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# A FIND OF A BRONZE MACEHEAD FROM THE KRAKÓW-CZĘSTOCHOWA UPLAND IN POLAND

**Abstract:** The Upper Silesian Museum in Bytom houses an interesting find of a macehead discovered in the Michałowiec nature reserve (commonly known as the Michałowiec/Michałówka Forest). The reserve is located on the northern slope of a large rise of terrain of the Kraków-Częstochowa Upland (Polish: *Jura Krakowsko-Częstochowska*) that shelves toward the River Biała Przemsza valley. Regrettably, the exact coordinates of the find location are not known, and only very imprecisely defined forest limits where the discovery was made were indicated. The artefact in question is a reasonably well-preserved macehead of the so-called star-shaped type. The macehead was cast in a pre-prepared mould using a non-ferrous metal alloy with a dominant share of Cu, Pb, and Sb. A comparative analysis of maceheads with finds from the territory of Hungary and south-eastern Europe, as well as a concentration of such finds along the southern and the eastern borders of Poland allow for a supposition that such artefacts could also come from this direction. On the other hand, it cannot be excluded that the find is of local manufacture. Concerning its chronology, on the basis of analogies a wide time frame between the 12$^{th}$ and the first half of the 14$^{th}$ century can be proposed. The territory of the Kraków-Częstochowa Upland is a landscape that since the early 14$^{th}$ century has been marked by numerous works of military architecture. These were the background of the defensive system of the border of the Kingdom of Poland. Therefore, a high number of warriors could be at least temporarily stationed in this area. This can perhaps offer grounds to rather accept a later (that is, the 14$^{th}$ century) chronology of the artefact. Such a date can also be implied by its chemical composition.

**Keywords**: macehead, weaponry, Late Middle Ages, Kraków-Częstochowa Upland

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## Introduction

In recent years, a huge assemblage of metal artefacts has been contributed to the collection of the Upper Silesian Museum in Bytom. Unfortunately, however, this assemblage came from illegal metal detector prospections that were carried out, among others, in the territory of the Kraków-Częstochowa Upland. It is significant that these artefacts were not discovered within one deposit, but were chance finds both from the northern part of this geographic area (in the vicinity of Kroczyce), its central part (in the vicinity of Olsztyn and Rabsztyn), as well its southern region, that is, in the valley of the Szklarka stream that flows in the neighbourhood of Kraków.

A considerable part of the assemblage were offensive arms, which were quite frequently almost completely surviving examples of medieval weaponry.[1] What is of special interest from the point of view of historical arms and armour studies are finds that can be interpreted as maceheads, or perhaps the striking ends of flails. These finds differ with regard to their forms and shapes, as well as to the raw materials they are comprised of. The artefacts in question were made of iron, lead, and copper alloys. It must be stressed,

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[1] Many of these weapons were mentioned in an exhibition catalogue, see Imiołczyk and Kawka 2017.

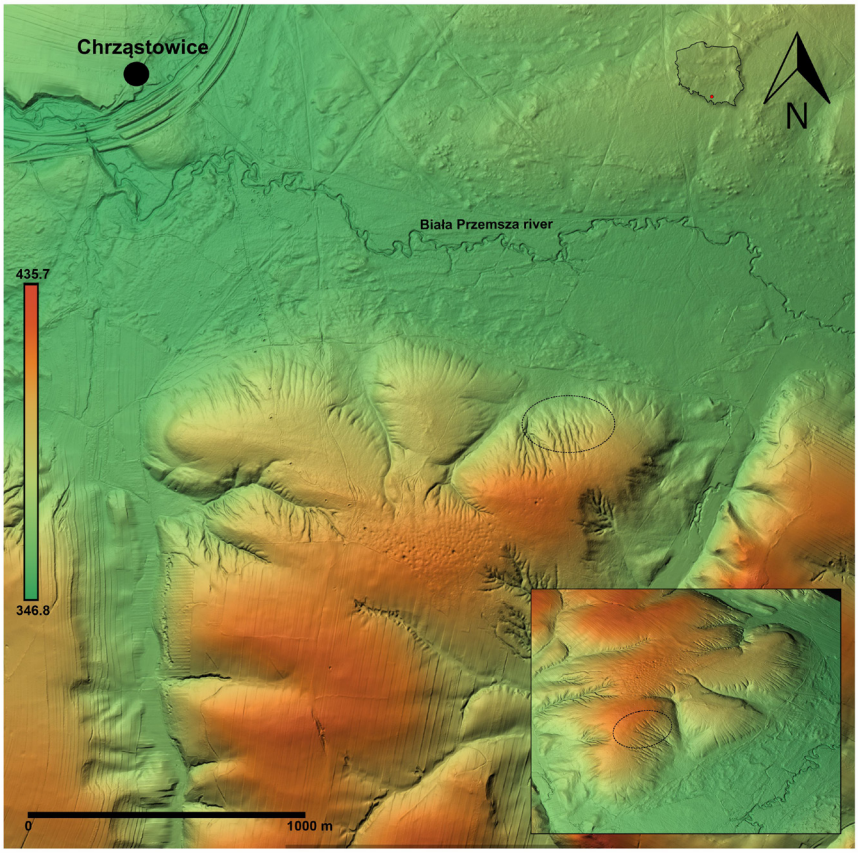



Fig. 1. Lidar AMS with the find location of the mace. Graphic design: R. Zdaniewicz, based on Planlauf software.

however, that an interpretation of some finds is not unequivocal, which sometimes suggests a more conservative assessment and discussion. Within this context, the assemblage in question certainly merits a presentation to a wider scholarly audience as an extremely interesting collection of tools of war that were used in the Middle Ages. On the other hand, we decided to devote this paper to one find only: a bronze macehead.

## Find location

According to the inventory record of the artefact and an oral confirmation provided by the discoverer, the artefact was found within the Michałowiec nature reserve (commonly known as the Michałowiec/Michałówka Forest) on the northern slope of a large rise of terrain of the Kraków-Częstochowa Upland that shelves toward the River Biała Przemsza valley (Fig. 1). Regrettably, the exact coordinates of the find location are not known, and only very imprecisely defined forest limits where the discovery was made were indicated. The area in question is located about 2.5 km to the north of the Michałówka village and about 2 km to the south-east of the locality of Chrząstowice in the present-day Olkusz District in the Małopolskie Voivodeship. This area is now covered with forest and low-growing plants. No archaeological research has been carried out so far in this place, and the only archaeological prospections were surveys within the Archaeological Record of Poland (AZP). These surveys, however, brought no positive results (AZP 96-54). What is more, no remains of possible buildings or traces of more or less permanent settlement here have survived. An analysis of the earliest maps of this territory from the 18th and the first half of the 19th century also does not indicate any remains (ruins) of earlier features (defensive, residential-defensive, or settlement) (Fig. 2). It is worth underlining, however, that a numerous assemblage of weaponry and parts of equestrian equipment was found within the reserve, dating from both the Early and the Late Middle Ages.[2]

The central part of the Kraków-Częstochowa Upland macroregion is a fascinating settlement area for researchers studying Polish historical archaeology, as a significant economic centre existed there since the Early Middle Ages (11th-12th century), related to the mining of, among others, lead and silver ores.[3] In the Late Middle Ages two large royal urban centres, Olkusz and Wolbrom, developed in the nearest vicinity of the macehead find location. What is more, a few

[2] Imiołczyk and Kawka 2017, 28-47.
[3] Molenda 1978, 148; Godzik and Woch 2015, 37-39.


Fig. 2. a. Detailed Map of the Voivodeship of Kraków and the Duchy of Siewierz, 1787, collection of the Central Archives of Historical Records in Warsaw, acc. No. AGAD, AK 92 (Zb. SA 9). Source: http://igrek.amzp.pl; b. Topographic Map of the Kingdom of Poland ed. 1843, by General Quartermaster of the Polish Army. 1822-1831, prepared by the Russian Corps of Topographers under the direction of General Richter, 1832-1843. Collection of the Library of the Polish Academy of Sciences in Kórnik, acc. No. A III 085. Source: https://www.wbc.poznan.pl.

castles and watchtowers were constructed on the so-called 'Trail of the Eagles' Nests' (Polish: *Szlak Orlich Gniazd*) (Fig. 3).[4] The presence of numerous features of military architecture is related to the fact that since the beginning of the 14th century this territory was a borderland of the Kingdom of Poland and the Upper Silesian duchies that were fiefs of the Kingdom of Bohemia.[5] This area was also a theatre of minor and major scale battles and skirmishes in the Middle Ages, such as the battle of Bogucin in 1273 between the troops of the Piast dukes under Bolesław the Chaste and the army of Władysław, Duke of Opole and Racibórz.[6]

## Description of the find

The discovered artefact is a reasonably well-preserved macehead of the so-called star-shaped type

[4] Bogdanowski 1964, 7, Pl. I.

[5] Rajman 1998, 176-223.

[6] Rajman 1998, 181.

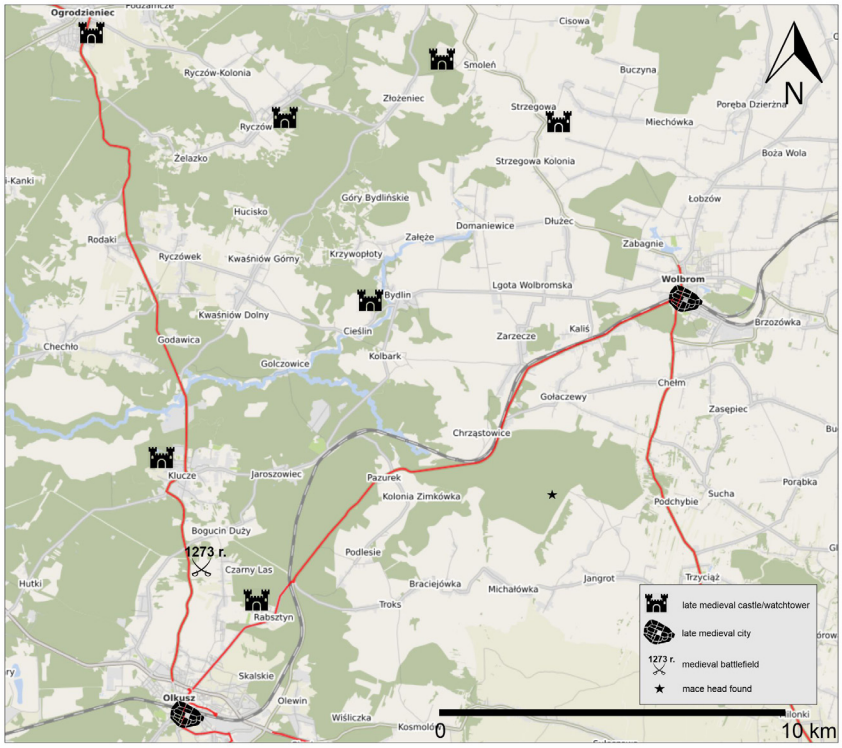



Fig. 3. Map of important late medieval towns and castles near the location of the find location of the macehead. Graphic design: R. Zdaniewicz, based on OpenStreetMap, licence: CC BY-SA 2.0.

(Figs. 4 and 5). Its shape is irregular and quite complex, due to the presence of three rows of cubic pyramidal knobs of various sizes. In the central part of the artefact's body the most pronounced four knobs are placed symmetrically to the axis of the macehead. Beneath and above this range there are two other rows of somewhat smaller knobs, placed at intervals of about 90 degrees horizontally in relation to the axis of the central range. The maximum height of the artefact is 4.05 cm and its maximum width is between 4.2 and 5.7 cm. The opening of the macehead's hole is oval and slightly funnel-like in the vertical plane. Its diameter at the upper edge is about 1.8 cm and at the lower edge about 2.1 cm. In the lower part near the base of the eye there is a low flange. The present weight of the artefact is 292.96 g.

The discussed macehead was cast in a pre-prepared mould using an alloy of non-ferrous metals.[7] Thanks to examinations with a spectrometer it can be assumed that copper was the main component of the alloy. Its content in different parts within the matrix micro-sections which underwent the analysis slightly exceeded 50% (Fig. 6).[8] The result of the analysis implies that other components of the alloy are mainly antimony and lead, in roughly similar proportions of about 13-14%. The tin content is low (about 1.5%) (Fig. 6). The lead content certainly influenced the weight of the artefact, and as a result, the combat value of such an offensive weapon as a mace. For the sake of comparison, point analyses of the not-cleaned surface of the artefact were carried out. It must be stressed, however, that this result may be distorted and may not reflect the actual composition of the original metallic mass, as the examinations included the corroded surface of the artefact. The macehead was found in a forested area and it probably remained in acidic soil for a long time, which may have influenced the results of the chemical analysis.[9] In the case of acidic soils with a pH of 3-4 (which usually contain organic acids or carbonic acid), corrosion

[7] The analyses were carried out with a Bruker Traces i5 spectrometer at the Department of Archaeology of the Silesian Museum in Katowice. The authors are obliged to Mr Jacek Soida MA for his help.

[8] The analyses of the chemical composition were based on measurements done only within the micro-sections near damaged parts of the artefact's surface (Measurements 8-10). At present, the mace's surface is covered with a layer of dark green noble patina. Due to conservation reasons, it was decided not to prepare dedicated larger sections or to take samples from the artefact's structure. This could influence its aesthetic values and, more importantly, have an impact on its general condition. For the sake of comparison, the spectrometric analyses also included the corrosion layer of the aforementioned patina and the obtained results chiefly apply to metallic corrosion products (Measurements 1-7).

[9] The authors are obliged to Prof. Piotr Strzyż, Dr Arkadiusz Michalak, and Ms Katarzyna Hasiak MA for their help and important suggestions concerning the results of the analysis.

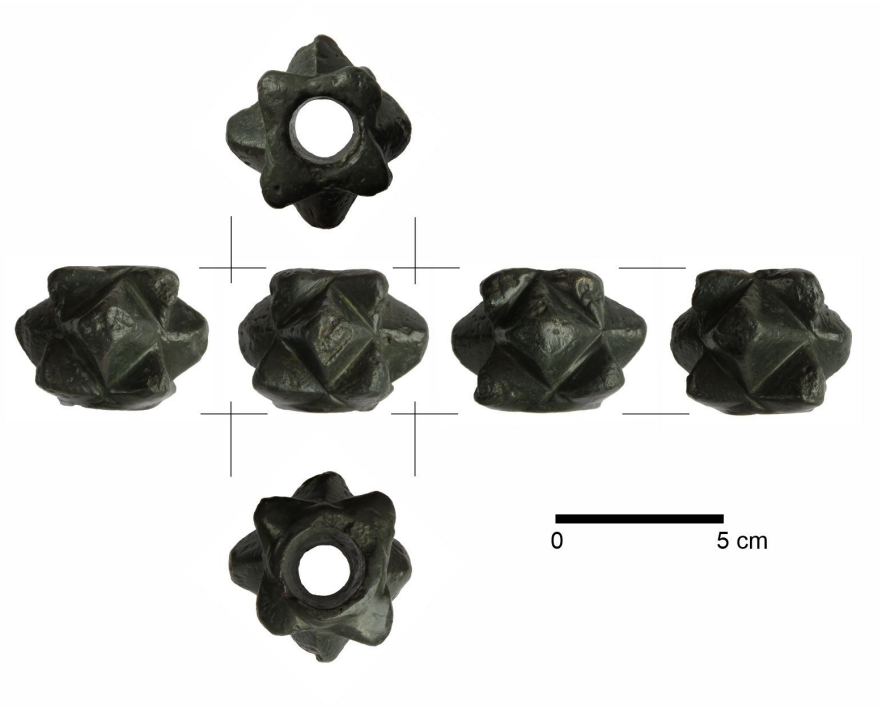



Fig. 4. Macehead from the Michałowiec Forest. Photo: R. Zdaniewicz.

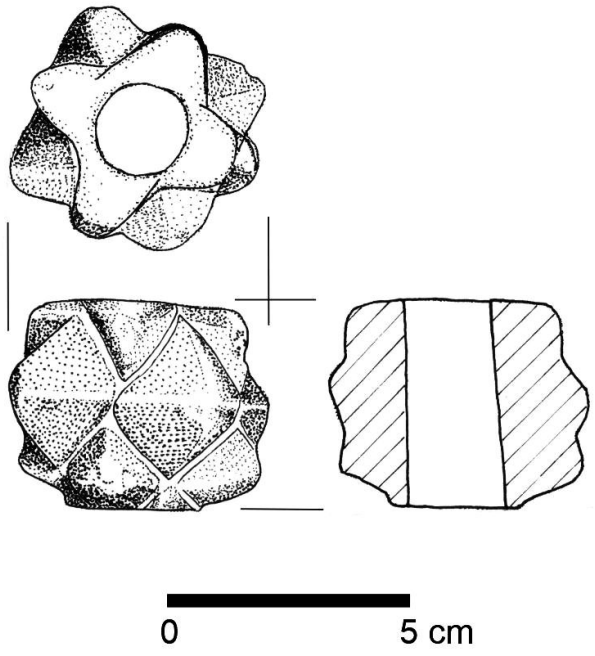


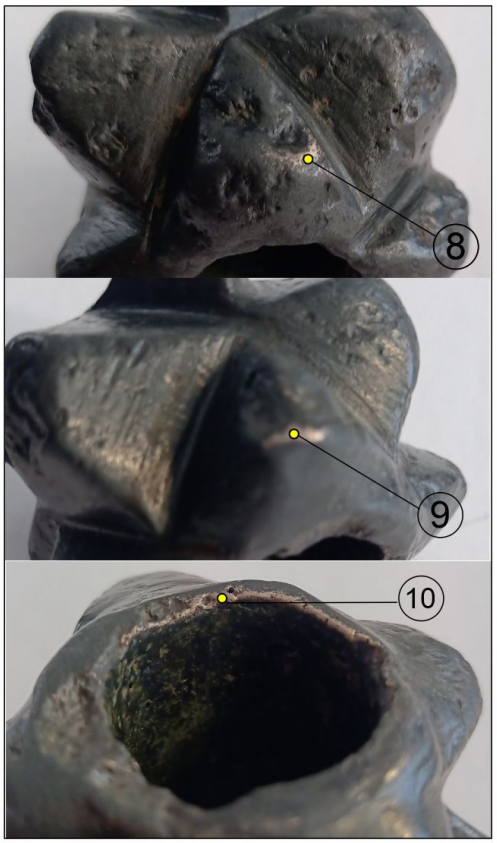

Fig. 5. Macehead from the Michałowiec Forest. Drawn: J. Święcicki.

processes proceed at a much faster pace.[10] Within this context, the very high share of antimony in the analyses, oscillating between 15 and 26% (about 13-14% within the artefact matrix), is worth stressing. This element was and is still used in metallurgy as an alloy substitute in order to increase functionality.[11] Antimony increases the metal's volume during consolidation, which makes it a perfect addition for metal casts. It also increases the hardness and toughness of metals, e.g., lead.[12] Due to the level of early medieval technology,

[10] Surowska 2022, 50.

[11] Anderson 2012, 3-8; Herring 2018.

[12] Herring 2018.




| lp./% | Cu | Sb | Pb | Fe | Hg | Sn | Ni | Au | Ag |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 52.784 | 14.514 | 14.593 | 5.314 | 4.359 | 1.498 | 3.298 | 3.221 | 0.418 |
| 9 | 50.849 | 14.111 | 14.456 | 5.494 | 5.143 | 1.559 | 3.358 | 3.927 | 0.458 |
| 10 | 54.871 | 13.307 | 13.721 | 5.405 | 4.463 | 1.442 | 3.255 | 3.090 | 0.448 |

Fig. 6. The results of the chemical analysis of the macehead. Graphic design: R. Zdaniewicz.

however, we should consider it likely that copper and lead ores already containing antimony were used, not that antimony was added separately during the preparation process.

Although the very presence of antimony in the chemical composition of the macehead is not surprising, its content exceeding even 10% in the matrix of the artefact is remarkable as regards the raw material. In this place it is perhaps worth noting that copper ore outcrops in the territory of Western Ukraine had been a considerable raw material basis for Central European populations since prehistory,[13] but interestingly, no presence of antimony was detected in these ores.[14] Trace amounts of Sb can be found in bronze artefacts discovered in present-day Poland that were made of copper ores extracted since antiquity in the territory of present-day Slovakia (Spiš).[15] The extraction of local ores also continued in the Middle Ages and the obtained metal may have been used in the manufacture of various artefacts all over Central Europe.[16] Antimony metallurgy in this region, however, is first confirmed in the early Modern Period.[17]

Antimony is also a component of lead minerals in Silesian-Lesser Poland's tin-lead ores which had been extracted since the Early Middle Ages.[18] The concentrations and chemical forms in which it occurs vary and depend on the peculiarities of a given deposit.[19] In the examined slag and soil samples that have been gathered in the course of archaeological works in the territory of local early medieval smelting settlements, the presence of antimony compounds has not been attested; this, however, may be a result of the technology of the manufacturing process itself or only reflect on the selection of finds that were examined.[20] The presence of elements accompanying the minerals of tin-lead ores in a lead bar or in given artefacts may have

[13] Klochko et al. 2002, 48-50.
[14] Klochko et al. 2002, 52, 56, 63-66, 72-73.
[15] Kowalski et al. 2009, 4358-4365.
[16] Molenda 1989, 803-804; Kúšik 2015, 8-10.
[17] Herčko and Hronček 2010, 155-165; Tomášek 2017, 21-24.
[18] Mikulski et al. 2020, 19-23; Cabała et al. 2021, 162-163.
[19] Jończy et al. 2017, 86.
[20] Cabała et al. 2020, 5-13.

depended on deposit traits or on the level of metallurgical competence of the manufacturers. Spectroscopic examinations of a famous lead bar from the 13th- early 14th century that was discovered in the Market Square in Kraków revealed only trace amounts of antimony (0.0052%) and the same applies to other elements.[21] On the other hand, because this artefact should be considered a professionally prepared trade bar of raw material, it can be hardly seen as a representative marker of the level of metallurgy that was relevant for all lead smelted in Silesia-Lesser Poland during the period in question.

The share of antimony in the chemical structure of ready artefacts made of non-ferrous metal alloys which could be of local origin may also have varied. For the sake of comparison, spectrometric analyses of temple rings discovered at the cemetery in Strzemieszyce Wielkie near Dąbrowa Górnicza (11th-12th century) were carried out.[22] The examinations demonstrated that these artefacts were made of alloys of copper with tin, and alloys of copper with silver. Only in one case (inv. no. B:39:528:6) the presence of antimony at the level of 0.3% was identified. The manufacture of ornaments which did not have a utilitarian function perhaps did not require care for eventual high hardness and durability of the alloy. Due to paucity of research on the chemical composition of non-ferrous alloy artefacts that are known from early medieval settlements discovered in the region of Silesia-Lesser Poland, it is hard to draw any broader conclusions. On the other hand, some indication can be provided by examinations of the chemical composition of utilitarian artefacts dated to the 14th-15th century from this part of Europe. A fragment of a 15th century bronze hackbut barrel from Rokštejn Castle in Moravia is perhaps worth mentioning. Metallographic examinations demonstrated that it was cast of copper and tin alloy, but a 3% share of lead and antimony was also identified in the composition.[23] Worth noting is also the 4.5-6.5% share of antimony (the share of lead being 10-39%) in fragments of metal vessels (so-called pipkins or *Grapen*) discovered within a 14th-15th century manorial residence in Gliwice-Czechowice.[24]

Within the framework of the above considerations, the question must remain whether the discussed macehead can possibly be considered a local product of Western Lesser Poland. This could be suggested by a distance of merely a few kilometres between the find location and the Olkusz basin of lead and silver metallurgy.[25] Such an assumption could only be confirmed by possible specialist isotopic examinations focusing on the source of provenance of raw materials of which the macehead was cast. As suggested previously, it cannot be excluded that medieval manufacturers knew the traits of ore minerals that were locally extracted in various parts of the Silesia-Kraków basin: perhaps the raw material was selected depending on the kind of manufactured artefacts, and manufacturers were aware of properties of a given deposit. The share of more than 10% of antimony in the metal demonstrates that its content in the alloy must have been intentional. Therefore, it is possible that a preselected large portion of a chemical compound containing this element, most probably antimony trisulphide ($Sb_2S_3$), was added to the alloy. However, the provenance of this compound is difficult to assess. Such a possibility should rather be discussed within the framework of late medieval metallurgy (14th-15th century).[26]

In addition, isotopic analyses have demonstrated that lead from deposits near Olkusz was used for refining precious metals in early medieval workshops in Central Europe, e.g., in Prague in Bohemia.[27] This means that it could also easily find its way via trade to other territories, where it may have been used for casting the macehead.

Regrettably, no broad scale analyses of the raw material composition of medieval maces discovered in the territory of Central and Eastern Europe are available. This renders possible comparisons or more general conclusions difficult, especially concerning analyses of metal alloys that were used in the manufacture of individual find types. A recently published list of a dozen or so examples of various types of medieval maceheads that were discovered chiefly in the territory of southern Poland (and in some cases in the territory of Bohemia, Sweden, and Ukraine) demonstrates that in nearly all cases an alloy of copper and tin was clearly dominant.[28] In the course of chemical analysis, artefacts included in this list displayed a very low content of antimony oscillating around 1-2%, and only in a few cases reaching 5-6%.[29] The content of antimony in the composition

[21] Garbacz-Klempka and Głowa 2009, 227-237.

[22] Five temple rings discovered at this cemetery and stored in the collection of the Upper Silesian Museum in Bytom, inv. nos. B:39/528:60, B:53/528:60, B:52/528:60, B:40/528:60, and B:61:42 were examined. For research at the cemetery, see Marciniak 1933, 238-241.

[23] Strzyż 2011, 20.

[24] Four fragments of vessels underwent spectrometric examinations. These fragments were discovered in the course of excavations in 2020-2021 within the remains of buildings of the manorial residence in Gliwice-Czechowice.

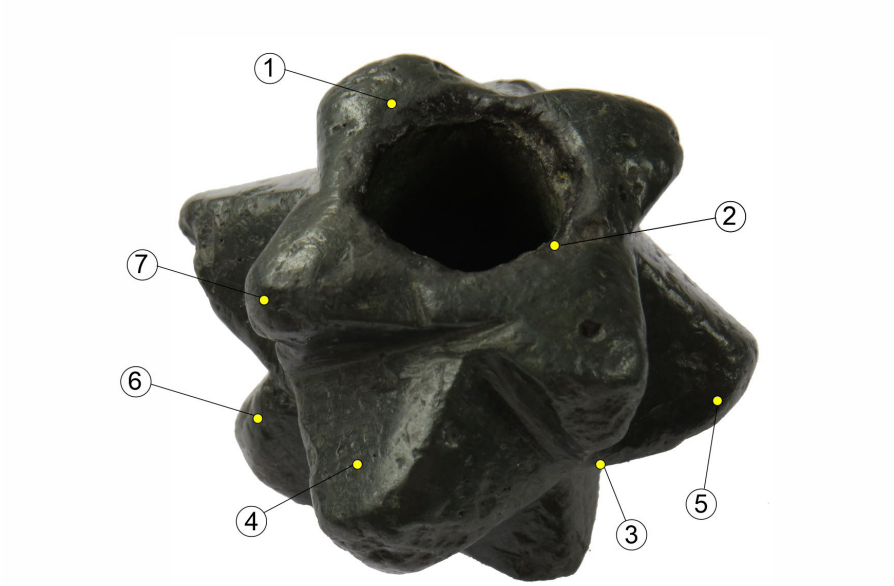
[25] Rozmus 2013, 261-272; Rozmus 2014, 17-29.

[26] Antimony was already known in antiquity. Pieces of information on the smelting and use of antimony were given in an alchemy treatise by the 15th-century monk Basilius Valentinus, e.g., Tomášek 2017, 21.

[27] Ettler et al. 2015, 76-80.

[28] Michalak 2019, Table 1, 151.

[29] Michalak 2019, 151.




| lp./% | Cu | Sb | Pb | Fe | Hg | Sn | Ni | Au | Ag |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 33.225 | 26.874 | 18.770 | 8.299 | 6.741 | 2.392 | 1.960 | 0.998 | 0.740 |
| 2 | 39.073 | 21.688 | 18.440 | 7.628 | 5.225 | 2.290 | 2.073 | 2.918 | 0.663 |
| 3 | 50.796 | 17.456 | 16.047 | 5.986 | 4.062 | 1.670 | 2.094 | 1.470 | 0.419 |
| 4 | 44.548 | 15.252 | 15.177 | 7.579 | 6.351 | 2.073 | 2.837 | 4.789 | 0.622 |
| 5 | 41.582 | 18.726 | 18.085 | 6.203 | 5.803 | 1.888 | 2.347 | 4.428 | 0.460 |
| 6 | 40.111 | 18.496 | 16.325 | 8.749 | 6.204 | 2.196 | 2.484 | 4.667 | 0.648 |
| 7 | 41.065 | 17.576 | 16.627 | 7.130 | 6.525 | 1.970 | 3.105 | 4.975 | 0.535 |

Fig. 7. The results of the chemical analysis of the macehead. Graphic design: R. Zdaniewicz.

of a 13th/14th century macehead of Hungarian origin discovered in Librantowa near Nowy Sącz was even lower, being about 0.3-0.5%.[30] The content of antimony in the chemical composition of the mace from the collection of the Archaeological Museum in Kraków was slightly higher, about 1.5 -1.9%.[31]

Spectrometric examinations also demonstrated a content of antimony over 20% in the corrosion layers of the artefact (Fig. 7). This is perhaps a result of the fact that the metals used for casting maceheads have different properties and tendencies to enter chemical reactions with components of the environment, that is, to oxidise.[32] The high share of antimony in the corrosion layer may be a result of the faster pace of oxidisation of, among others, lead and tin, which may have originally been more important components of the alloy. Therefore, these spectrometric analyses can perhaps become a valuable source of information for research on the corrosion processes of non-ferrous metals that were used in the manufacture of historical artefacts.

The surface of the discussed macehead bears traces of use. These can be mainly seen on the spikes as larger and smaller surface defects with smooth edges of damage (Fig. 8). It seems that these may have originated during the use of the artefact while hitting against harder structures and are not a result of post-deposition erosion processes of the artefact's surface. What is more, sporadic remains of linear wear and tiny percussions with relatively sharp edges of defects were observed. These may have come into existence both in the course of combat but also, e.g., while picking the artefact off the ground, cleaning it, or during other post-deposition processes.

**Analogies and the chronology of the artefact**

The macehead from the collection of the Upper Silesian Museum in Bytom belongs to Type IV Group A according to A. N. Kirpichnikov.[33] This group includes maceheads with three rings of spikes. The middle ring is composed of centrally placed large spikes, while the two remaining rows are formed by smaller trilateral spikes. The vast majority of Group A maceheads are provided with feebly pronounced sockets for mounting the artefact on a shaft.[34] Such finds correspond to Type I according to L. Kovács,[35] that is, maceheads with four

[30] Liwoch 2016, 676.

[31] Rudzińska et al. 2013, 141.

[32] Surowska 2022, 132-135. The content of antimony in the chemical composition of the mace from the collection of the Archaeological Museum in Krakow before conservation was at a level of about 1.9-3.2 %, and after conservation about 1.5-1.9%, see: Rudzińska et al. 2013, 141.

[33] Kirpichnikov 1966, 52.

[34] Michalak 2005, 193.

[35] After Fărcaș 2016, 29.

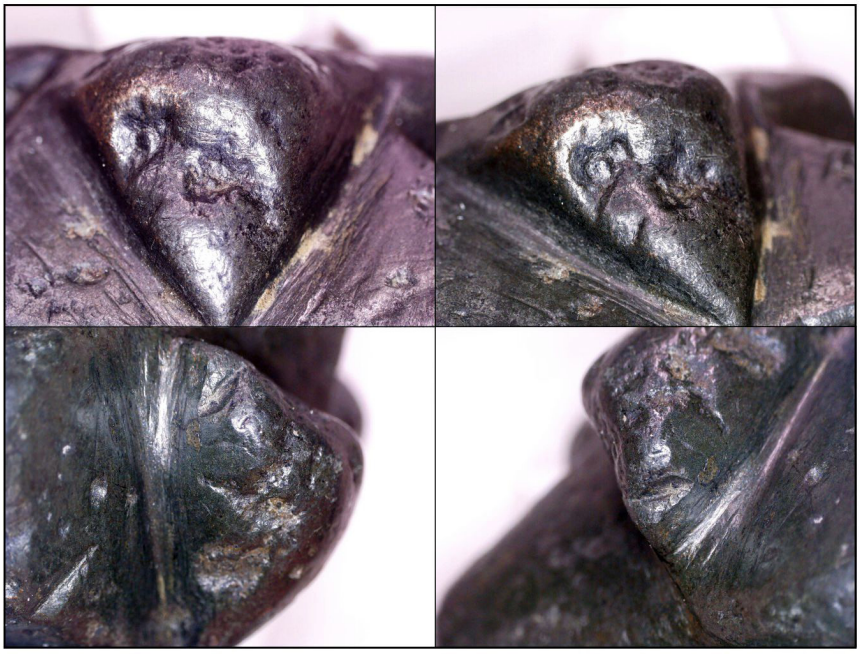


Fig. 8. Traces of use of the macehead on microscopic photos, zoom ×4. Photo: R. Zdaniewicz.

pyramidal spikes and without sockets. The origin of this macehead type is believed to have been related to territories in the Dnieper river basin in the region of Kyiv, from which it spread to central Europe. On the basis of finds from eastern Europe, A. N. Kirpichnikov dated this macehead type to the period between the 12th and the early 13th century. On the other hand, L. Kovács[36] also considered find contexts and technological traits of artefacts from Hungary and shifted the chronology of maceheads with four pyramidal spikes to the period between the 12th and the early 14th century.[37] Star-shaped type maceheads had complex shapes and were, in a vast majority of cases, cast of non-ferrous metals, while the empty spaces inside were sometimes ballasted with lead. Such artefacts were in all probability a very dangerous weapon that was used in close combat or was thrown at the enemy.[38]

As it is impossible to precisely define the chronology of the find from the collection of the Upper Silesian Museum in Bytom on the basis of its find context, its dating must be based on analogies.[39] This paper is not a comprehensive discussion of the issue of maceheads in Europe and it merely aims to offer an overview of the state of research on maceheads and to make an attempt at discussing the artefact from Bytom. Among more than 36 maceheads recovered from the territory of Poland, finds of so-called star-shaped maceheads from Lesser Poland[40] will be dealt with in more detail. P. Strzyż discussed examples of medieval maces from Lesser Poland and pointed out their chiefly Rus' provenance. He believed that maceheads of Types III and IV according to A. N. Kirpichnikov were typically of Rus' origin.[41] Most of the star-shaped maceheads from the Lesser Poland area were dated to the 13th-14th centuries, but unfortunately these are mostly chance finds devoid of context.

A bronze-cast mace with a bulbous head provided with 4 large and 8 small spikes is known from Czermno on the Huczwa River. This is a chance find from the area of the suburbium and it is dated to the 12th-13th century. It has pyramid-like spikes surrounded by 12 small knobs.[42] The spaces between them are filled with a double line of grain-like knobs. The macehead ends with a cylindrical socket with its edge folded outwards.[43]

A chance find from Radymno discovered in the bank of the San River belongs to the same group. This is a bronze-cast mace with 4 large and 8 small spikes. The spikes are pyramid-shaped and are surrounded with

[36] Cf. Kovács 1971, 165-181.

[37] Fărcaș 2016, 29.

[38] Marek and Miazga 2012, 370.

[39] It is impossible to discuss here all star-shaped maces that are known from literature. We will solely focus on maceheads of Type IV according to A. N. Kirpichnikov that are known from Lesser Poland and neighbouring territories, as well as on such finds which seem to be stylistically related to the artefact in question.

[40] After Michalak 2011, 174. This number is based on the available literature, but we are aware that at the moment it is higher. Unfortunately, a significant part of research on these maces is still unpublished.

[41] Strzyż 2006, 138.

[42] Strzyż 2006, Pl. VI/1.

[43] Strzyż 2005, 109. Cf. Gurba 1997, 65, Fig. 1; Kuśnierz 2003, 219, Pl. IV:33.

three rows of button-like knobs.[44] This find, discovered in the course of gravel extraction on the San River, is similar to the artefact from Czermno with regard to its form. Differences consist solely in the fact that the spaces between the large spikes and the socket are ornamented with a triple row of button-like knobs. The macehead was filled inside with lead, which points to a combat use of the artefact. As in the case of the find from Czermno, the artefact can be dated to the 12th-13th century.[45]

A find from the Museum in Rzeszów is a cast-bronze macehead with 4 large and 8 small spikes. The spikes are pyramid-shaped and are surrounded with two rows of button-like knobs.[46] This artefact is also similar to the find from Czermno with regard to its shape, but differs with additional ornamentation. Each of the large spikes and the socket are surrounded with pseudo-cord decoration, while the small spikes are decorated with engraved ornaments. The spaces between the pseudo-cord decoration are filled with a double row of small knobs. A significant difference is that the mace from the Museum in Rzeszów has empty spikes, so perhaps it merely fulfilled the function of a command attribute.[47] All these artefacts are remarkable for a very high precision of manufacture, which is why their Rus' (perhaps Kyivan) provenance was proposed.[48]

P. Strzyż assumes that artefacts from Mount Birów in Podzamcze and from the Pieniny Mountain Range are perhaps of local manufacture.[49] This researcher shifts their chronology to the 2nd half of the 13th and the 14th century on the basis of their cultural context.[50] The find from Mount Birów is provided with three rows of pyramid-shaped spikes. What makes this artefact unique is also a crowning of the upper part of the socket which is shaped as an openwork pyramid.[51] The lack of analogies among known archaeological finds and a considerable simplification of the macehead's body may imply the local origin of the artefact or its provenance from the territory of Bohemia or Slovakia.[52] The find from research at the Pieniny Castle on the Dunajec River is a small mace fragment which does not provide an unequivocal answer with regard to its origin. It is absolutely certain, however, that this mace can be dated to the 2nd half of the 13th to the early 14th century.[53]

The aforementioned macehead from Librantowa is an import from Hungary. It was in all probability discovered at the site of a battle waged by George of Sóvár, who rushed in support of Duke Leszek the Black in a clash against the Tatars.[54] The macehead is star-shaped and is provided with four central pyramid-shaped knobs. Six smaller knobs are trilateral. The artefact was in all probability cast of bronze. Its spikes are solid inside and are ornamented with hardly noticeable ribs.[55] Both the find from Librantowa and the artefact from Pieniny Castle are classified as Type IV according to L. Kovács (Variant *Tustań*). These artefacts in all probability come from Hungary and are dated to the 2nd half of the 13th to the 1st half of the 14th century.[56]

Most Type IV maces from the territory of Lesser Poland are chance finds.[57] Due to this, it was possible to define their chronology and provenance on the basis of analogies from beyond the territory of Poland. The work by A. N. Kirpichnikov[58] is an invaluable help in the case of maces. This researcher discussed maces (19 finds) from the territory of Rus' and grouped them, dating 'star-shaped' maces to the 12th to the first half of the 13th century.[59] Maces with pyramid-shaped spikes were classified as Type IV.[60] This type was divided into four variants named after manufacturing centres.[61] A vast majority of maces came from the territory of Kyivan Rus' and the Land of Halych-Volodymyr. As in the case of the aforementioned artefacts from Lesser Poland, the differences between them solely consist in their ornamentation.[62] Maces were initially cast in bipartite clay moulds. In order to facilitate manufacture, ready artefacts were used as matrices for producing new maces. A simplification of the manufacturing process influenced not only the appearance of artefacts, but also the spread of similar products in vast territories.[63] Maces from the territory of Western Ukraine that belong to a type that is similar to the artefact in question are known, among others, from the site in Dorogobuzh (Дорогобуж). A bronze-made macehead with four

[44] Strzyż 2006, Pl. VI:7.
[45] Strzyż 2005, 109.
[46] Strzyż 2006, Pl. VI:6.
[47] Strzyż 2005, 109.
[48] Strzyż 2006, 138.
[49] Strzyż 2006, 138.
[50] Muzolf 1998, 115, Fig. 2; Strzyż 2005, 109.
[51] Strzyż 2005, 109.
[52] Strzyż 2005, 111.
[53] Strzyż 2005, 111.
[54] Liwoch 2006, 67; Liwoch 2016, 675;
[55] Liwoch 2020, 58, Fig. 1, 59.
[56] Liwoch 2016, 678.
[57] Michalak 2005, 188; Strzyż 2005, 111.
[58] Kirpichnikov 1966.
[59] Type IV maces from the territory of Western Ukraine are believed to have been related to the Mongol invasion in 1240. Most of these were found in strongholds that were destroyed in the course of invasion. On these grounds star-shaped maces from the territory of Western Ukraine can be dated to the 1st half of the 13th century, see Liwoch 2006, 68.
[60] Kirpichnikov 1966, Fig. 10.
[61] Kirpichnikov 1966, 52; Strzyż 2005, 111.
[62] Cf. Kirpichnikov 1966, 130-133, Pls. XXVI:4; XXVII:1-7; XXVIII:2-44; XXIX:2.
[63] Strzyż 2005, 111.

central large tetrahedral pyramid knobs and eight small knobs is dated to the 1st half of the 13th century.[64]

Apart from the territories of present-day Poland and Ukraine, star-shaped maces can also be found in south-eastern Europe. The National Museum in Budapest holds a large number of Type IV maces.[65] These artefacts can be dated to the period between the 12th and the mid-14th century. Star-shaped maces from the territory of Hungary are also ornamented with granulation. However, over time their forms became more and more simplified, and eventually they simply assumed the shape of cubic knobs.[66] A mace with four central pyramid knobs and eight smaller knobs is known from the locality of Kajárpéc in the territory of north-western Hungary.[67] This bronze-cast mace of Type IV according to L. Kovács (Variant *Tustań*) is dated to the 12th-13th century.[68] This find seems to have the most simplified form which is close to the discussed find from the Kraków-Częstochowa Jura.

An almost identical shaped core of a mace to that of the find from the Museum in Bytom comes from the territory of Slovakia. The form of this artefact is much more simplified and bears no ornaments. This mace is dated to the mid-14th century and is solely provided with large and small cubic knobs on its surface. Such maces are also more massive than the artefacts from Rus'.[69]

A. Fărcaș[70] classified 7 finds of such weapons as Type I according to L. Kovács in his monograph on maces in the territory of Romania. Among these artefacts attention is drawn to three finds whose form seems to be related to that of the artefact stored at Bytom. All three maces are made of bronze and are held in the National Museum of the Union in Alba Iulia. Their find locations are not known. These artefacts are provided with four pyramid spikes and have no sockets. The author of the monograph dates them to the period between the 12th and the 13th century.[71]

Stylistically similar maces can also be found in the collection of the Museum of Varna in Bulgaria.[72] A bronze mace surviving in fragments is provided with trihedral and tetrahedral pyramid spikes. This artefact comes from the locality of Kiten (Китен) and is dated to the 12th-14th century.[73] An analogous mace was found in the territory of the medieval village of Znamenosec (Знаменосец).[74] H. Kuzov also deals with a bronze mace from an unknown locality which is also provided with trihedral and tetrahedral pyramid spikes.[75] Maces appear in the territory of Bulgaria in the mid-10th century. The first mentions in early medieval Hungarian sources say that this weapon was used by commoners.[76] Maces were a typical weapon used by the *garde du corps* in the Byzantine Empire. This type of arms (called *Vardoukion*) appeared as the weapon of the Byzantine troops in the 8th to the 11th century.[77]

## Conclusions

The development of medieval weaponry was a result of many interrelated factors. These were to a great degree an effect of social and economic changes and of contacts with the territories of southern and eastern Europe. Butt weapons held an important place in the repertoire of medieval arms and armour. This particularly applies to axes, which enjoyed considerable popularity due to their effectiveness.[78] Other blunt weapons such as clubs, maces, or war flails are relatively rare in the archaeological material. In recent years it is possible to note a strong increase in the number of such finds from the territory of Europe. This allows for a more comprehensive discussion of the issue of the provenance of individual mace types. In literature hitherto there was a dominant opinion that this weapon was exclusively of eastern origin. However, a detailed comparative analysis of maces with finds from the territory of Hungary and south-eastern Europe, as well as a concentration of such finds along the southern and eastern borders of Poland, allow us to suppose that such weapons may have also arrived from this direction. What is more, it cannot be excluded that some artefacts, e.g., that from Mount Birów in Podzamcze,[79] or the discussed find, are local products. Regarding the chronology of the artefact, a broad timeframe of the 12th to the first half of the 14th century can

[64] Liwoch 2006, 70, 71, Fig. 2:2. R. Liwoch in his work *Buławy z zachodniej Ukrainy*… gathered 16 finds classified as so-called star-shaped maces of Type IV according to A. N. Kirpichnikov. He discussed in detail both such finds that can be termed 'classic' as well as maceheads that differ with regard to some formal traits, see Liwoch 2006, 67-78.

[65] Strzyż 2005, 110, Pl. II:10-12; cf. Kovács 1971, 171-178, Pls. 3:2-3; 4:2-4; 5:1-4; 6:1-3; 7:2.

[66] Strzyż 2005, 111.

[67] Liwoch 2016, Fig. 2:d.

[68] Liwoch 2016, 676. R. Liwoch classified nine of the discussed weapons from the territory of Poland and the neighbouring countries as Type IV according to Kovács (Variant *Tustań*). Their forms are similar to that of the artefact from Bytom, see Liwoch 2016, 675-679.

[69] Strzyż 2005, 11.

[70] Fărcaș 2016.

[71] Fărcaș 2016, Figs. 58:1,2 and 59:3.

[72] We would like to thank Mr Hristo Kuzov (Христо Кузов) from the Museum of Varna for making materials available to us.

[73] Kuzov 2002, Table II:9.

[74] Kuzov 2002, Table II:10.

[75] Kuzov 2002, Table II:11.

[76] Kuzov 2002, 174.

[77] D'Amato 2011, 14.

[78] Nowakowski 1972, 167.

[79] Michalak 2006, 56-57.

be proposed on the basis of the aforementioned analogies. Because of its location on the defensive border of the Kingdom of Poland beginning in the 14th century, a large military presence could have been stationed in the Kraków-Częstochowa Upland, a which can offer grounds to propose a later (i.e., 14th century) chronology of the discussed artefact. Such a dating can also be confirmed by its chemical composition.

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