

## TOUCHSTONES IN GRAVES FROM THE AVAR AND GREAT MORAVIAN PERIODS

European archaeology collections record hundreds of thousands of stone artefacts from the Early Middle Ages, which are identified as whetstones. And while the vast majority of these objects probably did in fact serve as whetstones, numerous touchstones, tools for determining the value of metal, have been found among them<sup>1</sup>. Thousands of carefully and impressively crafted stone artefacts in a shape characteristic of touchstones have been recorded in European early medieval burials. Some of the graves also contain weapons, equestrian equipment, jewellery or other objects. The construction of these graves is often exacting, suggesting the elite status of the buried individuals.

More complicated are cases in which the deceased was buried with only an inconspicuous stone, perhaps along with a knife. We cannot establish the social status of the individuals buried in these »simple« graves. However, the occurrence of touchstones, including those on which traces of tests on gold and silver have been preserved, documents the widespread availability of precious metal, even in early medieval European rural settings, and is a strong argument in favour of a revision of the existing opinions on social stratification in the early medieval society. Touchstones appear also in early medieval graves in the Danube region, although far less frequently than in the northern part of Europe<sup>2</sup>. However, as in other parts of Europe, they appear in the Danube region also in earlier periods.

### THE METHOD

For the purpose of identifying and studying the stone artefacts, we utilised the method of electron microanalysis combined with surface observations of the objects using a scanning electron microscope (SEM). Even minute streaks of metal on the surface of the touchstones appear as luminous colours on a grey or black background in the image created by back scattered electrons. These anomalies can then be precisely measured and subjected to chemical microanalysis using the energy-dispersive X-ray spectroscopy. The chemical microanalysis of lines and/or grains of precious and other non-ferrous metal on the surface of touchstones furnished data on the content of individual oxides, or chemical elements in the investigated alloys<sup>3</sup>. The findings are given in the **tables 1-4** in per cent and calculated at 100%; these data are semi-

no.	grave no./inv. no.	Ag	As	Cu	Fe	Pb	Sn	Zn	Σ
1	79/136			60.46	3.03			36.51	100
2	104/187			55.46	9.38			35.16	100
3	104/187			63.91	5.35			30.74	100
4	104/188			66.12				33.88	100
5	104/188			7.55	1.01	36.49	54.95		100
6	104/188		2.42	9.18	2.53	69.31	16.56		100
7	104/189			63.20	4.88			31.92	100
8	104/189			7.12	3.31	6.09	83.41		100
9	104/189	100							100

**Tab. 1** Devínská Nová Ves, graves nos 79 and 104. – Results of the chemical microanalysis (in wt.%) of the streaks on the surface of the stone artefacts inv. nos 136, 187, 188, 189. Iron comes from the geochemical background of the stone raw material (as well as Si, Ca, K, Mg, Al, etc., which are missing in the table). For the zinc streak on the surface of touchstone from grave no. 79 see **tab. 2**.

grave no./inv. no.	Al	Ca	Fe	K	Mg	S	Si	Zn	Σ
79/136	2.71	0.87	2.71	0.73	0.73	7.82	7.94	74.71	100

**Tab. 2** Devínská Nová Ves, grave no. 79, inv. no. 136. – Complete results (including the geochemical background; in wt. %) of the analysis of a streak on the surface of the touchstone at a spot with an anomalous zinc concentration.

no.	site	grave no.	Ag	Cl	Cu	Pb	S	Sb	Sn	Zn	Σ
1	UH-NV	224/51	100								100
2	UH-NV	224/51	89.42	3.45			7.13				100
3	UH-S	142/59			1.90	47.33			50.77		100
4	UH-S	142/59				87.84			12.16		100
5	UH-S	142/59				100					100
6	UH-S	142/59			56.85	3.62				39.53	100
7	B-P	116				4.48			95.52		100
8	B-P	116				89.09			10.91		100
9	B-P	116	100								100
10	B-P	116	82.94	1.17			5.89				100
11	B-P	116				100					100
12	B-P	116							100		100
13	B-P	327				93.60			6.40		100
14	B-P	327				6.61			93.39		100
15	B-P	327			14.56	49.55			35.89		100
16	DV	159/46		3.84		34.54			61.62		100
17	DV	159/46					30.42	69.58			100
18	DV	159/46	86.32				13.68				100
19	DV	159/46			100						100
20	DV	159/46				100					100
21	DV	125/46				100					100

**Tab. 3** Results of the chemical microanalysis (in wt. %) – without the geochemical background – of the streaks on the surface of the stone artefacts from Uherské Hradiště »Na Valách« (UH-NV); Uherské Hradiště »Sady« (UH-S); Břeclav-Pohansko (B-P); Dolní Věstonice (DV). For zinc traces on the surface of the touchstone from Dolní Věstonice, grave no. 159/46, see **tab. 4** and **fig. 5**.

element	wt. %	at. %	composition	wt. %
Zn	29.51	11.77	ZnO	36.73
Fe	3.64	1.70	FeO	4.68
Ca	2.35	1.53	CaO	3.29
K	2.08	0.39	K <sub>2</sub> O	2.50
Ti	0.33	0.18	Ti <sub>2</sub> O	0.56
Al	6.71	6.49	Al <sub>2</sub> O <sub>3</sub>	12.68
Si	14.53	13.49	SiO <sub>2</sub>	31.08
P	1.57	1.32	P <sub>2</sub> O <sub>5</sub>	3.60
Cl	0.32	0.24		0.32
Mg	0.92	0.99	MgO	1.53
Na	2.25	2.55	Na <sub>2</sub> O	3.03
O	35.79	58.35		
Σ	100.00	100.00		100.00

**Tab. 4** Dolní Věstonice, grave no. 159/46. Complete results of the point analysis of one of the local concentrations of zinc (different from that presented in **fig. 5**) on the touchstone, including the geochemical background. – (at. % = atomic %; wt. % = weight %).

quantitative. We are not the first to use this method: 20 years ago Frank Wietrzichowski identified in the SEM traces of gold with a small amount of silver and copper on a touchstone from the 8<sup>th</sup> or the first half of the 9<sup>th</sup> century Baltic coast settlement of Groß Strömkendorf (Lkr. Nordwestmecklenburg)<sup>4</sup>. The main complication in making a positive identification of touchstones among archaeological finds is related to their actual use in the distant past: prior to (or after) each test, it was necessary to remove the traces left on the touchstone from the previous test. As a result, the only specimens remaining as evidence are those that their early medieval users, for whatever reason, did not clean (or failed to clean thoroughly) prior to their disposal. Therefore, traces of metal tests came to light typically on touchstones

that were discarded as the result of being damaged, lost or placed among the grave-goods of their deceased owner. Although betting on an *argumentum ex silentio* in archaeology seldom pays off, in the case of stone artefacts with a shape common for whetstones(?) and touchstones, this line of reasoning can be quite valuable. Sharpening clearly leaves far heavier traces than the tests of the quality of a potentially valuable object. Therefore, if a chemical microanalysis on a stone artefact with the characteristic form and raw material does not reveal streaks of iron, the object is not a whetstone.

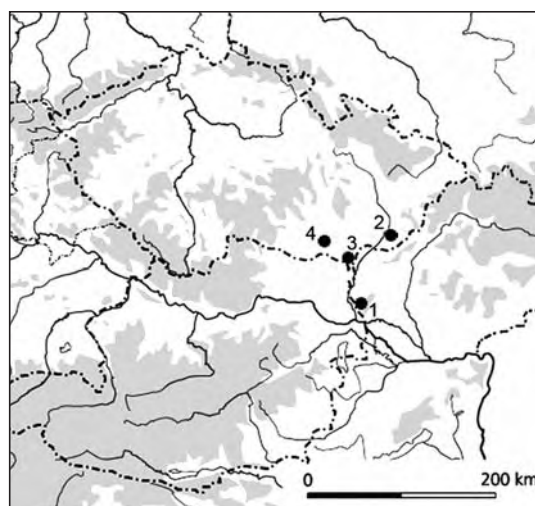
## AVAR CULTURE PERIOD

Stone artefacts in a shape characteristic of touchstones have been recorded at numerous Avar culture burial grounds from the 7<sup>th</sup> and 8<sup>th</sup> centuries. They are known, for example, from a grave in Vác-Kavicsbánya (Kom. Pest/H), containing an axe, from a grave with a sword in Visznek (Kom. Heves/H), or from a grave in Želovce (okr. Velký Krtíš/SK) with a wooden frame construction holding a man and a child and furnished with a sword<sup>5</sup>. However, stone artefacts also occur in Avar graves with simpler furnishings throughout the whole of Hungary, southern Slovakia and Lower Austria, e.g. in Tiszafüred (Kom. Jász-Nagykun-Szolnok/H), Kiskőrös Pohibuj-Mackó-Dúló (Kom. Bács-Kiskun/H), Alattyán (Kom. Jács-Nagykun-Szolnok/H), Szekszárd (Kom. Tolna/H) and Sommerein am Leithagebirge (Bz. Bruck an der Leitha/A)<sup>6</sup>. Touchstones and candidates for this classification appear as in the burials with weapons, riding gear and horses as in child burials<sup>7</sup>. They are frequent in so-called smith's burials<sup>8</sup>.

Four samples from two graves from the Avar culture period burial ground in Devínská Nová Ves (okr. Bratislava IV/SK; **fig. 1, 1**) were analysed in the SEM. Both of the deceased individuals were buried with a horse and riding gear. Approximately 880 graves were uncovered at this site in the 1920s and 1930s. Stone artefacts were documented in no other graves at this burial ground, including graves with more valuable goods. The finds are deposited in the Slovenské Národné Múzeum in Bratislava.

Nothing remains of the body buried in grave no. 79; the grave pit was surrounded by the rests of a wooden coffin. A sword was lying in the place of the human body. An iron object, similar to a pickaxe, a triple-edged arrow, and riding gear were found where the horse skeleton was rested; the grave likewise contained three fragments of deer antler (two of which were decorated), etc.<sup>9</sup>

An 18-cm long irregular four-sided stone artefact made of hard metasiltstone or siltstone from the inventory of this grave was analysed (inv. no. 136; **fig. 2**)<sup>10</sup>. Three sides of the object are worked roughly; the fourth side is smoothed. Linear traces from rubbing an artefact made of an alloy of copper and zinc (brass) have survived on the surface of the stone (**tab. 1, 1**). Spots with an anomalous content of zinc were discovered in additional analyses (**tab. 2**). A high local concentration of zinc in the line of the brass streak can likely be explained by the presence of the products of alloy corrosion (secondary zinc minerals such as hemimorphite, hydrozincite and smithsonite). The conditions in grave pits were favourable to metal corrosion or selective alloy decomposition



**Fig. 1** Localisation of the touchstones analysed for this article: **1** Devínská Nová Ves (Slovakia). – **2** Uherské Hradiště (Czech Republic). – **3** Břeclav-Pohansko (Czech Republic). – **4** Dolní Věstonice (Czech Republic). – (Map M. Ježek / J. Zavřel).



**Fig. 2** Touchstones from the graves nos 79 and 104 in Devínská Nová Ves. – The numbers in the illustration indicate grave no./inv. no. – (Photos M. Ježek / J. Zavřel).

(even if in the form of thin streaks on the stones). However, as seen later, zinc has been found also in cases, which cannot be explained by the presence of brass traces.

Small remnants, perhaps of human bones, came to light in grave no. 104; the horse skeleton was preserved in better condition. A stirrup, a side-piece and the bronze remnants of a belt and other objects were found next to the skeleton<sup>11</sup>. Three artefacts from the inventory of this grave described as »whetstones« were analysed (fig. 2). One is four-sided; three of the four sides are smoothed, the fourth is apparently untouched (inv. no. 187)<sup>12</sup>. There are prominent scratches on one side of the stone, both ends of which are broken. The present length of the object is 9.5 cm. The artefact is made of fine-grained metagreywacke

or wackestone. The second object (inv. no. 188), 5.3 cm in length, is made of an easily workable whitish, non-calcareous fine-grained rock (quartzose siltstone?). All sides of the stone are even, though not smoothed. The artefact has no significant damage<sup>13</sup>. Remnants of resin have survived on several sides of the stone. The third artefact (inv. no. 189) analysed from grave no. 104 is flat and made of coarse siltstone. One edge and one surface of the stone are smoothed. One end of the object is broken off, and the existing length is 12.8 cm<sup>14</sup>.

Streaks of brass have survived on the first of these artefacts (inv. no. 187; **tab. 1, 2-3**). In addition to a trace of brass (**tab. 1, 4**), the next artefact (inv. no. 188) also bears lines left by an alloy of lead, tin and copper (**tab. 1, 5-6**); the fluctuating concentrations of individual components likely speak of the alloy's low homogeneity. The surface of artefact inv. no. 189 carries traces of tests with brass objects (**tab. 1, 7**), tin bronze (**tab. 1, 8**) and silver (**tab. 1, 9**).

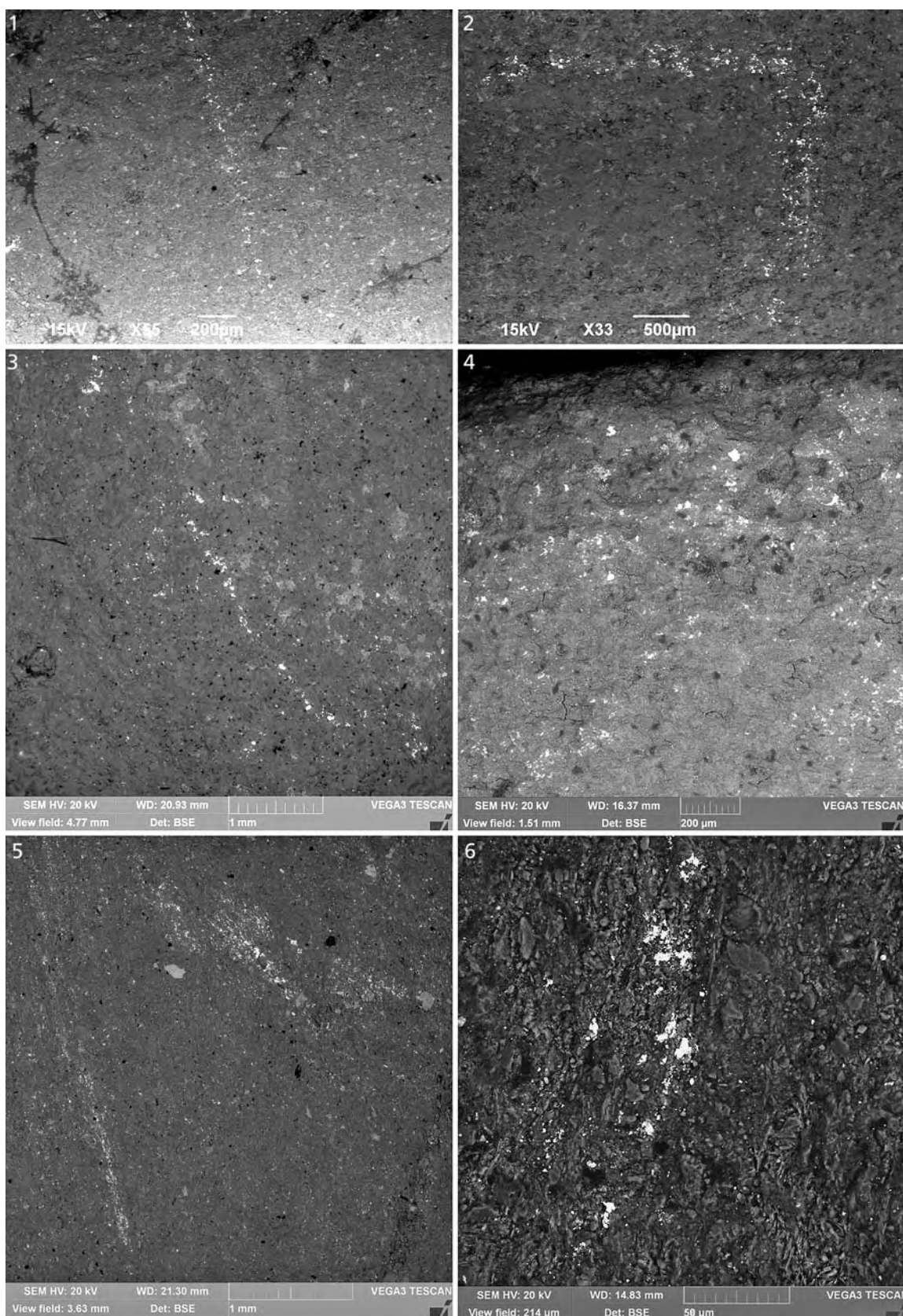
### »GREAT« MORAVIA

Touchstones also occur in graves from the period after the decline of the Avar Khaganate, when the power of the Slavic elite was established in the western part of Slovakia, the north-eastern part of Austria and the southern part of Moravia. Selected for analysis were four objects from graves uncovered in southern Moravian (Czech Republic) burial grounds of residential agglomerations at centres of power in present sites of Uherské Hradiště (**fig. 1, 2**) and Břeclav-Pohansko (**fig. 1, 3**), and two artefacts from the burial ground in Dolní Věstonice (okr. Břeclav; **fig. 1, 4**). The finds are held today in the Moravské Zemské Muzeum in Brno (Uherské Hradiště, Dolní Věstonice) and in the collections of the Ústav Archeologie a Muzeologie, Masarykova univerzita, Brno (Břeclav-Pohansko).

»Whetstones« are recorded in 7 of the 1479 documented graves from the »Na Valách« burial ground in Staré Město near Uherské Hradiště (several hundred additional graves were destroyed prior to the commencement of systematic excavations, i. e. before the 1920s); the majority of these are dated to the 9<sup>th</sup> century<sup>15</sup>. Particularly interesting for us are the graves nos 313/49, 86/51 and 224/51, which were furnished with an axe, spurs and other objects, and grave no. 185/49, which also held spurs. The remaining graves in which a »whetstone« was found contained only a knife (graves nos 338/49, 113/50, 111/51), an object that was also present in all of the aforementioned graves. We could analyse the stone artefact from grave no. 224/51 (**fig. 4**). This undamaged stone object made of beige, homogeneous rock is in the shape of a small block with dimensions of 9.4×1.7×1.3 cm, the surface of which is carefully smoothed. The stone has streaks from an object made of silver (**tab. 3, 1**), some of them are preserved as silver with a weathering rind of sulphides and Ag chlorides (**tab. 3, 2**).

An object from a different burial ground near Uherské Hradiště, at the »Sady« site, was removed from grave no. 142/59 (**fig. 4**), which dates to the second half of the 9<sup>th</sup> century and was located in a church, or in its annex<sup>16</sup>. The deceased individual was furnished with a knife with a bronze handle, spurs, an antler ring, a fragment of flat glass with a golden film and the stone artefact, etc.<sup>17</sup> Both the position and furnishings of the grave document the elite status of the buried person. The stone artefact of grey metasiltstone is 5.2 cm long, four-sided with rounded edges and with a rectangular profile (max. 1.3×0.8 cm). The stone tapers toward the end with a drilled hole. Preserved on the stone are streaks from an object of lead (**tab. 3, 5**), of alloys of lead and tin, with and without an admixture of copper (**tab. 3, 3-4**), and also of an alloy with the character of brass with point concentrations of zinc of up to 40 % (**tab. 3, 6**).





**Fig. 3** 1 Devínská Nová Ves, touchstone from the grave no. 79, microphotography of the trace of a copper and zinc alloy (tab. 1, 1). – 2 Devínská Nová Ves, touchstone from the grave no. 104 (inv. no. 187), traces of a copper and zinc alloy (tab. 1, 3). – 3 Břeclav-Pohansko, touchstone from the grave no. 116, traces of a tin and lead alloy (tab. 3, 7). – 4 Uherské Hradiště-Staré Město »Na Valách«, touchstone from the grave no. 224/51, traces of silver (tab. 3, 1). – 5 Dolní Věstonice, touchstone from the grave no. 125/46, traces of lead (tab. 3, 22). – 6 Dolní Věstonice, touchstone from the grave no. 159/46, traces of a tin and lead alloy (tab. 3, 16).

The burial ground in Břeclav-Pohansko with approx. 400 graves featured three graves with stone artefacts, one of which was a small fragment (grave no. 393). Their furnishings do not exceed the standard of common graves: they contained a knife, buckles, an awl and other objects<sup>18</sup>. No stone artefacts were found in graves at this burial ground furnished with weapons, riding gear, jewellery, etc.

The worked stone (inv. no. P1226; **fig. 4**) from grave no. 116 is undamaged and has a trapezoidal shape with a length of 5.2 cm, a width of 3.3/2.3 cm and a maximum thickness of 0.7 cm. All sides of the object are smoothed. The stone artefact from grave no. 327 (inv. no. P16337; **fig. 4**) is damaged on both ends. The present length of the stone is 8.9 cm, and from its narrow end (0.6×1.2 cm) the artefact expands to its wider end (max. 0.9×2.0 cm) with a drilled opening. All of the sides of the stone are smoothed. Traces from a ring for hanging purposes are preserved on the edges of the drilled hole; the ring was made of tin with an admixture of lead (**tab. 3, 14**). Both artefacts were made of grey sericitic metasiltstone or metashale. Surviving on the surface of the stones are numerous streaks and grains of lead (**tab. 3, 11**), tin (**tab. 3, 12**) and their alloys (**tab. 3, 7-8, 13-15**). The object from grave no. 116 also had traces of silver (**tab. 3, 9**), or silver with a weathering rind of sulphides and Ag chlorides (**tab. 3, 10**).

Systematic excavations in the 1940s and 1950s at the Dolní Věstonice burial ground, which is not located near such important period centres of power as the previous sites, uncovered approx. 1300 early medieval graves (around 200 graves had already been destroyed prior to the commencement of the systematic excavations)<sup>19</sup>. The burial ground was used continuously from the end of the 8<sup>th</sup> century up to the middle of the 11<sup>th</sup> century. None of the local graves with jewellery or weapons contained stone artefacts, and »whetstones« were found in six simple graves<sup>20</sup>. In addition to vessels, the burials were also furnished with a knife, an awl and a sharpening steel. Both of the graves described below contained only remnants of knives.

The artefact from grave no. 159/46 (9<sup>th</sup>-10<sup>th</sup> centuries) has one smoothed side; the other sides are worked, though not carefully (**fig. 4**). The narrow, oblong stone with an irregular profile has a length of 12.5 cm and a maximum width of 2.2 cm. The light grey, finely micaceous metasiltstone is, in all likelihood, an elongated fluvial pebble with a coarsely and irregularly abraded surface. Two opposite sides of the stone bear numerous traces of lead (**tab. 3, 20**) and several traces of copper (**tab. 3, 19**) and of a tin and lead alloy (**tab. 3, 16**). The proportion of chlorine is probably related to the weathering of the lead component of the alloy at the origin of PbCl<sub>2</sub> (**tab. 3, 16**). Antimony sulphide (**tab. 3, 17**) and silver sulphide (**tab. 3, 18**) were encountered occasionally. The atomic concentrations of Sb and S (in %) stoichiometrically correspond to Sb<sub>2</sub>S<sub>3</sub>. Based on the X-ray microanalysis alone, however, it cannot be decided whether it is a streak by natural mineral antimonite, a weathering trace of metallic antimony in the form of its sulphide, or a streak by artificially prepared antimony sulphide (so-called antimony glass).

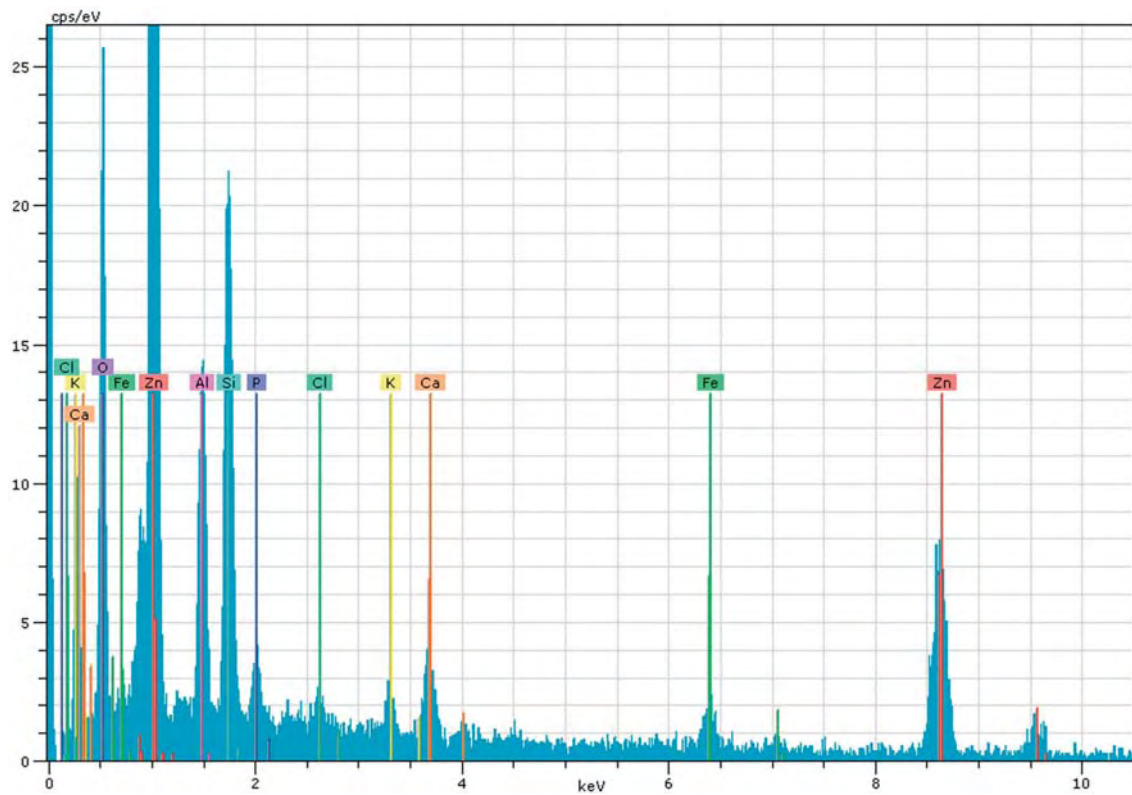
Numerous grains of zinc with a size of 2-5 µm were also recorded (**fig. 5**). The high point concentrations of zinc could be related to the selective disintegration of the surface of the alloy streaks containing this metal with the formation of secondary Zn minerals (see above); at the same time, it is necessary to point out that on this touchstone – unlike the previous case (Devínská Nová Ves, grave no. 79) – we did not detect traces of tests with brass. Nevertheless, with the exception of zinc, all other elements are detectable also at places on the stone outside the analysed grains.

Grave no. 125/46, which likely dates to the first half of the 11<sup>th</sup> century, produced a fragment of a flat, trapezoidal object with one broad surface and one side surface that are smoothed; the other two surfaces appear to be unworked (**fig. 4**). The existing length of the object is 8.5 cm, the width 3 cm. The artefact is made of a brownish-grey metasiltstone. Nearly the entire smooth surface is covered with numerous traces of lead streaks (**tab. 3, 21**).





**Fig. 4** Touchstones from Břeclav-Pohansko (Po), Uherské Hradiště (UH) and Dolní Věstonice (DV). – The numbers in the illustration indicate the grave no. – (Photos M. Ježek / J. Zavřel).



**Fig. 5** Dolní Věstonice, grave no. 159/46. Complete results of the point analysis of one of the local concentrations of zinc (different from that presented in **tab. 4**) on the touchstone, including the geochemical background and chlorine. – (Measurement V. Böhmová).



## DISCUSSION OF THE ANALYTICAL RESULTS

The results of the microanalyses of metal traces left on the surface of the stones are just as important as the identification of the touchstones themselves. Streaks of lead are very often found on touchstones. Lead – the metal is very frequently observed on early medieval touchstones – was essential for the work of every jeweller; its use was definitely much wider. However, we still have no idea of the purpose of the large quantity of lead, of which only fragments (weighting dozens of kilogrammes) are found as a raw material at archaeological excavations of early medieval central sites in Central Europe. Copper, tin and/or their alloys are also frequent on the surface of touchstones from many locations in different parts of Europe.

The detected alloys provide surprising information on the skills of early medieval metallurgists. We repeatedly encounter brass with a zinc content of around 40%. The information presented in archaeometallurgy literature on a maximum zinc content of around 30% in early medieval brass<sup>21</sup> was taken from an analysis of preserved metal objects, unlike the results obtained from the chemical microanalysis of streaks left on touchstones from tests on metal objects. Other archaeological finds also document the inaccuracy of such claims. The results of X-ray fluorescence (XRF) analysis showed that an object from a grave near Prague Castle from the period around the turn of the 10<sup>th</sup> century was made of an alloy of Cu, Zn, Pb and Ag in which the zinc made up a 38.6% share<sup>22</sup>. Modern archaeometallurgy literature is also in a direct conflict with the information provided by Lazar Ercker, who, in 1574, described the production of brass with a zinc share of up to 40%<sup>23</sup>.

The chlorides and/or the sulphides were repeatedly detected in connection with silver<sup>24</sup>. The chlorides likely involve the reaction of the silver streaks with airborne chlorides or with NaCl from human sweat. The presence of silver sulphides (Ag<sub>2</sub>S) is apparently related to the natural reaction of the silver streaks with hydrogen sulphide, which forms during the decomposition of organic substances (silver tarnishing). The interpretation of the sulphide of antimony would be premature, it can be however noted that the same compound has been detected relatively often on the touchstones.

Arsenic in the brass alloy is encountered less frequently. This element is a common component of certain magmatic and hydrothermal deposits of copper, lead and tin. Its presence can be related in some cases to the presence of grains of mineral arsenopyrite (FeAsS) in the studied rocks. Our proposed interpretation of the occurrence of zinc in the above-presented case (**tab. 4; fig. 5**) is by no means the only alternative. We have no explanation at this moment<sup>25</sup>, however, this is by far not the only touchstone (and by far not the only site) with zinc concentrations evidenced in Europe at this time.

## CONCLUSION

The occurrence of touchstones can be expected in other graves from the Avar and Great Moravian periods, i. e. in the 7<sup>th</sup>-9<sup>th</sup> centuries in Hungary, Slovakia, Lower Austria and Moravia. Similar objects naturally also appear in these areas in the 10<sup>th</sup> and 11<sup>th</sup> centuries<sup>26</sup>, as well as in other European countries<sup>27</sup>. The same artefacts occur even earlier: from Danube region and from the most famous finds only, e. g. in the Langobard burials in Poysdorf, no. 6 (Bz. Mistelbach/A), in Brno-Kotlářská/Kesselschmiedgasse, the Gepidic burial no. X in Bandul de Câmpie (jud. Mureş/RO), etc.<sup>28</sup> For instance in the Gepidic burial ground in Kölked-Feketekapu A (Kom. Baranya/H) with almost 700 graves, we note two stone artefacts with the characteristic shape, both of them in graves furnished with weapons<sup>29</sup>. In the Langobard cemeteries in Hegykő (Kom. Győr-Moson-Sopron/H), Szentendre (Kom. Pest/H) and Tamási (Kom. Tolna/H), »whetstones« have been

found only in graves furnished simultaneously with weapons, glass vessels and other objects<sup>30</sup>. However, they appear also in the Iron Age elite burials, from the Danube region e. g. in Pottenbrunn (Bz. St. Pölten/A), Dürrnberg near Hallein (Bz. Hallein/A), etc.<sup>31</sup>, as well as in numerous European Bronze Age elite burials – interpreted as whetstones<sup>32</sup>. The situation is more paradoxical in that an entire range of identical objects, classified as touchstones, has been recorded in settlement and metallurgic contexts of the Bronze Age<sup>33</sup>.

In the Early Middle Ages, along with scales and weights, touchstones deposited in graves represent the sign of access to precious metal, or – better – of the social standing in the community. They occur both in the graves of the societal elite and in »simple« graves, which, due to the absence of other socially significant objects, we are not able to classify from a social perspective. However, touchstones are not the rule in either of these grave categories; the absence of tools used to test the quality of metal does not mean that the buried individual did not have access to precious metal. The occurrence of the touchstones in the southern part of Central Europe is rare even among richly furnished early medieval graves, in contrary to the northern part of Europe. Items described as »whetstones« are often left out of grave inventories subjected to general and statistical treatment. Yet, these artefacts can provide an important testimony on the social and economic connections of a find, evidence that is frequently far more valuable than that provided by other objects included in the statistics. This especially holds true for grave or settlement finds in rural environments.

Naturally, we are not able to explain the circumstances surrounding the testing of metal, indispensable in the smelting of non-ferrous metals and in the production of jewellery, on the finds from the »simple« furnished graves. Locations where the elite was present, exchange environments and even metallurgy environments frequently overlapped in the Early Middle Ages. Identifying the specific reason for testing a particular non-ferrous metal is possible in fortuitous finds only on the basis of a review of the archaeological contexts from the settlement features. It was necessary, after all, to test a wide range of lustrous materials encountered by metallurgists, goldsmiths, jewellers, deposit prospectors, and all others who came into contact with precious metal. Exchange, regardless of its specific form and social circumstances, also belonged among these activities – not only in the Early Middle Ages.

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## Notes

- 1) Ježek / Zavřel 2010. – Ježek / Zavřel 2011, with bibliography.
- 2) For these reasons, see Ježek / Zavřel 2011.
- 3) For the artefacts from Devínská Nová Ves (okr. Bratislava IV/SK) a SEM JEOL 6490 LV equipped with Oxford SSD detector Inca X-Act was used. – For the artefacts from Uherské Hradiště, Břeclav-Pohansko and Dolní Věstonice (all Czech Republic) a SEM Tescan Vega 3 equipped with Bruker SDD X Flash Detector 5010 type ED was used.
- 4) Wietrzichowski 1993, 38.
- 5) Tettamanti 2000, 89 tab. 22, 5 (grave no. 397). – Török 1975a, fig. 6, 18 (grave no. 68). – Čilinská 1973, 57 fig. 22, 15.
- 6) Garam 1995, 336 pls 62, 17 (grave no. 44); 74, 4 (grave no. 192); 133, 5 (grave no. 941). – Török 1975a, fig. 7, 7 (grave no. 75?). – Török 1975b, figs 4, 9 (grave no. 44); 5, 17 (grave no. 53). – Kovrig 1963, pls 29, 29; 42, 3. – Rosner 1999, 84 pl. 43, 2 (grave no. 664). – Daim / Lippert 1984, pls 56, 7; 92, 6.

- 7) Sós / Salamon 1995, 58: as »whetstones«. – On the child burials see Ježek / Krzyszowski / Zavřel in print.
- 8) For the Avar culture period e.g. the burial no. 1 in Kunszentmárton (Kom. Jász-Nagykun-Szolnok/H) with two »whetstones« (Csallány 1933).
- 9) Eisner 1952, 25 f.
- 10) Ibidem 24-26 fig. 13, 14.
- 11) Ibidem 33-35.
- 12) Ibidem fig. 29, 7.
- 13) Ibidem fig. 15, 10.
- 14) Ibidem fig. 29, 12.
- 15) Hrubý 1955.
- 16) Galuška 1996, 61 f. 86.
- 17) Ibidem 135 f.
- 18) Kalousek 1971, 79 f. 178 f.
- 19) Ungerman 2007, 9-15.
- 20) Ibidem 158.
- 21) Craddock 2009, 148 f. – Craddock / Eckstein 2003.
- 22) Frána / Tomková 2005, 321 tab. 4.
- 23) Holub 2011, 531 f.
- 24) See Ježek / Zavřel 2011, 150 f.
- 25) See Nováček 2004.
- 26) Török 1962, 154 pl. 23, 519.
- 27) Ježek / Zavřel 2011.
- 28) Daim / Mehofer / Tobias 2005. – Kovács 1913, 284-296.
- 29) Graves nos 312 and 471: Kiss 1996.
- 30) Barbiera 2005, tab. 5.
- 31) Pottenbrunn, graves nos 48, 520 and 1005: Ramsel 2002, 88 f. – Dürrnberg near Hallein, graves nos 24/2, 29 and 44/2: Penninger 1972. – Not many touchstone candidates are known from La Tène period burials, however, their local occurrence is clearly limited to the social elite. Numerous chemical confirmed touchstones and candidates for this classification fill the collections of »whetstones« from the La Tène period oppida, e.g. Stradonice, Staré Hradisko, Třisov, Závist (all Czech Republic), Manching (Germany; cf. Jacobi 1974, pls 83-85), etc. For Bibracte (départ. Saône-et-Loire/F), see Fleischer / Teegen 2004; however, we expect a far higher number of touchstones from this site. For instance, the site of a mint, the oppidum Stradonice has also produced finds of blacksmith tongs, hammers and, as in the oppidum Třisov, balance scales: see Pič 1906, pls 35, 30; 46, 1-2. 9. Metallurgical activities are evidenced usually in the oppida; cf. also Cauuet 1994, fig. 24.
- 32) Cf. e.g. Steffen 2010, pls 1, 18; 11, 4, with bibliography.
- 33) See e.g. Löhner 1985. – Armbruster 2006, 178 f., with bibliography.

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### *Zusammenfassung / Abstract / Résumé / Resumé*

#### **Probieřsteine aus Gräbern der awarischen und großmährischen Zeit**

Mithilfe eines Elektronenmikroskops haben die Autoren des vorliegenden Artikels Spuren eisenfreier Metalle – einschließlich Edelmetalle – auf ausgewählten Steinartefakten aus Gräbern der awarischen und großmährischen Zeit (7.-10. Jh.) entdeckt. Die Funde, ursprünglich als Schleifsteine identifiziert, dienten eigentlich als Probieřsteine – Werkzeuge, mit denen man die Beschaffenheit eines bestimmten Metalls untersucht. Die Autoren interpretieren Probieřsteine in frühmittelalterlichen Gräbern als einen Hinweis auf den Zugang der bestatteten Person zu Edelmetallen. Zusätzlich zur Frage nach der sozialen Gliederung innerhalb der frühmittelalterlichen Gesellschaft eröffnen die Probieřsteine ein weites Feld für die Archäometallurgie: Die chemische Mikroanalyse erlaubt die Bestimmung der Zusammensetzungen der Legierungen, welche im vorliegenden Aufsatz diskutiert werden.

### Touchstones in graves from the Avar and Great Moravian periods

Using electron microscopy, the authors have uncovered traces of non-ferrous metals, including precious metals, on selected stone artefacts from the Avar and Great Moravian periods graves (7<sup>th</sup>-10<sup>th</sup> centuries). The finds, originally identified as whetstones, served in fact as touchstones – tools to test the quality of a particular metal. The authors interpret touchstones in early medieval graves as a sign of the buried individual's access to precious metals. In addition to questions of social stratification of the early medieval society, touchstones open a wide field for archaeometallurgy: the chemical microanalysis allows the identification of the composition of the alloys, which are discussed in the paper.

### Pierres de touche en provenance de tombes avars et de la période de la Grande-Moravie

A l'aide d'un microscope électronique à balayage, les auteurs ont relevé des traces de métaux non ferreux – y compris précieux – sur des objets lithiques des périodes avars et de la Grande-Moravie (7<sup>e</sup>-10<sup>e</sup> siècle ap. J.-C.). Ces artefacts qui avaient initialement été interprétés comme des pierres à affûter sont en réalité des pierres de touche – des outils permettant de définir les propriétés de certains métaux. Les auteurs interprètent ces pierres de touche en provenance de tombes du Haut Moyen Âge comme une preuve que les défunts avaient un accès à des métaux précieux. En plus de problématiques en relation avec la structure sociale du Haut Moyen Âge, ces pierres de touche ouvrent un large champ pour de nouvelles études archéométriques: une analyse chimique fine permet d'identifier la composition d'alliages qui sont ensuite discutés dans l'article.

Traduction: L. Bernard

### Prubířské kameny v hrobech avarského a velkomoravského období

Na povrchu vybraných kamenných artefaktů z hrobů avarského kulturního okruhu a z doby tzv. Velké Moravy, doposud pokládaných za brousky, identifikovali autoři za využití elektronové mikroskopie otěry neželezných kovů. Tyto předměty sloužily jako prubířské kameny – nástroje k určení neželezného kovu, resp. k určení hodnoty drahého kovu. Prubířský kámen v hrobě, stejně jako vážky či závaží, autoři pokládají za atribut přístupu pohřbené osoby k drahému kovu: kromě otázek sociální stratifikace raně středověké společnosti otevírají prubířské kameny široké nekonečné možnosti pro rozvoj archeometalurgického bádání.

### Schlüsselwörter / Keywords / Mots clés / Klíčová slova

Slowakei / Ungarn / Tschechische Republik / Frühmittelalter / Awarenzeit / Großmähren / Edelmetall  
Slovakia / Hungary / Czech Republic / Early Middle Ages / Avar period / Great Moravia / precious metal  
Slovaquie / Hongrie / République Tchèque / Haut Moyen Âge / période avar / Grande-Moravie / métal précieux  
Slovensko / Maďarsko / Česká republika / raný středověk / Avaři / Velká Morava / drahý kov

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