW generator, 3 collimators, 8 crystals (PX1, PX5, PX4a, PX7, PE002, Ge 111, LiF 200, LiF 220), 2 detectors – proportional and scintillation. Evaluation using Omnian software. One of the inlays on the S-shaped brooch from Žehuň (no. 11) was loose, so it was possible to measure the compartment material. The analysis was performed using a Thermo Scientific Nicolet iN10 microscopic FT-IR spectrometer with an MCT-A detector equipped with a germanium microATR attachment. The sample was measured at 15 $\times$  magnification with a measuring footprint of ca. 75  $\times$  75  $\mu$ m. The spectra were measured in the spectral range 4000–675 cm<sup>-1</sup> at a resolution of 4 cm<sup>-1</sup> and with 64 spectral accumulations, aperture 300  $\mu$ m.

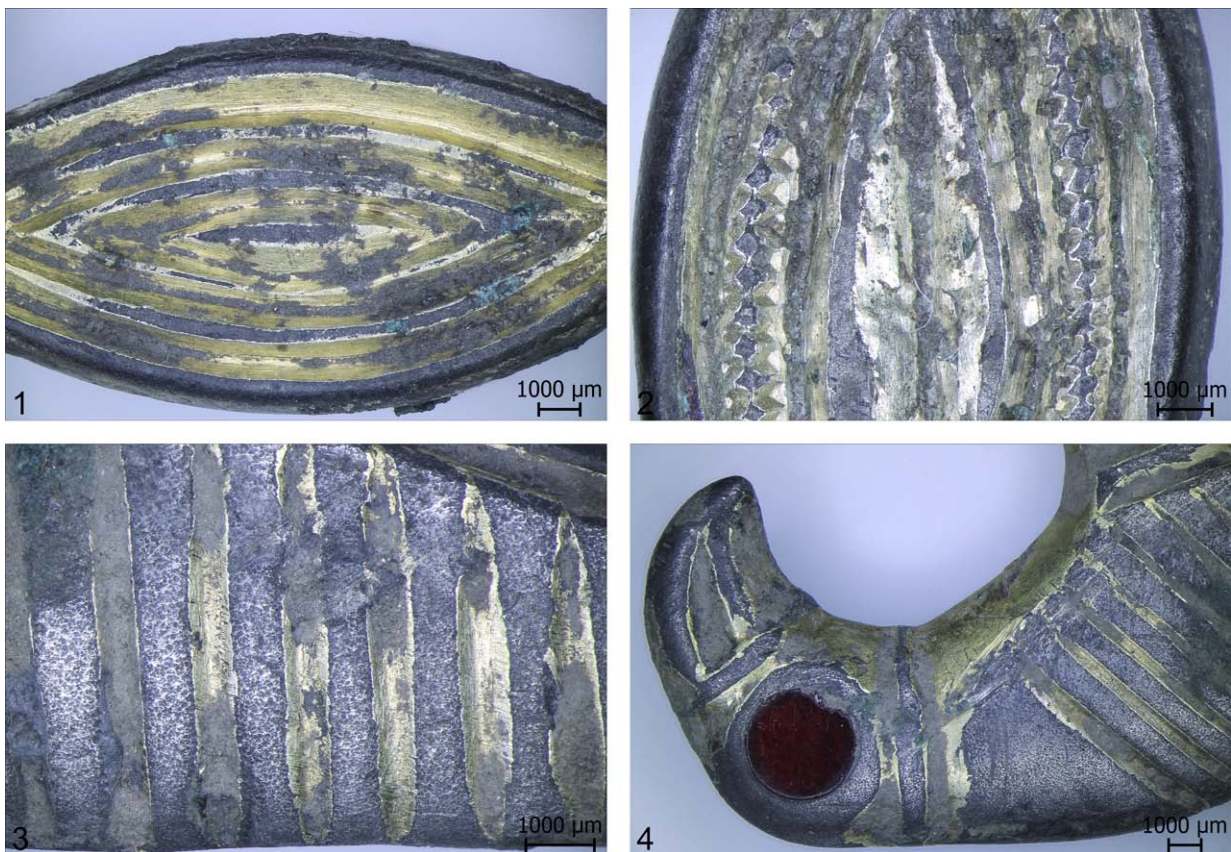


Fig. 6. Grooved and chip carved decoration. 1 – Velké Chvalovice (no. 1); 2 – Třebestovice (no. 2); 3, 4 – Budihostice (no. 3). Photo Z. Zlámalová Cílová.

### Jewellery production technology, jewellery techniques and analysis of metals used in the production of jewellery

The technique of setting coloured inlays (not only precious stones, but also pieces of glass, other semi-precious stones, or even bones) into jewellery has been known in Western and Central Europe since about the beginning of the 5<sup>th</sup> c., and in the Alemannic-Frankish region it was widespread in the second third of the 6<sup>th</sup> c., with the upper limit of its occurrence being traced back to the 8<sup>th</sup> c. (Bitner-Wróblewska/Pesch/Przybyła 2020, 255–274; Gilg/Gast/Calligaro 2010; Hilgner 2018; Quast/Schüssler 2000, 75). This decorative ('polychrome') style came to the West from the Roman East, especially from the Black Sea region, where it was known since the 4<sup>th</sup> c. (summary in Čisťáková *et al.* 2022, 339–342). In the 5<sup>th</sup> c., this decoration was mainly used on truly elite jewellery, but gradually this decorative method began to be applied to simpler objects as well. This led to a gradual simplification and standardisation of production and decoration techniques (Horváth 2012, 216; Horváth *et al.* 2024, 2; Mozgai/Horváth/Bajnóczi 2021, 48). At the end of the 6<sup>th</sup> c. and in the

7<sup>th</sup> c., it is possible to observe a certain renaissance in the use of garnet inlays, which reappear on impressive (elite) objects. At the beginning of the 8<sup>th</sup> c., this method of jewellery decoration disappears and is replaced by other fashionable techniques (von Freeden 2000; Horváth *et al.* 2024, 2).

In the individual typological groups of analysed jewellery, the use of different materials can be observed, e.g., qualitatively distinct alloys of precious metals and different production processes (Horváth 2012, 208; Horváth *et al.* 2024). The typological-chronological analysis and the technological study of the jewellery presented here is helping us look for answers to the following questions: Is it possible to distinguish between products of domestic and foreign origin? Can domestic production traditions and technological transfers from other territories be traced? Can the supply of raw materials be reconstructed and trade routes interpreted?

Finding answers to these questions is complicated by the fact that in times of migration, the mobility of artefacts and specialised producers – as itinerant craftsmen – is quite common. Such representatives of a supraregional goldsmithing tradition could produce 'local' artefacts anywhere and literally adapt



Fig. 7. Grooved, stamped and chip carved decoration. 1 – Prague-Podbaba (no. 4); 2, 3 – Nový Bydžov (no. 6); 4 – Plaňany (no. 7); 5, 6 – Hostivice-Palouky (no. 9). Photo Z. Zlámalová Cílová.

the morphology of the products to local demand. Based on the technological properties of jewellery, it is usually possible to determine or estimate only goldsmithing traditions or workshop procedures, but not the specific place of production (Horváth 2012, 216).

#### Decorative techniques

At the beginning, it is appropriate to define the basic terminology of jewellery techniques observed

in the studied assemblage. First, we can mention the technique of 'true *cloisonné*', for which two basic conditions must be met: the beds for the coloured inlays must be separated by separate metal compartments that are soldered both to the base plate and to each other. Furthermore, two main variants of this technique can be distinguished: 'standard *cloisonné*', where the compartments are soldered directly to the backing plate, and 'suspended *cloisonné*' (or 'fused paste *cloisonné*'), where only the surrounding frame is soldered to the substrate, while the



Fig. 8. Grooved and chip carved decoration. 1, 2 – Dolní Kamenice (no. 10); 3 – Žehuň (no. 11); 4 – Šlotava (no. 13); 5, 6 – Ločenice (no. 15). Photo Z. Zlámalová Cílová.

individual compartments are connected only to this frame and to each other and are anchored using a backing paste (for older overview of techniques used in Arrhenius 1985, 79–91; and new in Hilgner 2018, 305; Horváth 2012, 210–215). Only a few objects from the studied collection can be classified as cloisonné technique, specifically a circular brooch from Roudnice nad Labem-Hracholusky (no. 18; Fig. 5: 5, 20) and a pendant from Čelákovice-Záluží (no. 19; Fig. 5: 7; 26: 4). However, in Bohemia we most often encounter the 'pseudo cloisonné' technique, which

can be associated with the term *champlevé*, where coloured inlays are set in beds that were either directly cast or engraved into a metal base (Horváth 2012, 215, 224).

The entire assemblage is dominated by chip-carved cast artefacts (Fig. 6–9). This decorative technique is based on procedures that originated in late antiquity near the limits of the western provinces. Unlike the provincial products of the 4<sup>th</sup> c., which were usually made of copper alloys, the artefacts decorated using the chip-carved technique



Fig. 9. Čelákovice-Záluží (no. 17). 1–6 – grooved and chip carved decoration. Photo Z. Zlámalová Cílová.

from the 5<sup>th</sup> and 6<sup>th</sup> c. are made of silver alloy, often with amalgam gilding or niello decoration (Bitner-Wróblewska/Pesch/Przybyła 2020, 274–280; Horváth 2013, 284, 285). The basic shape of the artefacts was most often cast using the lost wax technique, with brooches being cast in one piece, with the exception of the profiled buttons and parts of the fastening mechanism, which were made separately (Mozgail/Horváth/Bajnóczi 2021, 48). Surprisingly fine details could be achieved with this method, including beds for inlaying stones. In objects with chip-carved decoration, one can observe a fluctuating quality

of craftsmanship related not only on the period of creation, but above all on the geographical origin. Fifth-century artefacts from the Carpathian arc are of exceptionally high quality – they are characterised by elaborate ornamentation and sharp lines. In contrast, quality declines on products from the 6<sup>th</sup> c.; these lack precision and artistic refinement. Nevertheless, the products of the Langobard workshops are somewhat higher quality than those found in the original Gepid territory the Tisza River region (Horváth 2013, 285). The craftsmanship of brooches found in the territory of the Czech Repub-



Fig. 10. Čelákovice-Záluží (no. 19). Example of beaded wire decoration. Photo Z. Zlámalová Cílová.

lic also varies, which is striking in the masterfully rendered chip-carving on the bow-shaped brooch from Čelákovice-Záluží (no. 17; Fig. 9), which is characterised by fine symmetry and the sharpness of lines. In general, however, simpler linear decoration prevails in other jewellery, as can be observed on bird brooches (Fig. 6: 3, 4; 8: 2). Here, it is undoubtedly appropriate to consider the existence of central workshops capable of producing very complicated products, often combining several jewellery techniques. The brooch from Nový Bydžov is decorated with stamped decoration (Fig. 7: 2). The decoration in the form of beaded wire appears only on the pendant from Čelákovice-Záluží (no. 19; Fig. 10). We also encounter the use of beaded wire elsewhere in the Bohemian environment, e.g., in the form of spirals from a necklace from grave 135 from Prague-Zličín, or on a pendant from a rich female grave from Úherce (Jiřík/Vávra 2015, 153, 157).

### Composition of metal alloy

Based on the analysis of the alloy composition in the examined jewellery assemblage, we can distinguish three groups:<sup>16</sup> an alloy with a higher silver content (90–98.6%), an alloy with a medium silver content (80–87.9%), and an alloy with a lower silver content (54.3–75.5%; Fig. 11; Tab. 1). The highest share of silver is found in the kidney-shaped pendant from Čelákovice-Záluží (no. 19), the lowest in the bird brooch from Velké Chvalovice (no. 24). The quality of the silver itself is extremely variable, as is also known from finds from other areas. The highest quality of 90–98.6% corresponds to the best

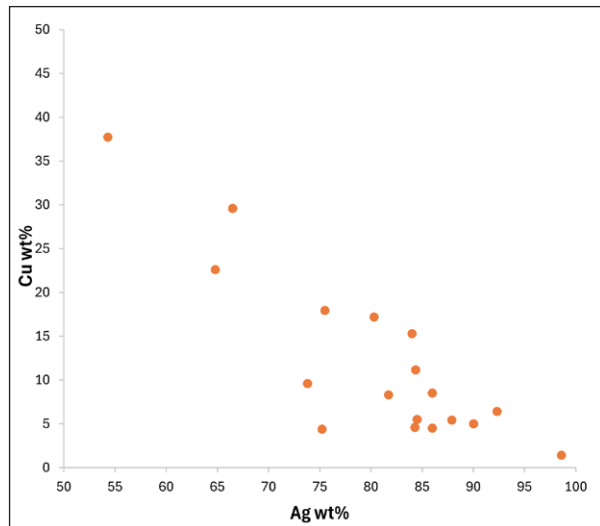


Fig. 11. Composition of the silver alloy of the objects based on the SEM/EDS measurements plotted on the Cu vs. Ag curve. Author V. Čisťáková.

Roman products (Horváth 2013, 289). Low-quality silver was characteristic of jewellery since the end of the 5<sup>th</sup> c., when the share of copper gradually increased (Horváth et al. 2024, 10; Mozgai/Horváth/Bajnóczi 2021, 59). A relatively broad range of alloys can be observed in the examined assemblage: silver was alloyed either with pure copper (3 cases) or with lead bronze (3 cases). Furthermore, alloying with tin bronze with additional lead (3 cases), tin bronze alloy (1 case), or a copper alloy containing lead, tin and zinc (8 cases) is documented. The presence of gold in the alloy of the bird brooch from Budihostice (no. 3) can be associated with the recycling of gilded silver (Horváth et al. 2024, 10). No connection can be observed between the type of artefact, the purity of the silver, and the composition of the alloy. However, it is possible to consider bronze alloying as waste from metallurgical production (Horváth/Mozgai/Bajnóczi 2019; Mozgai/Horváth/Bajnóczi 2021, 51, 52, tab. 3). Finally, lead, tin, and zinc admixtures are relatively common in silver jewellery from the 4<sup>th</sup>–6<sup>th</sup> c. (Horváth et al. 2024, 10). Alloying using copper was intended to lower the melting point of the alloy.<sup>17</sup> On the other hand, the more copper is added to silver, the more yellowish the alloy becomes. This can be prevented by adding zinc to the alloy to provide a 'bleaching' effect. The addition of zinc also boosts tarnish resistance, and the objects acquire a much more attractive shine. Brass was used primarily

<sup>16</sup> For most objects, it was possible to remove the top layer of material for more accurate measurements without contamination by gilding or corrosion products. However, for some artefacts, this intervention was not permitted, and measurements were only taken on the surface to identify the gilding.

<sup>17</sup> Specifically, the share of copper is up to 28%, when the melting temperature is the lowest, i.e., 779 °C (Selucká ed. 2022, 9, fig. 3).

Tab. 1. Elemental composition of metal objects analysed by SEM/EDS (wt%). Author Š. Msallamová.

| Catalogue number | Inv. number | Site                           | Ag   | Cu   | Sn   | Zn  | Pb   | Au  | S |
|------------------|-------------|--------------------------------|------|------|------|-----|------|-----|---|
| 1                | –           | Velké Chvalovice               | 73.8 | 9.6  | 12.2 | 0.9 | 3.4  | –   | – |
| 2                | –           | Třebestovice                   | 86   | 4.5  | 6.5  | 0.7 | 2    | –   | – |
| 3                | –           | Budihostice                    | 80.3 | 17.2 | –    | –   | 1.3  | 1.1 | – |
| 5                | –           | Vyšehořovice                   | 81.7 | 8.3  | 5.7  | –   | 2.9  | –   | – |
| 7                | –           | Plaňany                        | 92.3 | 6.4  | –    | 0.7 | –    | –   | – |
| 8                | 15911       | Hostivice-Palouky              | 84.3 | 4.6  | 6.5  | 0.4 | 2.4  | –   | – |
| 9                | 13589       | Hostivice-Palouky              | 84   | 15.3 | –    | –   | 0.8  | –   | – |
| 10               | 10297       | Dolní Kamenice                 | 84.5 | 5.5  | 5.7  | –   | 2.3  | 2   | – |
| 11               | –           | Žehuň                          | 87.9 | 5.4  | 3.8  | –   | 2    | –   | – |
| 12               | –           | Třebestovice                   | 66.5 | 29.6 | –    | 1   | 2    | –   | – |
| 13               | H1-429836   | Šlotava                        | 64.8 | 22.6 | 8    | –   | –    | –   | – |
| 14               | 14371       | Hostivice-Palouky – corrosion  | 75.2 | 4.4  | 4.7  | –   | 0.9  | –   | – |
| 15               | 24/77       | Lochenice                      | 90   | 5    | –    | –   | 3.5  | –   | – |
| 17               | H1-43432    | Záluží (near Čelákovice)       | 84.4 | 11.2 | –    | 0.2 | 2    | –   | – |
| 18               | H1-224026   | Roudnice nad Labem-Hracholusky | 75.5 | 17.9 | –    | 2.9 | 3.7  | –   | – |
| 19               | H1-43486    | Záluží (near Čelákovice)       | 98.6 | 1.4  | –    | –   | –    | –   | – |
| 20               | 10375       | Dolní Kamenice                 | –    | 71   | 13.2 | 1.9 | 13.8 | –   | – |
| 24               | –           | Velké Chvalovice               | 54.3 | 37.7 | –    | –   | –    | –   | 8 |
| 25               | –           | Řepov                          | 86   | 8.5  | –    | 2.2 | 3.3  | –   | – |

for the production of cast silver alloys and silver solders until modern times. The addition of tin has a similar effect in terms of improving colour and tarnish resistance in a copper-rich silver alloy. The natural lead content in silver is usually in the range of 0.5–1.2% by weight; higher percentages indicate intentional lead addition to the copper alloy (Greiff 2012, 249–251).

The group of bird brooches in our assemblage shows considerable inhomogeneity in alloy composition, the difference being particularly striking in the case of brooches from Třebestovice (no. 2) and Velké Chvalovice (no. 24). In the case of the brooch from Třebestovice, brass was used for alloying due to the zinc content. The buckle from Velké Chvalovice, on the other hand, contains an alloy of pure copper of approximately 37.7%. If we focus on the group of S-shaped brooches, we find a silver content in the alloy of 84–87.9%. The most similar composition is found in two S-shaped brooches (nos. 8 and 9) from the Hostivice burial ground with a silver content of 84–84.3%. The buckle pin from Dolní Kamenice (no. 20) has a different composition – it is an alloy of copper containing lead, tin and zinc. Differences in the elemental composition

of silver alloys mean that different types of silver were used in production. It is possible that the shortage of raw materials towards the end of the 5<sup>th</sup> c. led to more intense recycling of various materials (Mozgai/Horváth/Bajnóczi 2021, 61). Moreover, it has been shown that goldsmiths of the 5<sup>th</sup>–6<sup>th</sup> c. did not use a uniform or deliberately stable method of alloying metals.

### Gilding

Fire gilding (also amalgam gilding) is a historical plating technique in which gold is applied to a metal surface using a gold-mercury amalgam. This method may have been used as early as the 1<sup>st</sup> c. AD in the Roman world, but it was a relatively demanding and expensive technique, the origins of which can be traced back to ancient Greece and China in the 4<sup>th</sup>–3<sup>rd</sup> c. BC (Armbruster 2018, 13; Darque-Ceretti/Aucouturier 2013, 650; Oddy 1981, 78). The fire gilding technique began to be used to a greater extent in Europe no later than the 4<sup>th</sup> c. AD and dominated especially in the 5<sup>th</sup>–7<sup>th</sup> c., when it replaced older processes such as mechanical plating or gilding using gold foil (Aufderhaar

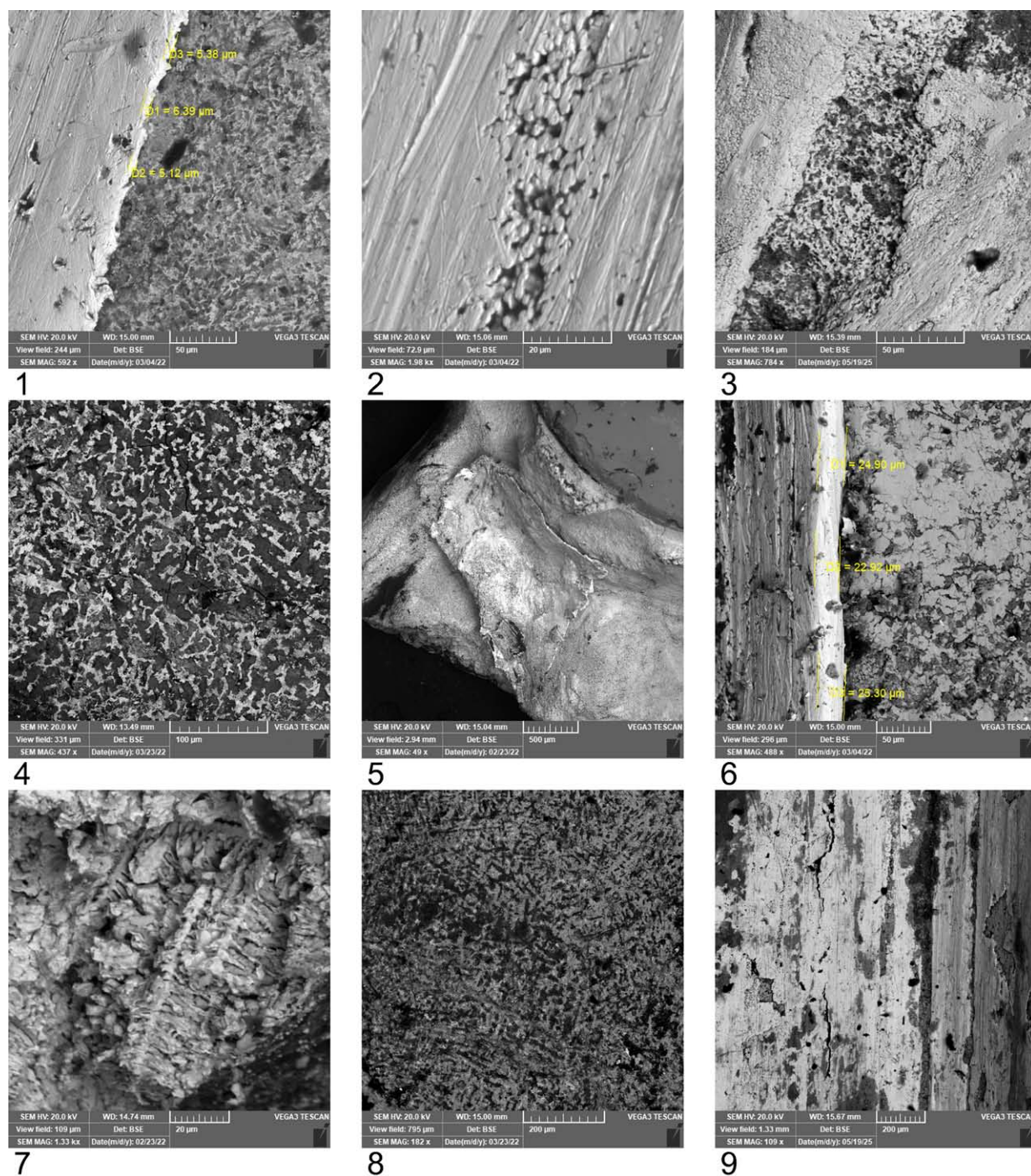


Fig. 12. Electron images of the surface and gilding. 1 – rather thin gilding on the surface of the brooch from Velké Chvalovice (no. 1); 2 – unfinished surface treatment of fire gilding on the brooch from Velké Chvalovice (no. 1); 3 – unfinished surface treatment of fire gilding on the brooch from Velké Chvalovice (no. 24); 4 – casting structure, Třebestovice (no. 2); 5 – traces of gilding on the brooch from Hostivice-Palouky (no. 8); 6 – rather thick gilding on the surface of the brooch from Dolní Kamenice (no. 10); 7 – casting structure of the brooch from Hostivice-Palouky (no. 22); 8 – casting structure of the buckle fragment from Dolní Kamenice (no. 20); 9 – gilding on the brooch from Řepov (no. 25). Photo Š. Msallamová.

2009, 247; Horváth/Mozgai/Bajnóczi 2019). It spread throughout Europe and remained the main gilding technique until the 19<sup>th</sup> c., when it was replaced by electroplating due to the toxicity of mercury. This technology is based on amalgam – a paste created

by mixing gold and mercury at a slightly elevated temperature, typically in a ratio of 1:6 to 1:8 by weight (Aufderhaar 2009, 247, 248; Margreiter et al. 2022, 1466). This mixture is applied to the surface of a metal object (bronze, copper, but preferably

Tab. 2. Traces of gilding – Au and Hg, analysed by SEM/EDS. Author Š. Msallamová.

| Catalogue number | Inv. number | Site                           | Au | Hg |
|------------------|-------------|--------------------------------|----|----|
| 1                | –           | Velké Chvalovice               | +  | +  |
| 2                | –           | Třebestovice                   | +  | +  |
| 3                | –           | Budihostice                    | +  | +  |
| 4                | H1-51291    | Prague-Podbaba                 | +  | +  |
| 5                | –           | Vyšehořovice                   | +  | +  |
| 6                | 96858       | Nový Bydžov                    | +  | –  |
| 7                | –           | Plaňany                        | +  | –  |
| 8                | 15911       | Hostivice-Palouky              | +  | +  |
| 9                | 13589       | Hostivice-Palouky              | +  | +  |
| 10               | 10297       | Dolní Kamenice                 | +  | +  |
| 11               | –           | Žehuň                          | +  | +  |
| 12               | –           | Třebestovice                   | +  | +  |
| 13               | H1-429836   | Šlotava                        | +  | –  |
| 14               | 14371       | Hostivice-Palouky – corrosion  | +  | +  |
| 16               | H1-51164    | Prague-Pobaba                  | +  | +  |
| 17               | H1-43432    | Záluží u Čelákovice            | +  | +  |
| 18               | H1-224026   | Roudnice nad Labem-Hracholusky | +  | –  |
| 19               | H1-43486    | Záluží (near Čelákovice)       | +  | –  |
| 24               | –           | Velké Chvalovice               | +  | –  |
| 25               | –           | Řepov                          | +  | +  |

silver) and then heated above the boiling point of mercury, i.e., 356.5 °C.<sup>18</sup> During this process, the mercury evaporates and a layer of gold remains on the surface, which is further smoothed and polished (*Darque-Ceretti/Aucouturier* 2013, 650). The resulting layer is often a few micrometres thick, typically 5µm, though some objects have thicker layers of up to 10µm. Yet another method, amalgam gilding, involved painting mercury on a metal substrate, pressing on gold foil and then heating. The result did not differ in appearance from the first amalgam gilding method, only the final thickness of the gold is greater (*Armbruster* 2018, 12). In the case of gold plating, a diffusion zone is created at a microscopic level between the substrate and the gold, which ensures its good adhesion (*Darque-Ceretti/Aucouturier* 2013, 650; *Margreiter et al.* 2022, 1469, 1470). The quality of the subsequent surface treatment after hot gilding can be observed on the surface of some of the studied objects (Fig. 12: 1–3, 5–6, 9). Poor surface sealing after gilding (Fig. 12: 2, 3) is even apparent on both bird brooches from Velké Chvalovice (nos.

1 and 24). In contrast, the surface of a fragment of a brooch or buckle pin from Řepov (no. 25) shows high-quality workmanship (Fig. 12: 9).

Evaporation occurs at a temperature of 250–350 °C and the final weight of mercury in the final gold layer is 5–25% (*Aufderhaar* 2009, 245, 246; *Margreiter et al.* 2022, 1468, 1469). In the case of 14 objects from the jewellery assemblage presented here, gold and the presence of mercury were identified on their surfaces, which can be linked to the application of the fire gilding method. Interestingly, traces of gold were found on the surface of six artefacts, but the mercury levels were below the detection capabilities of the device (Tab. 2). Lower mercury concentrations in amalgam gilding layers may actually signal partial mercury removal or leaching as a result of time and environment. Also, if no mercury was detected, the object need not have been gilded using the fire gilding technique. However, we must also take into account that the surface of archaeological finds may have been severely mechanically damaged (*Margreiter et al.* 2022, 1476). But we can

<sup>18</sup> In practice, this can mean a temperature of 400–500 °C.

also consider the diffusion bonding technique, i.e., a technology for applying a thin layer of gold that uses atomic diffusion between a gold foil and a substrate, typically silver. A gold foil up to 20 µm thick was applied to the metal substrate and pressed firmly into the grooves. This was followed by heating to temperatures around 300 to 500 °C, usually for a short time, to allow atomic diffusion and create a durable stable bond between the layers (Armbruster 2018, 10–12). The technique provided a high-quality and stable connection with a resulting gold layer approximately 5–20 µm thick, with high resistance to corrosion. However, the method was not suitable for heavily profiled or wavy metal shapes, or for copper alloys with a high oxidation tendency (Aufderhaar 2009, 246; Becker *et al.* 2003, 179, 180). This method was probably known only to a narrow circle of craftsmen and was more time- and technically demanding than later amalgam gilding (Becker *et al.* 2003, 187). Its use in the Barbaricum is documented since the 3<sup>rd</sup> c. AD, when it was scientifically verified on artefacts from the rich grave from Gommern. Other finds are known from Illerup, Klein Körös, and Thorsberg (Armbruster 2018, 26–28; Becker *et al.* 2003, 171).

### Niello

Another decorative technique, encountered mainly on brooches, is niello. Niello was composed primarily of one or more metal sulphides – primarily silver (Ag<sub>2</sub>S), copper (Cu<sub>2</sub>S), and lead (PbS; Newman/Dennis/Farrell 1982, 80). However, the proportions of these elements varied, sometimes considerably, based on different production traditions (Mozgai/Horváth/Bajnóczi 2021, 46). The niello technique, used to highlight engraved or punched lines on metal objects, was especially widespread in the 4<sup>th</sup>–7<sup>th</sup> c. AD; however, in the ancient world, niello made of silver and sulphur appears as early as the 1<sup>st</sup> c. AD (Stemann 1995, 133). This method of decoration used a dark metal mixture that was inlaid into depressions on silver, gold or bronze artefacts. The result was a striking contrast between the light background and the dark line – an effect with both aesthetic and symbolic value (Mozgai/Horváth/Bajnóczi 2021, 45, 46). Although niello was probably applied in the form of a powder or paste, K. Stemann Petersen (1995, 147) also offers the possibility of applying niello in the solid form of fine wire.

Niello decoration was recorded on a brooch from Čelákovice-Záluží (no. 17), a brooch from Lochenice

(no. 15), Prague-Podbaba (no. 16) and Plaňany (no. 7). All of these brooches feature simple decoration in the form of two lines of small triangles oriented towards each other, located on the lengthwise spine of the brooch bow (Fig. 8: 6; 9: 3). According to the analysis of the niello of the brooch from Prague-Podbaba, the mixture consisted of silver, copper and sulphur (Ag 12.13%, Cu 52.32%, S 12.13%). This niello belongs to group II after S. La Niece (1983), i.e., niello made of sulphur, silver and copper, which was widespread mainly at the turn of the 6<sup>th</sup> c.<sup>19</sup> A formula for niello made from sulphur, silver, and copper is found in Pliny the Elder (Niece 1983, 281). Pure single-component silver sulphide produces niello with a metallic lustrous blue-black surface, but has a higher melting point of 845 °C. In contrast, multi-component niello mixtures (Ag<sub>2</sub>S, Cu<sub>2</sub>S and also PbS in the Middle Ages) have a lower melting point, as the addition of copper enabled work at lower temperatures of approximately 600–650 °C (Kmošek/Prášil 2014, 54; Newman/Dennis/Farrell 1982, 83, 84; Stemann 1995, 133, 134). The amount of copper also affects the resulting hardness of the niello. For gilded brooches, niello was applied first, as it requires a temperature of at least 600 °C, while amalgam was applied later, as it only required a temperature of 350 °C (Kmošek/Prášil 2014, 55–57). Niello was applied into pre-prepared grooves, in our case in the form of triangles created using the punching technique.

### Backing foils

The development of decorated backing foils is closely related to the development of the cloisonné technique itself. These foils are usually thin sheets of gold alloy that were decorated by stamping decorative patterns. However, it was not just an aesthetic detail; the ornamentation significantly influenced the optics of the whole and created the impression of depth or the glow of the inlays. The oldest use of backing foils without decoration is documented as early as the Hellenistic period, when they were used as purely functional reflective layers. It is possible that this technique reached the Mediterranean from India. The use of undecorated backing foils is also documented in the Roman-provincial environment from the 1<sup>st</sup> c. AD, specifically with translucent stones in finger-rings. This technique truly flourished in the 5<sup>th</sup>–7<sup>th</sup> c. and originated from Late Roman sheet metal jewellery decorated with engraving or stamping. In the end,

<sup>19</sup> A similar composition (Ag 66.49%, Cu 32.89%, Zn 0.15%, Pb 0.13%) was measured in niello from a brooch from Čelákovice-Záluží (no. 17). However, sulphur values were not measured, which was due to previous careless conservation that removed sulphides from the surface of the object.

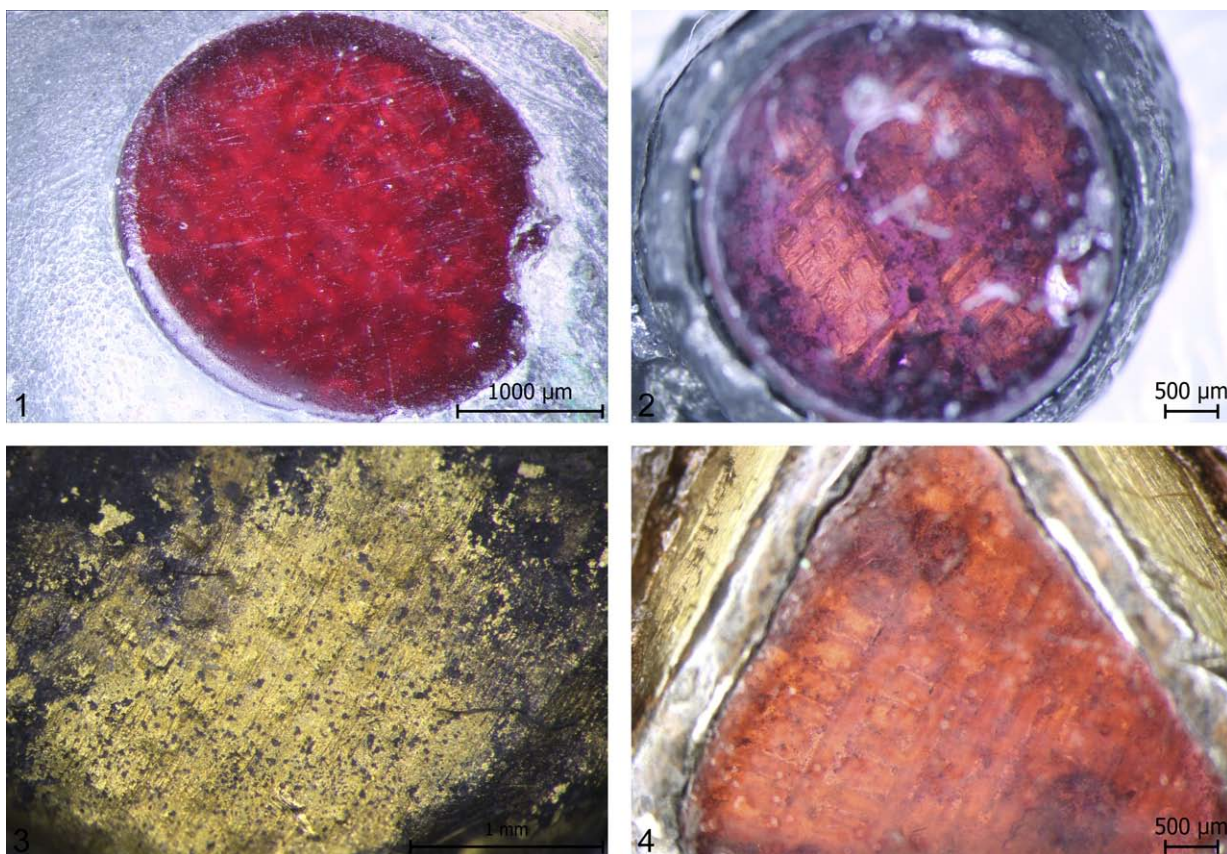


Fig. 13. Backing foils. 1 – Budihostice (no. 3); 2 – Hostivice-Palouky (no. 8); 3 – Nový Bydžov (no. 6); 4 – Žehuň (no. 11). Photo Z. Zlámalová Cílová.

these two techniques – backing foil and engraved decoration on sheet metal jewellery – appear together in the 5<sup>th</sup> c. (Adams 2006, 12, 16). N. Adams (2006, 13, fig. 3) describes several basic groups of backing foil: waffle, boxed waffle patterns and ring-and-dot. The most widespread pattern is the waffle pattern, which is known from jewellery from Kerch dated to the turn of the 5<sup>th</sup> c. and continuing until the 7<sup>th</sup> c. In the case of waffle patterns, one can find different variations, e.g., a grid in the form of diamonds, or different grid coarseness (Avent/Leigh 1977, 2, fig. 1). From the assemblage we examined, we were able to document the backing foil for only a few objects due to the state of preservation of the artefacts and the translucency of the stones. Of course, the removal of stones from beds where they were well-fixed was ruled out. In most recorded cases, the pattern is predominantly a waffle, but it has varying coarseness and design (Fig. 13; 14: 1, 3, 4). On the S-shaped brooch from Žehuň (no. 11; Fig. 13: 4), we can observe a relatively coarser grid, while on the brooch with bird heads from Prague-Podbaba (no. 16), we can observe an uneven design of the pattern (Fig. 14: 1). In contrast, the foil from the circular brooch from Roudnice

nad Labem-Hracholusky is finer and more regular, with the spacing between individual lines being 0.17–0.23 mm. The brooch from Hracholusky also has a combination of foils with a boxed waffle pattern and concentric rings (Fig. 14: 2–4). The ring-and-dot pattern appears at the turn of the 6<sup>th</sup> c. and continues throughout the 6<sup>th</sup> c. and into the 7<sup>th</sup> c. (Adams 2006, 12, 17, 18). This pattern was quite popular, and one of the areas with which these products are associated is South Germany, where workshops significantly influenced by the Mediterranean jewellery tradition may have operated. These products were then distributed further east, e.g., to Langobard Pannonia. The same motif is found on S-shaped brooches from the Pannonian region (Horváth 2012, 221–224), where we can nevertheless observe the alternation of foils with different motifs on a single product (Horváth 2013, fig. 12). However, objects with ring-and-dot backing foil appear over a wider area – examples are known from England, the Rhineland, northern Italy, North Africa, Spain and the eastern coast of the Black Sea (Adams 2006, 19).

The production of foils required specialised jewellery skills and technological knowledge. The foils

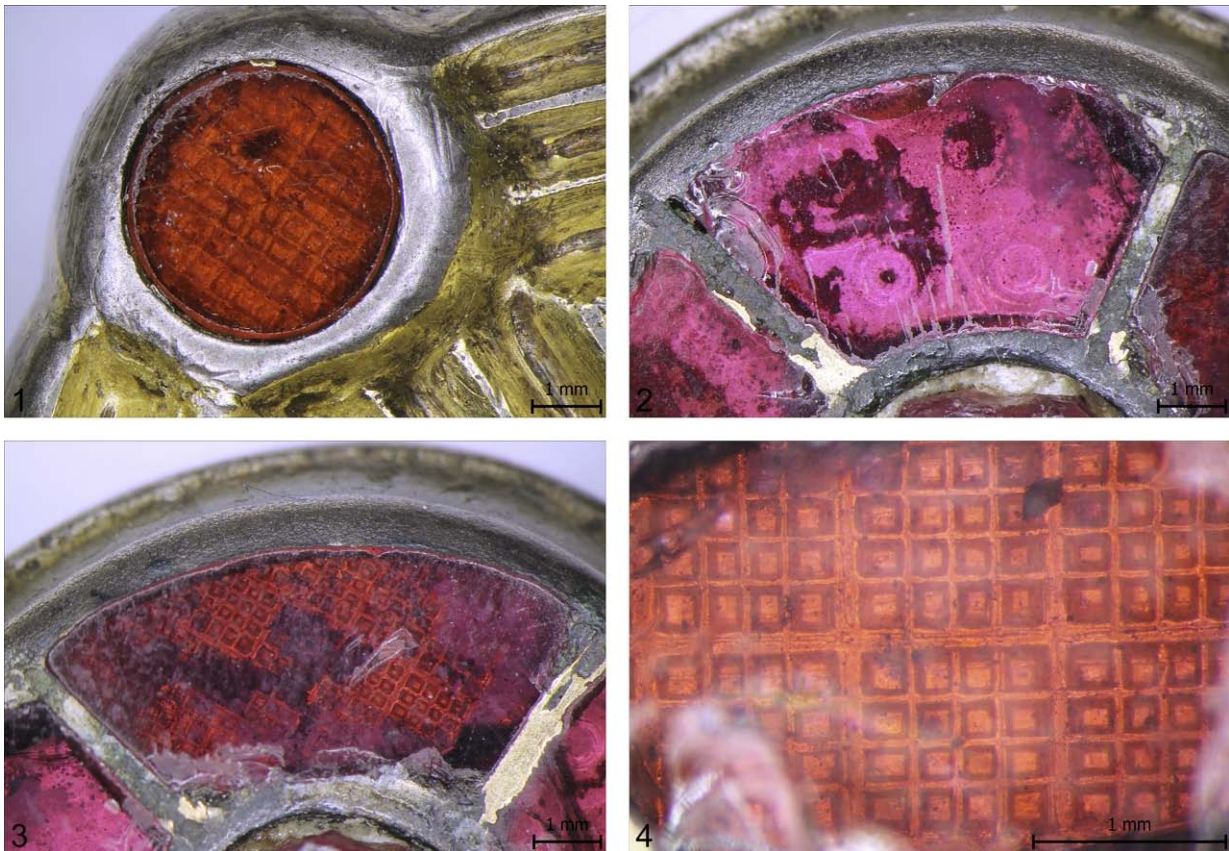


Fig. 14. Backing foils. 1 – Prague-Podbaba (no. 16); 2–4 – Roudnice nad Labem-Hracholusky (no. 18). Photo Z. Zlámlová Cílová.

were first rolled or hammered to an extreme thinness (less than 0.1 mm). It was necessary to achieve a uniform thickness of the surface, as deformations would impair the quality of the decoration (Arrhenius 1985, 39, 40). Matrices were used for decoration – metal (probably bronze or iron) or ceramic plates with an engraved negative of the ornament. The sheet metal was pressed onto the matrix (with a wedge, trowel or hammer), and in this way the decoration was transferred. This process allowed for the repeated production of identical motifs, as evidenced by the finds of decorated foils on which the same pattern errors are repeated (Avent/Leigh 1977, 41). The metal matrix was more advantageous in terms of slower wear, whereas the ceramic ones were significantly easier to manufacture (Adams 2006, 19, 20). The best-preserved example is the Frisian matrix, found at the Tjitsma (Wijnaldum) settlement and dated to 650–750 AD. The small bronze matrix has the positive relief of an intricate boxed waffle pattern, i.e., deeper grid lines forming larger fields, which are further divided into small squares by finer engraving (Nicolay 2014, 259, fig. 9: 28, 29; Tulp/Meeks 2000, 13, 14). The use of textile as a matrix for creating a fine motif has not been proven, as its use would result in the textile

weave being imprinted directly into the matrix or foil, which has not been documented anywhere (Arrhenius 1985, 39). It is still uncertain whether these films were made at specialised production centres, from which the films were then distributed throughout Europe. One argument for this claim is the identical motifs that appear in different places and on objects, indicating the standardisation of production and style. However, we must not forget the hypothesis of itinerant craftsmen, or regional workshops that could have adopted popular patterns, or even the direct transfer of skills between individual workshops and craftsmen. In the end, producing a ceramic matrix with a grid pattern was not that complicated (Adams 2006, 19–24; Avent/Leigh 1977, 40–42; Tulp/Meeks 2000, 19–21). On the contrary, the existence of a larger number of regional workshops is suggested by the great variability of patterns, which retain a uniform grid concept but differ in the fine details of the grid (e.g., Fremersdorf 1955, 118, fig. 14). Grid patterns also differ in the number of lines, with the coarser patterns having spacing of 0.25 mm and the finest up to 0.1 mm (Avent/Leigh 1977, 38). The variability of the design of the backing foils can also be observed in the assemblage we examined,

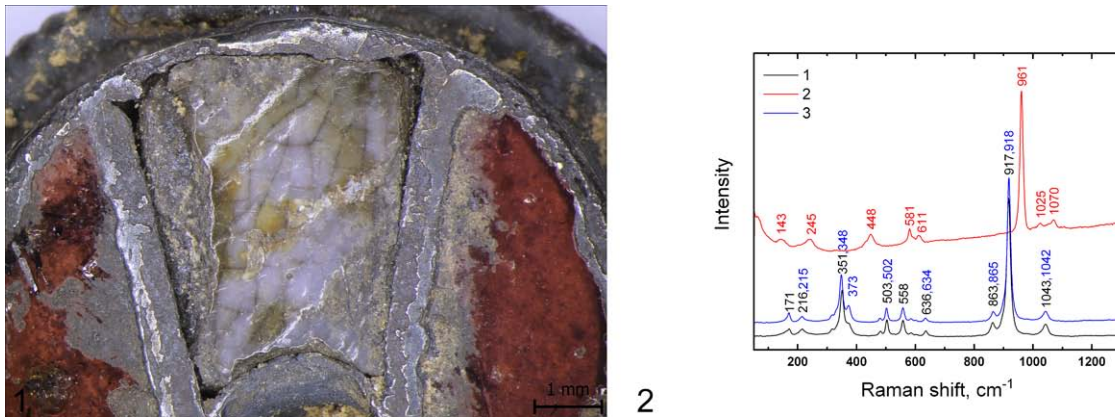


Fig. 15. Čelákovice-Záluží (no. 19). 1 – detail of the inlay in the artefact; 2 – Raman spectrum of the non-garnet inlay (2) and garnets (1, 3). Author L. Lapčák, photo Z. Zlámalová Cílová.

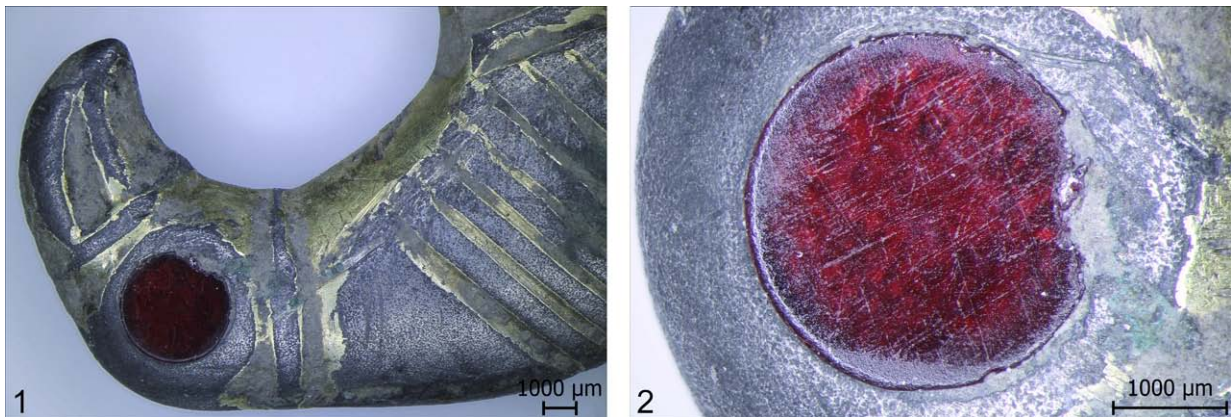


Fig. 16. Budihostice (no. 3). 1 – bird shaped fibula; 2 – detail on the chromium-rich pyrope. Photo Z. Zlámalová Cílová.

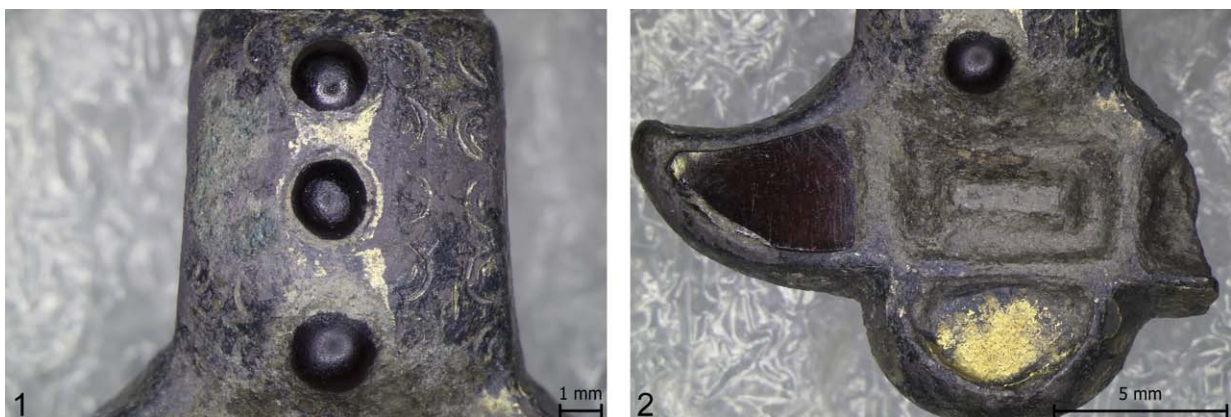


Fig. 17. Nový Bydžov (no. 6). 1 – cabochon cut; 2 – detail on the different gemstone cuts. Photo Z. Zlámalová Cílová.

Tab. 3. Various garnet types (the table is based by *Thoresen-Schmetzer 2013*, 219, table V, supplemented with additional information). Author Z. Zlámalová Cílová.

| Reference                                    | Designation of garnet species |                                                           |                                         |                               |                                    |                |
|----------------------------------------------|-------------------------------|-----------------------------------------------------------|-----------------------------------------|-------------------------------|------------------------------------|----------------|
| <i>Calligaro/Périn 2022</i>                  | Type I                        |                                                           | Type II                                 | Type III*                     | Type IV                            | Type V         |
| Geographical area                            | Rajasthan (India)             |                                                           | area of India with no specific location | Sri Lanka                     | Portugal (Monte Suimo near Lisbon) | Bohemia        |
| <i>Gilg et al. 2024; Horváth et al. 2024</i> | B                             | G                                                         | A                                       | H (X)                         | D                                  | E              |
| Chemical characteristics                     | Mn-, Cr-, Y-poor almandine    | almandine with a higher MnO content compared to cluster B | Mn – rich almandine                     | Intermediate pyrope-almandine | Cr-poor pyrope                     | Cr-rich pyrope |
| Geographical area                            | Rajasthan (Northern India)    | the Garibpet (Eastern India)                              | unknown                                 | Southern                      | Portugal/Nigeria                   | Bohemia        |
|                                              |                               |                                                           |                                         | Sri Lanka                     |                                    |                |

\* Further differentiated into: Type IIIa (Sri Lanka, central part of the island near Elahera), Type IIIb (Sri Lanka, near Ratnapura).

where no two identical foils were identified. We can also observe a different gold purity in them, so while in the case of the foil from the brooch from Nový Bydžov (no. 6) the composition is 22.39% Ag, 77.6% Au, in the foil from the fragment from Řepov (no. 25) the composition is 12% Ag, 1.8% Cu and 80.2% Au.

### Garnet evaluation

#### Stone analyses

In the available literature (*Calligaro/Périn 2022; Gilg/Gast/Calligaro 2010; Gilg/Then-Obtúska/Dussubieux 2024; Horváth et al. 2024; Pion et al. 2020*), we encounter the evaluation of garnets from the Migration Period according to their chemical composition, in particular their CaO, MgO, FeO and MnO content. Based on these contents, they are divided into five categories designated as Type I to V (after *Calligaro/Périn 2022*). These groups are linked to the geological area of their occurrence, as shown in the table above.

In addition to this evaluation system, another one in which categories are ‘clusters’ was used (*Gilg/Then-Obtúska/Dussubieux 2024; Horváth et al. 2024; Schmetzer et al. 2017; Then-Obtúska et al. 2021*). The clusters are labelled A to I (some added in the table above) and, in addition, heterogeneous group X (intermediate pyrope-almandine) is defined. It contains garnets from several different geological deposits (also determined based on mineralogical evaluation; *Gilg/Gast/Calligaro 2010*) and corresponds to Type III according to *Th. Calligaro and P. Périn (2022)*. Within group X, links to the territory of southern Sri Lanka have been determined thus far for cluster H (*Nasdala et al. 2023*). Some works (*Gilg/Then-Obtúska/Dussubieux 2024; Horváth et al. 2024*)

also mention cluster C with a link to Scandinavia, cluster F (garnets with a higher CaO content, provenance unknown) and cluster I (garnets with a higher MgO content, high yttrium of 180 to 1205 ppm, and an origin in Nubia; Tab. 3).

As part of the presented study, 51 garnets were measured, along with one inlay (a kidney-shaped pendant from Čelákovice-Záluží, no. 19), which was already visually distinct (Fig. 15: 1). It was identified as apatite based on its chemical composition (high calcium, phosphorus and chlorine content detected) and Raman spectroscopy (Fig. 15: 2). Although a similar colour combination is described by *E. Horváth et al. (2024, 2)*, the white rings were characterised as magnesite. The same team of authors also mentions other non-garnet inlays used in early medieval polychrome jewellery: bone, shell, magnesite, calcite, aragonite, chalcedony, cristobalite, steatite and sepiolite (*Horváth et al. 2024, 10*).

If we base our assessment on the above and, e.g., the MgO content, we can distinguish several groups of garnets in the assemblage. The highest MgO contents were determined in the stones of two objects, namely the bird brooch from Budihostice (no. 3) and the brooch from Nový Bydžov (no. 6). The garnets belong to cluster E, i.e., chromium-rich pyropes (Type V according to *Calligaro/Périn 2022*; provenance Bohemia). While the stone from the first artefact is relatively well worked into a flat inlay (Fig. 16), the stones in the second object are in the form of cabochons (Fig. 17: 1). Although a flat piece is less common for pyrope stones (*Bugoi/Oanță-Marghitu/Calligaro 2016*), this shape was also found on fittings from Kounice (*Čiřáková et al. 2022*). Moreover, pyropes processed in the form of polished plates also appear, for instance, on a belt buckle from Tournai (*Calligaro/Périn 2022, 52*) and on inlays on the terminal of a gold ‘snake-like chain’

from Isenbüttel, probably dating to the 7<sup>th</sup> c. (Hilgner 2016, 403–405). On the brooch from Nový Bydžov, in addition to four set cabochons (all chromium-rich pyropes), there is also a flat inlay (Fig. 17: 2), and it can be assumed that there are also other set stones, judging by the shape of the object, or rather the cast holes, but also inserted gold foil (Fig. 17: 2). Based on analyses, the stone in the lower part of this brooch can be classified in Cluster H (Group X; provenance Sri Lanka).

Another group is stones characterised by a relatively high content of MgO (ca. 11.6% MgO), but also CaO (average 6.1% CaO). Both stones from the brooch with bird heads from Lochenice (no. 15; Fig. 18), the stone marked 14.2 from Hostivice (plier-shaped brooch) and the central stone from the Szarvas-type brooch from Plaňany (no. 7; Fig. 19) can be included in this group. The other two stones from the Plaňany brooch have lower CaO contents (up to 1.5%) and, conversely, higher FeO contents of ca. 28.4% compared to 20.6% FeO (value for the centre stone). This is also reflected in the higher share of almandine in these samples. Chemically, rocks with higher MgO and CaO can be classified in the cluster H (Group X; the chemically and mineralogically heterogeneous group). In addition to pyrope, these stones also contain spessartine and even (rarely) andradite.

Another stone, chemically unique in the collection, is the garnet from the brooch with bird heads from Prague-Podbaba (Fig. 14: 1; stone no. 16.1), again with a high MgO content (12.7%), but rather low CaO (1.3%). According to these contents, this one also belongs to group X. It is combined on the brooch with a stone of a somewhat different composition (5% MgO and 2.1% CaO), with a high share of almandine, which has a low manganese content – i.e., cluster B.

Another group of samples is stones in which a content of ca. 8.5% MgO and 3.8% CaO was determined both contents lower than in cluster H. The lower contents of these oxides are compensated by the higher FeO content, which is manifested by the presence of almandine (the share of spessartine decreases). The following samples can be included in this group: the bird brooch from Třebestovice (no. 2; Fig. 21: 2), stone no. 20.1 from the buckle pin from Dolní Kamenice, the S-shaped brooch from Dolní Kamenice (no. 10), stone no. 6.5 from the brooch from Nový Bydžov (Fig. 17: 2) and stone no. 19.1 from the kidney-shaped pendant from Čelákovice-Záluží (Fig. 15: 1). The origin of the stones can be linked to Sri Lanka, and based on their composition, they are classified in group X. Comparison of the data from E. Horváth *et al.* 2024 with our Raman spectroscopic data allows a more specific attribution of samples 2,

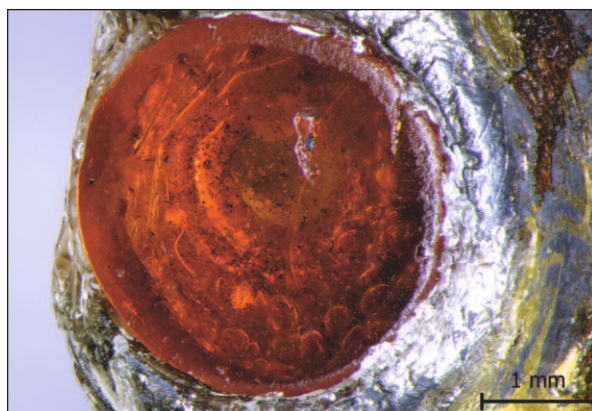


Fig. 18. Lochenice (no. 15). Garnet from the brooch. The spessartine content shifts the colour towards shades of orange. Photo Z. Zlámálová Cílová.

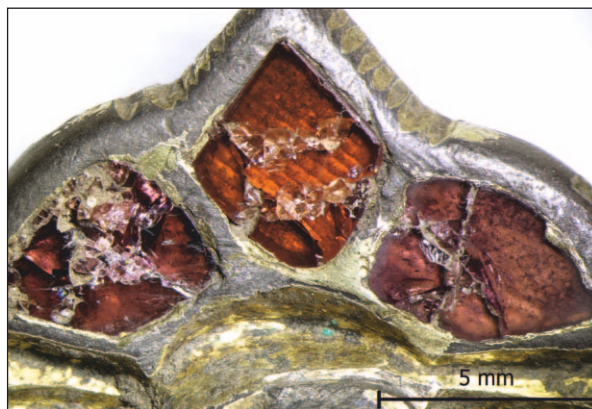


Fig. 19. Plaňany (no. 17). Detail of the stones from the brooch. The centre stone is a different colour than the outer stones. Photo Z. Zlámálová Cílová.

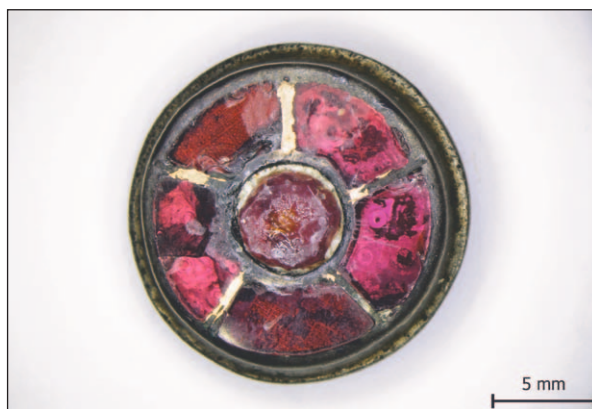


Fig. 20. Roudnice-Hracholusky (no. 18). Disc brooch. In addition to the presence of different types of garnets, different types of foils were also observed under the stones. Photo Z. Zlámálová Cílová.

10 and 20.1 to group H, as indicated by the absence of a band at approximately  $370\text{--}372\text{ cm}^{-1}$ .

A relatively large group consists of samples that were classified in cluster A, for which more recent studies do not indicate their provenance, or they describe it as unknown (Gill/Then-Obtúska/Dussubieux 2024; Horváth *et al.* 2024). The list of included stones is given in Tab. 4. The last distinguished group is garnets with a high content of almandine, with pyrope represented to a lesser extent. This is also confirmed by data from measurements of chemical composition, where FeO is present to a significant extent. The MnO contents are relatively low, which corresponds to the classification of the stones in cluster B (Mn-poor almandine) originating in northern India. This group includes a number of stones from the Hostivice site (nos. 8, 9, 21 and 22; S-shaped brooches and loose stones) and most of the stones from the plate-shaped brooch from Roudnice-Hracholusky (no. 18; Fig. 20).

Individual objects contain garnets of various types without signs of careful selection, similar to finds from France, Belgium and Slovenia. It is once again confirmed that jewellers mostly did not distinguish between different types of garnets and simply used stones that were currently available (Calligaro *et al.* 2002; Šmit *et al.* 2014).

According to C. Pion *et al.* (2020), type I (cluster B) was the most common type in the Merovingian period (up to 48% of the total representation) and the representation of type II (cluster A) garnets is 32%. Even in the given study, these two groups have the highest representation (see Tab. 4).

### Raman and Infrared Spectroscopy

The results obtained by the Miragem program were supplemented by chemical composition data, with almandine being the main component for cluster B at approximately 72%, with pyrope as the second. Garnets with the highest MgO content are representatives of V/cluster E-type garnets, and the predominant garnet is pyrope in combination with andradite. Fourier-transform infrared spectroscopy (FTIR) was also employed to evaluate the material forming the lining beneath the inlay of one of the analysed objects. One of the inlays on the S-shaped brooch from Žehuň (no. 11; Fig. 2: 6) was loose, which made it possible to analyse the material of the compartment directly. The obtained spectrum showed absorption bands corresponding to carbonates, most likely calcium carbonate, and OH stretching bands typical of hydroxides. This suggests that the material could be lime or reaction products resulting from its transformation.

### Stone inlays

Garnets were worked using a variety of methods depending on the intended application and type of jewellery. The most common was 'table-cut', which allowed for the easy setting of stones in the cells. This cut had a flat top and often polished underside, maximising the optical effect while minimising the loss of material (Arrhenius 1985, 55–58). In some cases, the stones were shaped into cabochons, lenses, or ornamental forms, especially for brooches or buttons (Arrhenius 1985, 43–46). The technology of polishing and cutting garnets itself required specialised skills. Due to the high hardness of garnet (Mohs scale 7–7.5), manual processing was difficult. It is possible that instead of cutting, some workshops used more primitive methods, such as splitting, in which either thermal shock or mechanical impact could cause deformed crystals to shatter along their natural planes. The garnet flakes obtained in this way represented a semi-finished product from which the desired shapes were created by cutting. A rotary grinding wheel was used for rough working and levelling of the stone; the use of this wheel was common already in the Late Roman period and was adopted even in barbarian workshops (Arrhenius 1985, 55; 2000, 214). Traces of cutting are also preserved on the finds, which indicates that this was the basic technique for creating flat pieces and for subsequent shaping (Horváth/Bendő 2011, fig. 5). For more complex cuts, templates prepared in advance could be used (Arrhenius 2000, 214). Craftsmen could grind and then polish by hand, e.g., by rubbing the garnet against a flat surface sprinkled with abrasive. The cutting of the stone was followed by polishing, which required the use of additional abrasives, i.e., powder from harder minerals, such as carborundum (emery) or sand from the island of Naxos (Bimson 1985, 127, 128). Careful polishing produced a mirror-like shine. To reconstruct production processes, one can also look at later finds from the Early Middle Ages. From the example of a craftsman's workshop in Cologne, where crystal was worked, we know that basic shaping was accomplished using coarse-grained and subsequently finer sandstone slabs or stones. The final polishing was then carried out on smooth lead plates (Burianek/Höltken 2017, 142, 143).

In the studied assemblage, we can observe stones of two basic cuts: small cabochons and flat pieces (table-cut). Although the flat pieces are characterised by a polished surface, the processing of their edges is significantly different. Circular-shaped flat pieces predominate and were usually used as the 'eyes' for brooches. However, other shapes are also represented, formally based on the morphology

Tab. 4. Chemical composition of garnets (wt%) and representation of end members according to Miragem. Author Z. Zlámalová Cílová.

| Catalogue number_stone | Inv. Number | Site                           | Cluster (Group) | MgO   | Al <sub>2</sub> O <sub>3</sub> | CaO  | TiO <sub>2</sub> | Cr <sub>2</sub> O <sub>3</sub> | MnO  | FeO   | SiO <sub>2</sub> | Almandine | Pyrope | Spessartine | Andradite | Grossular |
|------------------------|-------------|--------------------------------|-----------------|-------|--------------------------------|------|------------------|--------------------------------|------|-------|------------------|-----------|--------|-------------|-----------|-----------|
| 3                      | –           | Budihostice                    | E               | 20.75 | 20.68                          | 4.15 | 0.46             | 2.26                           | 0.35 | 9.13  | rest             | –         | 90     | –           | 10        | –         |
| 6_4                    | 96858       | Nový Bydžov                    | E               | 19.80 | 20.66                          | 4.20 | 0.55             | 2.08                           | 0.32 | 9.42  | rest             | –         | 88     | –           | 12        | –         |
| 6_1                    | 96858       | Nový Bydžov                    | E               | 19.64 | 20.73                          | 4.37 | 0.44             | 2.37                           | 0.35 | 9.73  | rest             | –         | 88     | –           | 12        | –         |
| 6_3                    | 96858       | Nový Bydžov                    | E               | 19.37 | 19.75                          | 4.86 | 0.40             | 4.19                           | 0.36 | 9.03  | rest             | –         | 86     | –           | 14        | –         |
| 6_2                    | 96858       | Nový Bydžov                    | E               | 18.80 | 20.40                          | 4.47 | 0.71             | 2.27                           | 0.37 | 10.09 | rest             | –         | –      | –           | –         | –         |
| 15_2                   | 24/77-6     | Lochenice                      | H/X             | 12.26 | 21.53                          | 6.49 | 0.04             | n.d.                           | 0.50 | 18.22 | rest             | –         | 58     | 38          | 4         | –         |
| 7_2                    | –           | Plaňany                        | H/X             | 11.55 | 21.52                          | 5.67 | 0.02             | n.d.                           | 0.67 | 20.60 | rest             | 8         | 58     | 32          | 2         | –         |
| 15_1                   | –           | Lochenice                      | H/X             | 11.11 | 21.52                          | 6.14 | 0.01             | n.d.                           | 0.68 | 19.92 | rest             | –         | 48     | 52          | –         | –         |
| 14_2                   | 14371       | Hostivice-Palouky              | H/X             | –     | –                              | 4.83 | n.d.             | n.d.                           | 0.83 | 22.90 | rest             | 12        | 60     | 26          | 2         | –         |
| 16_1                   | H1-51164    | Prague-Podbaba                 | X               | 12.70 | 21.53                          | 1.27 | n.d.             | n.d.                           | 0.15 | 22.89 | rest             | 42        | 58     | –           | –         | –         |
| 20_1                   | 10375       | Dolní Kamenice                 | X               | 9.39  | 21.53                          | 4.18 | 0.02             | n.d.                           | 0.64 | 26.04 | rest             | 42        | 48     | 6           | 4         | –         |
| 2                      | –           | Třebestovice                   | X               | 8.95  | 21.53                          | 3.76 | n.d.             | n.d.                           | 0.19 | 27.64 | rest             | 44        | 42     | 12          | 2         | –         |
| 10                     | 10297       | Dolní Kamenice                 | X               | 7.99  | 21.52                          | 3.55 | n.d.             | n.d.                           | 0.84 | 28.83 | rest             | 48        | 46     | 2           | 4         | –         |
| 6_5                    | 96858       | Nový Bydžov                    | X               | 7.62  | 21.53                          | 4.33 | n.d.             | n.d.                           | 0.74 | 27.39 | rest             | 42        | 36     | 20          | 2         | –         |
| 19_1                   | H1-43486    | Záluzí (near Čelákovice)       | X               | 6.30  | 21.53                          | 3.32 | 0.06             | n.d.                           | 0.87 | 31.01 | rest             | 52        | 38     | 6           | –         | 4         |
| 14_1                   | 14371       | Hostivice-Palouky              | A               | –     | –                              | 1.77 | n.d.             | n.d.                           | 0.55 | 28.82 | rest             | 52        | 48     | –           | –         | –         |
| 7_1                    | –           | Plaňany                        | A               | 9.91  | 21.51                          | 1.19 | n.d.             | n.d.                           | 0.41 | 26.82 | rest             | 60        | 40     | –           | –         | –         |
| 4_2                    | H1-51291    | Prague-Podbaba                 | A               | 9.34  | 21.53                          | 1.74 | n.d.             | n.d.                           | 0.29 | 29.07 | rest             | 52        | 48     | –           | –         | –         |
| 7_3                    | –           | Plaňany                        | A               | 7.77  | 21.52                          | 1.45 | n.d.             | n.d.                           | 0.64 | 29.87 | rest             | 64        | 36     | –           | –         | –         |
| 20_2                   | 10375       | Dolní Kamenice                 | A               | 7.72  | 21.52                          | 1.44 | n.d.             | n.d.                           | 0.94 | 31.86 | rest             | 62        | 38     | –           | –         | –         |
| 12                     | –           | Třebestovice                   | A               | 7.64  | 21.52                          | 1.46 | 0.04             | n.d.                           | 1.53 | 31.63 | rest             | 62        | 36     | 2           | –         | –         |
| 11_2                   | –           | Žehuň                          | A               | 7.00  | 21.53                          | 1.55 | n.d.             | n.d.                           | 0.47 | 33.49 | rest             | 64        | 36     | –           | –         | –         |
| 11_3                   | –           | Žehuň                          | A               | 5.58  | 21.49                          | 1.69 | 0.04             | n.d.                           | 3.80 | 32.87 | rest             | 62        | 32     | 4           | –         | 2         |
| 17_1                   | H1-43432    | Záluzí (near Čelákovice)       | A               | 6.92  | 21.53                          | 1.77 | 0.01             | n.d.                           | 0.83 | 32.22 | rest             | 60        | 38     | 2           | –         | –         |
| 1                      | –           | Velké Chvalovice               | A               | 6.87  | 21.53                          | 1.58 | n.d.             | n.d.                           | 1.59 | 32.37 | rest             | 62        | 36     | –           | 2         | –         |
| 18_6                   | H1-224026   | Roudnice nad Labem-Hracholusky | A               | 6.75  | 21.52                          | 1.64 | 0.03             | n.d.                           | 1.47 | 31.57 | rest             | 60        | 36     | 4           | –         | –         |

Tab. 4. Continuation.

| Catalogue number_stone      | Inv. Number | Site                           | Cluster (Group) | MgO  | Al <sub>2</sub> O <sub>3</sub> | CaO  | TiO <sub>2</sub> | Cr <sub>2</sub> O <sub>3</sub> | MnO  | FeO   | SiO <sub>2</sub> | Almandine | Pyrope | Spessartine | Andradite | Grossular |
|-----------------------------|-------------|--------------------------------|-----------------|------|--------------------------------|------|------------------|--------------------------------|------|-------|------------------|-----------|--------|-------------|-----------|-----------|
| 4_1                         | H1-51291    | Prague-Podbaba                 | A               | 6.42 | 21.40                          | 1.93 | -0.00            | n.d.                           | 1.64 | 33.27 | rest             | 62        | 36     | 2           | –         | –         |
| 17_3                        | H1-43432    | Záluží (u Čelákovíc)           | A               | 5.84 | 21.53                          | 1.68 | 0.00             | n.d.                           | 3.54 | 31.06 | rest             | 62        | 36     | –           | –         | 2         |
| 17_2                        | H1 -43432   | Záluží (u Čelákovíc)           | A               | 5.83 | 21.53                          | 2.24 | n.d.             | n.d.                           | 3.30 | 30.60 | rest             | 60        | 36     | 2           | –         | 2         |
| 23                          | 13347       | Hostivice-Palouky              | A               | –    | –                              | –    | –                | –                              | –    | –     | –                | 60        | 26     | 12          | 2         | –         |
| 24                          | –           | Velké Chvalovice               | A               | 5.15 | 22.55                          | 1.59 | n.d.             | n.d.                           | 1.90 | 31.10 | rest             | 62        | 32     | 4           | 2         | –         |
| 25                          | –           | Řepov                          | A               | 7.40 | 21.72                          | 1.35 | n.d.             | n.d.                           | 0.76 | 31.80 | rest             | 62        | 38     | –           | –         | –         |
| 11_1                        | –           | Žehuň                          | B               | 6.01 | 21.49                          | 1.13 | n.d.             | n.d.                           | 1.09 | 35.16 | rest             | 72        | 28     | –           | –         | –         |
| 11_5                        | –           | Žehuň                          | B               | 5.77 | 21.46                          | 0.90 | n.d.             | n.d.                           | 0.16 | 36.95 | rest             | 72        | 28     | –           | –         | –         |
| 18_1                        | H1-224026   | Roudnice nad Labem-Hracholusky | B               | 4.91 | 21.52                          | 1.03 | n.d.             | n.d.                           | 0.06 | 36.27 | rest             | 72        | 28     | –           | –         | –         |
| 18_2                        | H1-224026   | Roudnice nad Labem-Hracholusky | B               | 5.27 | 21.53                          | 0.81 | n.d.             | n.d.                           | 0.14 | 36.16 | rest             | 72        | 28     | –           | –         | –         |
| 18_3                        | H1-224026   | Roudnice nad Labem-Hracholusky | B               | 4.06 | 21.53                          | 0.94 | n.d.             | n.d.                           | 0.46 | 37.47 | rest             | 72        | 28     | –           | –         | –         |
| 18_4                        | H1-224026   | Roudnice nad Labem-Hracholusky | B               | 5.39 | 21.52                          | 1.08 | n.d.             | n.d.                           | 0.14 | 36.34 | rest             | 72        | 28     | –           | –         | –         |
| 18_5                        | H1-224026   | Roudnice nad Labem-Hracholusky | B               | 4.57 | 21.53                          | 0.93 | n.d.             | n.d.                           | 1.06 | 36.61 | rest             | 72        | 28     | –           | –         | –         |
| 16_2                        | H1-51164    | Prague-Podbaba                 | B               | 5.00 | 21.53                          | 2.08 | 0.02             | n.d.                           | 0.07 | 35.27 | rest             | 72        | 28     | –           | –         | –         |
| 19_2                        | H1-43486    | Záluží (u Čelákovíc)           | B               | 4.97 | 21.53                          | 1.98 | 0.02             | n.d.                           | 0.11 | 35.58 | rest             | 72        | 28     | –           | –         | –         |
| 11_4                        | –           | Žehuň                          | B               | 4.14 | 21.52                          | 1.04 | n.d.             | n.d.                           | 0.40 | 39.06 | rest             | 76        | 24     | –           | –         | –         |
| 22                          | 14671       | Hostivice-Palouky              | B               | –    | –                              | 1.19 | n.d.             | n.d.                           | 0.37 | 37.18 | rest             | 74        | 26     | –           | –         | –         |
| 9_1                         | 13589       | Hostivice-Palouky              | B               | –    | –                              | 0.99 | n.d.             | n.d.                           | 0.15 | 35.70 | rest             | 76        | 24     | –           | –         | –         |
| 8                           | 15911       | Hostivice-Palouky              | B               | –    | –                              | 1.29 | n.d.             | n.d.                           | 0.60 | 40.71 | rest             | 72        | 28     | –           | –         | –         |
| 21                          | 15284       | Hostivice-Palouky              | B               | –    | –                              | 1.25 | n.d.             | n.d.                           | 0.75 | 39.56 | rest             | 84        | 16     | –           | –         | –         |
| 9_2                         | 13589       | Hostivice-Palouky              | B               | –    | –                              | 0.99 | n.d.             | n.d.                           | 0.48 | 40.92 | rest             | 72        | 28     | –           | –         | –         |
| samples were not identified |             |                                |                 |      |                                |      |                  |                                |      |       |                  |           |        |             |           |           |
| 5_1                         | –           | Vyšeňovice                     | –               | 7.18 | 21.79                          | 0.90 | 0.18             | n.d.                           | 1.54 | 29.02 | rest             | 74        | 26     | –           | –         | –         |
| 5_2                         | –           | Vyšeňovice                     | –               | 6.42 | 23.07                          | 3.51 | 0.12             | n.d.                           | 0.17 | 31.44 | rest             | 62        | 32     | –           | 6         | –         |
| 5_3                         | –           | Vyšeňovice                     | –               | 4.11 | 22.15                          | 2.14 | n.d.             | n.d.                           | 0.57 | 31.43 | rest             | 76        | 18     | 2           | 4         | –         |
| 13                          | –           | Štolava                        | –               | 4.82 | 21.51                          | 3.39 | 0.02             | n.d.                           | 0.19 | 35.33 | rest             | 72        | 24     | –           | 4         | –         |

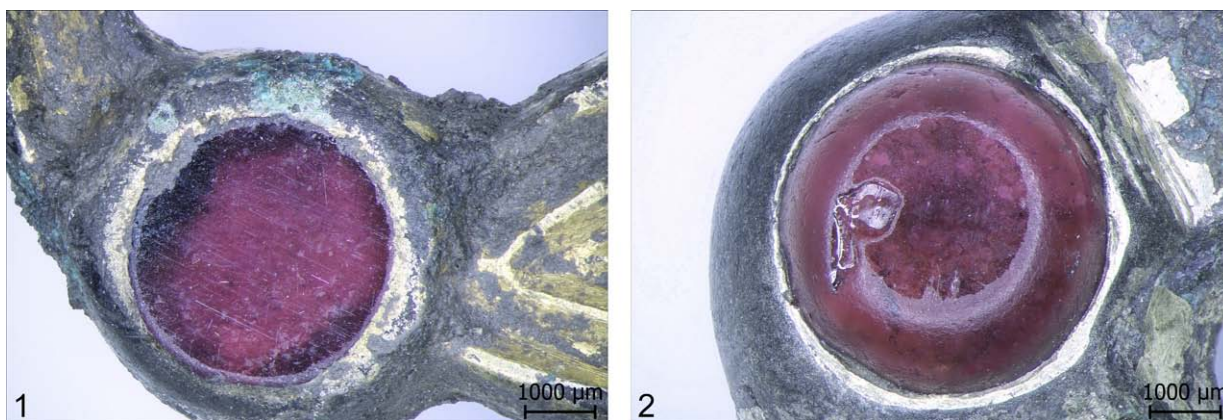


Fig. 21. Details of garnet inlays and their settings. 1 – Velké Chvalovice (no. 1), 2 – Třebestovice (no. 2). Photo Z. Zlámalová Cílová.

of the products (Fig. 21–26). The bird brooch from Třebestovice (no. 2) is set with a specific and exceptional cut in the form of a cabochon with a cabochon with flat top (Fig. 21: 2). At first glance, there is a clear qualitative difference in the stones from the artefacts at the Hostivice-Palouky burial site, where stone inlays dislodged from jewellery beds were found (Fig. 23; 24). This made it possible to examine their side edges (which could not be viewed on the other artefacts), including a stone with a perfectly polished edge (no. 22; Fig. 24: 1, 2) and stones with traces of poor-quality shaping (breaking), which were never polished again (Fig. 23: 2–6; 24: 3, 4). This phenomenon is also observed in other assemblages and can be interpreted as meaning that the imported flat garnet piece was secondarily modified in one of the local workshops so that it could be fitted into the bed of a specific piece of jewellery. These ‘secondary workshops’ probably did not have the necessary technological know-how, so their method of modifying the coloured inlays was different and involved breaking rather than cutting, which leaves specific marks on the edges of the inlays, as observed, e.g., on the ‘serpentine chain’ from Isenbüttel dating back to the 7<sup>th</sup> c. (Hilgner 2016, 402, 403). In England, more roughly worked stones were observed on a number of pieces of jewellery from the same period, which was explained as a decline in craftsmanship. However, this phenomenon was also observed on later stone-inlaid jewellery from the Vendel period in Scandinavia (Arrhenius 1985, 76; Hamerow 2017, 77–79).<sup>20</sup> However, evidence of lower-quality craftsmanship with the cloisonné technique,

represented by the imperfect setting of inlays in compartments and imprecise jewellery work, exists as early as the 5<sup>th</sup> c. (e.g., a belt fitting from Kounice in Central Bohemia; see Čisťáková *et al.* 2022, 336; for similar cases from Hungary see Horváth/Mozgai/Bajnóczi 2019). Evidence of the occurrence of stones of different processing and quality in circulation is a grave find from the Hajdúnánás-Fürj-Halom-dűlő site, where 17 red garnets were found in a robbed grave from the late 5<sup>th</sup> c. (more in the following chapter). The absence of gold parts of the jewellery suggests that it was not a disassembled piece of jewellery, but a set of semi-finished and finished products placed in the grave, perhaps as part of the craftsman’s equipment or a treasure (Horváth/Bendő 2011, tab. 1). The diversity of the quality of the stone inlays used is also evidenced by the fact that on one article of jewellery it is possible to see stones of completely different processing, from secondary stones to irregular cabochons and flat pieces (Horváth 2013, 288; Horváth *et al.* 2024, 8, fig. 9; Horváth/Mozgai/Bajnóczi 2019).

#### THE ORIGIN OF COLOUR INLAYS AND THE ORGANISATION OF TRADE

Given the large geographical distribution of the polychrome decorative style – and therefore the quantity of coloured inlays consumed – it is clear that their import must have been relatively well organised. In this work, we are naturally only interested in garnets of various shades of red.<sup>21</sup> Based

<sup>20</sup> One example is a workshop from the 6<sup>th</sup>–7<sup>th</sup> c. in Gamla Uppsala, which was engaged in complete processing, i.e., also the cutting and polishing of raw garnets (Ljungkvist/Lundahl/Frölund 2017).

<sup>21</sup> The superordinate term ‘almandine’ was often used in German literature. However, this is a misleading name, as it is only one of the members of the garnet supergroup, a term used to describe a group of minerals that includes nearly 30 types of minerals.

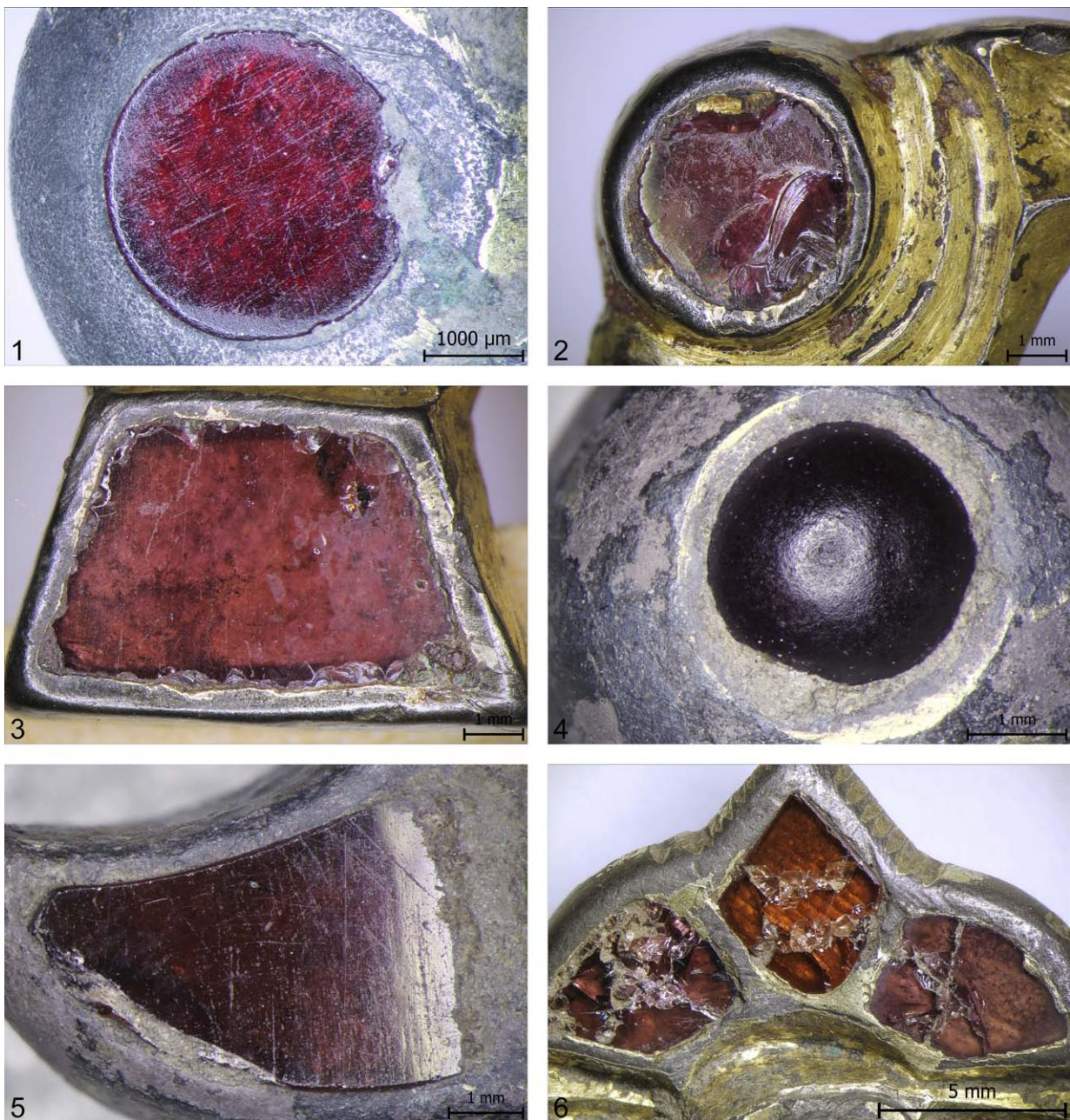


Fig. 22. Details of garnet inlays and their settings. 1 – Budihostice (no. 3); 2, 3 – Prague-Podbaba (no. 4); 4, 5 – Nový Bydžov (no. 6); 6 – Plaňany (no. 7). Photo Z. Zlámalová Cílová.

on written sources, it was previously assumed that most garnets originated on the Indian subcontinent (Quast/Schüssler 2000, 76), but only in recent decades has it been possible to achieve a more precise determination of the origin of these stones thanks to a se-

ries of archaeometric analyses.<sup>22</sup> *F. Farges (1998)* was probably the first to chemically prove the Bohemian origin of stone inlays in Merovingian jewellery in France.<sup>23</sup> D. Quast and U. Schüssler also proved the existence of Bohemian garnets by analysing

<sup>22</sup> However, it should be noted at this point that there are a relatively large number of deposits of similar garnets of varying quality, including at European locations. Not all of them are in the relevant databases, e.g., because they were already fully mined in the past or have been forgotten (Gilg/Gast/Calligaro 2010, 96–100). A garnet deposit also recently discovered in Scandinavia was apparently also used to a limited extent and locally during the Migration Period (Gilg/Gast/Calligaro 2010, 99; Hedenstierna-Jonson/Ljungkvist 2023, 197; Mannerstrand/Lundqvist 2003).

<sup>23</sup> However, this was preceded by a number of attempts (some more successful than others) to distinguish specific types of stones using a variety of methods. Summarised e.g., in Calligaro 2023; Gilg/Gast/Calligaro 2010, 91–96.

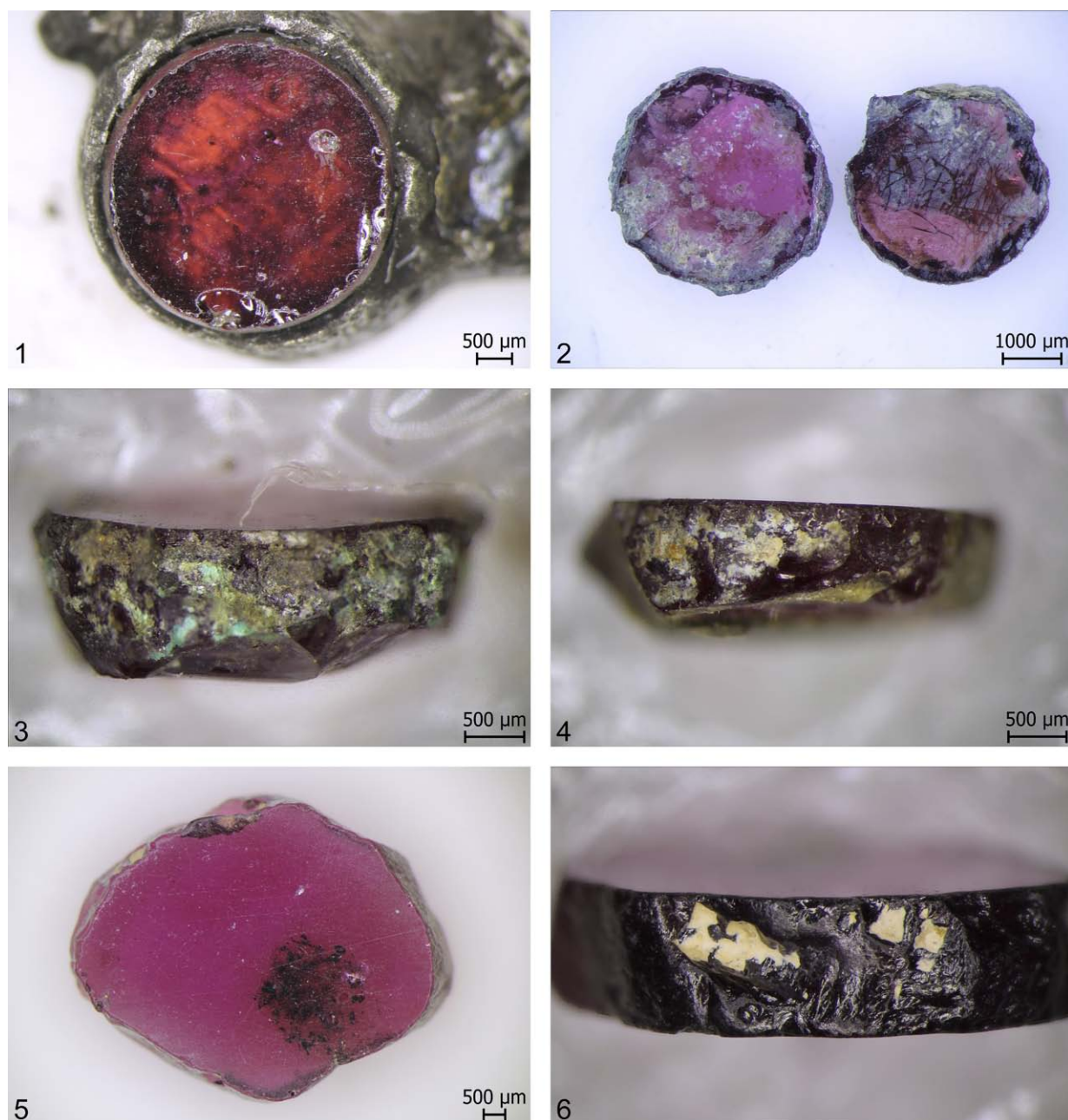


Fig. 23. Details of garnet inlays. 1 – Hostivice-Palouky (no. 8); 2–4 – Hostivice-Palouky (no. 9); 5, 6 – Hostivice-Palouky (no. 21). Photo Z. Zlámalová Cílová.

a collection of jewellery in Southwest Germany. While Indian almandines were observed on objects from the 5<sup>th</sup> and 6<sup>th</sup> c., the Bohemian group of pyropes was dated to the 7<sup>th</sup>–8<sup>th</sup> c. (Quast/Schüssler 2000, 87–93). However, it is now documented that Bohemian garnets were used in Central Europe as early as the 5<sup>th</sup> c., as evidenced by jewellery from the Gepid tomb from Apahida III, from Childeric's tomb in Tournai and, of course, from the royal jewellery from Mšec in Central Bohemia (Bugoi/Oanță-Marghitu/Calligaro 2016; Calligaro 2023; Čiřáková et

al. 2022, 334). Czech garnets were also identified in the assemblage from the rich grave of the nobleman from Cezava near Blučina; in this case as well, they are small stones cut as cabochons (Hanus et al. 2013, 14, 15). Currently, a number of new studies are being developed using new technical possibilities of chemical analyses that make research even more precise (Kos et al. 2020; Pion et al. 2020).

Let us now focus briefly on the trade network that was associated with the distribution of red garnets. The current state of research indicates that garnets

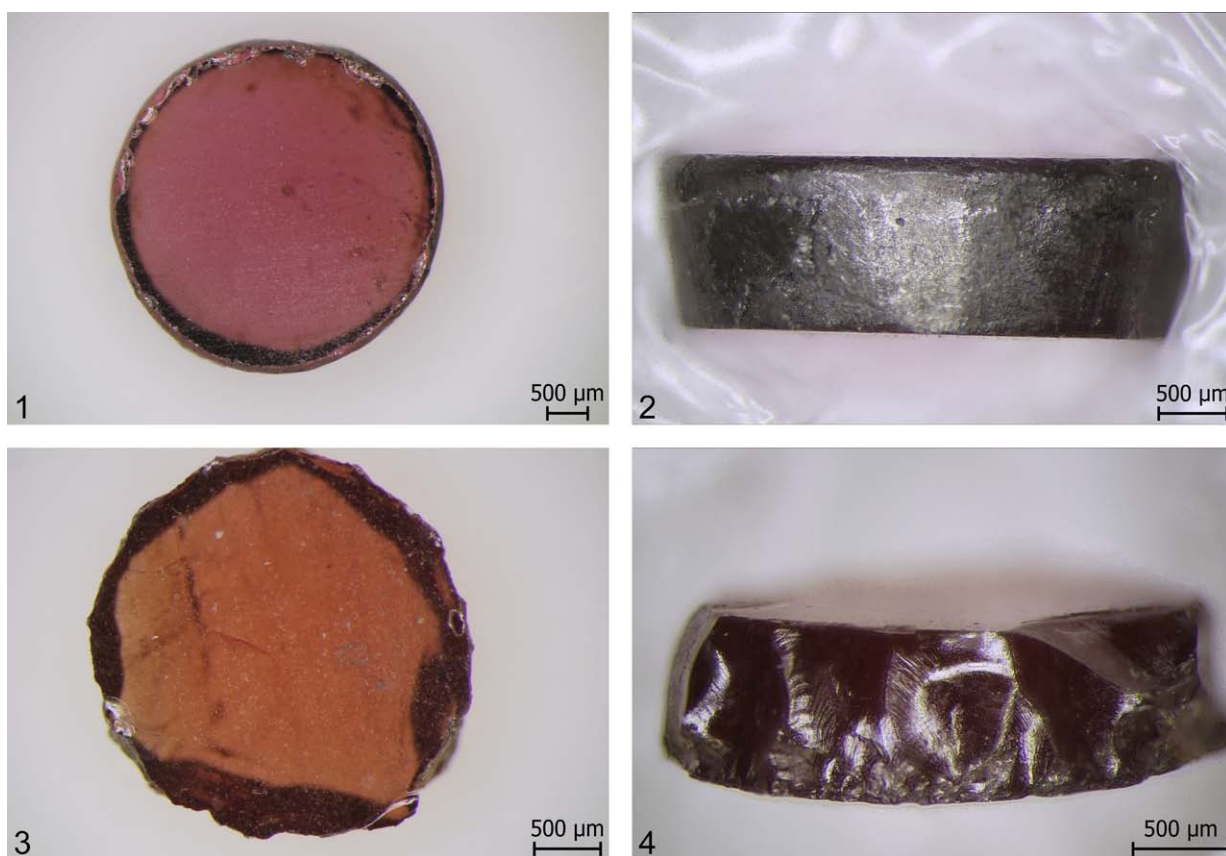


Fig. 24. Details of loose inlays without settings. 1, 2 – Hostivice-Palouky (no. 22), 3, 4 – Hostivice-Palouky (no. 23). Photo Z. Zlámalová Cílová.

from the Migration Period come primarily from India (especially the Rajasthan region) and Sri Lanka, from where they reached both the Persian Gulf and the Red Sea. This second variant was probably the most important for European consumers of garnets. Apparently important for this route were ports in the Gulf of Aden and certainly the ports on the western shore of the Red Sea in the Eastern Desert, from where they reached the Mediterranean coast. This route was mainly influenced by the monsoon season and wind direction throughout the year (Gilg/Gast/Calligaro 2010; Seland 2017). While it is certainly not ruled out that a certain degree of stone processing was already performed in the place of origin, today the first professional workshops where stones were processed are already documented closer to European jewellery manufacturers, including one in Alexandria, Egypt (Rifa-Abou El Nil/Calligaro 2020). However, it is clear that there must have been many workshops of this type, especially in Mediterranean port cities (Gilg/Gast/Calligaro 2010, 97). The favourites undoubtedly include Constantinople (Jiřík 2023) and Italian workshops, even after the formal demise of the Western Roman Empire (Boschetti/Gratuze/Schibille 2023; Pinar Gil 2023). This

is also where the newly discovered direct evidence of garnet workshops come from. These include, e.g., the discovery of a semi-precious stone cutting workshop on Monte Barro in Lombardy (first half of the 6<sup>th</sup> c.) and a jewellery workshop in the Crypta Balbi complex in Rome (functional until the 7<sup>th</sup> c.), where garnets were processed directly on site. Certain indications also come from other locations, e.g., at the Loppio fortified settlement in the Alpine region of Northern Italy there was a hypothetical workshop dated to the 6<sup>th</sup>–7<sup>th</sup> c., where raw, unworked garnets were discovered (Boschetti/Gratuze/Schibille 2023, 110–112). Based on the technological specifics and decoration, it is possible to assume the existence of a central workshop in the Rhineland, e.g., in Trier (Arrhenius 1985, 100–102). The problem is that garnets, as small and compact objects, were usually sold through various intermediaries, not directly, so sometimes contemporaries did not always know the exact place of their origin and thus referred not to the stone deposits, but to the places where they were resold (Seland 2017, 51). However, it appears that most of these trade and redistribution centres were in territories controlled by the Byzantine Empire, which had a monopoly on

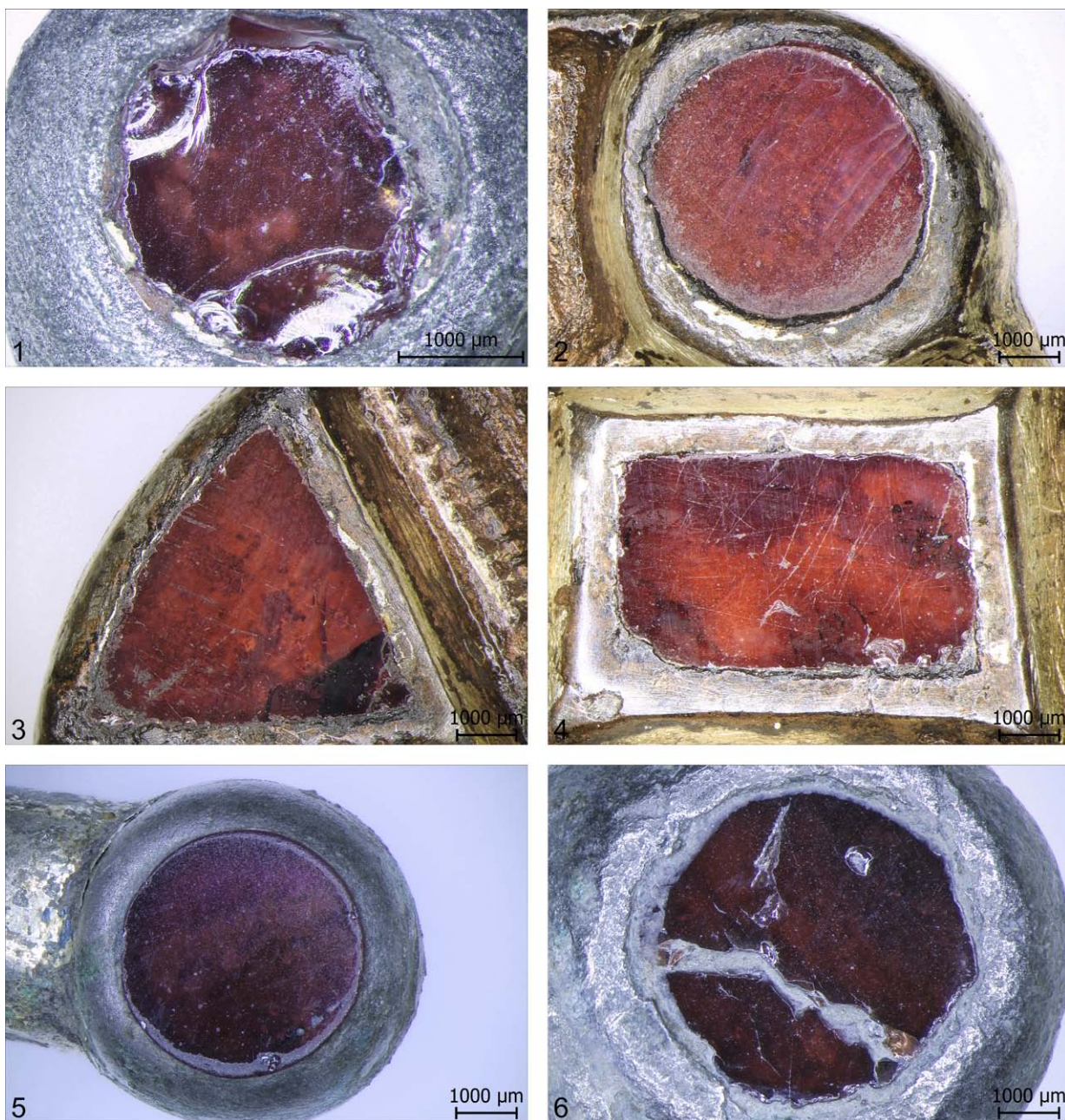


Fig. 25. Details of garnet inlays and their settings. 1 – Dolní Kamenice (no. 10); 2–4 – Žehuň (no. 11); 5 – Třebestovice (no. 12); 6 – Šlotava (no. 13). Photo Z. Zlámalová Cílová.

the circulation of exotic oriental imports, as well as craftsmen capable of skilfully cutting and polishing such stones (Boschetti/Gratuze/Schibille 2023, 113).

Turning away from the Mediterranean region and the professional workshops of jewellers and gem cutters, we see the world of barbarian elites and their craft circles. Based on grave goods, we can judge that jewellery with stone inlays was an elite domain, and both giving and receiving such items represented an honour for both parties (Arrhenius 1985, 193; Hamerow 2017, 71). Precious stones circu-

lated among merchants, jewellers, and their clients. H. Hamerow offers two sources for understanding the circulation of stones. On the one hand, these are the objects themselves in the graves, i.e., artefacts that spread over great distances through exchange, exogamy (marriage outside one's own community), warfare, tributes, and other processes. Artefacts of this quality have been traditionally studied in professional literature for more than a century. The second source is stores of raw or processed stones. As yet unknown from the territory of Czech Republic,

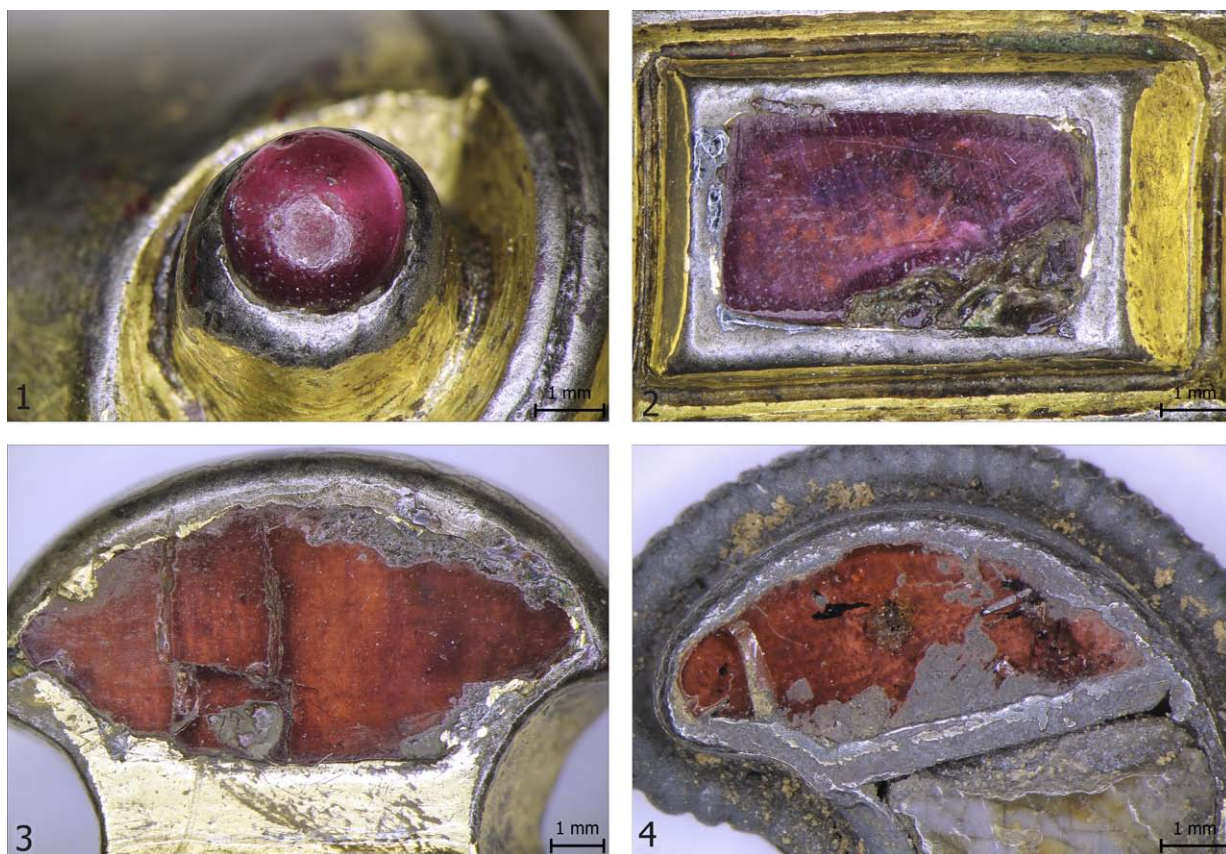


Fig. 26. Čelákovice-Záluží. Details of garnet inlays and their settings. 1–3 – no. 17; 4 – no. 19. Photo Z. Zlámlová Cílová.

they constitute a remarkable type of archaeological source in Northern Europe. These stores can contain hundreds of pieces of stone within a single context. They are found both in settlements and in graves (this applies to Northern Europe, albeit nearly exclusively to England). In the case of settlements, these are usually 'central locations' associated with trade (Hamerow 2017, 74–77, fig. 3). H. Hamerow's working hypothesis is that these gemstones did not circulate as freely as final jewellery products but were under the control of high-ranking families and their craftsmen. According to this author, these stone stores are found close to their original entry into the specific region (e.g., ports in SE England) and as such, their distribution may better reflect the trade route they travelled. The same is claimed by J. Nicolay, who sees in the distribution of luxury jewellery made of precious metals and exotic commodities (which would also include stone inlays) the fact that masterful jewellery products were only completed in the workshops of the elite residences, i.e., that the stone inlays were set in them on site. Only then did the process by which the objects were

distributed begin, undoubtedly again among other high-ranking people (Nicolay 2014, 264–266).

However, we also encounter treasures or hoards of individual stones in Central Europe.<sup>24</sup> An example is the 17 pieces of stone in an otherwise robbed grave at the Gepid burial site of Hajdúnánás-Fürj-Halom-dűlő in eastern Hungary (Horváth/Bendő 2011). The remaining graves at this cemetery are dated to the end of the 5<sup>th</sup> c., which is why the aforementioned and otherwise more precisely undated grave with a hoard of stones is also dated to this period. As for these stones, they are both flat pieces and cabochons. Likewise, the assemblage is a combination of pieces that have already been worked and those that have not been completed. The stones, garnets of Southeast Asian origin, were probably originally stored in some type of sack made of organic material. In the Carpathian Basin, the authors report several other cases of hoards of individual stones deposited in graves (Horváth/Bendő 2011, fig. 4). Stones from grave 1 at the Langobard burial site in Bezenye-Papréti from the 6<sup>th</sup> c. were identified as Indian almandines, whereas the origins of

<sup>24</sup> Likewise noteworthy is a case in Northern Italy (Lombardy) of a (female) grave (T US 6) from the 7<sup>th</sup> c. at the Lodi Vecchio cemetery with an assemblage of stone inlays, perhaps originally placed in a wooden box (Boschetti/Gratuze/Schibille 2023, 107, 108, fig. 3).

stones from other locations remain undetermined. Although the number of identified stones makes up a small group, it roughly corresponds to findings from the West Merovingian area (Horváth/Bendő 2011, 30). An interesting interpretation of these 'treasures' of stone inlays in tombs comes from ethnographic observations from India, where small fragments from grinding waste were collected and cleaned up so that they would not become the subject of unauthorised trade. If someone was buried with such an assemblage, it may mean that they had a direct relationship to these workshops or close contact with those who were involved in this activity (Boschetti/Gratuze/Schibille 2023, 112).

The significant decline in red stone inlays in Western European workshops is often attributed to the interruption of the trade route from Southeast Asia to the Red Sea by the military raids of the Sasanians around AD 580 (von Freeden 2000; Hammerow 2017, 77–79). These stones almost completely disappeared from jewellery products by the end of the 7<sup>th</sup> c. There are a few exceptions that indicate that trade with Asian garnets continued to a limited extent. This is evidenced by a gold buckle from the elite Avar tomb of Kunszentmiklós-Kunbábony, which represents an example of excellent Byzantine jewellery work (Horváth et al. 2025, 163).

Unfortunately, we must admit to knowing almost nothing about the routes taken by Bohemian garnets to the cutting workshops and distribution centres of the Mediterranean and the barbarian part of Europe. On the one hand, we know of natural deposits of these minerals (e.g., Hanus/Soumar 2023), while on the other, we can assume that they (probably unprocessed) reached Mediterranean workshops. We can conclude that in Bohemia, garnet grains were collected in deluvio-fluvial sediments, where they came through the erosion of primary rocks. However, due to the lack of any sources, it is not yet possible to say who participated in this collection and further distribution. However, we can mention in passing that in recent years the figure of the Frankish merchant Samo, who lived in the first half of the 7<sup>th</sup> c., has been theoretically associated with this activity (Charvát 2023). However, this is only an episodic event.

## CONCLUSION

At this point we can summarise the knowledge gained from the detailed examination of artefacts and the analyses performed. It is noteworthy that in the studied assemblage, Czech garnets are found only on artefacts that we date back to the 5<sup>th</sup> c. (a brooch with a bird head on a foot from Nový

Bydžov and a bird brooch from Budihostice). On the one hand, we are adding to the list of evidence of the use of Bohemian garnets as early as the 5<sup>th</sup> c., which was not known until a few years ago based on studies of jewellery in some regions (cf. Quast/Schüssler 2000). On the other hand, we can show that Bohemian garnets were also used on more common jewellery, i.e., not only on artefacts belonging to the highest barbarian elite, such as jewellery from Childeric's tomb in Tournai, the Gepid royal tomb of Apahida III, or from the assemblage from Mšec in Central Bohemia (Jířík 2023). As for the use of Czech garnets in the Nový Bydžov brooch, they were used here as typical spherical cabochons, which appear as decoration on the borders of intricate and richly decorated objects (e.g., Jířík 2023, fig. 2; 3). However, it should be noted that the head of this brooch was decorated with a flat stone from Sri Lanka. It was all the more surprising to discover that the flat inlay of the eye of the bird brooch from Budihostice was cut from Czech garnet and not from the more common Indian almandine. And while this is not the only case of such use – and not even in Bohemia (see belt fitting from Kounice; Čisťáková et al. 2022) – it is a less common cut for this type of stone. Another known case where Bohemian garnet was ground into a flat piece is represented by the Childeric tomb from Tournai (Calligaro/Kazanski/Périn 2023, 79).

Most of the jewellery analysed here comes from the later phase of the Migration Period, i.e., both stages E1 and E2. All of these later artefacts contain Asian garnets, usually from India, less often from Sri Lanka. However, their distribution over time does not reveal any regularities. It also does not matter whether the artefacts refer to the 'Thuringian' manufacturing tradition or whether their origin is sought in the Danube region. Moreover, it can be argued that this distinction does not make much sense in Central Europe from the point of view of garnet inlays, because in terms of distribution it is a single trade flow in which stones from various natural deposits on the Indian subcontinent were mixed somewhere in the ports of the Red Sea or, at the latest, in workshops on the Mediterranean coast. They probably then travelled to the barbaric region together. This is evidenced by the finding that if an artefact contained multiple stone inlays, they were often of different origins (i.e., either from India or Sri Lanka). In our assemblage, this is the case with the Szarvas-type brooch from Plaňany, the Schwechat-Pallersdorf-type S-shaped brooch from Žehuň, and the discbrooch from Roudnice nad Labem-Hracholusky. Other researchers from different parts of Europe have also reached the same conclusion (Calligaro et al. 2002; Šmit et al. 2014).

Artefacts with coloured garnet inlays represent only a small part of the jewellery inventory from the Migration Period in Bohemia. Because of this – and of course also because of their undeniably attractive appearance – they are considered evidence of the elite, which appears to be true in many cases. For example, the bow brooch from grave 5/I from Čelákovice-Záluží is a truly high-quality product from an experienced jeweller. This can be seen in the precision of the stone inlays and the skilled execution of the chip-carved decoration (Fig. 9). It can be noted that the example of the inlays in the eyes of this brooch shows that cabochons were not always made only from Bohemian garnets. Simpler products, such as small bird and S-shaped brooches, can then be placed in contrast to these extraordinary artefacts. The dislodged inlays from the Hostivice graves allow us to see the actual working of the stones from the side, which is no longer visible after they are set in the bed on the artefact. In many cases, these stones are not polished on the sides, but rather broken or chipped, a situation that has also been observed elsewhere (*Arrhenius 1985, 76; Hamerow 2017, 77–79; Hilgner 2016, 402, 403*). This is probably evidence that in barbarian workshops it was necessary to adjust the stones into beds in any way possible when it was not possible to use a sufficiently technically capable cutting workshop. Sometimes this type of fitting was not entirely successful, as evidenced by, e.g., belt fitting from Kounice (*Čiřáková et al. 2022, 336*) or some jewellery from the territory of Hungary (*Horváth/Mozgai/Bajnóczi 2019*).

As with the processing of the stone inlays themselves, significant qualitative differences can be observed in the jewellery work applied to the artefacts analysed here. Three basic groups were distinguished based on the purity of the silver: an alloy with a higher silver content (90–98.6%), an alloy with a medium silver content (80–87.9%), and an alloy with a lower silver content (54.3–75.5%). A wide range of alloys were also documented: copper, lead, tin and zinc. Brooch from Budihostice content traces of gold. But these factors indicate the use of recycle material. The quality of the material used (in our case silver) was not determined by either typological classification or territorial origin. Production circuits cannot be defined based on the material used. This reflects the wide use of recycled material and the uneven supply of individual workshops. Based on the studied material, it is possible to judge the existence of workshops producing jewellery of various quality. The existence of various workshops, whose production was probably determined by regional demand, supply and the qualifications of jewellers, is evidenced by the

decorative techniques and the level of processing of stone inlays. Some products show a high level of specialisation, represented by a combination of several techniques: intricate chip-carving, the grinding of stone inlays, gilding and niello decoration. Other jewellery, on the other hand, has only simple decoration. Surface treatment were observed, with the buckle from Velké Chvalovice (Fig. 12: 2) having unfinished surface treatment of fire gilding. In the case of the surface of gilded objects, the question of the absence of mercury, which was the basic component for amalgam gilding, remains open (Tab. 2). First of all, we can mention the gradual degradation of mercury, and we can also consider the use of the diffusion bonding technique. As mentioned above, cooperation between stone cutting workshops and regional jewellery workshops was not always established. Garnet inlays reached jewellers in barbarian Europe in various states of processing. There is also a lack of any standardisation of production in terms of the use of metal materials or certain technological processes. In contrast, there were central workshops that focused on the production of elite jewellery intended for the ruling elite of the time. Here, one can observe the precise and targeted selection of stones, the preparation of special cuts according to the desired shape of the jewellery, the use of gold, and exceptionally high-quality jewellery workmanship. An observation that is also related to the question of the point at which in the assignment of work to the jeweller it was decided whether or not the piece of jewellery would contain a stone inlay. It is undeniable that brooches of the same variants appear with and without inlays. Some S-shaped and bird brooches (see Fig. 4) can serve as examples, as can Thuringian brooches with bird heads and, of course, miniature plier-shaped brooches. Most likely, at the moment of creating the wax model, the space usually intended for the inlay was either left full (in the case of bird or S-shaped brooch heads, the eye was later indicated here by a circle with a central point), or a bed for the inlay was created. It seems as if the final decision of whether or not to use an inlay is either a matter of customer or manufacturer preference, or the availability of a suitable stone inlay. This, of course, only applies to some brooches, not to products on which the coloured inlays play a crucial and determining role (for example, in the cloisonné technique). In such cases, the possession of suitable coloured inlays was a prerequisite for creating such jewellery.

Here we are already dealing with the actual producers of the mentioned artefacts. It is known from the rich literature that there were jewellers who (often as slaves) worked directly at the courts of rulers, i.e., a tradition that reached the courts

of barbarian elites from the Roman milieu (Hardt 2004, 225–227). A remarkable story from the Middle Danube Region around the middle of the 5<sup>th</sup> c. comes from The Life of Saint Severinus by *Eugippius* (1981), who speaks of Queen Giso, the wife of the Rugian king, who imprisoned barbarian goldsmiths somewhere north of the Danube and forced them to make royal jewellery for her. These craftsmen secured their freedom by taking the king's young son Frederick hostage, threatening him with death by sword, and only releasing him after they themselves were freed (Hardt 2004, 227). Another well-known case is that of Eligius, first the leading goldsmith of the Frankish Kingdom under Chlothar II and Dagobert I, later bishop of Noyon and venerated as a saint after his death. Eligius himself was not a slave, but at the royal court he had a number of slaves of various origins at his disposal in his household, from Germanic people to provincials. Such multi-ethnic diversity could certainly have led to the easy absorption of various styles and techniques (Hardt 2004, 228, 229; cf. Tejral 2015, 292). It is still not clear whether and to what extent jewellers operated outside the residences of the ruling class, in the countryside, so to speak. Knowledge of them escapes us, and perhaps they did not even exist, if we assume that the handling of precious metals and precious stones was the exclusive domain of the elite (Hamerow 2017, 76; Nicolay 2014, 228). Certain expectations regarding the location of such elite settlements were also presented in the past by 'craftsmen's graves', of which the closest to Bohemia are the graves from Poysdorf in Lower Austria and Brno-Kotlářská Street (Daim/Mehofer/Tobias 2005), or the more distant but chronologically significant grave from Bobenheim-Roxheim in the Rhineland (Bernhard 1999, fig. 18). However, whether more complex judgments can be made on the basis of these rather rare findings is a question that remains to be answered today (cf. Ježek 2015). Another way to discover craft centres is through craft hoards, such as Buschberg-Steinmandl in Lower Austria (Szameit 1997; Tejral 2015). In this context, it is interesting that a summary of evidence about jewellers during the Migration Period in the Middle Danube Region was recently presented by J. Tejral, who noted that in many cases these were hilltop sites (Tejral 2015, map 1). In Bohemia, in this context, it is possible to mention the discovery of a bronze model of a Taman-type brooch from Závist (Droberjar 2008a, 138, fig. 6: 2). However, no other finds from the later phase of the Migration Period are yet recorded, though we must not forget that a significant settlement, also represented by imports

of late Argonne terra sigillata, must be assumed here in the first half of the 5<sup>th</sup> c. (Halama 2014). After the mid-5<sup>th</sup> c., it is not yet possible to find any central elite seat in Bohemia other than on the basis of the concentration of richly furnished graves, and it is clear that the current picture is grossly distorted by the high frequency of their looting at the time. With the current state of research, it is therefore possible to identify only the wider area of Prague and the region of the east-central Bohemian Elbe region, or the Ohře River region in Northwest Bohemia, where archaeological finds indicate that the density of settlement was the highest.

## CATALOGUE OF FINDS<sup>25</sup>

### Velké Chvalovice, Kolín District

1. Almost completely preserved bird-shaped brooch, missing only the spring and pin, originally probably made of iron. The brooch has the form of a stylised bird's body, relatively narrow and tall. The obverse is gilded. The head is turned to the right and is almost entirely filled with a circular red inlay representing the eye. The slightly curved beak is somewhat raised. The body is almond-shaped, decorated with concentric chip-carved lines. A small trapezoidal tail is placed on the lower edge. On the reverse are two bars, one with a perforation for the spring axis, the other forming the pin catch-plate, now broken. l. 28 mm, w. 10.5 mm, weight 2.38 g. Silver and gold. Stored in the Historical Museum of the National Museum (Fig. 2: 8).

### Třebestovice, Nymburk District

2. Almost completely preserved bird-shaped brooch, missing only the bar with the spring and pin. The obverse is gilded. The bird's body is elongate-oval, with a tail stylised as a trapezoid and a circular head turned with its beak to the right. The eye consists of a cabochon inlay of red colour with a flat top surface. The gilded obverse is decorated with chip carving; the body is divided by ribs (some with fine notching) arranged in a bilaterally symmetrical oval pattern. l. 29 mm, w. 12.5 mm, weight 3.35 g. Silver and gold. (Fig. 2: 10).

### Budihostice, Kladno District

3. Almost completely preserved bird-shaped brooch, missing only the spring and pin. The brooch has the form of a stylised bird's body with its head turned to the right. The obverse is gilded, though partly worn. The head bears a small circular red inlay representing the eye. The slightly curved beak is decorated with a chip-carved groove. The head is separated from the body by a transverse rib. The body is elongated and slightly profiled, with a semicircular projection on the right side, probably representing a claw. This projection is smooth, in contrast to most of the body's surface, which is decorated with densely set oblique grooves. On the narrowed lower end of the body is a smooth circular

<sup>25</sup> Abbreviation key: l. = length; w. = width; pre = preserved.

projection representing the tail. On the reverse is the remnant of a bar originally carrying the spring axis or catch. l. 36 mm, w. 14 mm, weight 3.88 g. Silver and gold. Stored in the Historical Museum of the National Museum (Fig. 2: 7).

#### Prague-Podbaba

4. Completely preserved silver brooch in the form of a stylised bird of prey. The head, turned to the right, is located at the foot of the brooch (on the reverse is a solid catch), while on the spring side (originally iron, now missing) is a trapezoidal projection representing the tail, entirely filled with a flat red inlay. The head is also decorated with a flat circular red stone inlay representing the eye. The beak is markedly curved. The left side of the brooch is rounded, representing the back, while the right side forms the belly, adorned with a crescent-shaped projection representing talons. The obverse of the body is decorated with deep chip carving forming rounded, narrow longitudinal fields, the central one densely filled with interlocking triangles separated by a zigzag rib. The obverse is gilded. l. 26.5 mm, w. 12 mm, weight 2.7 g. Silver and gold. From disturbed graves. Stored in the Historical Museum of the National Museum (inv. no. H1-51291; Fig. 2: 11).

#### Vyšehorovice, Prague-East District

5. Almost completely preserved bird brooch. The large circular head is entirely filled with a single piece of flat dark red stone inlay, while the upward-turned beak on the left is broken at the base. The central part of the brooch is egg-shaped, decorated along the outer edge with semicircular punched ornaments. The centre bears a small circular cabochon of dark red colour. The foot (tail) of the brooch is shaped as bifurcated flukes, filled with a single piece of flat stone inlay. On the reverse, a pair of bars with remains of an iron spring is visible. The pin is broken. Above the spring there is a transversely oriented bar with a small circular hole of unclear function. The foot bears a small narrow catch. l. 29.5 mm, w. pre. 12.5 mm, weight 4.87 g. Stored at the Institute of Archaeological Heritage Care of Central Bohemia (inventory no. AMČR-PAS C-202109132-N00660; Fig. 2: 12).

#### Nový Bydžov, Hradec Králové District

6. Small brooch with a pair of beak-shaped projections on the sides of the headplate, each filled with flat, coloured inlays. A semicircular projection on the upper edge was likewise originally filled with a flat inlay. The bow bears three small circular red cabochon inlays. On either side of the bow are two rows of five punched concentric semicircles. The foot is shaped as a bird's head, with the neck beneath it grooved. The obverse is gilded. l. 29 mm, weight 5.5 g. Silver and gold. Stored in the Museum of East Bohemia in Hradec Králové (inv. no. 96858; Fig. 2: 1).

#### Plaňany, Kolín District

7. Fragment of a Szarvas-type bow brooch, with the obverse gilded. Preserved is only the headplate, approximately semicircular, with the central field pointed upwards in a triangular shape. Three fields on the

headplate hold flat red inlays. At the lower edge of the lateral sides is an open area filled with a chip-carved bar. Of the relatively wide bow, only the upper part of the arch is preserved, richly decorated on the obverse. Along the longitudinal axis runs a rib decorated with opposed punched triangles filled with niello, while the sides of the bow are adorned with larger triangular punched motifs. On the reverse of the headplate two bars are preserved, between which the axis of the spring survives intact, though without the spring. l. pre. 16 mm, w. 16 mm, weight 2.43 g. Silver and gold. Stored at the Institute of Archaeological Heritage Care of Central Bohemia (Fig. 2: 2).

#### Hostivice-Palouky, Prague-West District

8. Fragment of an S-shaped brooch comprising one piece of the head with a sleeve containing a circular flat red inlay, and one piece of the neck-arch with clearly visible chip-carved decoration of parallel longitudinal ribs. On the reverse of this neck fragment is the remnant of a thin catch-plate bar. The obverse is gilded. Head fragment 8 × 5 mm, weight 0.205 g. Neck fragment 12.5 × 8.5 mm, weight 0.321 g. Silver and gold. Grave H1762. Stored in the Central Bohemian Museum in Roztoky (inv. no. 15911; Fig. 2: 4).

#### Hostivice-Palouky, Prague-West District

9. Almost completely preserved S-shaped brooch with dextrally coiled heads. The body is decorated on the obverse with simple transverse chip carving and gilding. The heads bear large eyes once filled with flat red inlays; one head is heavily damaged and the inlay was found loose, while the other was intact but its inlay, though preserved during excavation, fell out during conservation and was not replaced. Notably, at the bottom of the socket a concentric ring forms an eye-socket that would have shone through the inlay when lit at an angle. The beaks are closed and curved. The reverse is heavily covered in corrosion from iron, obscuring the pin and spring, which were probably iron. l. pre. 23 mm, w. 14 mm, weight 2.094 g. Silver, gold, and iron. Grave H1932. Stored in the Central Bohemian Museum in Roztoky (inv. no. 13589; Fig. 2: 3).

#### Dolní Kamenice, Kladno District

10. Almost completely preserved S-shaped brooch, missing only the broken spring, pin, and catch. The obverse is gilded. The relatively small bird heads face right, each with a circular flat red inlay, one of which is missing. The beaks curve rightwards and downwards, creating a circular perforation between beak and body. The central part of the brooch is an arched torso divided into three fields, each filled with parallel chip-carved grooves. On the reverse, only the remnant of a bar for the spring axis is preserved. l. 26 mm, w. 11.5 mm, weight 2.06 g. Silver and gold. Stored in the Historical Museum of the National Museum (acc. no. 10297; Fig. 2: 5).

#### Žehuň, Kolín District

11. Almost completely preserved S-shaped brooch, missing only the spring and pin (probably iron, as indicated by reddish imprints on the reverse). A fragmentary

axis survives in one of the two bars on the reverse; the catch-plate is broken from the bar. The obverse forms conjoined bird heads, dextrally oriented. There are five flat inlays: one circular for each eye, one triangular at the back of each head, and one rectangular to trapezoidal in the centre of the brooch. Remaining fields are decorated with chip carved parallel lines with the so-called dental ornament 'Zahnschnitt ornament'. The plate is broken in two places, each between a bird head and the central field. l. 28 mm, w. 20.5 mm, weight 5.32 g. Silver and gold. Stored in the Historical Museum of the National Museum (Fig. 2: 6).

#### **Třebestovice, Nymburk District**

12. Small plier-shaped brooch with a closed headplate pierced by two small circular holes. The bow is small, arched, D-shaped in section. The foot is extended into a circular terminal set with a single flat red stone inlay. On the reverse, a short iron spring is preserved without the broken pin, and a small catch. The obverse retains traces of gilding. l. 25.5 mm, w. 13.5 mm, weight 2.38 g. Silver and gold (Fig. 2: 15).

#### **Šlotava, Nymburk District**

13. Brooch foot made of thin casting, ending in a circular expansion with a circular flat red inlay. The middle section of the foot is densely transversely grooved; the opposite end is broken from a slightly widening central section decorated with longitudinal grooves. Reverse with a short catch. l. pre. 25.5 mm, w. 9.5 mm, weight 2.8 g. Silver and gold. Stored in the Historical Museum of the National Museum (inv. no. H1-429836; Fig. 2: 14).

#### **Hostivice-Palouky, Prague-West District**

14. Completely preserved plier-shaped bow brooch with a trapezoidal foot. The headplate is shaped in the classic double-pliermotif. The obverse is chip-carved, following the outline of the headplate. The bow is fairly short, somewhat flattened on top, decorated with short parallel grooves, and heavily damaged in this area. The foot is prominent, trapezoidal with slightly convex sides; its lower part is cut into two rounded lobes forming a swallowtail. Each lobe bears a circular dark red stone inlay. The obverse of the foot is decorated with a zigzag interlace chip-carving. The entire obverse is gilded. On the reverse, a double bar for the spring axis survives; the spring is iron, producing heavy corrosion in this area. The iron pin is intact. l. 45 mm, w. 16.5 mm. Silver, gold, and iron. Grave H1905. Stored in the Central Bohemian Museum in Roztoky (inv. no. 14371; Fig. 5: 3).

#### **Lochenice, Hradec Králové District**

15. Completely preserved silver brooch with a headplate shaped as two upward-turned bird heads resting against a central bar with an expanded terminal. The obverse of the headplate is chip-carved; the birds' eyes are inlaid with circular dark red stones. Between the beaks and the central bar are two circular perforations. The bow is short and broad, with five longitudinal ribs, the central rib wider and decorated with two rows of punched triangles filled with niello. The longer foot is transversely grooved and ends in an animal head. On the reverse, a plate for the spring with remains of an

iron coil and a narrow catch are preserved. l. 58 mm, w. 24 mm. Stored in the Museum of East Bohemia in Hradec Králové (inv. no. 24/77-6; Fig. 5: 2).

#### **Prague-Podbaba**

16. Almost completely preserved silver brooch with a headplate formed as laterally turned bird heads with beaks touching stylised talons; triangular perforations mark the point of contact. This interpretation is supported by small circular flat red stone inlays at the birds' eyes. The obverse is in high relief with chip-carving into narrow opposed fields. The foot is shaped as an animal head with a straight-cut snout, almond-shaped eyes in relief, and a longitudinal dorsal ridge. Behind the head, the lower bow section is divided by transverse ribs, merging into an arch with a raised longitudinal rib decorated along its length with a double line of small punched dots filled with niello for contrast. The bow has accentuated edges, otherwise smooth, merging into the ornate headplate. On the reverse, two lugs for the spring axis and a plain short catch survive. Spring and pin are missing, likely iron. l. 48 mm, w. 25.5 mm, weight 10 g. Silver and gold. Stored in the Historical Museum of the National Museum (inv. no. H1-51164; Fig. 5: 1).

#### **Záluží near Čelákovice, Prague-East District**

17. Completely preserved large silver brooch with silver self-coiled spring (5 + 5 turns) and pin mounted on an iron axis. The obverse is almost entirely gilded except for selected raised fields for contrast. The foot is a large animal head, with a flat peltoid projection on the snout set with a flat red stone inlay. The head has prominent eyes with red cabochon inlays, as well as sculpted brows and a longitudinal nasal ridge. The head merges into a semicircular-section bow with a central longitudinal rib set with a rectangular flat red stone near the lower end. The rib is decorated in the convex part of the bow with two longitudinal rows of opposed triangles, now poorly preserved but originally niello-filled. The bow sides are richly decorated with deep chip-carved S- and spiral motifs. The bow merges into a semicircular headplate with raised silver edges, the inner gilded surface decorated with a bilaterally symmetrical spiral motif in chip-carving. Along the outer edge of the headplate are five conical knobs with transverse, finely notched ribs, ending in plain rounded heads left silver or polished to silver. On each side of the headplate one knob (second from bottom) is missing; it is unclear whether this was intentional or due to loss in use. Small round holes pierce the rim where these knobs should have been. It is possible that after one knob fell out, the user removed the opposite one for symmetry. The reverse shows the knobs were soldered or brazed in place. The reverse also shows the foot, bow, and headplate are hollow. At the junction of bow and foot is a short solid catch, intact. l. 86.5 mm, w. 51 mm, weight 55 g. Silver and gold. Grave 5/I. Stored in the Historical Museum of the National Museum (inv. no. H1-43432; Fig. 5: 4).

#### **Roudnice nad Labem-Hracholusky, Litoměřice District**

18. Almost completely preserved silver disc brooch. The obverse is raised compared to the rim (forming a collar) and divided by radial partitions into five

peripheral fields in the form of circular segments and a central circular field, all inlaid cloisonné-style with flat red stones. On the reverse are remnants of broken bars for the catch and spring. Diameter 16.5 mm, weight 2.68 g. Silver and gold. Stored in the Historical Museum of the National Museum (inv. no. H1-224026; Fig. 5: 5).

#### **Záluží near Čelákovice, Prague-East District**

19. Small silver kidney-shaped fitting, probably originally a pendant, now with the suspension loop broken. The central part of the obverse is raised and divided into three vertically separated fields; the two outer fields are inlaid with flat red stones, the central field with a matte dark-brown stone, evidently of a different material. Reverse flat. l. 10 mm, w. 12 mm, weight 0.93 g. Silver. Stored in the Historical Museum of the National Museum (inv. no. H1-43486; Fig. 5: 7).

#### **Dolní Kamenice, Kladno District**

20. Completely preserved thick buckle pin, missing only the hook for attachment to the buckle axis. The pin has a rectangular expanded base with two rectangular red inlays. After a slight constriction, a broader pin extends, curving beak-like at the end. The upper surface of the pin is distinctly and evenly convex. l. 25.5 mm, w. 12 mm, weight 5.39 g. Silver. Stored in the Historical Museum of the National Museum (acc. no. 10-10375; Fig. 5: 6).

#### **Hostivice-Palouky, Prague-West District**

21. Loose peltoid-shaped flat stone inlay, purple-red in colour. 8 × 6.5 mm, thickness 2 mm, weight 0.46 g. Grave H1951. Stored in the Central Bohemian Museum in Roztoky (inv. no. 15284; Fig. 23: 5, 6).

#### **Hostivice-Palouky, Prague-West District**

22. Circular flat red stone inlay, still partly set in a small fragment of metal mount. 3.5 × 4 mm, thickness 1.25 mm, weight 0.055 g. Grave H1762. Stored in the Central Bohemian Museum in Roztoky (inv. no. 14671; Fig. 24: 1, 2).

#### **Hostivice-Palouky, Prague-West District**

23. Loose circular flat red stone inlay. 2.5 × 2.75 mm, thickness 0.25 mm, weight 0.017 g. Grave H1946. Stored in the Central Bohemian Museum in Roztoky (inv. no. 13347; Fig. 24: 3, 4).

#### **Velké Chvalovice, Kolín District**

24. Fragment of a small bird brooch, consisting of a small circular head almost entirely filled with an eye of flat red inlay. From the head extends an upward-curving raptor's beak to the right. The body is narrow and oval; the lower part is broken, but most of the chip-carved decoration on the obverse is preserved, consisting of an almond-shaped central field divided crosswise into four smaller fields. The obverse was gilded. On the reverse, the remnant of a catch is visible. l. prel 19.5 mm, w. pre. 12 mm, weight 1.47 g. Silver and gold (Fig. 2: 9).

#### **Řepov, Mladá Boleslav District**

25. Small rectangular fragment with flat red inlay, joined to a narrower neck of rectangular section, now broken. The obverse bears traces of gilding. On the reverse is a trace of a small bar, perhaps a catch or loop for attachment to a buckle frame. Possibly the foot (bird?) of a brooch, or the base of a buckle pin. l. pre. 9 mm, w. 10 mm, weight 1.75 g. Silver and gold. Stored in the Museum of Mladá Boleslav (Fig. 2: 13).

## **BIBLIOGRAPHY**

- Adams 2006 – N. Adams: Back to Front: Observations on the development and production of decorated backing foils for garnet cloisonné. *Historical Metallurgy* 40, 2006, 12–26.
- Akhmedov 2007 – I. Akhmedov: The cross-like diadems in the Great Migration epoch (Preliminary Communication). In: *Tejral Hrsg. 2007*, 263–274.
- Armbruster 2018 – B. Armbruster: Techniken der Oberflächenveredelung mit Edelmetall, von den Anfängen der Goldmetallurgie bis in das Frühmittelalter. In: *Eilbracht et al. Hrsg. 2018*, 9–34.
- Arrhenius 1985 – B. Arrhenius: *Merovingian garnet jewellery. Emergence and social implications*. Stockholm 1985.
- Arrhenius 2000 – B. Arrhenius: Garnet Jewelry of the Fifth and Sixth Centuries. In: *Brown/Kidd/Little 2000*, 214–225.
- Aufderhaar 2009 – I. Aufderhaar: From the goldsmith's point of view. Gilding on metals during the first millennium AD – techniques and their development in the Germanic area. *Authentication and Analysis of Goldwork. Archo Sciences. Revue d'Archéométrie* 33, 2009, 243–253.  
DOI: <https://doi.org/10.4000/archeosciences.2269>
- Avent/Leigh 1977 – R. Avent/D. Leigh: A Study of Cross-Hatched Gold Foils in Anglo-Saxon Jewellery. *Medieval Archaeology* 21, 1977, 1–46.  
DOI: <https://doi.org/10.1080/00766097.1977.11735397>
- Becker et al. 2003 – M. Becker/M. Füting/P. Hammer/U. Sieblist: Rekonstruktion einer antiken Vergoldungstechnik und ihrer Anwendungsbereiche im damaligen Metallhandwerk. *Jahresschrift für Mitteldeutsche Vorgeschichte* 86, 2003, 167–190.  
DOI: <https://doi.org/10.11588/jsmv.2003.1.89621>
- Bemmann 2008 – J. Bemmann: Mitteldeutschland im 5. Jahrhundert – Eine Zwischenstation auf dem Weg der Langobarden in den mittleren Donaunraum? In: *Bemmann/Schmauder Hrsg. 2008*, 145–227.
- Bemmann/Schmauder Hrsg. 2008 – J. Bemmann/M. Schmauder (Hrsg.): *Kulturwandel in Mitteleuropa. Langobarden – Awaren – Slawen. Akten der Internationalen Tagung in Bonn vom 25. bis 28. Februar 2008*. Kolloquien zur Vor- und Frühgeschichte 11. Bonn 2008.
- Bernhard 1999 – H. Bernhard: Germanische Funde in römischen Siedlungen der Pfalz. In: T. Fischer/G. Precht/J. Tejral (Hrsg.): *Germanen beiderseits des spätantiken Limes. Materialien des 10. Internationalen Symposiums*

- „Grundprobleme der frühgeschichtlichen Entwicklung im nördlichen Mitteldonauegebiet“. *Xantem* vom 2.–6. 12. 1997. Spisy Archeologického ústavu AV ČR Brno 14. Köln – Brno 1999, 15–46.
- Bimson 1985 – M. Bimson: Dark-Age garnet cutting. *Anglo-Saxon Studies in Archaeology and History* 4, 1985, 125–128.
- Bitner-Wróblewska/Pesch/Przybyła 2020 – A. Bitner-Wróblewska/A. Pesch/M. J. Przybyła: Styles. In: A. Bursche/J. Hines/A. Zapolska (eds.): *The Migration Period between the Oder and the Vistula* 1. East Central and Eastern Europe in the Middle Ages, 450–1450 59. Leiden – Boston 2020, 225–298.  
DOI: [https://doi.org/10.1163/9789004422421\\_008](https://doi.org/10.1163/9789004422421_008)
- Blažková/Jiřík/Bezáková a kol. 2023 – K. Blažková/J. Jiřík/J. Bezáková a kol.: *Královské klenoty ze Mšece a Řevničova. Unikátní nálezy z období stěhování národů ze středních Čech*. Rakovník 2023.
- Bóna 1956 – I. Bóna: Die Langobarden in Ungarn. Die Gräberfelder von Várpalota und Bezenye. *Acta Archaeologica Academiae Scientiarum Hungaricae* 7, 1956, 183–244.
- Bóna 1991 – I. Bóna: *Das Hunnenreich*. Stuttgart 1991.
- Bóna/Horváth 2009 – I. Bóna/J. B. Horváth: *Langobardische Gräberfelder in West-Ungarn*. Monumenta Germanorum Archaeologica Hungariae 6. Budapest 2009.
- Bóna/Nagy 2002 – I. Bóna/M. Nagy: Gepidische Gräberfelder am Theissgebiet I. Monumenta Germanorum Archaeologica Hungariae. Monumenta Gepidica 1. Budapest 2002.
- Boschetti/Gratuze/Schibille 2023 – C. Boschetti/B. Gratuze/N. Schibille: Garnet Trade in Early Medieval Europe: The Italian Network. *European Journal of Archaeology* 26, 2023, 101–119.  
DOI: <https://doi.org/10.1017/ea.2022.25>
- Brown/Kidd/Little 2000 – K. R. Brown/D. Kidd/Ch. T. Little: *From Attila to Charlemagne. Arts of the Early Medieval Period in the Metropolitan Museum of Art*. New York – New Haven 2000.
- Bugoi/Oanță-Marghitu/Calligaro 2016 – R. Bugoi/R. Oanță-Marghitu/T. Calligaro: IBA investigations of loose garnets from Pietroasa, Apahida and Cluj-Someșeni treasures (5<sup>th</sup> century AD). *Nuclear Instruments and Methods in Physics Research Section B. Beam Interactions with Materials and Atoms* 371, 2016, 401–406.  
DOI: <https://doi.org/10.1016/j.nimb.2015.09.038>
- Burianek/Höltken 2017 – M. Burianek/Th. Höltken: A Rock Crystal Workshop from Cologne. In: *Hilgner/Greifff/Quast eds.* 2017, 137–147.
- Calligaro 2023 – Th. Calligaro: Sága českých granátů v temném středověku. In: *Blažková/Jiřík/Bezáková a kol.* 2023, 46–49.
- Calligaro et al. 2002 – T. Calligaro/S. Colinart/J.-P. Poirot/C. Sudres: Combined external-beam PIXE and  $\mu$ -Raman characterisation of garnets used in Merovingian jewellery. *Nuclear Instruments and Methods in Physics Research Section B. Beam Interactions with Materials and Atoms* 189, 2002, 320–327.  
DOI: [https://doi.org/10.1016/S0168-583X\(01\)01078-3](https://doi.org/10.1016/S0168-583X(01)01078-3)
- Calligaro/Kazanski/Périn 2023 – Th. Calligaro/M. Kazanski/P. Périn: Výzdoba pohřební výbavy krále Childericha I. In: *Blažková/Jiřík/Bezáková a kol.* 2023, 71–79.
- Calligaro/Périn 2022 – Th. Calligaro/P. Périn: Analyse géochimique et provenance des grenats ornant les chefs-d'œuvre de l'orfèvrerie mérovingienne conservés au département des Monnaies, médailles et antiques de la Bibliothèque nationale de France et au musée des Beaux-Arts et d'archéologie de Troyes. *Antiquités Nationales* 52, 2022, 42–71.
- Charvát 2023 – P. Charvát: Samo negucians. In: *Blažková/Jiřík/Bezáková a kol.* 2023, 201–207.
- Čiřáková et al. 2022 – V. Čiřáková/Z. Beneš/Z. Zlámalová Cílová/R. Hanus/L. Lapčák/Š. Msallamová/T. Trojek: Interdisciplinární pohled na zlaté kování z doby stěhování národů z Kounic. *Zborník Slovenského národného múzea* 116. *Archeológia* 32, 2022, 329–354.  
DOI: <https://doi.org/10.55015/QAUF7938>
- Čiřmář 2011 – M. Čiřmář: Das Gräberfeld von Holubice. In: *Tejral Hrsg.* 2011, 129–224.
- Čiřmář/Geislerová/Rakovský 1985 – M. Čiřmář/K. Geislerová/I. Rakovský: Pohřebiště z doby stěhování národů ve Strachotíně. *Památky archeologické* 76, 1985, 285–307.
- Csallány 1961 – D. Csallány: *Archäologische Denkmäler der Gepiden im Mitteldonaubecken (454–568 u. Z.)*. Archaeologia Hungarica. Series Nova 38. Budapest 1961.
- Daim/Mehofer/Tobias 2005 – F. Daim/M. Mehofer/B. Tobias: Die langobardischen Schmiedegräber aus Poysdorf und Brno. Fragen, Methoden, erste Ergebnisse. In: *Pohl/Erhard Hrsg.* 2005, 201–224.
- Daněček/Korený/Perlík 2017 – D. Daněček/R. Korený/D. Perlík: Zlaté závěsky na pohřebišti z merovejského období v Hostivici-Paloukách, okr. Praha-Západ. In: E. Droberjar/B. Komoróczy (eds.): *Římské a germánské spony ve střední Evropě. (Archeologie barbarů 2012.) – Römische und germanische Fibeln in Mitteleuropa. (Archäologie der Barbaren 2012.)* Spisy Archeologického ústavu AV ČR Brno 53. Brno 2017, 513–523.
- Daněček/Smíšek/Korený 2014 – D. Daněček/K. Smíšek/R. Korený: Předběžná zpráva o terénním výzkumu pohřebiště z mladší doby stěhování národů v polykulturní lokalitě Hostivice-Palouky, okr. Praha-západ. In: *Komoróczy ed.* 2014, 407–418.
- Darque-Ceretti/Aucouturier 2013 – E. Darque-Ceretti/M. Aucouturier: Gilding for Matter Decoration and Sublimation. A Brief History of the Artisanal Technical Know-How. *International Journal of Conservation Science* 4, Special Issue, 2013, 647–660.
- Droberjar 2005 – E. Droberjar: Praha germánská. In: M. Lutovský/L. Smejtek a kol.: *Praha pravěká*. Praha 2005, 777–841.
- Droberjar 2008a – E. Droberjar: Některé problémy mladší doby stěhování národů v Čechách. In: B. Niezabitowska-Wiśniewska/M. Juściński/P. Łuczkiewicz/S. Sadowski (eds.): *The Turbulent Epoch. New materials from the Late Roman Period and the Migration Period I*. Monumenta Studia Gothica 5. Lublin 2008, 133–148.
- Droberjar 2008b – E. Droberjar: Thüringische und langobardische Funde und Befunde in Böhmen. Zum Problem der späten Phasen der Völkerwanderungszeit. In: *Bemmann/Schmauder Hrsg.* 2008, 229–248.
- Droberjar 2013a – E. Droberjar: Gold und Elite des 5. Jahrhunderts in Böhmen. In: M. Hardt/O. Heinrich-Tamáska (Hrsg.): *Macht des Goldes, Gold der Macht. Herrschafts- und Jenseitsrepräsentation zwischen Antike und Frühmittelalter im mittleren Donauraum. Akten des 23. Internationalen Symposiums der Grundprobleme der frühgeschichtlichen Entwicklung im mittleren Donauraum, Tengelic, 16.–19. 11. 2011. Forschungen zu Spätantike und Mittelalter* 2. Weinstadt 2013, 281–294.

- Droberjar 2013b – E. Droberjar: Langobardské esovitě spony ve středních Čechách. *Archeologie ve středních Čechách* 17, 2013, 147–159.
- Eilbracht et al. Hrsg. 2018 – H. Eilbracht/O. Heinrich-Tamáska/B. Niemeyer/I. Reiche/H.-U. Voß (Hrsg.): *Über den Glanz des Goldes und die Polychromie. Technische Vielfalt und kulturelle Bedeutung vor- und frühgeschichtlicher Metallarbeiten. Akten des 2. und 3. Workshops des Netzwerks Archäologisch-Historisches Metallhandwerk in Frankfurt am Main*, 24.–27. Oktober 2013, und in Berlin, 11.–12. Mai 2017. Kolloquien zur Vor- und Frühgeschichte 24. Bonn 2018.
- Fabech/Näsman eds. 2017 – Ch. Fabech/U. Näsman (eds.): *The Sösdala Horsemen and the equestrian elite of fifth century Europe*. Moesgård 2017.
- Farges 1998 – F. Farges: Mineralogy of the Louvres Merovingian garnet cloisonné jewelry: Origins of the gems of the first kings of France. *American Mineralogist* 83, 1998, 323–330.  
DOI: <https://doi.org/10.2138/am-1998-3-416>
- von Freeden 2000 – U. von Freeden: Das Ende engzelligen Cloisonnés und die Eroberung Südarabiens durch die Sasaniden. *Germania* 78, 2000, 97–124.
- Fremersdorf 1955 – F. Fremersdorf: *Das fränkische Reihengraberfeld Köln-Müngersdorf*. Germanische Denkmäler der Völkerwanderungszeit 6. Berlin 1955.
- Friedrich 2002 – M. Friedrich: Fränkische Funde im langobardischen Pannonien – ein chronologischer Vergleich. *Acta Praehistorica et Archaeologica* 34, 2002, 175–190.
- Friedrich 2016 – M. Friedrich: *Archäologische Chronologie und historische Interpretation. Die Merowingerzeit in Süddeutschland*. Ergänzungsbände zum Reallexikon der Germanischen Altertumskunde 96. Berlin – Boston 2016.
- Gall 2008 – F. Gall: Die Altmark als Siedlungsgebiet der Langobarden – Ein Kommen und Gehen? In: *Bemmann/Schmauder Hrsg.* 2008, 79–88.
- Giesler-Müller 1992 – U. Giesler-Müller: *Das frühmittelalterliche Gräberfeld von Basel-Kleinhüningen. Katalog und Tafeln*. Basler Beiträge zur Ur- und Frühgeschichte 11 B. Derendingen-Solothurn 1992.
- Gilg/Gast/Calligaro 2010 – H. A. Gilg/N. Gast/Th. Calligaro: Granat Cloisonné. Der erste europäische Schmuckstil. In: L. Wamser (Hrsg.): *Karfunkelstein und Seide. Neue Schätze aus Bayerns Frühzeit*. Ausstellungskataloge der Archäologischen Staatssammlung 37. München 2010, 87–100.
- Gilg/Then-Obtuska/Dussubieux 2024 – H. A. Gilg/J. Then-Obtuska/L. Dussubieux: Four millennia of garnet trade in Northeast Africa – chemical analysis of ancient and Late Antiquity beads from Lower Nubian sites. *Archaeometry* 66, 2024, 860–876.  
DOI: <https://doi.org/10.1111/arcm.12964>
- Greiff 2012 – S. Greiff: Silver grave goods from early Hungarian contexts: technological implications of debased alloy compositions with zinc, tin and lead. In: B. Tobias (Hrsg.): *Die Archäologie der Frühen Ungarn. Chronologie, Technologie und Methodik. Internationaler Workshop des Archäologischen Instituts der Ungarischen Akademie der Wissenschaften und des Römisch-Germanischen Zentralmuseums Mainz in Budapest am 4. und 5. Dezember 2009*. RGZM Tagungen 15. Mainz 2012, 241–260.
- Haimperl 1998 – U. Haimperl: Die Vogelfibeln der älteren Merowingerzeit. Bemerkungen zur Chronologie, zur Herstellung und zur soziologischen Bedeutung. *Acta Praehistorica et Archaeologica* 30, 1998, 90–105.
- Halama 2014 – J. Halama: Pozdní argonská a severoafrická sigillata z Čech – doklady místních germánských elit? In: *Komoróczy ed.* 2014, 387–406.
- Hamerow 2017 – H. Hamerow: The Circulation of Garnets in the North Sea Zone, ca. 400–700. In: *Hilgner/Greiff/Quast eds.* 2017, 71–84.
- Hansen 2004 – Ch. M. Hansen: *Frauengräber im Thüringerreich. Zur Chronologie des 5. und 6. Jahrhunderts n. Chr.* Basler Hefte zur Archäologie 2. Basel 2004.
- Hanus et al. 2013 – R. Hanus et al.: *Český granát. Historie, geologie, mineralogie, gemologie, šperkařství*. Praha 2013.
- Hanus/Soumar 2023 – R. Hanus/J. Soumar: Český granát. In: *Blažková/Jiřík/Bezáková a kol.* 2023, 127–135.
- Hardt 2004 – M. Hardt: *Gold und Herrschaft. Die Schätze europäischer Könige und Fürsten im ersten Jahrtausend*. Europa im Mittelalter 6. Berlin 2004.
- Harhoiu 1997 – R. Harhoiu: *Die frühe Völkerwanderungszeit in Rumänien*. *Archaeologia Romanica* 1. Bukarest 1997.
- Hedenstierna-Jonson/Ljungkvist 2023 – Ch. Hedenstierna-Jonson/J. Ljungkvist: Hroby elity s českými granáty ve Švédsku. In: *Blažková/Jiřík/Bezáková a kol.* 2023, 195–199.
- Hilberg 2009 – V. Hilberg: *Masurische Bügelfibeln. Studien zu den Fernbeziehungen der völkerwanderungszeitlichen Brandgräberfelder von Daumen und Kellaren. Daumen und Kellaren – Tumiany i Kielary, Band 2. Schriften des Archäologischen Landesmuseums 9*. Neumünster 2009.
- Hilgner 2016 – A. Hilgner: Die frühmittelalterliche »Schlangenkette« von Isenbüttel (Lkr. Gifhorn) und ihre angelsächsischen Vergleichsfunde. *Archäologisches Korrespondenzblatt* 46, 2016, 399–420.
- Hilgner 2018 – A. Hilgner: The 'Polychrome Style' in Early Medieval gold ornaments: Garnet cloisonné of the fifth to seventh centuries in Europe. In: *Eilbracht et al. Hrsg.* 2018, 299–312.
- Hilgner/Greiff/Quast eds. 2017 – A. Hilgner/S. Greiff/D. Quast (eds.): *Gemstones in the First Millennium AD. Mines, Trade, Workshops and Symbolism. International Conference, October 20<sup>th</sup>–22<sup>nd</sup>, 2015 Römisch-Germanisches Zentralmuseum, Mainz*. RGZM Tagungen 30. Mainz 2017.
- Horváth 2012 – E. Horváth: Cloisonné jewellery from the Langobardic Pannonia: Technological evidence of workshop practice. In: V. Ivanišević/M. Kazanski (eds.): *The Pontic-Danubian Realm in the Period of the Great Migration*. Collège de France – CNRS. Arheološki institut Beograd. Posebna izdanja 51. Centre de recherche d'histoire et civilisation de Byzance. Monographies 36. Paris – Beograd 2012, 207–242.
- Horváth 2013 – E. Horváth: Gemstone and glass inlaid fine metalwork from the Carpathian Basin: the Hunnic and Early Merovingian Periods. *Dissertationes Archaeologicae ex Instituto Archaeologico Universitatis de Rolando Eötvös nominatae* 3/1, 2013, 275–302.
- Horváth/Bendő 2011 – E. Horváth/Z. Bendő: Provenance Study on a Collection of Loose Garnets from a Gepidic Period Grave in Northeast Hungary. *Archeometriai Műhely* 8, 2011, 17–32.
- Horváth et al. 2024 – E. Horváth/V. Mozgai/L. E. Aradi/B. Topa/B. Bajnóczi: Production perspectives of a high-status polychrome jewellery set from the Hunnic period (mid-5<sup>th</sup> century AD) Carpathian Basin. *Journal of Archaeological Science* 171, 2024, 106085.  
DOI: <https://doi.org/10.1016/j.jas.2024.106085>

- Horváth et al. 2025 – E. Horváth/L. E. Aradi/Zs. Bendő/T. Vácsi/Zs. Rácz: Byzantine polychromy at its finest: art, craft and aesthetics of the noblest Avar period jewel reconstructed. *Archaeological and Anthropological Sciences* 2025, 17:163.  
DOI: <https://doi.org/10.1007/s12520-025-02278-4>
- Horváth/Mozgai/Bajnóczi 2019 – E. Horváth/V. Mozgai/B. Bajnóczi: Pure gold with poor workmanship – some unusual pieces of polychrome metalwork from the 5<sup>th</sup>-century Carpathian basin. *Archeometriai Műhely* 16, 2019, 43–56.
- Ježek 2015 – M. Ježek: The Disappearance of European Smiths' Burials. *Cambridge Archaeological Journal* 25, 2015, 121–143.
- Jiřík 2023 – J. Jiřík: Šperky okruhu Tournai – Apahida – Mšec. In: Blažková/Jiřík/Bezáková a kol. 2023, 51–55.
- Jiřík/Vávra 2015 – J. Jiřík/J. Vávra: Třpyt šperků z drahých kovů. In: J. Jiřík/J. Vávra/M. Šmolíková/M. Kuchařík a kol.: *Hroby barbarů v Praze Zličíně. Svět živých a mrtvých doby stěhování národů*. Praha 2015, 149–167.
- John/Štěrbík 2024 – J. John/J. Štěrbík: Ptačí spona z Brlohu pod Kletí. *Archeologické výzkumy v jižních Čechách* 37, 2024, 45–50.
- Kazanski/Mastykova 2017 – M. Kazanski/A. Mastykova: The Sösdala finds in the perspective of Central and South-Eastern Europe. In: *Fabech/Näsman eds. 2017*, 297–311.
- Kazanski/Mastykova/Périn 2002 – M. Kazanski/A. Mastykova/P. Périn: Byzance et les royaumes barbares d'Occident au début de l'époque mérovingienne. In: *Tejral Hrsg. 2002*, 159–193.
- Klanica/Klanicová 2011 – Z. Klanica/S. Klanicová: Das Langobardische Gräberfeld von Lužice (Bez. Hodonín). In: *Tejral Hrsg. 2011*, 225–312.
- Kmošek/Prášil 2014 – J. Kmošek/J. Prášil: Niello – historie, technologie, restaurování. In: A. Selucká (ed.): *Výzdobné techniky kovů I*. Brno 2014, 52–59.
- Koch 1998 – A. Koch: *Bügelfibeln der Merowingerzeit im westlichen Frankenreich*. Römisch-Germanisches Zentralmuseum Monographien 41. Mainz 1998.
- Koch 2001 – U. Koch: *Das alamannisch-fränkische Gräberfeld bei Pleidelsheim*. Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 60. Stuttgart 2001.
- Komoróczy ed. 2014 – B. Komoróczy (ed.): *Sociální diferenciace barbarských komunit ve světle nových hrobových, sídlištních a sběrových nálezů*. (Archeologie barbarů 2011.) – *Soziale Differenzierung barbarischer Gemeinschaften im Lichte der neuen Grab-, Siedlungs- und Lesefunde*. (Archäologie der Barbaren 2011.) Spisy Archeologického ústavu AV ČR Brno 44. Brno 2014.
- Korený 2024 – R. Korený: Merovejské pohřebiště ve Světcí, okr. Teplce. *Studia archaeologica Brunensia* 29, 2024, 57–107.  
DOI: <https://doi.org/10.5817/SAB2024-1-3>
- Korený/Janíková 2011 – R. Korený/R. Janíková: Merovejský závěsek z Prahy-Šárky. *Archeologie ve středních Čechách* 15, 2011, 937–940.
- Korený/Kostka 2014 – R. Korený/M. Kostka: Langobardské ženy v Čechách? K problematice ženských hrobů v 6. století. *Archaeologica Pragensia* 22, 2014, 516–558.
- Korený/Kudrnáč 2003 – R. Korený/J. Kudrnáč: Pohřebiště z doby stěhování národů v Klučově. Nové zhodnocení a jeho místo v rámci Československa v období stěhování národů a počátků raného středověku. *Archeologie ve středních Čechách* 7, 2003, 417–456.
- Kos et al. 2020 – S. Kos/M. Dolenc/J. Lux/S. Dolenc: Raman Microspectroscopy of Garnets from S-Fibulae from the Archaeological Site Lajh (Slovenia). *Minerals* 10, 2020, 325.  
DOI: <https://doi.org/10.3390/min10040325>
- Kühn 1965 – H. Kühn: *Die germanischen Bügelfibeln der Völkerwanderungszeit in der Rheinprovinz*. Die Germanischen Bügelfibeln der Völkerwanderungszeit 1. Graz 1965.
- Kühn 1974 – H. Kühn: *Die germanischen Bügelfibeln der Völkerwanderungszeit in Süddeutschland*. Die Germanischen Bügelfibeln der Völkerwanderungszeit 2. Graz 1974.
- Ljungkvist/Lundahl/Frölund 2017 – J. Ljungkvist/J. S. Lundahl/P. Frölund: Two Workshops with Garnet Crafts in Gamla Uppsala. In: *Hilgner/Greiff/Quast eds. 2017*, 91–102.
- von der Lohe 1994 – K. von der Lohe: Eine langobardische S-Fibel von Vörs-Kerkerdö. *Somogyi Múzeumok Közleményei* 10, 1994, 23–35.
- Losert/Pleterski 2003 – H. Losert/A. Pleterski: *Altenerding in Oberbayern. Struktur des frühmittelalterlichen Gräberfeldes und »Ethnogenese« der Bajuwaren*. Berlin – Bamberg – Ljubljana 2003.
- Mannerstrand/Lundqvist 2003 – M. Mannerstrand/L. Lundqvist: Garnet Chemistry from the Slöinge Excavation, Halland and Additional Swedish and Danish Excavations – Comparisons with Garnet Occurring in a Rock Context. *Journal of Archaeological Science* 30, 2003, 169–183.  
DOI: <https://doi.org/10.1006/jasc.2000.0583>
- Margreiter et al. 2022 – R. Margreiter/J. Baumann/I. Mantouvalou/M. Radtke/U. Reinholz/E. Strub: Investigations on fire-gilding. *Archaeometry* 64, 2022, 1465–1478.  
DOI: <https://doi.org/10.1111/arcm.12797>
- Martin 1995 – M. Martin: Tradition und Wandel der fibelgeschmückten frühmittelalterlichen Frauen Kleidung. *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* 38, 1995, 629–680.  
DOI: <https://doi.org/10.11588/propylaeumdok.00004470>
- Martin 2000 – M. Martin: Early Merovingian Women's Brooches. In: *Brown/Kidd/Little 2000*, 226–241.
- Martin 2002 – M. Martin: „Mixti Alamannis Suevi“? Der Beitrag der alamannischen Gräberfelder am Basler Rheinknie. In: *Tejral Hrsg. 2002*, 195–223.
- Matoušková 2015 – A. Matoušková: Miniaturní kleštovitě spony z východních Čech z doby stěhování národů. In: L. Tyszler/E. Droberjar (red.): *Barbari Superiores et Inferiores. Archeologia barbarzyńców 2014. Procesy integracji środkowoeuropejskiego Barbaricum. Polska – Czechy – Morawy – Słowacja. Barbari Superiores et Inferiores. Archaeology of the Barbarians 2014. Integration processes of the Central European Barbaricum. Poland – Bohemia – Moravia – Slovakia*. Łódź – Wieluń, 2015, 517–524.
- Matoušková 2016 – A. Matoušková: Esovitá spona typu Poysdorf z Velešic, okr. Jičín. In: M. Popelka/R. Šmidtová/P. Burgert/J. Jílek (eds.): *... tenkrát na východě... Sborník k 80. narozeninám Váta Vokolka. Praehistorica* 33/1–2. Praha 2016, 269–274.  
DOI: <https://doi.org/10.14712/25707213.2017.22>
- Matoušková 2019 – A. Matoušková: S-shaped fibulae of Poysdorf and Záluží types. In: M. Karwowski/B. Komoróczy/P. Trebsche (Hrsg.): *Auf den Spuren der Barbaren – archäologisch, historisch, numismatisch* (Archäologie der Barbaren 2015). Spisy Archeologického ústavu AV ČR Brno 60. Brno 2019, 235–243.

- Menghin/Springer/Wamers Hrsg. 1987 – W. Menghin/T. Springer/E. Wamers (Hrsg.): *Germanen, Hunnen und Awaren. Schätze der Völkerwanderungszeit*. Nürnberg 1987.
- Milavec 2007 – T. Milavec: Prispevek h kronologiji S-fibul v Sloveniji. *Arheološki vestnik* 58, 2007, 333–355.
- Militká/Beneš/Šámal 2018 – L. Militká/Z. Beneš/Z. Šámal: Nové pravěké a raně středověké nálezy z areálu bojiště u Lipan, okr. Kolín. *Archeologie ve středních Čechách* 22, 2018, 663–678.
- Militká et al. 2021 – L. Militká/Z. Beneš/P. Burgert/Z. Šámal/P. Beran-Cimbůrková: Pravěké nálezy z místa bojiště u Lipan, okr. Kolín: výsledky povrchových a detektorových prospekci. *Archeologie ve středních Čechách* 25, 2021, 47–74.
- Mozgai/Horváth/Bajnóczi 2021 – V. Mozgai/E. Horváth/B. Bajnóczi: Possibilities and Limitations of Non-Invasive Analytical Methods in the Examination of Garnet- and Niello-Inlaid Precious Metal Objects – Case Study of Three Polychrome Animal-Style Silver Buckles from the 5<sup>th</sup>-Century Carpathian Basin. *Interdisciplinaria Archaeologica. Natural Sciences in Archaeology* 12, 2021, 45–67.  
DOI: <http://dx.doi.org/10.24916/iansa.2021.1.4>
- Nagy 2002 – M. Nagy: Die gepidischen Adlerschnallen und ihre Beziehungen. *Budapest Régiségei* 36, 2002, 363–382.
- Nasdala et al. 2023 – L. Nasdala/T. Lamers/H. A. Gilg/N. Chutimun Chanmuang/M. Griesser/F. Kirchweiger/A. Erlacher/M. Böhmeler/G. Giester: The Imperial Crown of the Holy Roman Empire, Part I: Photoluminescence and Raman Spectroscopic Study of the Gemstones. *The Journal of Gemmology* 38, 2023, 448–473.  
DOI: <http://dx.doi.org/10.15506/JoG.2023.38.5.448>
- Newman/Dennis/Farrell 1982 – R. Newman/J. R. Dennis/E. Farrell: A Technical Note on Niello. *Journal of the American Institute for Conservation* 21, 1982, 80–85.  
DOI: <https://doi.org/10.1179/019713682806028568>
- Nicolay 2014 – J. A. W. Nicolay: *The splendour of power. Early medieval kingship and the use of gold and silver in the southern North Sea area (5<sup>th</sup> to 7<sup>th</sup> century AD)*. Groningen Archaeological Studies 28. Groningen 2014.
- Niece 1983 – S. La Niece: Niello: an Historical and Technical Survey. *The Antiquaries Journal* 63, 1983, 279–297.  
DOI: <https://doi.org/10.1017/S000358150006652X>
- Novotný 1955 – B. Novotný: Pohřebiště z doby stěhování národů v Holáskách na Moravě. *Archeologické rozhledy* 7, 1955, 333–336, 338–342, 353.
- Oddy 1981 – A. Oddy: Gilding through the ages. An outline history of the process in the old world. *Gold Bulletin* 14, 1981, 75–79.
- Odenweller 2017 – M. Odenweller: Anmerkungen zur christlichen Deutung von Tiermotiven auf merowingerzeitlichen Grabbeigaben am Beispiel der Vogel-fibeln. In: V. Brieske/A. Dickers/M. M. Rind (Hrsg.): *Tiere und Tierdarstellungen in der Archäologie. Beiträge zum Kolloquium in Gedenken an Torsten Capelle*, 30.–31. Oktober 2015 in Herne. Veröffentlichungen der Altertumskommission für Westfalen Landschaftsverband Westfalen-Lippe 22. Münster 2017, 307–314.
- Ostritz 2018 – S. Ostritz: Das völkerwanderungszeitliche Gräberfeld Niederroßla, Lkr. Weimarer Land. *Alt-Thüringen* 45, 2018, 313–324.
- Pinar Gil 2023 – J. Pinar Gil: Childerich, Odoaker... a Čechy? In: *Blázková/Jiřík/Bezáková a kol.* 2023, 149–155.
- Pion et al. 2020 – C. Pion/B. Gratuze/P. Périn/Th. Calligaro: Bead and Garnet Trade Between the Merovingian, Mediterranean, and Indian Worlds. In: B. Effros/I. Moreira (eds.): *The Oxford Handbook of the Merovingian World*. New York 2020, 819–859.  
DOI: <https://doi.org/10.1093/oxfordhb/9780190234188.013.51>
- Pohl/Erhard Hrsg. 2005 – W. Pohl/P. Erhard (Hrsg.): *Die Langobarden. Herrschaft und Identität*. Forschungen zur Geschichte des Mittelalters 9. Wien 2005.
- Quast 2008 – D. Quast: Funde aus dem fränkisch-alamannischen Gebiet im langobardenzeitlichen Pannonien. In: *Bemmman/Schmauder Hrsg.* 2008, 363–375.
- Quast 2017 – D. Quast: Sösdala in a western perspective. In: *Fabech/Näsman eds.* 2017, 279–295.
- Quast/Schüssler 2000 – D. Quast/U. Schüssler: Mineralogische Untersuchungen zur Herkunft der Granate merowingerzeitlicher Cloisonnéarbeiten. *Germania* 78, 2000, 75–96.
- Rifa-Abou El Nil/Calligaro 2020 – P. Rifa-Abou El Nil/T. Calligaro: Chapitre 12: Un atelier de taille de pierre semi-précieuses à Alexandrie. In: M.-T. Ding-Audouin/D. Olivier/P. Rigny (coor.): *Chimie et Alexandrie dans l'Antiquité*. s.l. 2020, 247–266.  
DOI: <http://dx.doi.org/10.1051/978-2-7598-2415-1.c015>
- Schmetzer et al. 2017 – K. Schmetzer/H. A. Gilg/U. Schüssler/J. Panjikar/Th. Calligaro/P. Périn: The Linkage Between Garnets Found in India at the Arikamedu Archaeological Site and Their Source at the Garibpet Deposit. *The Journal of Gemmology* 35, 2017, 598–627.  
DOI: <http://dx.doi.org/10.15506/JoG.2017.35.7.598>
- Schmidt 1961 – B. Schmidt: *Die späte Völkerwanderungszeit in Mitteleuropa*. Veröffentlichungen des Landesmuseums für Vorgeschichte in Halle 18. Halle (Saale) 1961.
- Schmidt 1970 – B. Schmidt: *Die späte Völkerwanderungszeit in Mitteleuropa*. Katalog (Südteil). Veröffentlichungen des Landesmuseums für Vorgeschichte in Halle 25. Berlin 1970.
- Schmidt 1976 – B. Schmidt: *Die späte Völkerwanderungszeit in Mitteleuropa*. Katalog (Nord- und Ostteil). Veröffentlichungen des Landesmuseums für Vorgeschichte in Halle 29. Berlin 1976.
- Seland 2017 – E. H. Seland: Gemstones and Mineral Products in the Red Sea / Indian Ocean Trade of the First Millennium. In: *Hilgner/Greif/Quast eds.* 2017, 45–58.
- Selucká ed. 2022 – A. Selucká (ed.): *Uměleckofemeslné techniky zlatnictví. Památkový postup*. Brno 2022. Available on: [https://mck.technicalmuseum.cz/wp-content/uploads/2023/02/Pamatkovy\\_postup\\_Umleckoemeslne\\_techiky\\_zlatnictvi\\_TMB.pdf](https://mck.technicalmuseum.cz/wp-content/uploads/2023/02/Pamatkovy_postup_Umleckoemeslne_techiky_zlatnictvi_TMB.pdf)
- Šmit et al. 2014 – Ž. Šmit/H. Fajfar/M. Jeršek/T. Knific/J. Lux: Analysis of garnets from the archaeological sites in Slovenia. *Nuclear Instruments and Methods in Physics Research Section B. Beam Interactions with Materials and Atoms* 328, 2014, 89–94.  
DOI: <https://doi.org/10.1016/j.nimb.2014.02.121>
- Stemann Petersen 1995 – K. Stemann Petersen: Danish niello inlays from the Iron Age. A technological investigation. *Journal of Danish Archaeology* 12, 1995, 133–150.  
DOI: <https://doi.org/10.1080/0108464X.1995.10590090>
- Stuchlík 2011 – S. Stuchlík: Das Gräberfeld von Borotice. In: *Tejral Hrsg.* 2011, 75–127.
- Sundberg 2013 – I. M. Sundberg: En praktfull kontinental silverfibula. A magnificent continental silver fibula. In: B. Hårdh/L. Larsson (red.): *Folk, få och fynd*. Acta

- Archaeologica Lundensia 8°/64. Uppakrastudier 12. Lund 2013, 51–56.
- Svoboda 1965 – B. Svoboda: *Čechy v době stěhování národů*. Praha 1965.
- Szameit 1997 – E. Szameit: Ein Völkerwanderungszeitliches Werkzeugdepot mit Kleinfunden aus Niederösterreich. Ein Vorbericht. In: J. Tejral/H. Friesinger/M. Kazanski (Hrsg.): *Neue Beiträge zur Erforschung der Spätantike i mittleren Donauraum. Materialien der Internationalen Fachkonferenz. Kravsko 17.–20. Mai 1995*. Spisy Archeologického ústavu AV ČR Brno 8. Brno 1997, 233–257.
- Tejral 1990 – J. Tejral: K chronologii spon z langobardských pohřebišť v Podunají. In: V. Nekuda/J. Unger/M. Čížmář (eds.): *Pravěké a slovanské osídlení Moravy. Sborník k 80. narozeninám Josefa Poulíka*. Brno 1990, 231–250.
- Tejral 2002 – J. Tejral: Beiträge zur Chronologie des langobardischen Fundstoffes nördlich der mittleren Donau. In: *Tejral Hrsg. 2002*, 313–358.
- Tejral 2005 – J. Tejral: Zur Unterscheidung des vorlangobardischen und elbgermanisch-langobardischen Nachlasses. In: *Pohl/Erhard Hrsg. 2005*, 103–200.
- Tejral 2007 – J. Tejral: Das Hunnenreich und die Identitätsfragen der barbarischen 'gentes' im Mitteldonaauraum aus der Sicht der Archäologie. In: *Tejral Hrsg. 2007*, 55–119.
- Tejral 2008 – J. Tejral: Ein Abriss der frühmerowingerzeitlichen Entwicklung im mittleren Donauraum bis zum Anfang des 6. Jahrhunderts. In: *Bemmann/Schmauder Hrsg. 2008*, 249–283.
- Tejral 2011 – J. Tejral: Zum Stand der Langobardenforschung im norddanubischen Raum. In: *Tejral Hrsg. 2011*, 11–73.
- Tejral 2015 – J. Tejral: Zum Problem der Feinschmiedeproduktion im Mitteldonaauraum während des 5. Jahrhunderts nach Chr. *Památky archeologické* 106, 2015, 291–362.
- Tejral 2017 – J. Tejral: Les élites princières du pays norddanubien au début de l'époque mérovingienne. *Přehled výzkumů* 58, 2017, 103–137.
- Tejral Hrsg. 2002 – J. Tejral (Hrsg.): *Probleme der frühen Merowingerzeit im Mitteldonaauraum. Materialien des XI. Internationalen Symposiums 'Grundprobleme der frühgeschichtlichen Entwicklung im nördlichen Mitteldonaugebiet' Kravsko vom 16.–19. November 1998*. Spisy Archeologického ústavu AV ČR Brno 19. Brno 2002.
- Tejral Hrsg. 2007 – J. Tejral (Hrsg.): *Barbaren im Wandel. Beiträge zur Kultur- und Identitätsumbildung in der Völkerwanderungszeit*. Spisy Archeologického ústavu AV ČR Brno 26. Brno 2007.
- Tejral Hrsg. 2011 – J. Tejral (Hrsg.): *Langobardische Gräberfelder in Mähren I*. Spisy archeologického ústavu AV ČR Brno 39. Brno 2011.
- Then-Obłuska et al. 2021 – J. Then-Obłuska/H. A. Gilg/U. Schüssler/B. Wagner: Western connections of Northeast Africa: The Garnet Evidence from Late Antique Nubia, Sudan. *Archaeometry* 63, 2021, 227–246. DOI: <https://doi.org/10.1111/arcm.12607>
- Thiry 1939 – G. Thiry: *Die Vogelfibeln der Germanischen Völkerwanderungszeit*. Rheinische Forschungen zur Vorgeschichte 3. Bonn 1939.
- Thoresen/Schmetzer 2013 – L. Thoresen/K. Schmetzer: Greek, Etruscan and Roman garnets in the antiquities collection of the J. Paul Getty Museum. *The Journal of Gemmology* 33, 2013, 201–222. DOI: <https://doi.org/10.15506/JOG.2013.33.7.201>
- Tóth 1999 – Á. B. Tóth: A szarvasi gepida fibula és köre. A szarvasi gepida leletek a Magyar Nemzeti Múzeum gyűjteményében. *A Móra Ferenc Múzeum Évkönyve. Studia Archaeologica* 5, 1999, 261–277.
- Tóth 2019 – Á. B. Tóth: Traditions and innovation in fine metalwork in the Middle Danube region in the second half of the 5<sup>th</sup> and the early 6<sup>th</sup> centuries A.D. Once more on the 'Szarvas' brooch group: new finds, new hypotheses. *Acta Archaeologica Academiae Scientiarum Hungaricae* 70, 2019, 167–202. DOI: <https://doi.org/10.1556/072.2019.70.1.6>
- Tulp/Meeks 2000 – C. Tulp/N. Meeks: The Tjitsma (Wijnaldum) die: a 7<sup>th</sup> century tool for making a cross-hatched pattern on gold foil, or a master template? *Historical Metallurgy* 34, 2000, 13–24.
- Urbanová/Kostka/Korený 2010 – K. Urbanová/M. Kostka/R. Korený: Neznámý známý hrob XIV z Prahy-Dejvic-Podbaby. *Archaeologica Pragensia* 20, 2010, 361–392.
- Volf et al. 2021 – J. Volf/Z. Beneš/P. Kočár/R. Kočárová/L. Rypka: Sídliště z doby římské v Plaňanech (okr. Kolín) v poloze U silnice. Sonda do podoby osídlení z konce 2. až 4. století v okolí pohřebiště Dobřichov-Třebická. *Archeologie ve středních Čechách* 25, 2021, 567–638.
- Werner 1962 – J. Werner: *Die Langobarden in Pannonien. Beiträge zur Kenntnis der langobardischen Bodenfunde vor 568*. Bayerische Akademie der Wissenschaften. Philosophisch-historische Klasse. Abhandlungen. Neue Folge 55. München 1962.
- Zeman 1958 – J. Zeman: Pohřebiště z doby stěhování národů v Mochově. *Památky archeologické* 49, 1958, 423–471.
- Zeman 1990 – J. Zeman: Pohřebiště z doby stěhování národů. In: *Lochenice. Z archeologických výzkumů na katastru obce*. Praehistorica 16. Praha 1990, 69–101.
- Zlámalová Cílová et al. 2025 – Z. Zlámalová Cílová/V. Čisťáková/Z. Beneš/P. Horník/T. Kmječ/L. Lapčák: Characterisation of Jewellery with Glass and Garnet Inlays from the Bohemian Region and Great Migration Period. *Archaeometry* 67, 2025, 1177–1194. DOI: <https://doi.org/10.1111/arcm.13083>

## HISTORICAL SOURCES

- Eugippius 1981 – Eugippius: *Vita Sancti Severini – Das Leben des heiligen Severin*. Vienna 1981.

## Studie granátových intarzií a šperkařských technik na vybraných ozdobách z období stěhování národů v Čechách

Zdeněk Beneš – Viktoria Čisťáková – Zuzana Zlámalová Cílová – Šárka Msallamová – Ladislav Lapčák – David Daněček

### SOUHRN

Výzkum šperků z doby stěhování národů v Čechách, zejména těch s granátovými vložkami, představuje významný příspěvek k poznání materiální kultury elit 5. a 6. století. Tyto artefakty, často zdobené technikou *cloisonné*, jsou nejen důkazem estetického vkusu a technologické zručnosti tehdejších řemeslníků, ale především hmotným svědectvím o nadregionálních kontaktech a dálkovém obchodu. Objevují se v kontextu elitních hrobů i sídlišť, kde signalizují přítomnost sociálně vysoce postavených jedinců (Quast/Schüssler 2000, 75, 76; Tejral 2015, 292).

Cílem předložené studie je publikace nových nálezů s granátovými vložkami, převážně ze středních Čech, a především analýza původu těchto kamenů v kombinaci s průzkumem výrobních a výzdobných technik. Zkoumaný soubor zahrnuje nálezy z pohřebišť, především z Čelákovic-Záluží, Hostivic-Palouků a Prahy-Podbaby. Významnou složku souboru představují nově získané artefakty ze sídlištních lokalit ze středočeského Polabí. Přestože soubor není zcela vyčerpávající, co se známých nálezů z území Čech týče, představuje dosud nejrozsáhlejší analyzovaný celek tohoto typu v Čechách a umožňuje sledovat zapojení místních elit do nadregionálních obchodních a kulturních sítí.

### Typologicko-chronologická analýza

#### Spona s ptačí hlavičkou na patce

Spona se vyznačuje bohatou výzdobou: zobákovitými výběžky na hlavici s plochými granátovými inkrustacemi, kabošony na lučíku i patce v podobě ptačí hlavy se žlábkovaným krkem a kolkovanou výzdobou ze soustředných polokruhů.

Přímé analogie ve střední Evropě nejsou známy, avšak jednotlivé motivy lze srovnat s podunajskými sponami a přezkami typu Mózs, stejně jako s výzdobou pochev mečů z Karpatské kotliny, datovaných do stupňů D2–D3 (Nagy 2002; Tejral 2007; 2008). Tvar hlavičky spony zároveň připomíná spony typu Szarvas, odvozované od cikádovitých spon středodunajského okruhu. Spona z Nového Bydžova tak pravděpodobně představuje luxusní variantu cikádovitých spon, vzniklou ve středodunajské oblasti ve 2. polovině 5. století.

#### Spona typu Szarvas

Nově dokumentovaný zlomek spony typu Szarvas z Plaňan se připojuje k omezenému souboru těchto artefaktů

známých z celé Evropy (Tóth 2019). Spony typu Szarvas jsou drobné ozdoby, pravděpodobně nošené ženami v páru, a jsou jen odhadem (neboť žádný známý exemplář nepochází z dobře datovatelného kontextu) datovány do závěrečných desetiletí 5. století, případně na přelom 6. století. Jejich původ byl dříve spojován s durynským prostředím, avšak současný výzkum je interpretuje spíše jako produkt podunajské oblasti, ovlivněný cikádovitými sponami a polychromním stylem. Fragment z Plaňan vykazuje mimořádnou stylistickou shodu s nálezem z dolnorakouského Bernhardsthalu, což naznačuje společný výrobní okruh, případně přímou vazbu na stejnou dílnu.

#### Esovité spony

Esovité spony patří k nejběžnějším spínadlům na pohřebišťích severně od středního Dunaje v mladší fázi doby stěhování národů. Byly součástí ženského kroje a obvykle se nosily v páru. Z módy vycházejí ve druhé polovině 6. století spolu se zánikem kroje tvořeného čtyřmi sponami. V analyzovaném souboru jsou zastoupeny čtyřmi exempláři s granátovými vložkami, z nichž dvě pocházejí z pohřebišť z Hostivic-Palouků. První hostivická spona představuje variantu Stöben (Losert/Pleterski 2003). Jedná se o varianty (kromě varianty Stöben sem patří ještě varianta Záluží), které jsou považovány za nejstarší typy esovitých spon, vzniklé v labskogermánském prostředí střední Evropy a datované do stupně E1, s přesahem do první poloviny 6. století. Ploché barevné vložky v očích jsou u nich vzácnější. Druhý hostivický exemplář lze pravděpodobně zařadit k typu Poysdorf (Daim/Mehofer/Tobias 2005; Werner 1962), který je vývojově mladší, typický výraznějším esovitým tvarem a bohatší výzdobou. U tohoto typu je výskyt granátových vložek častější, což může souviset s postupně lepší dostupností kamenné suroviny ve středodunajské oblasti. Další esovitá spona z Dolní Kamenice představuje patrně alamanský derivát varianty Stöben, zatímco exemplář ze Žehuně náleží k pozdnímu okruhu spon typu Schwechat-Pallersdorf (Droberjar 2013b), které lze označit za středodunajské výrobky. Tento nálezy patří k nejmladším dokladům kultury doby stěhování národů v Čechách ve stupni E2, resp. druhé třetině 6. století.

#### Ptačí spony

Ptačí spony, podobně jako spony esovité, představují drobná spínadla ženského kroje, obvykle nošená v páru spolu s dalším párem větších spon. Jsou typickým prvkem ženského oděvu v západní části merovejského okruhu,

zatímco u východogermánských etnik doby stěhování národů se objevují jen výjimečně.

K nejstarším exemplářům patří spona z Budihostic, která se vyznačuje jednoduchou rýhovanou výzdobou bez plně rozvinutého vrubořezového ornamentu. Nejblíží analogie nachází na pohřebišti Basel-Kleinhüningen ve Švýcarsku, datované před přelom 5. a 6. století, pravděpodobně již do let 470/480 (Giesler-Müller 1992). Tyto rané ptačí spony jsou soustředěny především v západní Evropě; výskyty ve východnějších oblastech, včetně Čech, jsou spíše ojedinělé (Losert/Pleterski 2003). Spona z Budihostic tak odráží kontakty mezi hornorýnskou oblastí, Podunajím a Čechami v závěru 5. století. Tři ptačí spony z Velkých Chvalovic a Třebestovic tvoří kompaktní skupinu s mandlovitým tělem, výzdobou vrubořezu a malou hlavou s výrazným okem s inkrustací mají nejbližší ke sponám Thiry 330 (Thiry 1939). Přes drobné rozdíly v detailech výzdoby představují nejspíše lokální variantu, soustředěnou ve východní části středních Čech. Na základě těchto nálezů lze vymezit místní výrobní okruh, označovaný jako typ Tatce, který dokládá existenci regionální produkce ptačích spon.

Další exemplář spony z Prahy-Podbaby kombinuje vrubořezovou výzdobu s barevnými vložkami a je datován do stupně E2, tedy do první poloviny 6. století (Droberjar 2008b). Zcela výjimečný je nález z Vyšehořovic s rozměrnými plochými vložkami a centrálním kabošonem, který spojuje starší i mladší rysy a lze jej pouze rámcově zařadit do stupňů E1–E2. Celkově ptačí spony dokládají nejen dlouhodobý vývoj formy a výzdoby, ale také význam Čech jako aktivní součásti východomerovejského kulturního okruhu.

### Miniaturní spony

Fragment spony ze Šlotavy lze na základě krátké, příčné žebrované patky s kruhovým zakončením a granátovou vložkou zařadit do okruhu pozdních miniaturních spon příbuzných typu Weimar/Arcy-Sainte-Resitue (Koch 1998). Tyto spony jsou typické především pro střední Německo, ale jsou doloženy i v západomerovejské oblasti, v horním a středním Podunají a v Čechách. Jejich hlavní rozšíření spadá do pozdního 5. století (stupeň E1), s pokračováním do první poloviny 6. století. Spona z Třebestovic představuje durynskou miniaturní klešovitou sponu typu Rathewitz-Burlandingen (Bemmann 2008; Gall 2008; Tejral 2005). Analogické nálezy jsou známy ze středního Německa, Bavorska i Čech a jsou obecně datovány do stupně E1, přibližně do let 480–510/520.

### Durynské lučkovité spony s ptačími hlavičkami

Spony z Prahy-Podbaby a Lochenic jsou příklady ženského šperku s polychromní výzdobou typického pro durynsko-alamanský prostor mladší fáze doby stěhování národů (Koch 1998; Schmidt 1961). České exempláře se typologicky nejvíce blíží nálezům ze středního Německa, což dokládá intenzivní kulturní vazby Čech na tento prostor (Bemmann 2008). Tyto spony lze na základě typologických znaků dle A. Kocha řadit do dvou skupin, které obě patří 1. polovině 6. století.

### Durynské klešvité spony

Samostatnou a výraznou skupinu představují klešvité spony s lichoběžníkovitou patkou, zastoupené dosud

nepublikovaným nálezem z Hostivic-Palouků. Tento typ se vyznačuje bohatou vrubořezovou výzdobou, motivem cikcakového pletence a zakončením patky v podobě „vlaš-tovčího ocasu“ s granátovými vložkami. Tyto spony jsou rozšířeny ve středním Německu i v okrajových zónách východomerovejského okruhu a jsou datovány do přelomu 5. a 6. století až do stupně E2 (Hansen 2004; Koch 1998).

### Spona typu Várpalota-Udine-Čelákovice

Obloukovitá spona z hrobu 5/I v Čelákovcích-Záluží patří k nejmladším dokladům doby stěhování národů v Čechách. Jde o šperk mimořádně vysoké šperkařské úrovně, uložený do hrobu téměř nepoužitý. Nejblíží analogie představují spony z Udine a Várpaloty (Tejral 2002; Werner 1962), s nimiž sdílí výzdobu reliéfními úponky, obdélnou kamennou inkrustací i zoomorfní patku. Na základě těchto shod byl vymezen typ Várpalota-Udine-Čelákovice (Droberjar 2008a). Výrobky jsou považovány za severodunajský produkt s vazbami na severní Itálii a datovány do mladší fáze stupně E2.

### Destičková spona

Destičková spona z Roudnice nad Labem-Hracholusk náleží ke skupině drobných merovejských spon s jedním centrálním a dalšími periferními segmenty (Hansen 2004; Martin 1995). Tyto spony jsou typické pro ženské hroby západomerovejského prostředí, avšak ojediněle se vyskytují i v Panonii (Bóna/Horváth 2009). Vývojově souvisejí s módou miniaturních spon a jejich datování spadá do první poloviny 6. století, konkrétně do dunajského stupně E2.

### Trn přezky s granátovou inkrustací

Nově nalezený trn přezky z Dolní Kamenice má přímé analogie v širokém prostoru Evropy a náleží k raně merovejskému okruhu. Tyto předměty jsou spojovány s bohatými hroby a vznikaly již kolem poloviny 5. století a běžné jsou i ve 2. polovině tohoto století (Tejral 2015).

### Ledvinovitý přívěsek

Ledvinovitý přívěsek z Čelákovců-Záluží má několik analogií ve zlatých a stříbrných špercích z území Čech a tvarově je příbuzný lunicovitým závěskům se značným chronologickým a geografickým rozšířením (Daněček/Korený/Perlík 2017). Tyto přívěsky lze datovat od poloviny 5. do první třetiny 6. století.

### Archeometrický průzkum

Archeometrický průzkum artefaktů byl proveden za využití metod nedestruktivní rentgenové fluorescence (XRF) a skenovací elektronové mikroskopie s detektorem typu EDS (SEM/EDS). Tyto metody umožnily přesné určení chemického složení granátových vložek, aniž by došlo k poškození cenných artefaktů.

V rámci studie bylo analyzováno 51 granátů a jedna vložka z Čelákovců-Záluží, identifikovaná jako apatit. Hodnocení granátů z doby stěhování národů vychází především z jejich chemického složení, zejména obsahu CaO, MgO, FeO a MnO. Na tomto základě jsou rozlišovány typy

I–V, případně klastry A–I. Tyto skupiny lze spojit s konkrétními geologickými oblastmi původu. Nejvyšší obsah MgO vykazují chromem bohaté pyropy klastru E (typ V), jejichž původ je kladen do oblasti Čech. Tyto granáty byly identifikovány na sponách z Budihostic a Nového Bydžova. Další významnou skupinu tvoří chemicky heterogenní klastr H v rámci skupiny X, charakterizovaný zvýšeným obsahem MgO a CaO. Tyto granáty jsou spojovány především s ložisky na Srí Lance. Početně silně zastoupen je klastr B, tvořený almandiny chudými na mangan, s vysokým obsahem FeO. Jejich původ je kladen do severní Indie a tvoří nejběžnější typ granátů v merovejském období. Kromě toho se v souboru vyskytují granáty klastru A, jejichž provenience zůstává dosud nejasná. Jednotlivé šperky často kombinují granáty různých skupin, což svědčí o absenci cíleného výběru a využívání aktuálně dostupného materiálu.

### Technologie výroby šperků, šperkařské techniky a průzkum použitých kovů

Technologie výroby šperků s granátovými vložkami v období stěhování národů představuje fascinující kapitolu nejen archeologického výzkumu, ale i dějin řemesel a umění. Tyto šperky, často charakterizované vysoce sofistikovanou výzdobou v technice *cloisonné*, svědčí o vynikající řemeslné zručnosti tehdejších šperkařů a odrážejí zároveň estetické i symbolické hodnoty společnosti té doby. Studium jejich výroby vyžaduje kombinaci archeologických, technologických a materiálových analýz, které umožňují rekonstruovat jednotlivé fáze produkce od získání surovin až po finální produkt.

Nejznámější výzdobnou technikou bylo *cloisonné*, tedy osazování barevných kamenných vložek, nejčastěji granátů, do jemných kovových příhrádek vytvořených z tenkých zlatých nebo stříbrných pásků. Jen několik předmětů ze studovaného souboru lze zařadit k této technice, konkrétně kruhovou sponu z Roudnice nad Labem-Hracholusk a přívěsek z Čelákovic-Záluží. V Čechách se však nejčastěji setkáváme s technikou *champlevé*, kdy jsou barevné vložky zasazeny do lůžek, jež byla buď přímo odlité, nebo vyryté do kovového podkladu (Horváth 2012, 215, 224). Fragment spony z Plaňan a fragment přezky z Dolní Kamenice lze spojit s pokročilejší technikou spojeného *champlevé* (viz Horváth 2013, obr. 4).

Analýzy (SEM/EDS, doplněné XRF pro detekci Hg) ukazují tři skupiny stříbrných slitin podle obsahu Ag: vysoký (cca 90–98,6 %), střední (80–87,9 %) a nízký (54,3–75,5 %). Legování zahrnuje měď, olovo, cín i zinek v různých kombinacích; přítomnost zlata může odrážet recyklaci zlaceného stříbra. Ke konci 4. století patrně rostl význam recyklace a zlatníci nepoužívali jednotné „receptury“. Amalgámové zlacení pracuje se směsí Au-Hg nanesenou na povrch a následně zahřátou nad bod varu rtuti, která se odpaří a zůstane zlatá vrstva; její kvalita se liší podle následné povrchové úpravy. Ne vždy je rtuť zachytitelná (mohla se vylouhovat), případně mohly být použity i jiné postupy, např. difuzní spojování zlaté fólie se stříbrným podkladem. *Niello* je další výzdobná technika, jež byla běžně užívána na špercích z 5.–6. století n. l. Jedná se o tmavý sulfid stříbra a doplněný o měď a ve středověku i o olovo (Ag<sub>2</sub>S, Cu<sub>2</sub>S, případně PbS), jenž měl zvýraznit rytou výzdobu na světlém stříbrném podkladu.

Pod kameny se užívaly podkladové fólie ze slitiny zlata, často ražené vzory (nejčastěji mřížkový vzor a jeho variace, případně kroužek a bod). Nejde jen o dekor: vzor výrazně ovlivňuje výslednou barevnost vložek. Fólie se vyráběly extrémně tenké a zdobily se pomocí matric (kovových či keramických). Variabilita vzorů i ryzosti naznačuje spíše síť regionálních dílen a přenos vzorů (včetně putujících řemeslníků) než centrální dílny.

Granáty a další kameny jsou opracovány hlavně jako ploché destičky (tzv. *table-cut*) nebo malé kabošony. Kvalita opracování hran se liší: vedle pečlivě broušených kamenů se objevují kusy s nekvalitně štípanými hranami, což lze vysvětlit sekundárními úpravami importovaných polotovarů v lokálních dílnách s omezeným technologickým zázemím. Na jednom šperku se mohou kombinovat kameny různé kvality, což svědčí o proměnlivé dostupnosti materiálu i rozdílné úrovni dílenské praxe.

### Původ granátů a organizace obchodu

Značné rozšíření polychromního stylu v Evropě v době stěhování národů předpokládá existenci dobře organizovaných obchodních a distribučních sítí, zajišťujících přísun kamenů, především červených granátů. Starší výzkum vycházel z předpokladu, že většina granátů pocházela z indického subkontinentu (Quast/Schüssler 2000), avšak moderní archeometrické analýzy prokázaly mnohem komplexnější situaci. Vedle almandinů z Indie (zejména z oblasti Rádžasthánu) a ze Srí Lanky byly v evropských špercích již od 5. století využívány také pyropy českého původu. Almandiny byly do Evropy dopravovány především prostřednictvím dálkových tras vedoucích přes Rudé moře a Středomoří, jejichž fungování bylo závislé na monzunových cyklech (Gilg/Gast/Calligaro 2010; Seland 2017). Klíčovou roli v tomto systému sehrávala středomořská přístavní centra a území kontrolovaná Byzantskou říší, která disponovala nejen obchodními kontakty, ale i specializovanými dílnami schopnými kameny brousit a připravovat pro šperkařské využití. Archeologické doklady dílen na zpracování granátů jsou známy z Egypta, Itálie i dalších částí Středomoří (Boschetti/Gratuze/Schibille 2023; Rifa-Abou El Nil/Calligaro 2020).

České granáty představují v tomto kontextu specifický fenomén. Jejich využití v elitních špercích 5. století dokládá, že Čechy nebyly pouze pasivním příjemcem luxusního zboží, ale aktivně se zapojovaly do nadregionálních výměnných sítí. Granátová zrna byla pravděpodobně získávána ze sekundárních deluvio-fluviálních sedimentů (Hanus/Soumar 2023) a následně – zřejmě v surovém nebo jen minimálně opracovaném stavu – směřovala do specializovaných dílen mimo region. O konkrétní organizaci sběru a distribuce však nemáme přímé prameny.

Šperky s granátovými vložkami byly v barbarském prostředí výsadou elit a jejich distribuce probíhala v rámci darů, aliancí, sňatků či politických vztahů. Depoty jednotlivých kamenů v hrobech naznačují kontrolu této suroviny úzkými společenskými skupinami. Částečný ústup granátových vložek na konci 6. století souvisí s narušením dálkového obchodu i se změnou mocenských struktur ve střední Evropě, což se výrazně projeвило i v českém prostředí.

## Závěr

Předložená studie umožnila na základě detailního typologického, technologického a archeometrického rozboru shrnout několik zásadních poznatků k užívání kamenných vložek, zejména granátů, v době stěhování národů v Čechách. Zásadním zjištěním je skutečnost, že české granáty se ve zkoumaném souboru objevují výhradně na artefaktech datovaných do 5. století. Konkrétně se jedná o ptačí sponu z Budihostic a o sponu s ptačí hlavou na patce z Nového Bydžova. Tyto nálezy významně rozšiřují dosavadní poznání, neboť ještě na počátku 21. století se využívání českých granátů v takto raném období považovalo za výjimečné nebo dokonce nepravděpodobné.

Současné se ukazuje, že české granáty nebyly vyhrazeny pouze pro nejluxusnější šperky, známé z mimořádně bohatých hrobových celků, ale byly využívány i na artefaktech, které lze považovat za relativně běžnější. Tento poznatek významně relativizuje dosavadní představy o striktním oddělení „královského“ a „neelitního“ užívání lokálních surovin. Z hlediska technologie je pozoruhodné zejména použití českého granátu ve formě ploché inkrustace na ptačí sponě z Budihostic, neboť tento typ brusné úpravy je u pyropů méně obvyklý než u indických almandinů.

Naopak, většina analyzovaných šperků z pozdější fáze doby stěhování národů (stupně E1 a E2) obsahuje výhradně asijské almandiny, především indického původu, méně často ze Srí Lanky. Je přitom zřejmé, že jejich výskyt nelze spojovat s konkrétní regionální výrobní tradicí ani s určitým typem šperku. Z hlediska distribuce granátů ve střední Evropě se tedy nejedná o paralelní obchodní toky, nýbrž o jediný, vysoce propojený systém, v němž se

kameny z různých ložisek mísily již ve středomořských přístavech a dílnách. Tato skutečnost se zřetelně odráží i v tom, že jednotlivé artefakty často kombinují kameny různého původu.

Šperky s granátovými inkrustacemi představují v Čechách pouze menší část celkového nálezového spektra šperků, avšak jejich technologická úroveň je značně proměnlivá. Vedle mimořádně kvalitních výrobků, jako je spona z Čelákovic-Záluží, stojí jednoduché ptačí a esovité spony, u nichž jsou kameny často druhotně upravovány lámáním či štípáním. Tento jev lze chápat jako důsledek omezeného přístupu k vysoce specializovaným brusičským dílnám a zároveň jako doklad toho, že granátové inkrustace se k barbarským zlatníkům dostávaly v různém stupni opracování. Významným závěrem je rovněž absence jakékoli standardizace výrobních postupů. Rozhodnutí o tom, zda bude konkrétní šperk opatřen kamennou inkrustací, patrně vznikalo již při tvorbě voskového modelu a záviselo na kombinaci přání objednavatele, technických možností dílny a aktuální dostupnosti vhodných kamenů. To vysvětluje existenci stejných typů spon jak s inkrustacemi, tak bez nich.

Z hlediska sídelní struktury a organizace výroby lze při současném stavu poznání v Čechách identifikovat pouze širší oblasti s vyšší koncentrací elitních aktivit, zejména pražský prostor, oblast středního a východního Polabí a region povodí Ohře. Přesná lokalizace výrobních center zůstává otevřenou otázkou, a to nejen kvůli nedostatku přímých dokladů, ale i v důsledku rozsáhlého vykrádání bohatých hrobů již v době krátce po jejich uložení. Přesto tato studie ukazuje, že Čechy nebyly v době stěhování národů pouhou periferií, nýbrž aktivní součástí nadregionálních výměnných, technologických a kulturních sítí.

Obr. 1. Lokality zmíněné v textu. 1 – Nový Bydžov; 2 – Plaňany; 3 – Hostivice; 4 – Dolní Kamenice; 5 – Žehuň; 6 – Budihostice; 7 – Velké Chvalovice; 8 – Třebestovice; 9 – Praha-Podbaba; 10 – Vyšehořovice; 11 – Řepov; 12 – Šlotava; 13 – Lochenice; 14 – Čelákovice-Záluží; 15 – Roudnice nad Labem-Hracholusky. Grafika J. Souček.

Obr. 2. 1 – Nový Bydžov (č. 6); 2 – Plaňany (č. 7); 3 – Hostivice-Palouky (č. 9); 4 – Hostivice-Palouky (č. 8); 5 – Dolní Kamenice (č. 10); 6 – Žehuň (č. 11); 7 – Budihostice (č. 3); 8 – Velké Chvalovice (č. 1); 9 – Velké Chvalovice (č. 24); 10 – Třebestovice (č. 2); 11 – Praha-Podbaba (č. 4); 12 – Vyšehořovice (č. 5); 13 – Řepov (č. 25); 14 – Šlotava (č. 13); 15 – Třebestovice (č. 12). Kresby M. Černý, I. Vajglová a A. Waldhauserová, foto J. Souček, 6 podle *Droberjar 2013b*.

Obr. 3. Spony a jiné nálezy s ozdobným prvkem v podobě ptačích hlaviček, nebo další tvarově podobné předměty. 1–3 – Podunajské meče s ozdobami v podobě ptačích hlaviček (1 – Szirmabesenyő; 2 – Velika Bakta; 3 – Tarnaméra; 4–7 – cikadovité spony s ptačími hlavičkami (4 – Drösing; 5–7 – Ringelsdorf); 8, 9 – Slimnic; 10–12 – přezky typu Mózs (10, 11 – Mózs-Icsei-dűlő; 12 – Sály-Latorvár); 13 – spona typu Szarvas (Bernhardsthal); 14 – Nový Bydžov. Různá měřítko (1–3 podle *Tejral 2017*, obr. 12; 4–12 podle *Tejral 2015*, obr. 15; 13 podle *Tóth 2019*, obr. 1: 4).

Obr. 4. Ptačí spony typu Tatce a jejich koncentrace ve středních Čechách. 1 – Třebestovice; 2, 3 – Velké Chvalovice; 4 – Tatce (podle *Droberjar 2008b*, obr. 12: 5);

5 – Sokoleč. Kresby I. Vajglová, A. Waldhauserová, foto J. Souček.

Obr. 5. 1 – Praha-Podbaba (č. 16); 2 – Lochenice (č. 15); 3 – Hostivice-Palouky (č. 14); 4 – Čelákovice-Záluží (č. 17); 5 – Roudnice nad Labem-Hracholusky (č. 18); 6 – Dolní Kamenice (č. 20); 7 – Čelákovice-Záluží (č. 19). Kresby M. Černý a A. Waldhauserová, foto J. Souček, 2 podle *Zeman 1990*.

Obr. 6. Vrubořez a rytá výzdoba. 1 – Velké Chvalovice (č. 1); 2 – Třebestovice (č. 2); 3, 4 – Budihostice (č. 3). Foto Z. Zlámalová Cílová.

Obr. 7. Rytá, kolkovaná výzdoba a vrubořez. 1 – Praha-Podbaba (č. 4); 2, 3 – Nový Bydžov (č. 6); 4 – Plaňany (č. 7); 5, 6 – Hostivice-Palouky (č. 8). Foto Z. Zlámalová Cílová.

Obr. 8. Vrubořez a rytá výzdoba. 1, 2 – Dolní Kamenice (č. 10); 3 – Žehuň (č. 11); 4 – Šlotava (č. 13); 5, 6 – Lochenice (č. 14). Foto Z. Zlámalová Cílová.

Obr. 9. Čelákovice-Záluží (č. 17). 1–6 – vrubořez a rytá výzdoba. Foto Z. Zlámalová Cílová.

Obr. 10. Čelákovice-Záluží (č. 19). Příklad perlovcového drátu. Foto Z. Zlámalová Cílová.

Obr. 11. Prvkové složení stříbrných předmětů na základě měření SEM/EDS znázorněné v grafu Cu vs. Ag. Autor V. Čisfakova.

Obr. 12. SEM snímky povrchu a zlacení: 1 – poměrně tenká vrstva zlacení na povrchu spony z Velkých Chvalovic (č. 1); 2 – nedokončená povrchová úprava ohňového zlacení na sponě z Velkých Chvalovic (č. 1); 3 – nedokončená povrchová úprava žárového zlacení na sponě z Velkých

- Chvalovic (č. 24); 4 – lící struktura, Třebestovice (č. 2); 5 – stopy zlacení na sponě z Hostivic-Palouků (č. 8); 6 – lící struktura spony z Hostivic-Palouků (č. 22); 7 – poměrně silná vrstva zlacení na povrchu spony z Dolní Kamenice (č. 10); 8 – lící struktura fragmentu přezky z Dolní Kamenice (č. 20); 9 – zlacení na sponě z Řepova (č. 25). Foto Š. Msallamová.
- Obr. 13. Podkladové folie. 1 – Budihostice (č. 3); 2 – Hostivice-Palouky (č. 8); 3 – Nový Bydžov (č. 6); 4 – Žehuň (č. 11). Foto Z. Zlámálová Cílová.
- Obr. 14. Podkladové folie. 1 – Praha-Podbaba (č. 16); 2–4 – Roudnice nad Labem-Hracholusky (č. 18). Foto Z. Zlámálová Cílová.
- Obr. 15. Čelákovice-Záluží (č. 19). 1 – detail vložky u artefaktu; 2 – Ramanovo spektrum negranátové vložky (2) i granátů (1, 3). Autor L. Lapčák, foto Z. Zlámálová Cílová.
- Obr. 16. Budihostice (č. 3). 1 – ptačí spona; 2 – detail na chromem bohatý pyrop. Foto Z. Zlámálová Cílová.
- Obr. 17. Nový Bydžov (č. 6). 1 – spona; 2 – detail různých typů výbrusu drahých kamenů. Foto Z. Zlámálová Cílová.
- Obr. 18. Lochenice (č. 15). Granát ze spony. Obsah spe-sartinu posouvá barvu do oranžových odstínů. Foto Z. Zlámálová Cílová.
- Obr. 19. Plaňany (č. 7). Detail kamenů spony. Středový kámen je barevně odlišný od krajních kamenů. Foto Z. Zlámálová Cílová.
- Obr. 20. Roudnice-Hracholusky (č. 18). Destičkovitá spona. Kromě zastoupení různých typů granátů bylo pozorováno i odlišné typy fólií pod kameny. Foto Z. Zlámálová Cílová.
- Obr. 21. Detaily granátových vložek a jejich fasování. 1 – Velké Chvalovice (č. 1); 2 – Třebestovice (č. 2). Foto Z. Zlámálová Cílová.
- Obr. 22. Detaily granátových vložek a jejich fasování. 1 – Budihostice (č. 3); 2, 3 – Praha-Podbaba (č. 4); 4, 5 – Nový Bydžov (č. 6); 6 – Plaňany (č. 7). Foto Z. Zlámálová Cílová.
- Obr. 23. Detaily granátových vložek a jejich fasování. 1 – Hostivice-Palouky (č. 8); 2–4 – Hostivice-Palouky (č. 9); 5, 6 – Hostivice-Palouky (č. 21). Foto Z. Zlámálová Cílová.
- Obr. 24. Detaily vypadlých granátových vložek. 1, 2 – Hostivice-Palouky (č. 22); 3, 4 – Hostivice-Palouky (č. 23). Foto Z. Zlámálová Cílová.
- Obr. 25. Detaily granátových vložek a jejich fasování. 1 – Dolní Kamenice (č. 10); 2–4 – Žehuň (č. 11); 5 – Třebestovice (č. 12); 6 – Šlotava (č. 13). Foto Z. Zlámálová Cílová.
- Obr. 26. Čelákovice-Záluží. Detaily granátových vložek a jejich fasování. 1–3 – č. 17; 4 – č. 19. Foto Z. Zlámálová Cílová.
- Tabela 1. Prvkové složení kovů pomocí SEM/EDS (hm. %). Autor Š. Msallamová.
- Tabela 2. Stopy zlacení – Au a Hg, analyzované metodou SEM/EDS. Autor Š. Msallamová.
- Tabela 3. Různé typy granátů (tabela je založena na práci *Thoresen-Schmetzer 2013*, 219, tab. V, doplněná o další informace). \* Dále členěno na: typ IIIa Srí Lanka (centrální část ostrova v okolí Elahery), typ IIIb Srí Lanka (oblast v okolí Ratnapury). Autor Z. Zlámálová Cílová.
- Tabela 4. Chemické složení granátů (hm. %) a zastoupení koncových členů dle Miragem. Autor Z. Zlámálová Cílová.

Manuscript accepted 1. 11. 2025

*Souhrn přeložili Viktoria Čisťáková a Zdeněk Beněš*

Mgr. Zdeněk Beněš  
Ústav archeologické památkové péče středních Čech  
Nad Olšinami 448/3  
CZ – 100 00 Praha 10  
zdenek.benes@uappsc.cz  
<https://orcid.org/0000-0001-6130-7565>

Ing. Zuzana Zlámálová Cílová, Ph.D.  
Vysoká škola chemicko-technologická Praha  
Technická 5  
CZ – 166 28 Praha 6  
zuzana.zlamalova.cilova@vscht.cz  
<https://orcid.org/0000-0002-3566-964X>

Ing. Ladislav Lapčák  
Vysoká škola chemicko-technologická Praha  
Technická 5  
CZ – 166 28 Praha 6  
ladislav.lapcak@vscht.cz  
<https://orcid.org/0000-0002-0498-5148>

Mgr. Viktoria Čisťáková, Ph.D.  
Národní muzeum  
Oddělení pravěku a antického starověku  
Václavské náměstí 68  
CZ – 110 00 Praha 1  
viktoria.cistakova@nm.cz  
<https://orcid.org/0000-0001-6584-6478>

Ing. Šárka Msallamová, Ph.D.  
Vysoká škola chemicko-technologická Praha  
Technická 5  
CZ – 166 28 Praha 6  
sarka.msallamova@vscht.cz  
<https://orcid.org/0000-0002-3539-9897>

Mgr. David Daněček  
Středočeské muzeum v Rožtokách u Prahy  
příspěvková organizace  
Zámek 1  
CZ – 252 63 Rožtoky  
danecek@muzeum-roztoky.cz  
<https://orcid.org/0000-0002-2208-8774>

