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PhD DISSERTATION

ESZTER HORVÁTH

Gemstone and glass inlaid fine metalwork from the Carpathian Basin: the Hunnic and Early Merovingian Periods

THESIS BOOKLET

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1 Research Objectives

The subject of my dissertation is an impressive archaeological material from the Migration Period and Early Medieval Carpathian Basin – the 5th-6th century polychrome fine metalwork. The investigated artefacts represent the archaeological remains of various tribes settled in different periods and different regions of the Carpathian Basin. These finds belong to four main cultural-chronological groups. The discussed almost two hundred years cover the Hunnic Period as well as the Periods of the various post-Hunnic Germanic Kingdoms, the Gepidic Kingdom and the Langobard Kingdom. Nearly four hundred pieces of goldsmith work have been analysed and aside from the stray finds, they came from more than one hundred sites – graves, treasures as well as ritual deposits. Functionally they can be labelled as elements of jewellery, garment or different equipment and as other articles for personal use.

Apart from the three-volume monograph of József Hampel published at the beginning of the 20th century, not any synthesis has appeared about the 5-6th century polychrome metalwork found in the Carpathian Basin. Prior to my dissertation, mostly the stylistic and ornamental characteristics of this material were the subject of the archaeological and art historical research. The attained results pointed out that the trends of the decorating art and the archaeological styles represented by the artefacts were not consistent. Practically, the only common trait of the discussed metalwork is the polychrome decoration with gemstone or glass inlays. In the light of all these facts, classification of the archaeological material proved to be indispensable, even though the purpose of my work was not exactly this.

The research goal of the performed analyses was to refine and clarify numerous archaeological questions raised about the production of this fine metalwork. Listing of the available finds and their detailed documentation followed criteria of the modern archaeology; however, this was only a starting point in my dissertation. As a main issue of my research I have undertaken to interpret the phases, conditions, background and relations of the manufacturing process in a comprehensive, consistent and accurate way. In this investigation I was motivated by the indirect reconstruction of the early medieval goldsmith activity drawing attention to the finished artefacts themselves. With that I intended to compensate for the scarcity of relevant information on the practice of goldsmiths in Europe and the Mediterranean region as well as on the organization and scenes of their activity. Concerning the Carpathian Basin, our related knowledge was especially deficient so far.

Studying the material I have raised various questions. How were these pieces of fine metal work made, worn and altered? What kind of practice and tradition has driven their production? What kind of equipment, infrastructure and network of contacts served as a base for this? What kind of individual and regional features characterized the production? All these led to the three following primal questions discussed in the dissertation:

1) What kind of goldsmithing traditions are represented by the artefacts?
2) How was the organisational background of their production?
3) What kind of workshop affinities can be revealed regarding their production?
Widespread occurrence of the polychrome art made it necessary to also get familiar with analogies from the neighbouring areas of the Carpathian Basin. Consequently, I interpreted the observed features from a wider perspective. My investigation followed the international research directions and the obtained results got integrated into the European scholarship of the discussed Periods.

2 Methodology

To be consistent in terminology I have found the most essential expressions used in the dissertation necessary to define. Among fundamental terms I dealt particularly with the meaning of workshop, workshop practice, workshop area, goldsmithing tradition, polychrome style as well as materials technology.

The main features that the investigated artefacts had in common are the polychromy and the composite character. These two arise from the diversity of the used base-material and the complexity of the manufacturing process, respectively. The analyses performed on the finds required a wider research perspective exceeding the conventional archaeological methods. Descriptions and photos of different quality available in the publications did not prove to be sufficient in the discussion of the above mentioned questions. In order to identify material and technological details related to the production, autopsy, i.e. direct observation of every single object was indispensable. In the last few years I could perform this kind of examination in almost all of the four hundred cases. My investigation has been realised in terms of interdisciplinarity; i.e. the relationship of the different research fields and specialities served as its base. Besides archaeology, also the knowledge, methods and experiments of various natural sciences (mineralogy and gemmology, petrography and geochemistry, metallurgy and metallography) as well as of the related handcrafts (gem cutting and goldsmith art) and conservation works had to be taken into consideration.

One of the methods I adopted was comparative analysis; I considered five fundamental features of the production as its base: function, form, ornamentation, base material and manufacturing technique. The other applied method was the instrumental archaeometrical examination. In this way, I primarily intended to reveal the material and technological characteristics of the artefacts as specified as possible. Thus, investigation of the artefacts has been realized as a multistage process at macroscopic, microscopic and high resolution analytical levels. Analyses were performed or controlled personally by myself.

My classification neither related to nor overlapped the classical typological grouping, i.e. categories discerned by the typical formal marks of the artefacts. Namely, smaller or larger proportion of the finds belonging to the same typological group is often not decorated with gemstone or glass inlays, consequently is not discussed in the dissertation. Interpretation of the polychrome fine metalwork from the Carpathian Basin seemed to be likewise irrelevant from only a spatial or chronological point of view, since relationships of the finds may exceed both regions and periods. Finally, I have found it necessary to discuss the production independent from ethnicity as well. Instead, as a result of the completed com-
parison I created more neutral categories, so called *materials technological* groups, which served as reliable bases for the interpretation of goldsmithing traditions, organisational background and workshop affinities. *Materials technology* is a collective noun that covers the relation of the raw materials, the construction and the manufacturing, joining as well as decorative techniques.

Research has a special interest in tracing the origin and roots of the 5-6th century “polychrome style”. Although stylistic (formal and semiotic) as well as technological aspects have already been highlighted several times, the revealed differences and relationships have not been interpreted in the context of the goldsmithing traditions. Considering and reviewing the former results I have undertaken to reconstruct the process when different decorating arts have been turning into traditions. As a first step I brought into focus the goldsmith technology itself. Unlike the main research tendencies I did not concentrate only on the application forms of the garnets and other sorts of gemstones. In the question about the origin of the decorating art I put the most significant role on the manufacturing technology, as it reflects the roots of the handcrafts traditions best. In contrast, the choice of the various metals and minerals used have probably been stronger influenced by economic and cultural changes.

Regarding the production of polychrome fine metalwork I analysed the issue of the organisational background from two different aspects. One is the raw material supply, the other is the workshop organisation. Interpreting the archaeometrical results my attention was directed to the trading and economic background of the supply as well as to the different levels of *specialisation* of handcrafts and the different levels of *cooperation* of the particular craftsmen. In the light of the material composition of the artefacts I could contribute to the question of the *provenance* or *preceding uses* of the raw materials. Considering material and technological characteristics I discussed both the efficiency of the work invested in the manufacture and the *standardisation* of the workflow in a relative way. In the examinations I also paid attention to the general parameters of the organisation of handcraft activities, i.e. their context, concentration, scale and intensity.

In the question of the workshop affinities I supposed that workshop practices were represented by both individual and common characteristics, related to the given craftsman or workshop and to several workshops, respectively. Revealing individual traits of the workshop practice I aimed to prove or disprove the identity of the production site. On the other hand, identification of common traits having regional influence played an important role in the distinction of the production areas.

My interpretation of the individual workshop affinities was first of all based on the observation of the technical details worked out consistently, driven by automatism. In the light of the complexity of the base-material and the manufacturing technique I took into consideration certain material features as well, with higher weights. In contrast, in the *attribution* of the finds I attached less importance to the iconographical characteristics and the ornamental composition.
I considered the natural capabilities of the given territory as well as the economic and trading possibilities of the given population as regional determinants of the production. Furthermore – in the absence of more relevant information – I also viewed certain materials technological characteristics (know-how) to play rather a regional, than an individual role. Finally, I paid attention to the ideological and social principles as well, which might generally limit the scope of the admissible formal and ornamental traits in a particular region. As I pointed out, the effect of these three factors, i.e. capabilities, knowledge and principles could not have materialized only spot-like but rather in some wider districts, determining together the characteristics of the artefacts.

3 New results

3.1 Materials technological groups

Classifying the discussed artefacts I considered them first as whole units represented by their form and function. In the next step I particularly dealt with three of their main structural elements: the base, the mounts and the accessory ornaments. Among all of them I paid the most attention to the characterisation of the mounts giving full particulars about features and types of the frame, the inlay, the backing paste and the backing foil. Through my observations I discerned their ornamental, technological and material characteristics. A set of the values of these variables defined the criteria for the comparative analysis.

By means of optical microscope observations I could identify previously unknown technological details. In this way revision and development of the technological classification used in the literature so far became reasonable. As an example, regarding the art of incrustation, based on apparent features I discerned the true and the pseudo cloisonné techniques. I listed variations of this latter one among the champlevé methods. Apart from the well-known types of mounting I detected and designated the phenomena of the suspended cloisonné (a kind of true cloisonné technique) as well as of the jointed champlevé (a kind of champlevé technique). Identification of these two technical practices first led to refining the classification. Moreover, this had great importance in the discussion about both the organisational background and the workshop affinities.

As a result of the comprehensive analysis I have discerned five materials technological groups:

1) hammered-and-soldered gold artefacts
2) hammered-and-soldered silver artefacts with standard cloisonné technique
3) hammered-and-soldered artefacts made of diverse base-metals with suspended cloisonné technique
4) simple copper alloys
5) cast-and-carved silver- and copper artefacts with champlevé technique

Based on ornamental and technological features of the cellwork-construction I have divided the first and fourth group into further variations. I interpreted the chronological and regional
distribution of the discussed polychrome finds from a perspective of the materials technological groups. I outlined the chronological relationships of the five groups and their variations and presented in details the overlaps and hiatuses observed among them. I paid special attention to the buckle from Regőly. Based on its technology and ornamentation I considered it as an innovative, relatively modern work of art.

3.2 Goldsmithing traditions

Goldsmithing tradition with Hellenistic roots – hammered-and-soldered artefacts

Production of the gemstone decorated gold artefacts have been started far earlier than the Great Migration Period. According to the existing research results I traced back the line of the direct preceding phases until the Hellenistic Period, the 3rd-2nd century BC. At the same time I have drawn attention to the distant roots of this art of incrustation in the ancient Persia and Egypt as well as to the combination and hybridisation of the Imperial and Barbarian elements. I discerned the further and later examples of this hybrid style in the material of the Iberian royal tombs, barrows at the steppes, chamber graves at the Crimea and last but not least of the graves, treasures and ritual deposits in the Carpathian Basin.

The artistic influences came from several directions and I referred their impact to the cultural border zones. Among the centres of the Roman Empire I assigned a special role to the areas of the Crimea and the Caucasus. Furthermore, based on the distribution of the analogous finds I observed the early integration of the polychrome goldsmith art in the Mediterranean region. I emphasised that the further spread, changes and developments of this art were crossing not only the temporal and spatial but also the cultural boundaries. As a consequence I pointed out that the ancient and especially the antique ornamental elements might be identified in different forms but still as common features in the material culture of the various Barbarian peoples from the Hellenistic through the Roman until the Early Byzantine Periods.

I supposed that the Hellenistic goldsmithing tradition appeared in the Carpathian Basin by the influences from the regions of the Black Sea and Mediterranean Sea. Interpreting the investigated artefacts I traced back the transformation process of the decorating art. According to my observations, changes occurred mainly in the colours as well as the parameters and motives of the inlays. These latter ones necessitated the improvement of the gem cutting technology and on the other hand led to more complex cellwork-constructions. I underlined that this process has been realized still before the 5th century. As I concluded, the various precious materials of the hammered-and-soldered gold artefacts from the Hunnic Period Carpathian Basin refer to the goldsmith activity ran at the central territories of the Empire. Even though I could observe significant differences in the technological quality, these variations do not seem to follow a trend. Finds of higher or lower quality occurred inconsistently that I explained as the result of differences in the workshop practice.

Regarding the impact of the Pontic and Mediterranean influences I have drawn attention to the fact that in the second half or last third of the 5th century cloisonné decoration occurred only on the east side of the Danube within the Carpathian Basin.
Relevant archaeological material unearthed in the neighbourhood of Cluj (Kolozsvár) implies the central role of Transylvania. For this phenomenon the alliance between the Gepidic Kingdom and the Eastern Roman Empire served as a possible explanation. On the other hand, Early Merovingian Age hammered-and-soldered artefacts made of silver or diverse base-metals enriched mainly the western Germanic material of the Transdanubia, i.e. the area west of the Danube. My examinations on the examples from the second and third materials technological groups pointed out that there is no local continuity of Pontic-Mediterranean influences and no resurgence of the local crafts; this cloisonné jewellery rather represents a mode and a technological transfer arrived from a different direction. There is so far no argument from the 6th century Carpathian Basin that would suggest the direct continuity of the 5th century cultural phenomena.

In view of the investigated finds I interpreted the late 5th and 6th century flourishing of the cloisonné art as the result of Mediterranean influence. My conclusions strengthened the theory formed by the earlier research about the western European material. This influence has arrived in the Carpathian Basin either directly or through the Merovingian territories, indirectly. Goldsmith works decorated with true cloisonné technique and made of silver- or copper alloys or even diverse base-metals indicated a late antique continuity of the Hellenistic goldsmithing tradition; however, it reflects a more provincial character. This spread of the tradition has occurred simultaneously but likely independently from the changes and developments taken place in the Roman and Hunnic Period Crimea and Carpathian Basin.

Goldsmithing tradition with Late Roman roots – cast-and-carved artefacts

In comparison with the above mentioned examples I found the production of the 5th-6th century cast-and-carved polychrome finds considerably different. Not only the applied manufacturing and decorating techniques, but even the position and role of the inlays within the composition lack the resemblance. Investigating the origin of this decorating art I assign great significance to the distribution of analogous finds from all over the 5th-7th century Barbarian territories.

Concerning the chip carved castings of the Migration Period and Early Middle Ages I followed the line of their antecedents until the so called “Kerbschnitt Bronzen” – products of the Late Roman provinces along the Limes. Accepting theories of the former research – especially of Günther Haseloff and Horst Wolfgang Böhme – I related the origin of the figural and geometrical motives to the late antique decorating art and mythology. In accordance with most of the scholars I considered the Germanic foederati and mercenaries as the link between the Roman and Barbarian world. Materials technological characteristics of the “Kerbschnitt Bronzen” and the discussed artefacts seemed to be analogous. As an explanation for this phenomenon I referred to the process when practice of the Late Roman workshops became tradition. Among the polychrome goldsmith works of the Carpathian Basin I related the production of around one hundred forty pieces to the goldsmith activity of the provinces along the Limes. Dating of this group covers more than one hundred years in the
archaeological material of the Transdanubia, Great Plain and Transylvania. Their analyses allowed me to outline chronological and regional tendencies as well.

In comparison with the Late Roman analogies I observed that in spite of the stylistic relationships, quality of their materials and techniques is different. While Late Roman military equipment is mostly made of copper alloy, examples dated to the 5th-6th century are primarily silver castings. In addition, surface of these latter ones is mercury gilded and decorated with niello inlay. I found direct antecedents of this creative combination of silver – gold – niello among the Imperial Period fine metalwork likewise produced in the provinces along the Limes. Until the late 4th and early 5th century this combination of materials and colours occurred exclusively but even sparsely in the equipment of high-ranked soldiers serving at the frontiers of the Empire. I pointed out that the process when practice of the provincial workshops continued and developed to a tradition resulted in the wide spread of these features. Niello was generally applied on the 5th-6th century cast-and-carved artefacts but with a different chemical composition. I emphasised that changes have taken place during the Barbarian advancement. Even though application of this decorating method continued, there is so far no argument that would suggest the direct continuity of the former niello recipe too. I revealed not only practical reasons but also cultural differences in the background of this change.

Regarding the carved decoration I have drawn attention to the changes in the workmanship, especially in the technological quality. I observed that in the majority of the brooches, belt buckles and sword fittings dated to the second half of the 5th century, the period of the various Germanic Kingdoms, technical quality of the carvings still corresponds to that of the Late Roman belt garnitures. Spiral and geometrical motives are regular and have specifically sharp outlines. On the other hand, this outstanding quality is not common on the 6th century artefacts from the Great Plain and Transylvania, territories of the Gepidic Kingdom any more. I noticed a gradual decline in the workmanship of the carvings. I explained this process with the lack of the elaborate and precise work, and on the other hand, the reduction of the workflow. My examinations pointed out that decoration of the analogous artefacts from the Langobardic Pannonia were designed in a similarly reduced workflow. However, outlines of their carvings usually represent a higher quality than in case of the examples from the Gepidic territories.

Finally, I considered the inlay decoration as a new element on the 5th-6th century chip carved artefacts. In the background of the appearance of this grade of polychromy I found the partially concurrent production and wearing of gemstone or glass inlaid gold artefacts, which were made according to the Hellenistic goldsmithing tradition. Even though inlay decoration is much more moderated to the 5th century gold artefacts, the feature still reflects the creativity of the goldsmiths. As another improvement I considered the multicellwork of the 6th century cast-and-carved metalwork from the Transdanubia and Transylvania. I went into details concerning the jointed champlevé technique as well, applied on the S- and Š-shape brooches in the Langobardic Pannonia. I emphasized that this technical trick was still in practice outside of Pannonia even in the 6th-7th century; moreover, in Italy and
Southern Germany it had further developments. Thus, the process when practices of the Late Roman provincial goldsmiths became tradition did not rule out further developments and innovations.

### 3.3 Organisational background of the production

**Raw material supply**

Discussing the issue of the geological provenance, I took different possibilities into consideration regarding the raw materials and outlined the natural, human (one-time population) and scholar factors playing role in the background. Reconstructing the raw material supply, metal analyses had significance primarily in revealing the sort of preceding use and application phase(s). Namely, recyclability of the base materials, alteration of the original composition as well as the corrosion and enrichment of various chemical elements at the surface of the objects raised difficulties in the provenance study of the components of the metal alloys. Number of the artefacts involved in the investigation was limited because of the technical and financial conditions of the analyses. In spite of this, sample selection concerned every materials technological group, moreover, all of the main cultural-chronological groups.

Based on the different quality of the base-metals I discerned several groups among the gold, silver and copper alloys. Considering technological characteristics as well I pointed out that the majority of the groups does not reflect any typical alloying practice. I named only a few examples of silver and copper alloys as exceptions. In the selection of their components I supposed awareness or the effect of standardisation. According to my observations, quality of the base-metals did not depend on the practical aspects but usually on the financial circumstances, on the demand of the customer as well as on the available stock of gold, silver or copper. I based my conclusions on the differences showed in the base-metal composition of those artefacts, which were produced as a set of jewellery at the same time and in the same workshop. I mentioned some extreme examples as well where the material composition and the workmanship of the artefacts implied the recycling of several different objects.

Reconstructing the preceding phases of the base-metals I considered the general high purity of the gold artefacts as a significant feature. Great majority of them contains more than 93% gold but a ratio over 99% also occurs. I remarked that the not-alloyed gold is too soft and possesses low tensile strength and in fact, it was disadvantageous for the goldsmith. I discussed the question whether in which form could have this kind of good quality base material been available in larger quantity in the Hunnic Period Carpathian Basin. I supposed that the elite of the Hunnic Period society – acquiring Roman *tributum* – had their jewellery and wearing elements made of *solidus* by the goldsmith of the area. They could also pay for the finished products with these coins.

Analysed silver objects represented a wide spectrum of the material quality, in their case I have undertaken to outline a tendency. Pieces of the best quality contain 95-97% silver in accordance with the fineness of the Roman chased silver artefacts. I drew attention
to the possibility that silver of this very good quality appeared in the goldsmith workshops of the Barbarian territories even in form of finished products. My observations implied that previous products of the Roman workshops could play an important role in the production of various silver elements of the polychrome artefacts. Regarding the 5th-6th century, I could show a downward trend in the silver content that I interpreted as the result of the multiple recycling. In this circulation the valuable silver – originally purified by a long process – disappeared gradually, i.e. merged indiscernibly into the various alloys.

By means of the material analyses I could clarify that among the discussed copper alloy artefacts which pieces were made of unalloyed copper and which ones of bronze, brass or red-alloy. Based on the results of the measurements, in the majority of the so called Mediterranean buckles I supposed awareness in the use of metals. I remarked that metal composition of the brass alloys approximates or is in accordance with related data of the brooches generally extended in the Roman Period. I named two possible reasons behind this. Either the alloy was made following the Roman standard in the given workshop, or the goldsmith recycled some artefacts made by this standard.

I could increase our knowledge with relevant results concerning garnet inlays of the discussed fine metalwork. Purpose of my investigation was to identify not only the mineral species but also the possible geological-geographical sources of the raw material. Thanks to the performed analyses Carpathian Basin is not remaining a white spot any more in the well-disputed provenance issue about the mineral raw material of the Migration Period and Early Middle Ages garnet jewellery. Examinations revealed that the investigated gemstones represent two different types of almandine as well as intermediate varieties between pyrope and almandine, moreover, in one single case andradite. In view of the former results I could clearly exclude the European sources from the group of the potential provenances of the analysed almandine and pyrope-almandine inlays. On the basis of the data available in the geochemical literature I concluded that almandine garnets with higher chromium content are nearly related to garnets exploited in Southern India, while Sri Lanka is the potential provenance of the intermediate varieties between pyrope and almandine. Regarding almandine garnets with poor chromium content I named Northern India as the possible source. Last but not least, in case of the only piece of andradite I proposed the same provenance as for the intermediate varieties; even though, in absence of reference database I could not rule out Carpathian Basin from the list of the potential sources.

Analytical results pointed out that almandine and pyrope-almandine inlays from the Carpathian Basin do not show any differences to the western territories of the continent. This correspondence indicates that this region was the part of the same trade networks. I based the clarification of the trade links reviewing results of the previous research about relevant historical sources and archaeological finds. Gemstones arriving most likely from India and Sri Lanka could have got to various regions of Europe – among others to the Carpathian Basin – trough sea and land routes of the long distance trade. Archaeometrical analyses however pointed out that regarding the Carpathian Basin, chronological order related to the use of the various garnet types partially differs from the typochronology
outlined so far based on the intensively investigated find material of the western territories. Just as it was showed in case of Western Europe, my observations revealed an accord in the supply of the particular garnet types used in the 5th century Carpathian Basin. In contrast, almandines originating from the new source of Northern India appeared in the 6th century only on artefacts of the Transdanubian region. Thus, population settled on the left coast of the Danube did not cease the use of Southern Indian and Sri Lankan garnets, which they acquired probably in the same way as before. As reasons behind this difference I found dissimilar cultural relationships as well as distinct technological characteristics of the polychrome jewellery.

These results discussed in detail in the dissertation led to the conclusion that precious metals, i.e. base-metals of 5th-6th century polychrome fine metalwork were mostly not obtained from primary geological sites. Tribute coming from the Roman Empire as well as one-time trade wares could have served as the most reliable sources of the almost pure gold and silver material. Even though the use of the primary sources cannot be ruled out without doubt, in absence of further material analyses, this possibility could not be proved. Regarding the tendency of material quality change, I considered multiple recycling as a characteristic of the region. I supposed the standardised process of the casting only in case of one group of the copper alloys. Since their production required base-alloys of known composition, i.e. mainly purified metals, I emphasised the significance of the primary raw material sources. However, I drew attention to the regional factors that might drive their production and I referred to the foreign workshop practice reflected by them. Concerning the applied inlay material I stated as a conclusion that at the early stage, diverse ethnical groups – settled in the Carpathian Basin – obtained garnet material from the same geological sites as people of the Frankish and Alemann Kingdoms. However, with regard to chronological tendencies I pointed out that the practice in the area of east of the Danube did not follow entirely the changes took place in Western Europe.

Workshop organisation

First question arising about the specialisation was how many sort of handcraft’s activity can be related to the production of the artefacts. Based on the different types and kinds of the raw material I discerned craftsmen responsible for gem-processing and metal-working respectively. At the same time I did not considered the specialisation between these crafts as a rigid framework. My observations showed that certain overlap characterised the scope of tasks accomplished by the gem-cutter and goldsmith. As an example I mentioned those garnet inlays that although bear marks of the preparation work of the gem-cutter, might have got their final form in hands of the goldsmith responsible for the mounting. Related to the specialisation within one craft I concluded that there was not any fixed scope of tasks within neither the goldsmith’s nor the gem-cutter’s activities. Craftsmen possessed extensive knowledge about various workflows differing from each other.

I related the presence or the absence of the cooperation between the specialised crafts to the degree of standardisation of the manufacturing process as well as to the individual or common features of the finished products. In one part of the investigated
artefacts I could clearly verify the aligned activity of the gem-cutter and the goldsmith and I remarked also when the ornamental composition was known by both of them. As prime evidence I considered those inlays of unique form, which were mounted like elements of a picture puzzle. Cooperation between the crafts allowed to create much more complex, even mosaic-like compositions that I considered as the first step to the so called engzellig ornamentation. In the other part of the investigated artefacts I could obviously exclude even the occasional cooperation. Gem-cutter could shape the great majority of the gemstone inlays even without the knowing parameters of the given goldsmith artefacts. I identified the absence of the relationship between the crafts in three different cases. When artefacts contain 1) standardised inlays, compatible in many ways, 2) inlays obtained in semi-finished phase and finished likely by the goldsmith, 3) secondarily used inlays. In case of the standardised inlays I supposed that the goldsmith chose the needed pieces from a set or collection and shaped the settings according to their shape.

I deduced the presence of the cooperation within one single craft, i.e. the division of labour, discerning special technical marks. While these marks are related to the same phase of the manufacturing process, they represent very different quality of workmanship. As a result of the technological observation of the discussed artefacts I concluded that technical quality of the workmanship was in accordance with the designed form and ornamentation at almost every exemplar. If awareness and elaboration appeared in the ornamental composition, also the particular ornaments were characterised by thorough, meticulous workmanship. Similarly, poor composition appeared usually together with rough-and-ready details and careless or imperfect technical solutions. The revealed accord in the quality of the design and the workmanship implied that craftsmen consequently applied their knowledge and skills.

I considered as the only exception one of the pairs of brooches from the Szilágy-somlyó treasure. In case of the spiral decorated brooches I discerned essential differences in the workmanship of the particular phases of the workflow. Even though wire decorations of the brooches usually represent perfect technical details, the product itself seems to be the result of a low quality work. Formerly this pair was identified as the imitation of a brooch produced in a high quality workshop, even e.g. one of the other brooches from the treasure. However, the workmanship of certain elements attesting to intensive and continuous concentration raises the possibility that several (likely two) goldsmiths participated in the production of this pair of brooches. According to my observations, one of them was responsible for preparing the ornaments while the other one for composing and fastening them. This latter goldsmith, who finished the artefact, lacked both artistic ability and patience, concentration, needed during designing and fastening the elements, respectively. He simply slubbered over his work.

3.4 Workshop affinities

Another important question discussed in my doctoral thesis is whether the similarities and differences observed in the characteristics of the artefacts play an important role in
the reconstruction of either the specific practices or the regional relations of the workshops. In order to identify workshop affinities as well as to discern their possible degree, a set of criteria were developed based on the typical features of the production. I highlighted four groups of traits as criteria: 1) specific construction of the finds, 2) specific tool-marks, 3) composition of the receipt-like elements, 4) technical workmanship (quality and unique marks) of the different phases of the workflow. In addition, I have drawn attention to the typical combinations of the particular characteristics as well.

In case of the hammered-and-soldered gold artefacts, specific or unique elements of the construction as well as particular joining and fastening practices proved to be fundamental. Furthermore I labelled specific tool-marks and quality differences – manifesting in some manufacturing phases, such as the production of the backing foils, punchmarks, filigree work and pressed borders – as essential indicators. Among the receipt-like elements I highlighted the backing paste emphasising the analytical results about its composition. Finally with respect to other indicators, I also examined the specific combination and quality of the gemstone or glass inlays.

To illustrate the presence or even the absence of the individual workshop affinities, I discussed the emblematic assemblages of the 5th century Carpathian Basin: the grave goods from Regőly, Bakodpuszta, Gáva and “Beregvidék”, the Szilágysomlyó treasure and the ritual deposits from Nagyszéksós and Bátaszék. Moreover, I also dealt with the buckles from Lébény, Alcsút and the Eggers-collection, the bracelets from Beregszász and an unknown site, as well as a stray brooch said to be found in Szilágysomlyó in detail. Identifying their materials technological characteristics facilitated discerning the items produced in the same workshop. Finally in case of the Bakodpuszta-type bracelets and fingerings, the bird brooch from “Beregvidék” and various artefacts from Gáva I attempted to localise the production area as well.

Regarding the hammered-and-soldered silver artefacts decorated with standard cloisonné technique, I considered only one structural feature as a possible indicator for closer workshop affinities: the use of the semi-suspended standard cloisonné technique. I suggested that the artefacts representing this special practice were produced in the same workshop. However, I emphasised that in order to resolve this question a comprehensive comparative analysis would be needed on their backing paste. When comparing the main components known to constitute of the used pastes I did not exclude the possibility that the production of the hammered-and-soldered silver jewellery was related to a common area. Neither the construction nor the specific tool-marks did indicate any further relationships so far.

Concerning the localisation of the supposed production area(s), apart from the materials technological details I also considered the distribution of the typologically and ornamentally analogous exemplars of the same period. With respect to the hammered-and-soldered silver jewels, containing sand as main component of the paste, I ruled out the possibility of the local production in the Carpathian Basin. However, in lack of control measurements or further new analyses I could not localise their manufacturing sites in greater
detail. Regarding the distribution of the analogies I accepted the more moderate opinion of
the previous research. I viewed these artefacts as imported products assigning them to
workshops located in the West Germanic territories, mainly within the northern Frankish
and the southern Alamannic-Bauuvarian realms.

Cloisonné works – dated to the turn of the 5-6<sup>th</sup> century and the first two thirds of the
6<sup>th</sup> century – seem to be homogenous both in their typology and ornamentation. However,
in view of an unusual construction and the consequent use of diverse base-metals I could
clearly discern a special group of cloisonné jewellery. This group includes brooches and
buckles made by the suspended cloisonné technique. Considering their relatively scanty
occurrence and revealing the unique features of their production I proposed that they have
common origins in a smaller or broader scale. Based on the comparative analyses of their
ornamentation, their technology and their material, I suggested that at least three different
goldsmiths produced eleven pieces of the investigated material. It is still an open question if
these goldsmiths worked in different or in the same workshop(s). These products represent
various types of artefact, at the same time however, the three designs differ considerably
and consequently from each other. In fact, I could identify the specific marks of three
particular craftsmen independently from the typological and general materials technological
characteristics.

Apart from the Pannonian finds I attributed several other artefacts to the three
goldsmiths that were unearthed in Southern Germany and Northern Italy. The eastern- and
westernmost sites of their occurrence, Hegykő in Hungary and Andernach in Germany,
suggested labelling this trend as Hegykő-Andernach group. The concentration of the relevant
archaeological sites implies that the goldsmiths worked beyond the Carpathian Basin. Based
on the available results I suggested that the activity of the three goldsmiths ran relatively
close to each other, in the Alamannic-Bauuvarian territory.

With respect to the Mediterranean-type exemplars of the simple copper buckles,
I highlighted the characteristics of the structural elements, the backing paste and in some
cases the composition of the solder as well as the typical combination of the base-alloy and
the inlays. I could show the presence or absence of the different degree of workshop
affinities and made an attempt to discern the production areas in a wider sense as well. In
the majority of the buckles I suggested a Mediterranean origin; I considered the local
production (Carpathian Basin) only in two cases.

As for the localisation of the workshops, the greatest result I achieved is related to
the buckle from Rákóczifalva, where gypsum – the base-mineral of the backing paste –
proved to be fundamental. The presence of this type of paste in other artefacts suggested its
use in the practice of several workshops in the same geographical region working on differ-
ent quality and for different purposes. The identification of the brass-alloy, the preserved
fragment of red glass inlay and the tiny chip of blue glass mixed into the bright mass
suggested an Eastern-Mediterranean origin. I interpreted the enrichment of the various
Mediterranean, Eastern-Roman elements in the 5<sup>th</sup>-6<sup>th</sup> century material culture as the result
of the military alliance between the Gepidic Kingdom and the neighbouring Early Byzantine Empire. This alliance was formed at the disintegration of the Hunnic Empire and lasted until the outbreak of the Gepidic-Langobardic wars.

Concerning the bird head copper-alloy buckles the nature of their manufacture did not allow us to reveal any indicators for the individual relationships. The base-form and the construction of the buckles under analyses proved to be identical and the workmanship of their technical details seemed to be equally mediocre. Based on my observations I could take into account two different explanations behind this phenomenon. On the one hand, the seven pieces of metalwork could be derived from the same workshop or goldsmith. On the other hand, in the absence of the instrumental analytical measurements specific marks indicating different manufacturing sites could remain obscure. Thus, until any future analyses I could draw only moderate conclusions supposing that these finds originated from the same production area.

Apart from some rare occasions, the construction of the cast-and-carved silver- or copper artefacts did not facilitate the reconstruction of the workshop affinities. Differences and similarities in the workshop practice were manifested mostly in the use of specific tools. In case of the analysed artefacts I was primarily concerned with the punchmarks, the features of the chip carving decoration made with the help of the so called auxiliary mould as well as the pattern of the backing foils made by die.

First I discussed the question of workshop affinities related to the artefacts unearthed in the same site and assemblage, focusing on the cast pieces from Gáva and Zsibót-Domolospuszta in particular. Concerning the exemplars representing different assemblages, the performed comparative analyses also led to new results e.g. about the buckles from Kapolcs and Nagyvárad (Oradea) as well as about the brooches from Vörs and Keszthely. Through the presented case studies I have proved that artefacts produced in the same workshop – even approximately at the same time – could have reached regions situating quite far from each other. For this reason the investigation of distant analogies is highly necessary.

Similarly to the previous groups, analogues pieces found beyond the Carpathian Basin were also discussed among my case studies. By employing complex technological and compositional analyses I could prove or disprove whether the artefacts were produced at the same time and the same site. I discussed the regional workshop affinities of some groups of artefacts that represent the same formal or technological features. Extending the region of the relevant finds I elaborated my interpretation about the rhombic belt buckles, the bow brooches and eagle head belt buckles of the Gepidic Period, the bow and various S-shape brooches of the Langobardic Period. Not only did I aim to reconstruct their relative relationship but also in some cases I attempted to localise their production area, focusing primarily on the role and activity of the local goldsmiths in the regions of the Transdanubia and the Great Plain.
4 Publications of the author


Materials technological characteristics and workshop affinities of the polychrome metalwork from Gáva. In: Wandering and settled Barbarians in the Carpathian Region and neighbouring areas (1st - 5th cent.) International conference in Nyíregyháza – Satu Mare 2010 October. (Co-authors: Zsolt Bendő, Zoltán May) (accepted manuscript, in press)