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# THE OLDEST EVIDENCE OF SILVER PROCESSING IN EUROPE

## A HOARD FROM KOŠÍKY (OKR. UHERSKÉ HRADIŠTĚ/CZ)

The Early Eneolithic can be rightly called the time of the first real boom of metallurgy development in Central Europe. However, with regard to the occurrence of metal products themselves (and evidence of metallurgy) it is in fact the second horizon, dated to the interval of 4300/4200–3900/3800 BC (Balaton I – Ludanice – Jordanów – Bisamberg/Oberpullendorf – Brzéść Kujawski). It is preceded by the horizon 1 (Lengyel II and III, cf. Čižmář et al. 2004) with sporadic occurrence of metal objects. The spectrum of finds comprises small pieces of jewellery, the so-called heavy copper artefacts (hammer-axes, cross-headed axes, flat axes) deposited in hoards, but also direct evidence of metal production (Peška 2020). It is also a period of the first appearance of products from precious metals, mainly silver ornaments in the form of the Stollhof-type sheet-metal discs (Štramberk [okr. Nový Jičín/CZ], Vanovice [okr. Blansko/CZ]) (Šikulová/Zápotocký 2010; Malach/Štrof 2015; Prokeš et al. 2020). They are so far considered to be the oldest silver artefacts north of the Alps, older than the numerous silver ornaments, sculptures and vessels of the Maykop Culture or silver objects from Southwest Asia (Hansen 2014; Hansen/Helwing 2016). The only chronological parallels might perhaps be the silver (and gold) crescent-shaped »objects« (imitations of ornaments from boar tusks) from the region of the Lower Danube, which find a copper analogy in the Stollhof hoard (Bez. Wiener Neustadt/AT) (Popescu 2015), or the silver pendants from several caves in Greece (Hansen/Helwing 2016, 47), mostly dated to the last third of the 5$^{th}$ or to the 4$^{th}$ millennium BC.

A unique hoard of copper artefacts was recently found in the municipality of Košíky (okr. Uherské Hradiště/CZ). The hoard contains a Stollhof-type flat axe and is therefore dated to the period under review. Apart from the flat axe, the Košíky hoard also encompassed a completely new type of Eneolithic artefact with narrow grip and flat-hammered working surface instead of a cutting edge. These properties enable us to classify it as a hammering tool or a hammer, respectively. The fact that the tool was indeed used for metal hammering was proved by an analysis with the help of a scanning electron microscope, which has detected silver flakes sticking to the working surface of the tool. These or similar copper tools with even, flat working surface instead of a cutting edge thus may have been used to hammer out the first silver objects (maybe particularly the above-mentioned silver discs). The find therefore represents not only a unique and new type of Eneolithic copper industry, but also provides evidence of a very early phase of silver processing in Europe.

### THE KOŠÍKY HOARD

In 2016, a small hoard of two copper artefacts, which was found with the help of a metal detector within the municipality of Košíky, was handed over to the Museum of Moravian Slovakia in Uherské Hradiště. In terms of geography, the find comes from the south-eastern part of the Chřiby Hills, which are situated on the border between southeast and central Moravia (**fig. 1**). The hoard was buried in the earth on the NW slope of a forested hill (Vlčí jáma field) at an elevation of 380.5 m asl (**fig. 2a–b**). The top of the hill distinctly overlooks the surrounding landscape. The artefacts were found in a small bowl-shaped pit of about 40 cm in diameter, with a maximum depth of 50 cm. Both objects rested flatwise side by side at the bottom of the

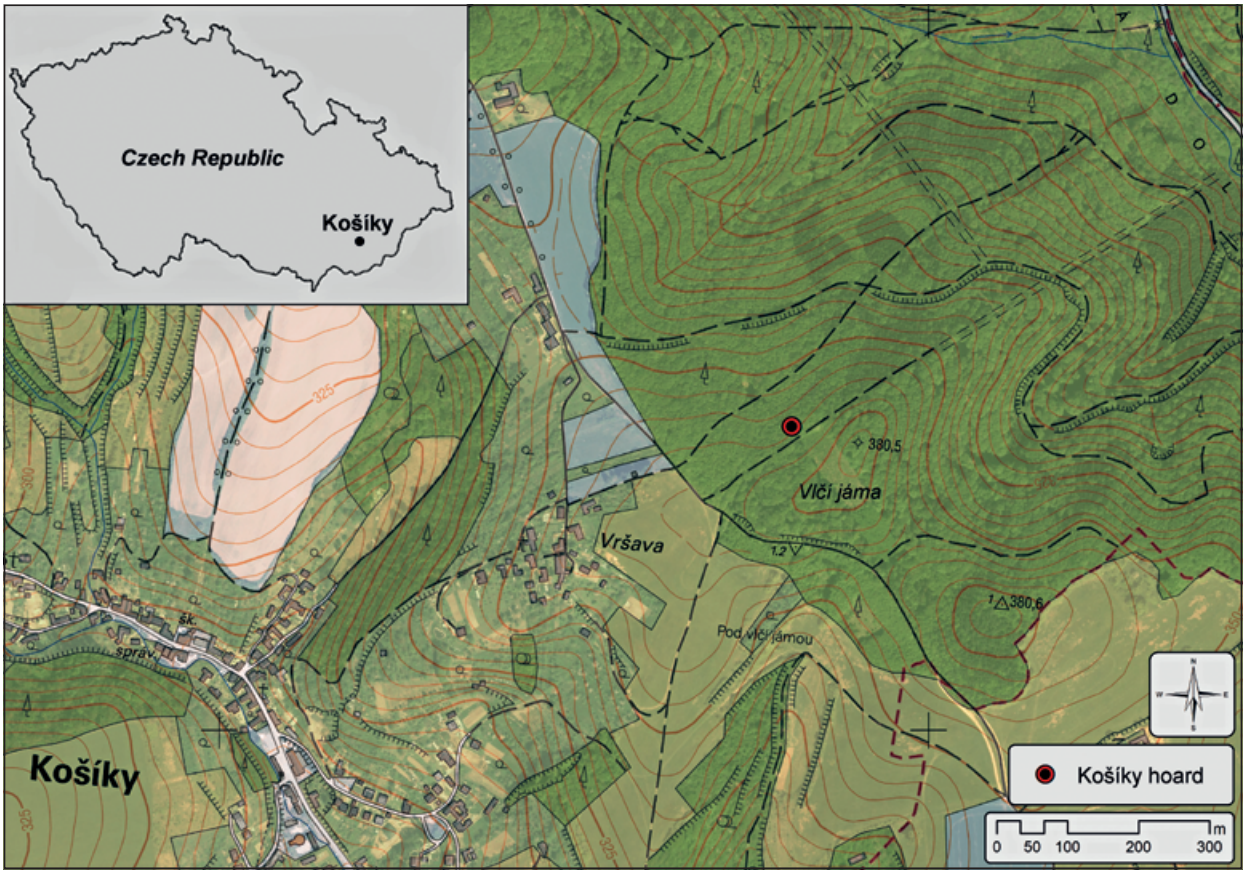


**Fig. 1** Košíky (okr. Uherské Hradiště/CZ). Localisation of the hoard of copper artefacts. – (Graphic design J. Bartík).


**Fig. 2** Košíky (okr. Uherské Hradiště/CZ). – **a–b** view of the findspot of the hoard. – **c** copper artefacts *in situ* during the excavation. – **d** copper artefacts immediately after retrieval. – (Photos J. Obdržálek).

**Fig. 3** Hoard of the copper artefacts from Košíky (okr. Uherské Hradiště/CZ). – (Photo T. Heřmánek).

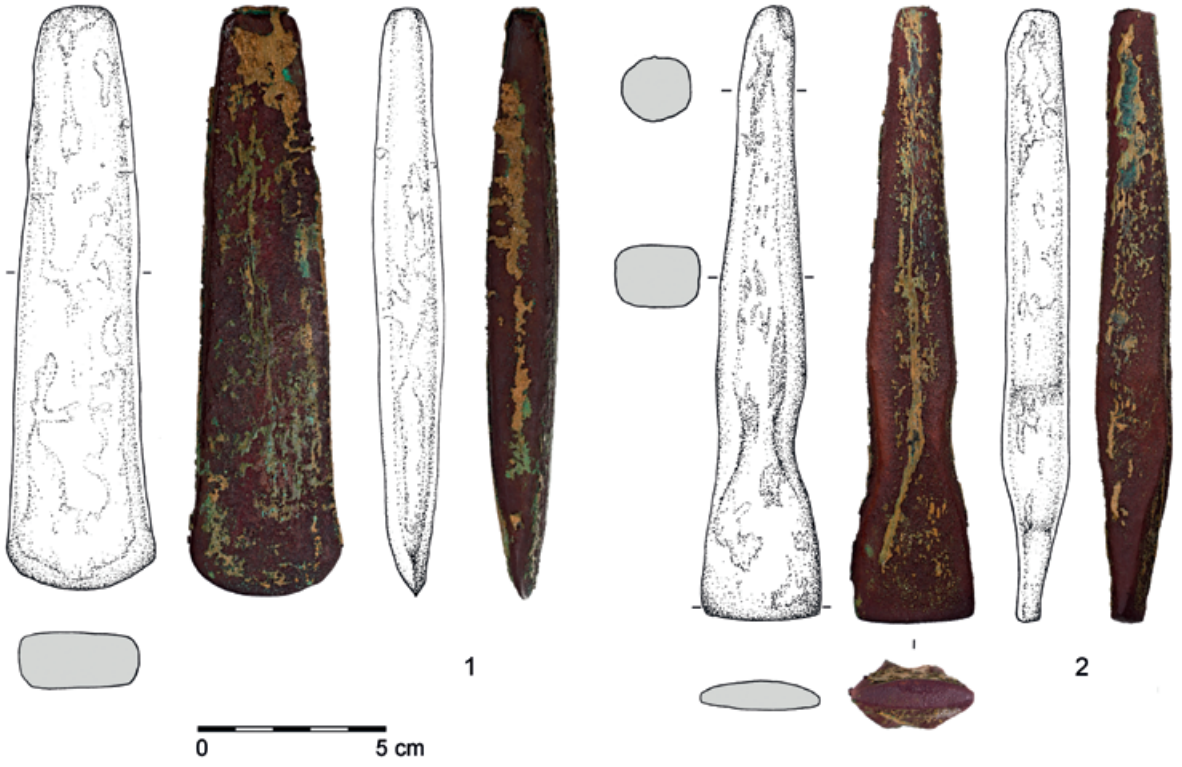


**Fig. 4** Drawings and photographic documentation of the hoard of copper artefacts from Košíky (okr. Uherské Hradiště/CZ). – **1** Stollhof-type flat axe. – **2** Košíky-type hammer. – (Drawings and photos J. Bartík / T. Heřmánek). – Scale 1:2.

pit, parallel to the inclination of the slope (**fig. 2c–d**). An ancient road runs along the ridge of the Chřiby Hills not far from the findspot (ca. 200 m). The geological subsoil is composed of greywacke sandstones and conglomerates of the Outer Western Carpathian Flysch Belt. The small hoard contained a Stollhof-type flat

axe and a still unknown type of a subtle tool with a flat-hammered working surface and a narrow grip in the lower third of the length (figs 3–4).

### Description of the Artefacts

1. Copper axe, slightly trapezoidal in plane, with an indication of a fan-like, arched cutting edge (fig. 4, 1). The cross-section is rectangular and rounded. The surface bears residues of wrinkled corrosion and a light green to ochre-coloured patina. Length 154 mm, max. width 40 mm, max. thickness 17 mm. Weight 503 g. Inv. no. A 2556 354.
2. Copper hammer, narrow and trapezoidal in plane, with an even, round facet in the neck part (fig. 4, 2). The working edge is slightly arched and flat-hammered. The lower third of the artefact is bilaterally narrowed. The surface bears residues of wrinkled corrosion and a light green to ochre-coloured patina. Length 164 mm, max. width 32 mm, max. thickness 20 mm, hammering surface 32 mm × 8 mm. Weight 390 g. Inv. no. A 256 355.

## REGIONAL CONTEXT

Seen from the perspective of prehistoric settlement, it is the first Eneolithic find from the municipality of Košíky. However, Early Eneolithic copper artefacts are already known from relatively numerous isolated finds and hoards on the eastern edge of the Chřiby Hills and in the foothills or hilltops of the White Carpathians (Kučera 1908; Novotná 1955; Pavelčík 1979; Říhovský 1992; Vaškových 2004), where these finds remarkably often occur in the vicinity of traffic corridors. In the region around Uherské Hradiště they are also found in the classical settlement territory in the catchment area of the Morava and Olšava rivers (fig. 5; Vaškových 2004; Menoušková et al. 2014), thus representing de facto the whole spectrum of artefacts known at that time. A hoard was also found on one of the White Carpathian hilltops in the municipality of Lopeník (Peška 2021). The hoard also contained, among other things, a Şiria-type hammer-axe (after the site of Uherský Brod-Maršov, it is only the second specimen of this type in Moravia).

## METHODS

Since the typological spectrum and chronological position of Eneolithic copper objects are sufficiently known from specialised literature (Antonović 2014; Dobeš 1989; 1992; 2013; Mayer 1977; Patay 1984; Říhovský 1992; Todorova 1981; Vulpe 1975; Žeravica 1993), we based our analysis of the studied hoard on the typo-chronological comparative analytical method using a combination of impressionistic and metrical approaches (cf. Dobeš et al. 2019, 31). An integral part of historical artefacts description are (at least) elemental composition analyses. In this case, three analytical methods were used – two for the determination of the elemental composition of the artefacts themselves and one for some special purposes described below. The Neutron Activation Analysis (NAA) was used as the primary analytical method. A complementary method for the determination of lead (Pb) and bismuth (Bi) was XRF (X-ray Fluorescence Analysis).
Both artefacts were examined with the help of NAA (Neutron Activation Analysis) in the Nuclear Physics Institute of the Czech Academy of Sciences at Řež near Prague, in order to determine the metal composition as well as the type and origin of the raw materials. It is true that NAA is a destructive method (a metal

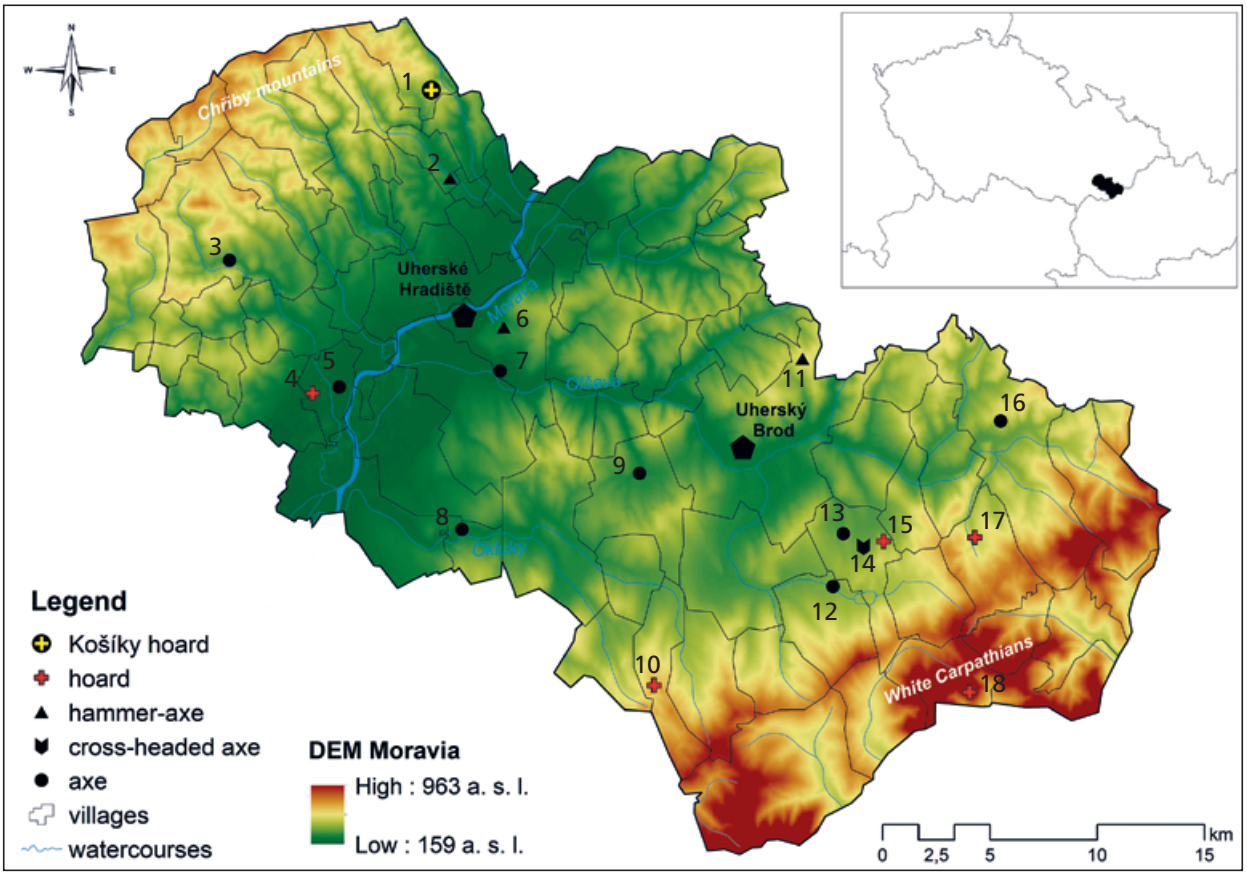


**Fig. 5** Spatial distribution of currently known finds of Early Eneolithic copper industry from southeast Moravia (okr. Uherské Hradiště/CZ): **1** Košíky. – **2** Sušice-Traplice. – **3** Buchlovice. – **4–5** Nedakonice. – **6** Uherské Hradiště. – **7** Uherské Hradiště-Sady. – **8** Ostrožská Lhota. – **9** Vlčnov. – **10** Slavkov. – **11** Uherský Brod-Maršov. – **12** Suchá Loz. – **13–15** Bánov. – **16** Bojkovice. – **17** Komňa. – **18** Lopeník. – (Graphic design J. Bartík).

shaving with the threshold detection weight of only 1 mg was drilled out) but it is able to detect both macro-concentrations and trace amounts of individual elements, which is of key importance for identifying the provenance of metals. For the NAA, it was necessary to have permission for taking a small sample (at least 1 mg). This sample was then packed into plastic foil and irradiated in a LVR15 nuclear reactor for two hours (thermal neutron flux = 4.6E13 n.cm-2.s-2) together with standards and reference materials. After a short time of decay (2–3 days), the first measurement was taken. The second and third measurements followed after ten and 20 days, respectively. A shortcoming of this method consists in the impossibility to determine lead (Pb) and bismuth (Bi) but, on the other hand, it can accurately determine the arsenic (As) content. The NAA method should therefore ideally be combined with X-ray Fluorescence Analysis, which, in turn, is unable to accurately determine arsenic). In our case, both measurement results (NAA and XRF) are in accordance with one another.

The untypical, flat-hammered working surface of the second tool was very carefully analysed by Scanning Electron Microscopy and micro-analysis (SEM JOEL 6490 LV) in the Department of Geological Sciences, Faculty of Science, Masaryk University in Brno. This analysis was primarily chosen with regard to the fact that the examined object lacks any direct analogies. The main aim of this time-consuming part of the analysis, therefore, was to identify the real function of the artefact. A logical step in this effort was to find out possible traces of metals on the flat-hammered working surface. The results were far more positive than expected.

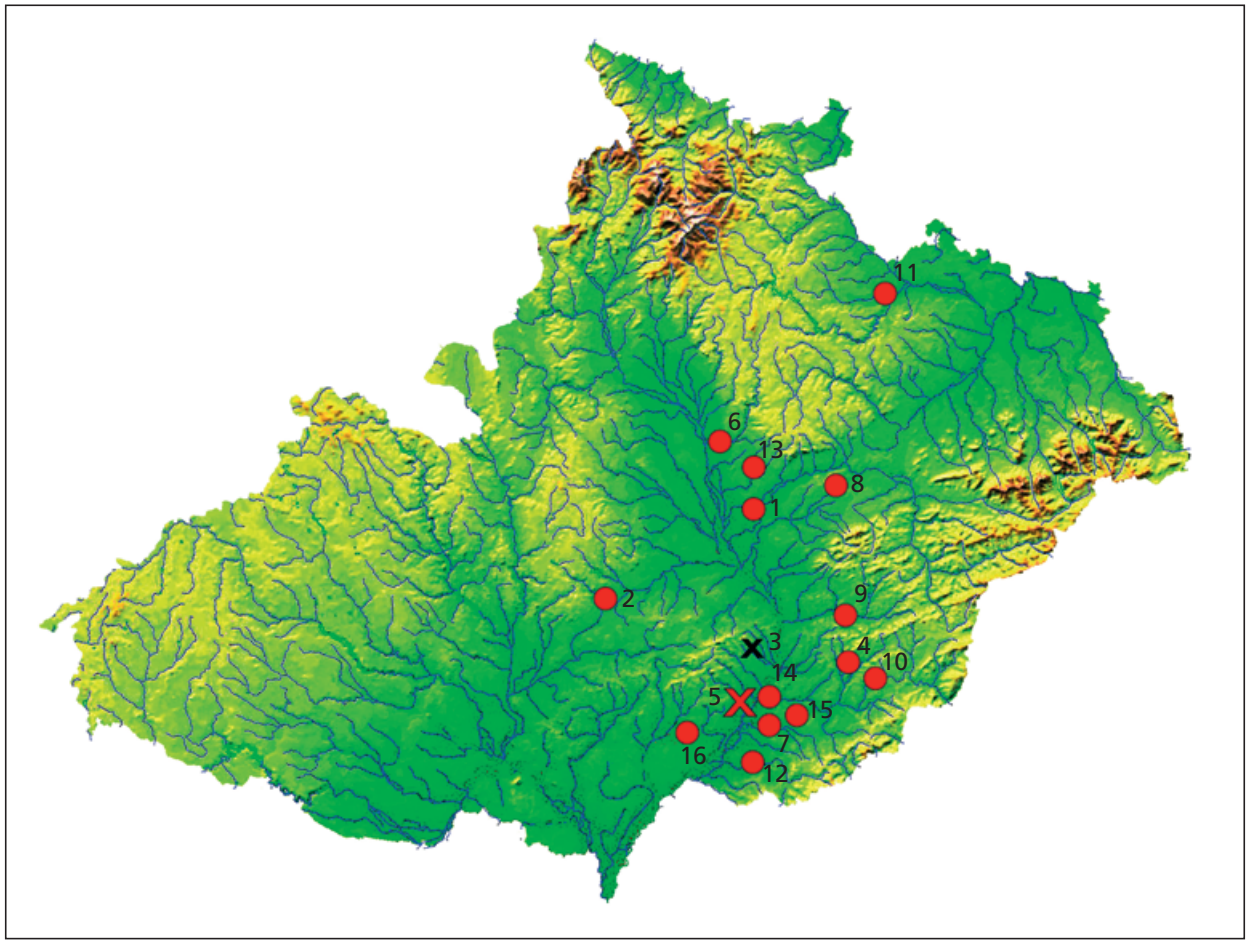


**Fig. 6** Spatial distribution of Stollhof-type axes in Moravia/CZ. – ● isolated finds, × finds from hoards, × Košíky hoard. – **1** Dluhonice (okr. Přerov). – **2** Drnovice-Luleč (okr. Vyškov). – **3** Košíky (okr. Uherské Hradiště). – **4** Ludkovice (okr. Zlín). – **5** Nedakonice (okr. Uherské Hradiště). – **6** Olomouc-Droždín (okr. Olomouc). – **7** Ostrožská Lhota (okr. Uherské Hradiště). – **8** Paršovice (okr. Přerov). – **9** Příluky (okr. Zlín). – **10** Rudimov (okr. Zlín). – **11** Slavkov-Uhlířov (okr. Opava). – **12** Tasov (okr. Hodonín). – **13** Tršice (okr. Olomouc). – **14** Uherské Hradiště-Sady (okr. Uherské Hradiště). – **15** Vlčnov (okr. Uherské Hradiště). – **16** Vracov (okr. Hodonín). – (Graphic design P. Grenar).

## RESULTS

### Typological Analysis and Dating

The flat axe most resembles the examples of the type Stollhof, which was defined by E. F. Mayer (1977, 45–58 pl. 117, A1) on the basis of an eponymous hoard. The Type Stollhof is characterised by a regularly rectangular to trapezoidal body with an approximately rectangular cross-section (**fig. 4, 1**). It belongs to the first (oldest) group of flat axes and is a genetic continuation of the old type Pločnik. Therefore, it was earlier considered to be a variant of the latter type (Dobeš 1989, 39) but is currently classified as a separate type (Dobeš 2013, 37–38; Dobeš et al. 2019, 31). The shape exhibits similarities with the types Hartberg (a common occurrence in the Stollhof hoard: Mayer 1977, pl. 117, A2) and Jordanów. This means that its dating to the Jordanów Culture or to the relevant chronological horizon (Balaton I – Ludanice – Jordanów – Bisamberg/Oberpullendorf – Brzéść Kujawski), which is based on the analysis of associated artefacts from the Stollhof hoard, seems to be well-founded. An earlier appearance is indicated by a similarity with the Balkan type Coteana (Cucuteni A-Gumelnița $A_2$) as well as with the axe types that occur in association with

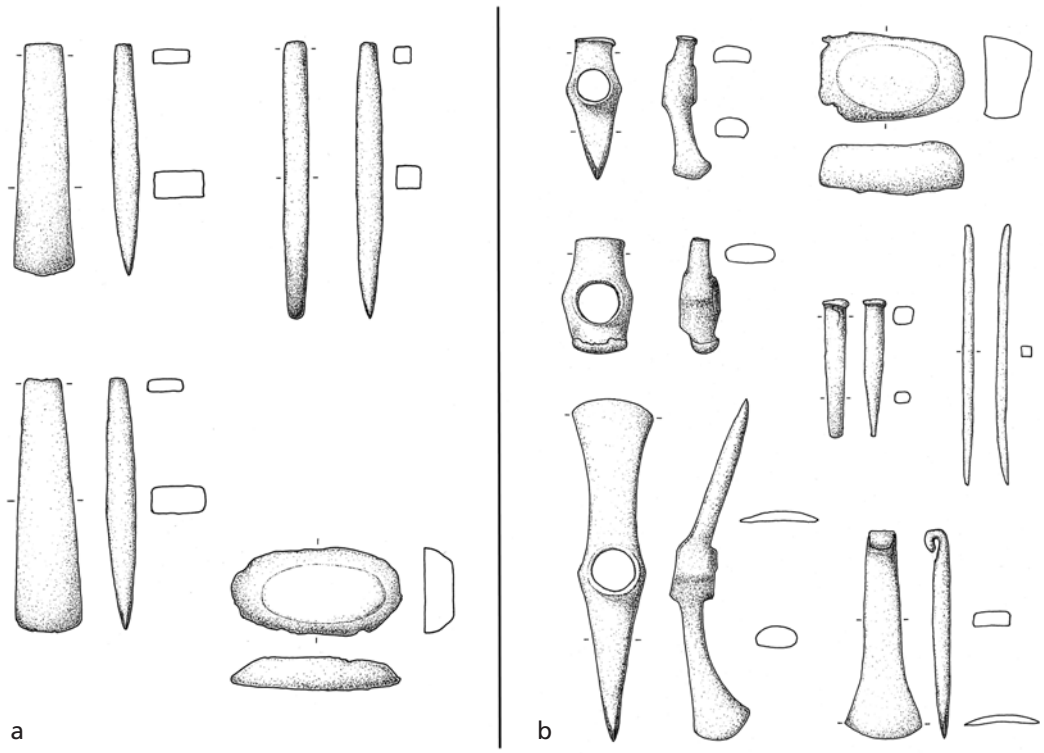


**Fig. 7** Hoards of copper artefacts with bun ingots. – **a** Nedakonice (okr. Uherské Hradiště/CZ). – **b** Szeged-Szillér (Kom. Csongrád-Csanád/HU). – (Adapted after Schubert/Schubert 1999). – Scale 1:3.

hammer-axes of types Varna/Pločnik and Vidra, for example in the recently discovered Silistra hoard in northeast Bulgaria (Chernakov 2018 after Dobeš et al. 2019).

In Moravia and Silesia, we currently know a total of 18 specimens of Stollhof-type axes from 17 sites with a clear concentration in southeast and east Moravia, in the middle Morava Valley (**fig. 6**). Outliers are represented by the axes from Drnovice/Luleč in the vicinity of Vyškov and by an isolated find from the region around Opava (Slavkov/Uhlířov). The vast majority of the collection is composed of isolated finds (in several cases maybe mono-deposits). The type studied occurred only twice in the context of a hoard. The older find is a hoard from Nedakonice (okr. Uherské Hradiště/CZ) (**fig. 7a**) on the right bank of the River Morava (SE Moravia), which is nowadays stored in the Naturhistorisches Museum at Vienna. The hoard contains two Stollhof-type axes, a narrow chisel and a pyramidal bun ingot (most recently Schubert/Schubert 1999, fig. 9). The second and most recent find is the currently analysed Košíky hoard.

The unique hammer reminds one of a type/variant of Early Eneolithic axes of the first group (either the narrow variety of type Stollhof or a form similar to the type Rödigen from the family of flat axes with triangular shape). However, it differs from them by the flat-hammered and asymmetrically arched edge (working surface) and a bilaterally narrowed lower third of the tool. The rounded neck is not typical, either (**fig. 4, 2**). This unique tool type, which has no direct typological parallels among contemporaneous finds, is designated by us as the Košíky-type hammer (its function is indicated by silver traces on the working surface).

The use of a metal implement as a hammer or a hammering tool can be observed on many copper objects since the earliest origins of metallurgy (**fig. 8a**). It is evidenced by traces of hammering or use-wear on the cutting edge and neck in hammer-axes of the type Pločnik B from the Ai Bunar mines (obl. Burgas/BG) (Todorova 1981, pl. 6, 101), type Mezőkeresztes from the surroundings of Szeged (Kom. Csongrád-Csanád/HU) or type Şiria from an unknown site (Patay 1984, pls 21, 257; 25, 296). However, these characteristic traces

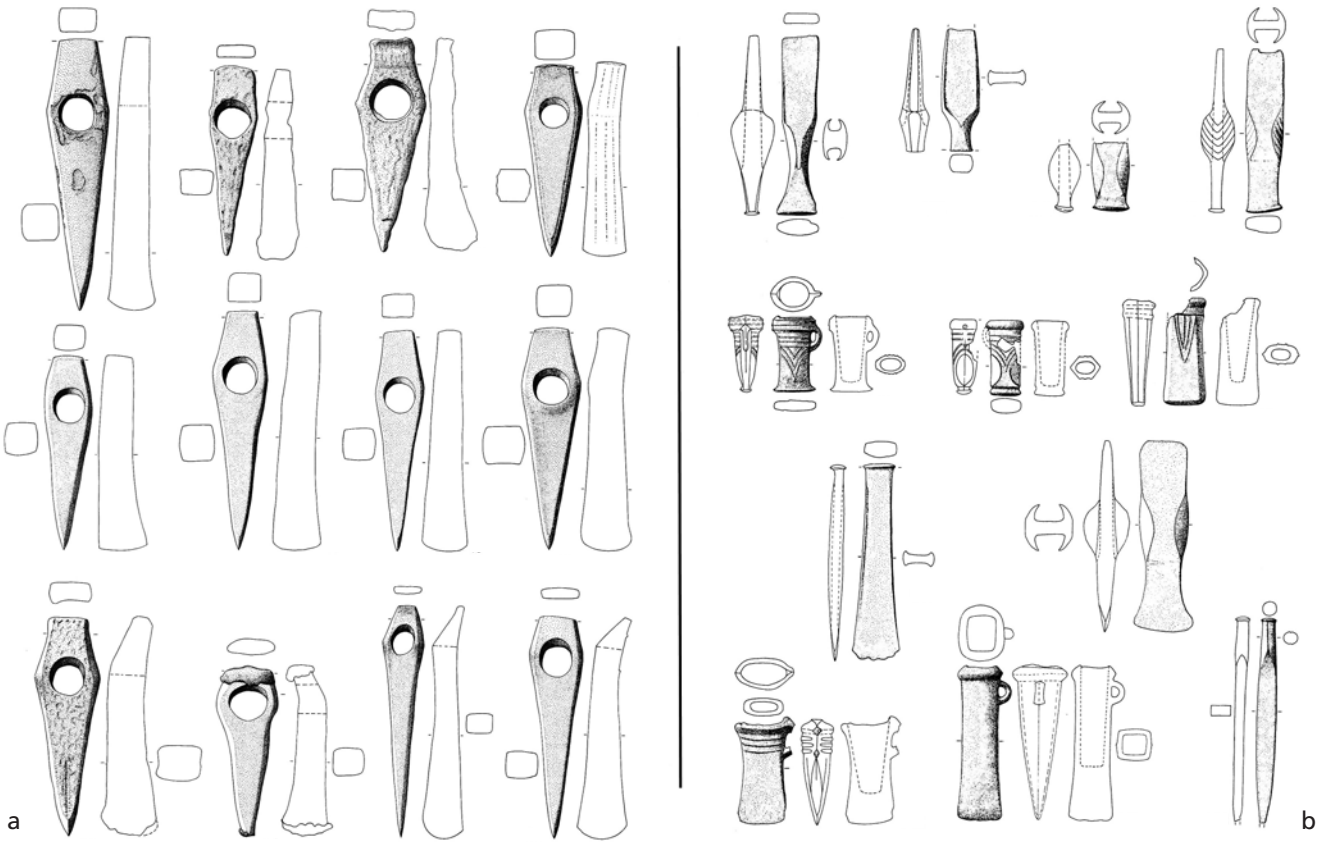


**Fig. 8** **a** Hoard of copper artefacts from the site of Ai Bunar (obl. Burgas/BG), containing a deformed Pločnik-type hammer-axe used as a hammer. – **b** Urnfield Period bronze artefacts adapted to hammers. – (After Todorova 1981; Říhovský 1992).

are most frequent on cross-headed axes of type Jászladány (Patay 1984, pls 27, 318; 31, 352. 373. 397. 449–504), as well as with flat axes, e. g. of type Szakálhát (Patay 1984, pl. 4, 56). In Moravia, we detected this use-wear on a cross-headed axe of type Nógrádmarcal from Nová Dědina (okr. Kroměříž/CZ) and on a Stollhof-type flat axe from Příluky (okr. Zlín/CZ) (Říhovský 1992, pls 3, 17; 9, 77). The adaptation to a two-sided hammer is very well illustrated by an original hammer-axe or cross-headed axe from the hoard of Szeged-Szillér (Patay 1984, pl. 68, 1; Schubert/Schubert 1999, fig. 10, 2), which also contains other tools and a bun ingot identical with the above-mentioned piece from Nedakonice (**fig. 7b**). A similar function can be also supposed with the so-called *Zungenbarren/Beilbarren*, which are usually regarded as a form of ingots (Hundt 1975, pl. 31; Moucha 2005, pls 73, 15; 189, 25; 215, 9–10). The use of these tools for the extraction or processing of wood for instance is hardly imaginable due to their high weight and softness of the metal, not to mention that stone tools with the same function were also available at that time (Hundt 1975). Particularly interesting are specimens (Ai Bunar, Pločnik) which were found directly in the copper mining areas (copper mines) and were thus most probably used for ore extraction (?) (Todorova 1981, 2–15; Antonović 2014, 2–16).

True (gold) hammers are already known, e. g. in the cemetery of Varna (Leusch et al. 2014, fig. 5), from the mid-5$^{th}$ millennium BC (**fig. 9**) and this tool type was still provably used at least during the Late and Final Bronze Age (directly produced or secondarily adapted flanged axes and socketed axes with loop) (**fig. 8b**; cf. Říhovský 1992; Salaš 2005 etc.). Metal hammers became a sort of universal tools, e. g. in jewellery making (Armbruster 1995).


**Fig. 9** Metal hammer (**1**) in one of the graves in the cemetery of Varna/BG. – (After Leusch et al. 2014).

With regard to the presence of a Stollhof-type flat axe in the Košíky hoard, we date its deposition in the ground to the Early Eneolithic, i. e. to the chronological horizon Balaton I – Ludanice – Jordanów – Bisamberg/Oberpullendorf – Brzéść Kujawski, in our territory most probably to the Jordanów Culture. On the basis of comparable absolute dates we thus assume the time interval of 4300/4200–3900/3800 BC.

### X-Ray Fluorescence and Neutron Activation Analysis

As mentioned above, both artefacts were subjected to comparative palaeometallurgical analysis (NAA and XRF) with a good correlation of results from both methods (**tab. 1**). The main component was copper (Cu) (>95 %), accompanied by silver (Ag), antimony (Sb) and bismuth (Bi) (almost on the detection limit), which is typical for the copper of the Nógrádmarcal type. Artefacts made from this material are concentrated at the northern edge of the Carpathian Basin west of the Bükk Mountains and west of the Carpathian Arch in Moravia, Bohemia, but also in Central Germany or even in Denmark (Klassen et al. 2008/2009, 18 tab. 1).

| sample | ID | Ag ppm | As ppm | Au ppm | Cu % | Ni ppm | Sb ppm | Sn % | Zn % | Fe % | Bi % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A256 354 | 5727 | 2211 | n/d | 10 | 95.10 | n/d | 1752 | n/d | n/d | n/d | n/d |
| A256 354 | XRF | 2200 | n/d | n/d | 97.3 | n/d | 1900 | n/d | n/d | n/d | 0.06 |
| A256 355 | 5726 | 2384 | n/d | 2.5 | 96.50 | n/d | 3353 | n/d | n/d | n/d | n/d |
| A256 355 | XRF | 2300 | n/d | n/d | 97.2 | n/d | 4000 | n/d | n/d | n/d | 0.06 |

**Tab. 1** Results of the elemental composition of the analysed artefacts determined by both NAA (id with numbers) and XRF.

The problem of provenance consists in a considerable dispersion of suitable tetrahedrite ores and in the overlap of results from various selected regions, including a discussion about the Central Slovak or Tyrolean sources (most recently Dobeš et al. 2019, 35. 39–40 note 8). In Moravia, the above-mentioned type of copper was used for almost all flat axes of the first group (types Stollhof, Hartberg, Lešná, Malhostovice, Jordanów, Kaka/Treuen, Rödigen), cross-headed axes, a spectacle-shaped pendant of type Malé Leváre from Pohořelice (okr. Brno-venkov/CZ), but also e. g. all artefacts of the Nedakonice hoard, the dagger and chisels in the Velehrad hoard (okr. Uherské Hradiště/CZ), as well as a precious sheet-metal pectoral ornament from Štramberk (Dobeš et al. 2019, 35–40; Schubert/Schubert 1999, fig. 9; Vaškových 2004, 162; Šikulová/Zápotocký 2010, tab. 1).

### Scanning Electron Microscopy

The analysis of the flat-hammered working surface of the hammer head (from a technological perspective in fact the cutting edge) by Scanning Electron Microscopy has detected clear traces of silver in the form of metal flakes sized as much as 13 µm with a relatively high concentration within the range of 49.59–74.72 wt% (**fig. 10**). This is indisputable proof that the tool had been used to work (hammer out) silver artefacts during the Early Eneolithic, which has no parallel in European prehistory. A similar situation was only observed in a settlement context with pottery, a fragment of a hammer-axe type F IA, a set of stone tools and direct evidence of metallurgy (clay nozzle, a lump of daub with traces of green patina – pure copper, analysis M. Hložek) in a feature (506/2011) from the early phase of the Funnel Beaker Culture in Podolí near Brno. The analysis by the same method (SEM) detected here traces of copper, gold and silver on the surface of stone artefacts. The feature has yielded a radiocarbon date, which after calibration corresponds to the range of 3797–3709 or 3812–3693 BC respectively (Peška 2020). These finds give us the first clear evidence of a metalworking workshop, one of the oldest in Europe. Similar observations (metal flakes on stone hammers and anvils) are later only known from metalworkers' graves from the end of the Eneolithic (less Corded Ware Culture, more Bell Beaker Culture: Peška 2016; 2019; 2020).

## DISCUSSION

The region of southeast Moravia with its numerous finds of the Early Eneolithic copper industry has yielded another exceptional piece of evidence of an intentional deposition of objects from the so-called group of heavy artefacts. Moreover, this time they were found in the context of a completely unique tool for hammering out silver artefacts. In the Early Eneolithic, silver artefacts represented a highly valued article all over the world, because silver was far more valuable than gold due to its rare natural resources as well as a lower amount of archaeological artefacts. In Southwest Asia, the earliest silver ornaments (beads) occurred in the 6$^{th}$ millennium BC and their number then gradually increased at the beginning and in the course of the 4$^{th}$ millennium BC (Primas 1995; Hansen/Helwing 2016, 43–45). Dominant articles of this kind in Europe, where silver occurred earlier than in the Near East (Ozieri Culture in Sardinia), were silver discs of the type Stollhof – the oldest known silver artefacts north of the Alps. The earlier known hoard of Štramberk (silver discs and a spectacle-shaped copper pendant of type Malé Leváre) (Jisl 1967; Šikulová/Zápotocký 2010) was recently supplemented with another Stollhof-type silver disc from a hoard in Vanovice in the Boskovice Furrow (most recently Prokeš et al. 2020) with ceramic bowls in the post-Jordanów style, whose accurate dating will still probably be discussed (cf. Malach/Štrof 2015; Šmíd 2017, 210; Dobeš et al. 2019, 42; Prokeš

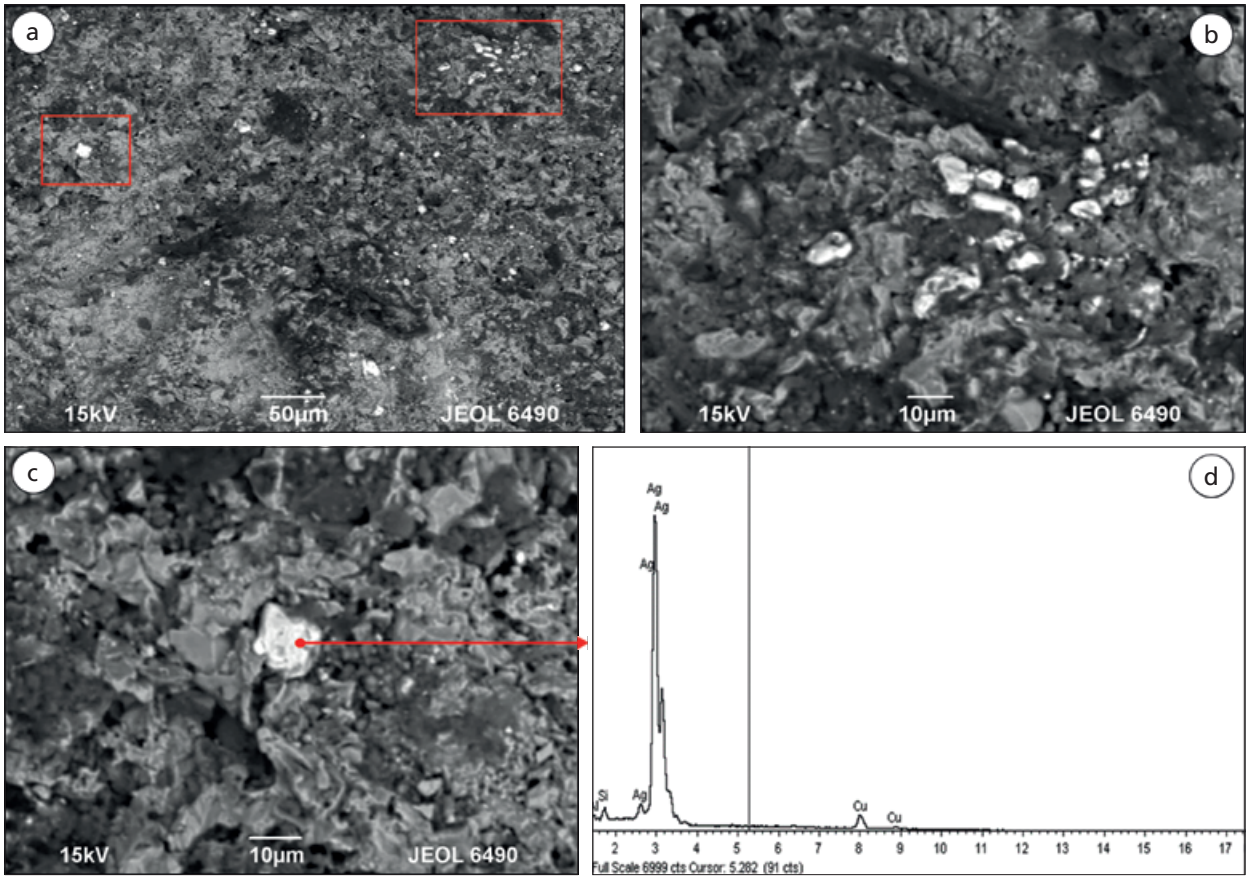


**Fig. 10** The results of Scanning Electron Microscopy of the head of the Košíky-type hammer. – **a** silver flakes sticking to the working surface of the hammer, chosen for the measurement of elemental composition. – **b–c** selected silver flakes in detail. – **d** results of the measurement of the elemental composition in the largest identified silver flake. – (Graphic design J. Bartík / P. Gadas).

et al. 2020, 8). But a general dating (4300–3800 BC) makes the discs some hundreds of years older than the »early silver horizon« in Southwest Asia. Golden discs of the same type from the Stollhof hoard were accompanied by a copper-sheet, crescent-shaped (or boar tusk shaped) pendant, whose exact silver analogies are known from Bulgaria (Popescu 2015). A very old example for the of production of silver ornaments is represented by a pair of sheet-metal pendants from Grave B2 in the burial ground of Tiszalúc-Sarkad (Kom. Borsod-Abaúj-Zemplén/HU) (dated to the Hunyadihalom horizon) with calibrated absolute dates of 3950–3800 or 3970–3770 BC, respectively (Patay/Szathmári 2001; Raczky/Siklósi 2013, 561; Prokeš et al. 2020, 6 tab. II).

Multiple silver pendants, which may date from the second half of the 5$^{th}$ to the early 4$^{th}$ millennium BC, are known from Greece and the Cyclades. In the 4$^{th}$ millennium BC, the Northern Caucasus became a centre of mining and metallurgy. It was represented by the Maykop Culture (over 1,000 features) with its strings of beads, animal figurines and some of the oldest metal vessels worldwide (Govedarica 2002; Hansen 2014; Hansen/Helwing 2016). Absolute dating has shifted deeper into the 4$^{th}$ millennium BC (3800/3600–3000 BC) and, approximately at the same time, we register silver beads at a cemetery of the Rinaldone Culture in Central Italy (Hansen/Helwing 2016, 48–49). Less clear is the dating of a silver, crescent-shaped ornament with hammered decoration from a grave at Villafranca Veronese (prov. Verona/IT) and a Guardistallo-type dagger from a grave at San Biagio della Valle (prov. Perugia/IT) in Umbria, made from a copper/silver alloy (Heyd 2013, 35 fig. 19). Precious silver and gold weapons occur as a part of fu-

nerary equipment in elite graves in the Western Balkans with a distinct concentration on the Adriatic coast (cf. Govedarica 1989; Baković/Govedarica 2009; Heyd 2013, 27 fig. 13), together with other noticeable assemblages, including e. g. four pieces of hammer-axes (silver/copper alloy) from a hoard of an unknown site in Bosnia (Born/Hansen 2001), a pair of silver hammer-axes from a supposed burial mound on the site of Stari Jankovci (Vukovarsko-srijemska županija/HR) (Balen/Mihelić 2003; 2007), or a silver dagger with rivets and a distinct central rib which is now stored in the National Museum in Budapest (Heyd 2013, 31 fig. 16, B). The large silver hair spirals or hair rings, e. g. of the type Zimnicea (most recently Alexandrov 2020, 154–164), which occur in the Carpathian Basin and in the Balkans during the 3rd millennium BC, have been associated with the penetration of the Yamna Culture into the heart of Europe at the beginning of the 3rd millennium BC (Ruttkay 2002; 2003). The next phase of the upswing of silver artefacts in Central Europe is connected with the Bell Beaker Culture. Typical ornaments had the form of hair spirals, Sion-type hair rings with flat-hammered decorated surface, decorated sheet-metal plates and ornaments with bent ends (Peška 2004; 2013; 2016; 2019; Endrődi 2013; Patay 2013), many of which made from electrum. Their connection to richly furnished metalworkers' graves is not unusual (Peška 2016; 2019). The set of ornaments is supplemented with a silver awl from a grave at Vyškov-Dědice (okr. Vyškov/CZ) (Dvořák/Peška 1993, 32 obr. 2A; 4B, 6). A tool made from precious metal can be considered absolutely exceptional in our territory.

## CONCLUSIONS

A small but very significant hoard of two copper artefacts, which was found in the municipality of Košíky in the area of the Chřiby Hills in SE Moravia, fits with its dating very well into the currently known structure of similar finds from the given region. Its exceptionality consists in the fact that a copper, Stollhof-type flat axe was deposited in the ground together with a completely unique hammer with narrowed grip in the lower third and with a flat-hammered working edge, on which the SEM analysis detected silver flakes. This finding has no analogy in prehistory, at least not in Europe. The find is comparable with the horizon of the oldest occurrence of silver artefacts in Europe north of the Alps. This horizon is mainly represented by the Stollhof-type silver discs (Štramberk – Kotouč, Vanovice) from the turn of the 5th to the 4th millennium BC. Several very valuable silver artefacts from that time are known from multiple regions (see above), but we do not find any direct evidence of silver processing and this makes our find unique.

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*Zusammenfassung / Summary / Résumé*

Das älteste Zeugnis der Silberverarbeitung in Europa. Ein Hort aus Košíky (okr. Uherské Hradiště/CZ)
Im Frühneolithikum (4300–3800 v. Chr.) traten in Europa vermehrt sowohl einzelne Kupferfunde als auch Horte auf. Seit kurzem können wir ihnen einen kleinen Hort aus Košíky (Südostmähren/CZ) hinzufügen. Der Hort von Košíky ist einzigartig, da er eine neue Art von Artefakt enthielt – einen Kupferhammer mit einem verengten Griff und einer flach gehämmerten Arbeitsfläche anstelle einer Schneide. Die Autoren führten eine Rasterelektronenmikroskop-Analyse (REM) durch, die das Vorkommen von Silberplättchen nachwies, die an der Arbeitsfläche des Hammers klebten. Die Studie stellt nicht nur eine noch unbekannte Art der Kupferindustrie vor, sondern liefert auch den ersten Nachweis für die frühe Verwendung von Silberhämmern in Europa.

The Oldest Evidence of Silver Processing in Europe. A Hoard from Košíky (Okr. Uherské Hradiště/CZ)
In the Early Eneolithic (4300–3800 BC), Europe saw an increased occurrence of both isolated copper finds and hoards. Since recently, we can add to them a small hoard from Košíky (SE Moravia/CZ). The Košíky hoard is unique, because it contained a new type of artefact – a copper hammer with a narrowed grip and flat-hammered working surface instead of a cutting edge. The authors conducted a Scanning Electron Microscopy (SEM) analysis that proved the occurrence of silver flakes sticking to the hammer's working surface. The study introduces not only a still unknown type of copper industry, but also the first evidence of the early use of silver hammering in Europe.

Le plus ancien témoin archéologique du travail de l'argent en Europe.
Un dépôt à Košíky (okr. Uherské Hradiště/CZ
Au début de Néolithique final (4300–3800 av. J.-C.), l'Europe a connu une présence accrue de dépôts et d'objets isolés en cuivre. Nous pouvons depuis peu leur ajouter le petit dépôt de Košíky (SE de la Moravie/CZ). Ce dépôt est unique en son genre, car il contenait un nouveau type d'artefact: un marteau de cuivre à manche étroit et tête martelée plate au lieu d'un tranchant. Les auteurs ont réalisé une analyse de microscopie électronique à balayage (MEB) qui a révélé la présence de paillettes d'argent collées à la face de frappe du marteau. Cette étude dévoile non seulement un type de l'industrie du cuivre encore inconnu, mais également le premier témoin de l'usage précoce du martelage de l'argent en Europe.
Traduction: Y. Gautier

*Schlüsselwörter / Keywords / Mots-clés*

Tschechische Republik / Mähren / Frühneolithikum / Hort / Kupferwerkzeuge / Silberverarbeitung
Czech Republic / Moravia / Early Eneolithic / hoard / copper tools / silver processing
République tchèque / Moravie / début du Néolithique final / dépôt / outils en cuivre / travail de l'argent

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