

Early Iron Age arrowheads and the research possibilities

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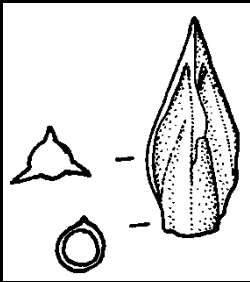


XIV. mezinárodní konference „Doba popelnicových polí a doba halštatská“
Kutná Hora 4. 10. – 7. 10. 2016

Introduction

- The area of spread of the so called „Eastern type“ arrowheads in the Early Iron Age stretches from the Near East, Pontic area to the Central Europe, including the Carpathian Basin and the surrounding mountain areas.
- Contribution aims to look at other research options of these variable artifacts.
- The presentation will focus to the possibilities of production and technological process as well.

- Most of the literature focuses on their typological-chronological classification in presence from second half of the 7th century to first half of the 5th century BC. One of the main indicators of the dating is presence of socket.



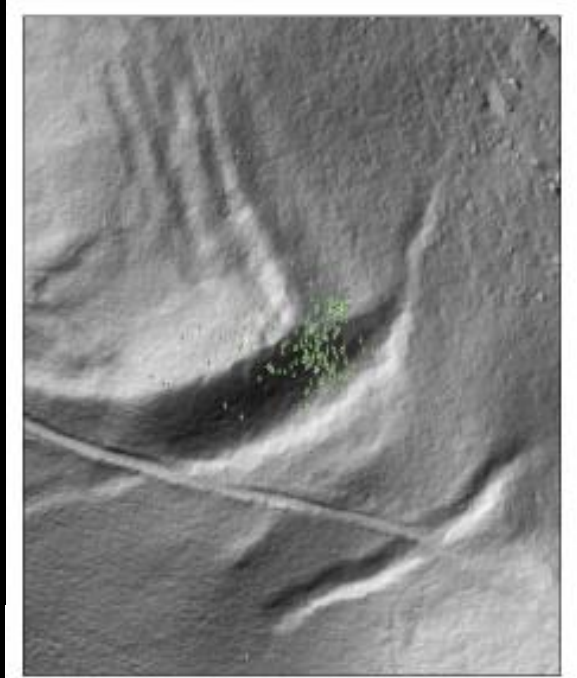
TYP	ZWEIFLÜGELIG I ←							DREIFLÜGELIG II ∨							DREIKANTIG III ▽							VIERKANTIG IV		SONDERFORMEN				
GRUP.	A							A																				
VARIA.	1a	1b	2a	2b	3a	3b	4	1a	1b	2a	2b	3a	3b	4	1a	1b	2a	2b	3a	3b	4	1a	1b	BZ				
	B							B							*													
	C							C																				
	D							D																				
								E																				
								F																				
	I							I*							G													
	Y							Y																				

Types of arrowheads found at Molpír hillfort,
after Hellmuth 2006

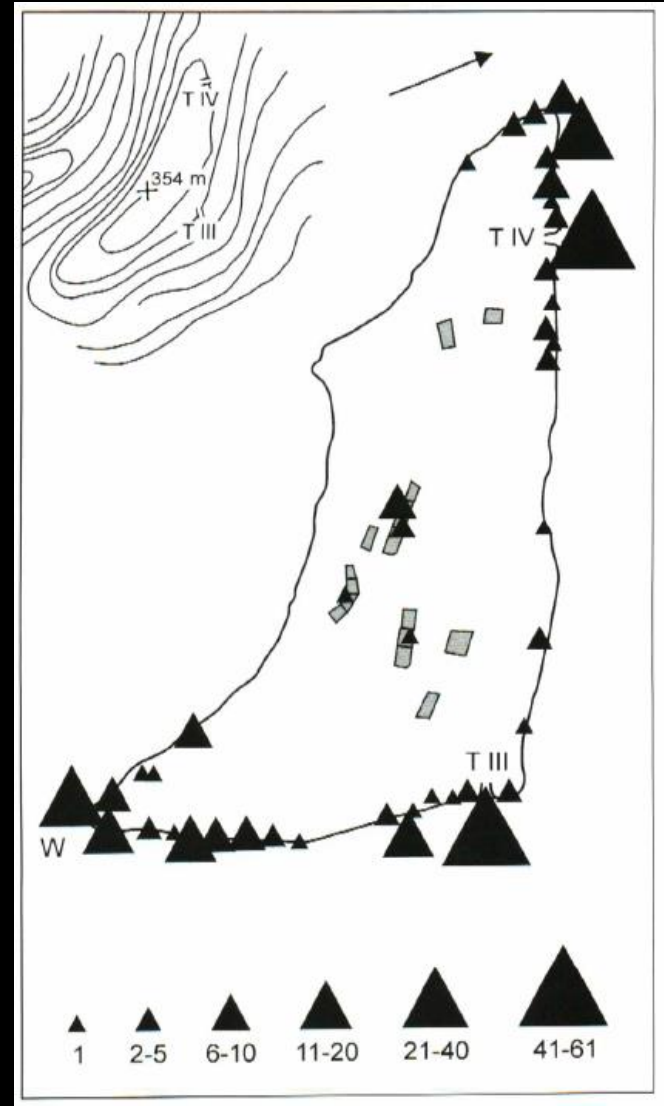
Typ I - variant 1			
Typ I - variant 2			
	I 2a	I 2b	I 2c
Typ I - variant 3			
	I 3a	I 3b	I 3c
Typ II - variant 1			
	II 1a	II 1b	II 1c
Typ II - variant 2			
	II 2a	II 2b	II 2c

Types of arrowheads found at Chotín Burial Ground, after Kozubová 2013

Distribution of arrowheads, found on ramparts of hillforts in Carpathian Basin



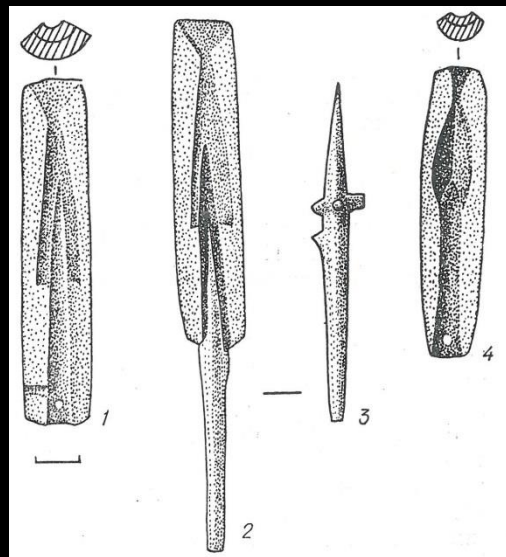
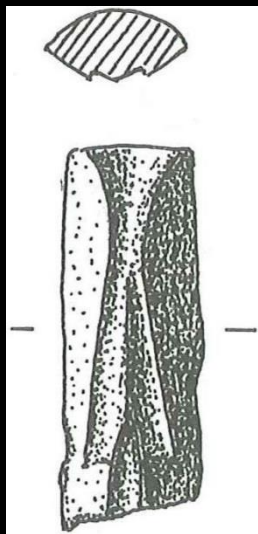
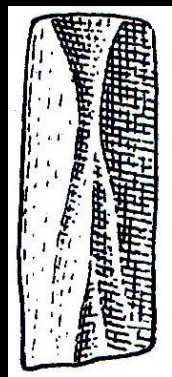
Dédestapolcsány – Verebce,
after Szabó/Czajlik/Reményi 2014



Smolenice – Molpír,
after Hellmuth 2006

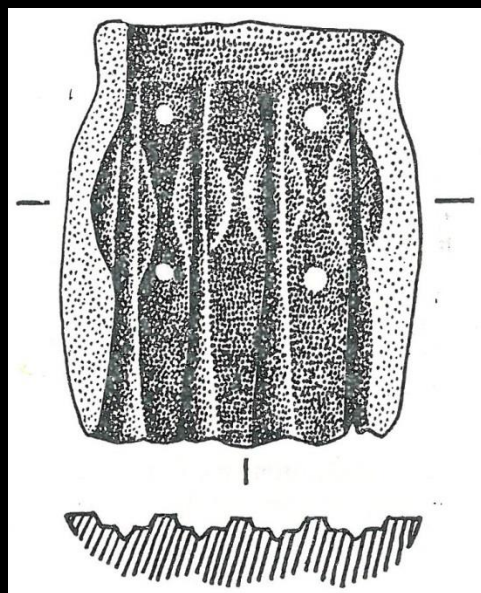
- The number of arrowheads can be estimated to the thousands in its areas of spread, while the discoveries of casting stone moulds exceed not even a hundredth of arrowheads finds itself.



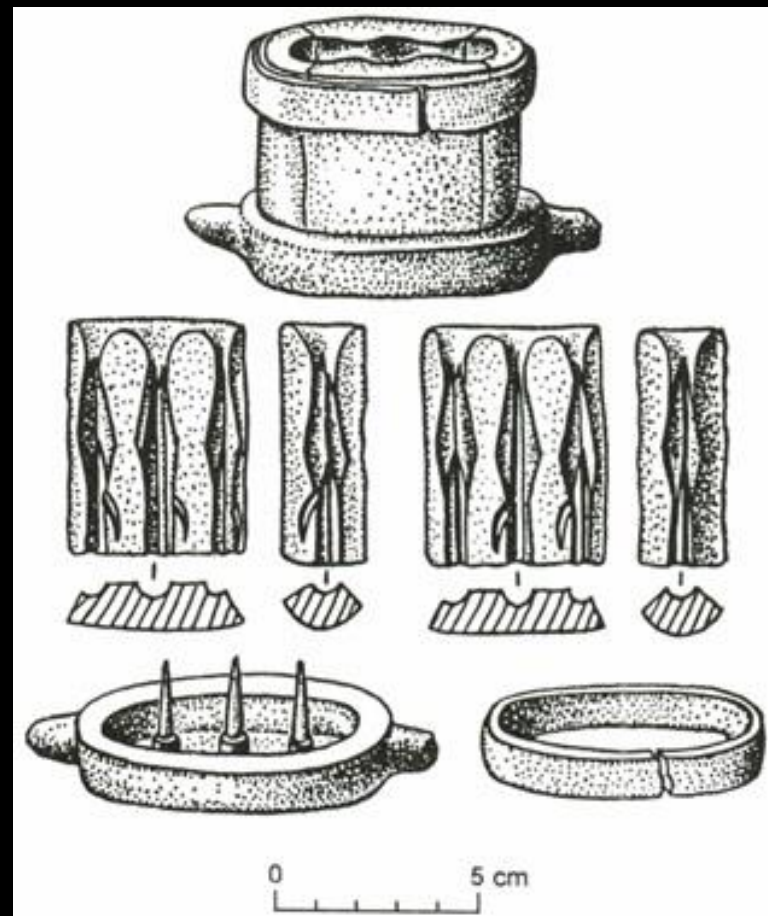


Smolenice - Molpír,
after Dušek/Dušek 1995,
Novák 1993

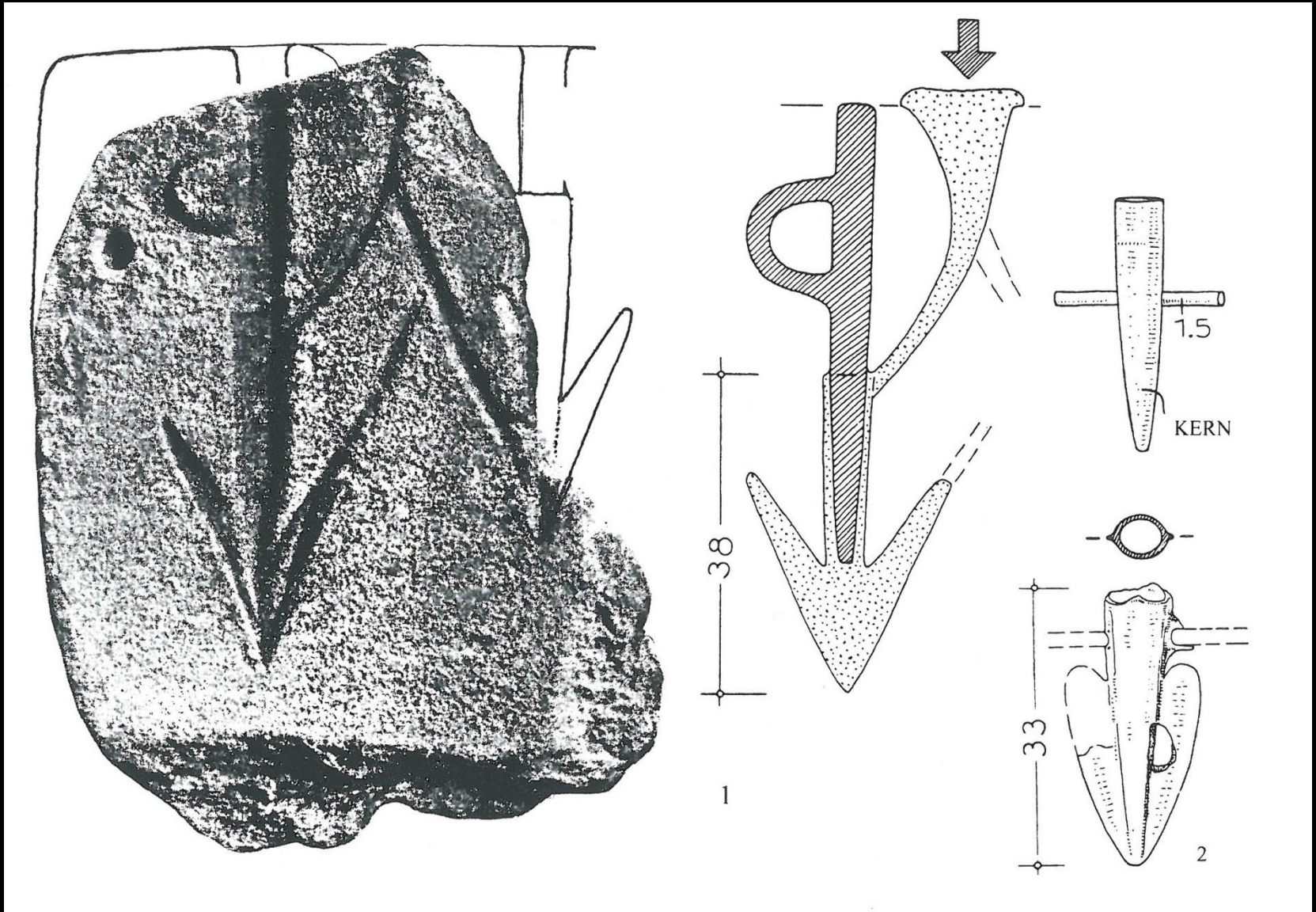
Bukriny (distr. Kiev),
after Shramko 1962



Novocherkassk,
after Iessen 1953

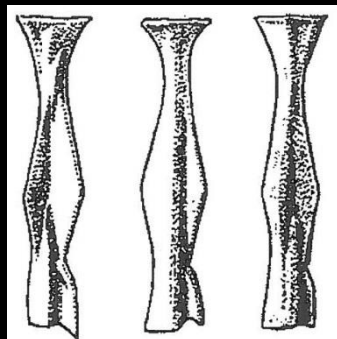
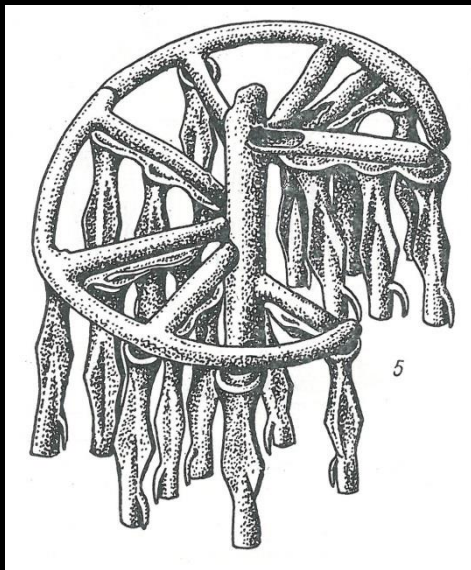


Mosul on Tigris,
after Černenko 1981

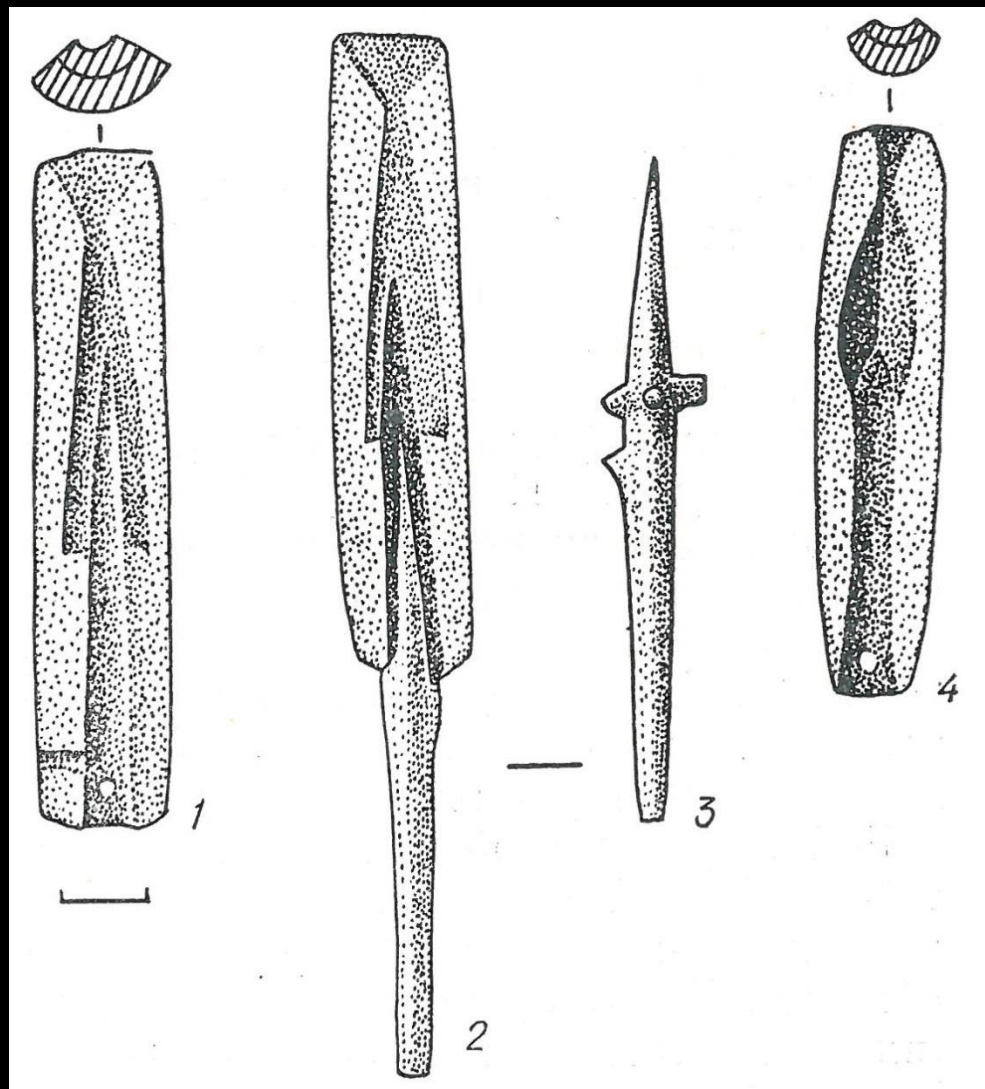


Sandstone mould from Goldberg (dist. Aalen) represent very different casting advance from previous Late Bronze Age period, After Drescher 1958.

- The presentation will focus to the possibilities of production and technological process as well.

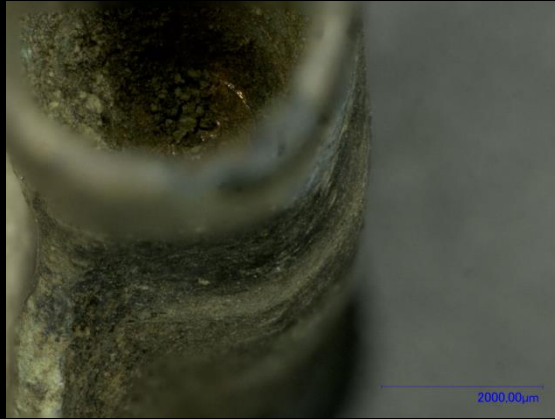
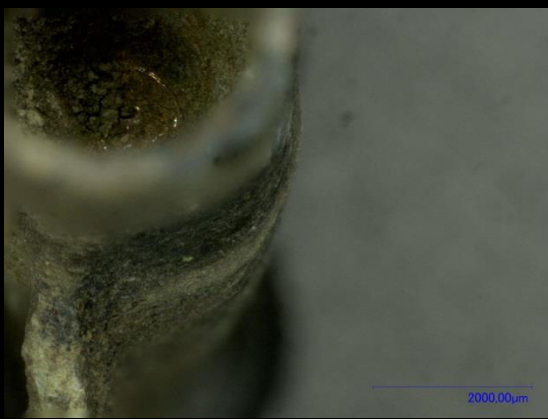


Experimental arrowheads casting by L. Underwood (Černekó 1981) showed that experienced smelter with helpers could produce in workflow 10 000 arrowheads by week, that means 520 000 in year and for such a production they would need approximately 2 tons of metal.



The same weight like f. e. Marcus Aurelius statue has...





After casting – final drilling the end of the socket?

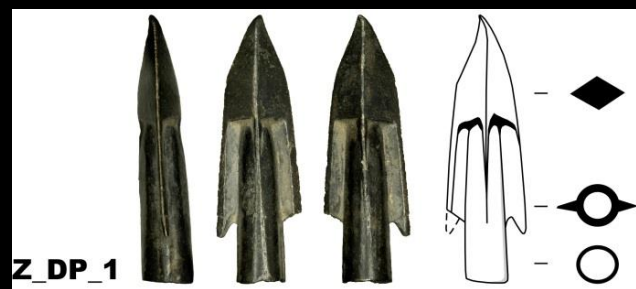


Non-intentionally faults did by casting process



Traces of different directions by grinding process and "untouched areas" between edges and socket after casting and cooling.

Non-intentionally faults did by casting process



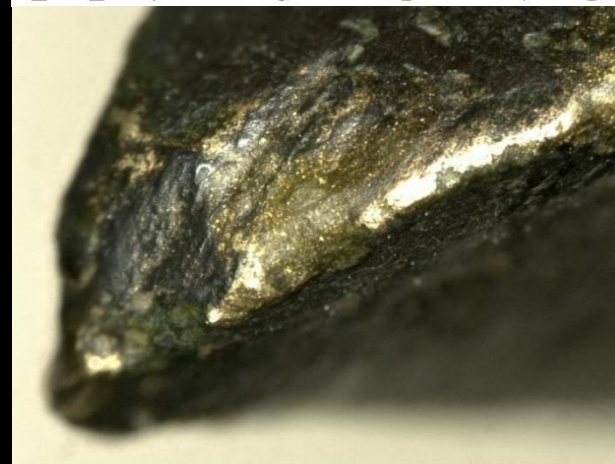
zoomed 100x



zoomed 100x



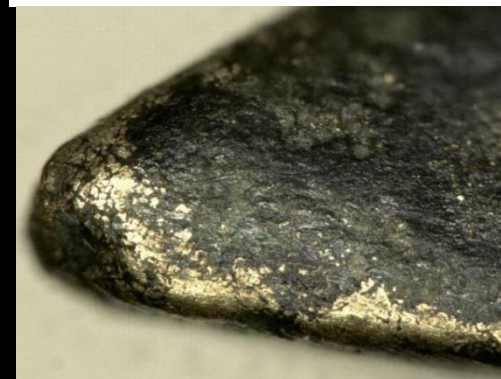
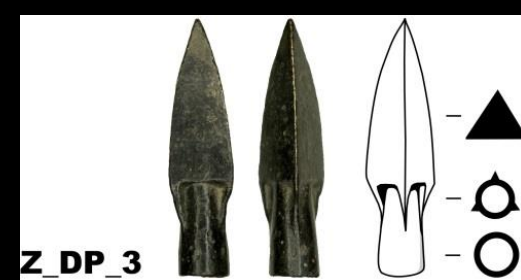
zoomed 50x



zoomed 100x



zoomed 50x



zoomed 200x



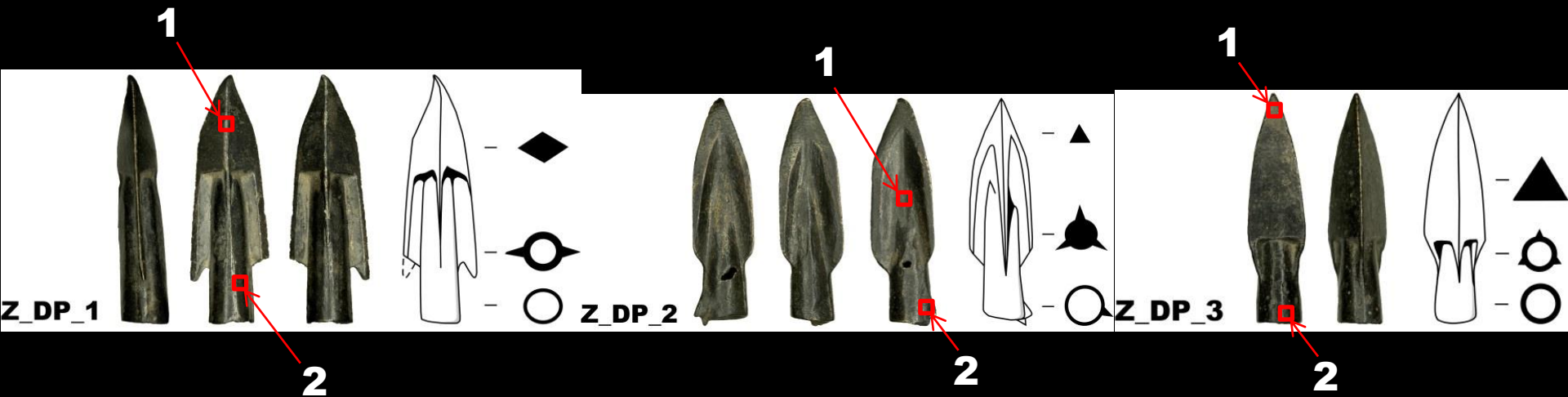
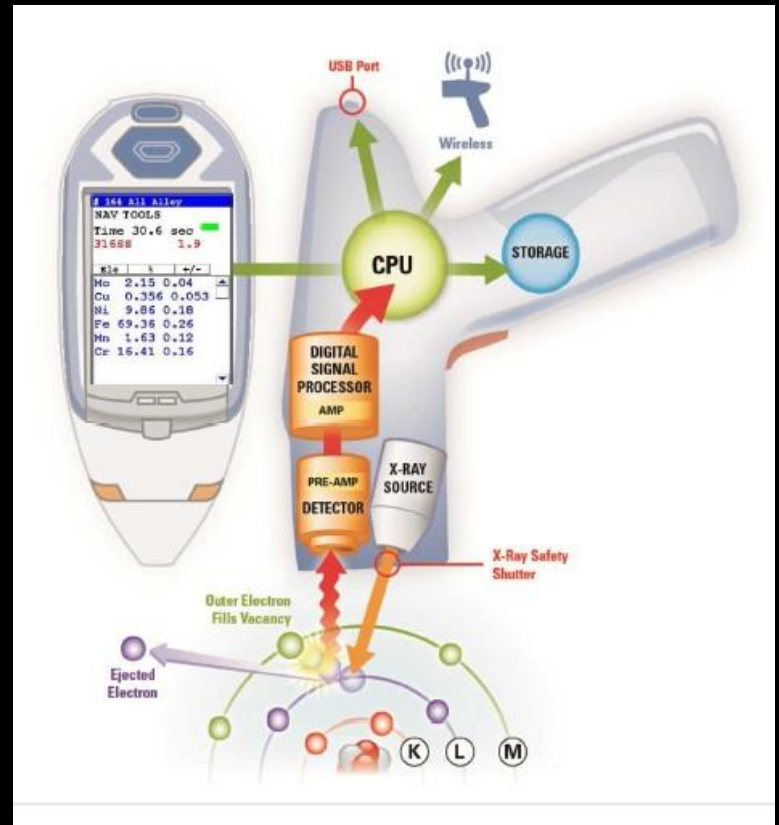
zoomed 30x

Various defects on nibs
of arrowheads caused by
f. e. bumping on hard
material

XRF method for analysing the composition of larger groups of arrowheads opens many questions, including problem of verifying copper alloys and bronze itself.

100 measurements of arrowheads from Chotín

51 measurements of arrowheads from Smolenice-Molpír, Prašník, Marhát, Žibrica and Velký Lysec



Example result of XRF analyse of arrowheads EIA hillforts South-western Slovakia.

Nr.24



č.m.	číslo	Predmet	Lokalita	Fe %	Co %	Ni %	Cu %	Zn %	Ga %	As %	Ag %	Sn %	Sb %	Pb %	Bi %
#65C	1	Hrot šípu	zber	0,00	0,00	0,00	80,67	0,84	0,00	0,00	0,00	16,41	0,00	1,48	0,60
#66C	2	Hrot šípu	zber	0,00	0,00	0,15	70,86	0,80	0,00	0,17	0,00	27,84	0,00	0,19	0,00
#67C	3	Hrot šípu	zber	0,00	0,00	0,00	56,98	0,00	0,00	4,37	0,00	36,98	0,00	1,67	0,00
#68C	4	Hrot šípu	zber	2,12	0,00	0,00	56,87	0,89	0,00	0,00	0,00	40,12	0,00	0,00	0,00
#69C	5	Hrot šípu	zber	0,00	0,00	0,97	50,23	0,00	0,00	0,67	1,27	42,41	2,61	1,85	0,00
#70C	6	Hrot šípu	zber	0,00	0,00	0,29	53,23	0,00	0,00	0,00	0,00	35,14	0,00	5,43	5,91
#1C	7	Hrot šípu	zber	0,00	0,00	0,00	67,00	0,88	0,00	0,00	0,00	25,83	0,00	5,60	0,70
#2C	8	Hrot šípu	zber	0,00	0,00	0,00	53,28	0,57	0,00	0,00	0,00	42,53	0,00	3,62	0,00
#3C	9	Hrot šípu	zber	0,00	0,00	0,54	57,83	0,70	0,00	1,12	0,84	36,57	0,00	2,40	0,00
#4C	10	Hrot šípu	zber	1,15	0,00	1,09	59,69	0,91	0,00	2,55	2,62	21,04	3,97	6,98	0,00
#5C	11	Hrot šípu	zber	0,00	0,00	0,68	51,64	0,59	1,16	4,34	2,66	23,64	5,12	10,17	0,00
#6C	12	Hrot šípu	zber	1,36	0,00	0,00	32,76	0,68	0,00	0,37	0,00	63,60	0,00	1,23	0,00
#7C	13	Hrot šípu	zber	0,00	0,00	0,00	54,17	0,81	0,00	0,00	0,00	43,42	0,00	1,12	0,48
#8C	14	Hrot šípu	zber	0,00	0,00	0,00	67,59	0,65	0,00	0,86	0,00	30,34	0,00	0,56	0,00
#9C	15	Hrot šípu	zber	0,00	0,00	0,00	58,46	0,65	0,00	0,57	0,00	39,92	0,00	0,40	0,00
#10C	16	Hrot šípu	zber	0,00	0,00	0,97	55,01	0,71	0,00	3,82	1,73	27,74	3,75	6,27	0,00
#11C	17	Hrot šípu	zber	0,00	0,00	0,00	45,85	0,70	0,00	0,00	0,00	48,31	0,00	5,14	0,00
#12C	18	Hrot šípu	zber	1,71	0,00	0,00	51,84	0,76	0,00	0,00	0,00	42,25	0,00	3,44	0,00
#13C	19	Hrot šípu	zber	0,00	0,00	0,00	63,06	0,64	0,00	0,00	0,00	36,07	0,00	0,23	0,00
#14C	20	Hrot šípu	zber	0,00	0,00	0,37	58,05	0,00	0,00	0,61	0,49	39,09	0,00	1,39	0,00
#15C	21	Hrot šípu	zber	0,00	0,00	0,00	83,82	0,93	0,00	0,00	0,00	14,33	0,00	0,92	0,00
#16C	22	Hrot šípu	zber	0,25	0,00	0,00	85,30	0,64	0,00	0,99	0,00	12,64	0,00	0,17	0,00
#17C	23	Hrot šípu	zber	0,00	0,00	0,00	64,34	0,89	0,00	0,00	0,00	34,40	0,00	0,37	0,00
#18C	24	Hrot šípu	zber	0,00	0,00	0,00	41,48	0,00	0,00	0,64	0,37	55,50	0,00	2,01	0,00
#19C	25	Hrot šípu	zber	1,18	0,00	0,00	59,79	0,91	0,00	0,00	0,00	38,12	0,00	0,00	0,00
#20C	26	Hrot šípu	zber	1,12	0,00	0,87	57,22	0,84	0,00	4,27	2,33	21,23	3,38	8,74	0,00
#21C	27	Hrot šípu	zber	0,76	0,00	0,53	56,56	0,00	0,00	1,36	0,81	38,46	0,00	1,52	0,00

Example result of XRF analyse of Chotín burial ground arrowheads.

Nr.60



Meranie	Predmet	Nejlepsi shoda	Cr	Fe	Ni	Cu	Zn	Ga	As	Ag	Sn	Sb	W	Pb	Bi
#43C	Hrot šípu - hrob 49/61 Inv 4983/H-2		0,00	0,00	0,26	75,22	0,66	0,00	0,91	0,61	13,19	1,13	0,00	8,02	0,00
#44C	Hrot šípu - hrob 49/61 Inv 4983/H		0,00	0,00	1,02	61,07	0,79	0,00	0,38	0,00	35,70	0,00	0,00	1,04	0,00
#45C	Hrot šípu - hrob 96/54 Inv 4896/A		0,00	0,00	0,00	73,65	0,00	0,00	0,00	0,00	6,63	0,00	0,00	19,72	0,00
#47C	Hrot šípu - hrob 96/54 Inv 4896/B		0,00	0,00	0,00	75,74	0,60	1,40	0,00	0,00	6,87	0,00	0,00	15,39	0,00
#48C	Hrot šípu - hrob 197/54 Inv 4623		0,00	0,00	0,00	79,00	0,58	0,95	0,00	0,00	7,77	0,00	0,00	11,70	0,00
#49C	Hrot šípu - hrob 81/54 Inv 4868		0,00	0,00	0,20	85,28	0,77	0,00	0,69	0,41	8,67	0,00	0,00	3,98	0,00
#50C	Hrot šípu - hrob 89/54 Inv 4887		0,00	0,00	0,00	91,68	0,65	0,00	0,00	0,46	4,78	0,85	0,00	1,57	0,00
#51C	Hrot šípu - hrob 87/54 Inv 4880/A		0,00	0,36	0,00	72,22	0,68	1,76	0,00	0,00	9,82	0,00	0,00	15,16	0,00
#52C	Hrot šípu - hrob 87/54 Inv 4880/B		0,00	0,35	0,32	88,71	0,65	0,00	0,00	0,00	8,81	0,00	0,00	1,16	0,00
#53C	Hrot šípu - hrob 17/52 Inv 4781		0,00	0,22	0,00	86,10	0,71	0,00	0,00	0,00	12,15	0,00	0,00	0,81	0,00
#54C	Hrot šípu - hrob 249A Inv 4679/A		0,11	0,55	0,00	84,03	0,78	0,00	1,61	1,98	2,17	0,00	0,00	8,77	0,00
#55C	Hrot šípu - hrob 249A Inv 4679/B		0,00	0,00	0,16	88,93	0,67	0,00	0,83	1,90	2,46	0,00	0,00	5,05	0,00
#56C	Hrot šípu - hrob 249A Inv 4679/C		0,00	0,56	0,16	81,49	0,82	0,00	0,00	0,00	13,36	0,00	0,00	3,61	0,00
#57C	Hrot šípu - hrob 249A Inv 4679/D		0,00	0,26	0,00	77,52	0,74	1,23	1,62	0,00	1,62	0,00	0,00	17,01	0,00
#58C	Hrot šípu - hrob 249A Inv 4679/E		0,00	0,00	0,00	81,39	0,67	0,00	0,00	0,00	17,38	0,00	0,00	0,57	0,00
#58C	Hrot šípu - hrob 68-B Inv 5005/A		0,00	0,93	0,42	78,45	0,53	0,00	0,00	0,36	10,24	0,00	0,00	9,07	0,00
#60C	Hrot šípu - hrob 68-B Inv 5005/B1		0,00	0,00	0,52	21,44	0,00	3,49	3,27	0,00	15,74	0,00	1,14	54,40	0,00
#61C	Hrot šípu - hrob 68-B Inv 5005/B-2		0,00	0,00	1,45	47,86	0,00	2,31	2,22	0,00	13,26	0,00	0,59	32,31	0,00
#62C	Hrot šípu - hrob 18/52 Inv 4782		0,09	0,17	0,00	91,91	0,75	0,00	0,00	0,00	2,18	0,00	0,00	4,90	0,00
#63C	Hrot šípu - hrob 22/52 Inv 4789/A		0,28	0,45	0,00	72,12	1,16	0,00	1,12	0,00	21,32	0,00	0,00	3,55	0,00
#64C	Hrot šípu - hrob 22/52 Inv 4789/B		0,58	1,12	0,00	58,40	1,77	1,28	2,62	0,93	19,08	0,00	0,00	14,22	0,00
#65C	Hrot šípu - hrob 22/52 Inv 4789/C		0,16	0,38	0,00	75,62	1,09	0,00	0,00	0,00	19,08	0,00	0,00	3,67	0,00
#66C	Hrot šípu - hrob 22/52 Inv 4789/D		0,18	0,91	0,32	80,73	1,05	0,00	1,95	0,00	7,67	0,00	0,00	7,19	0,00

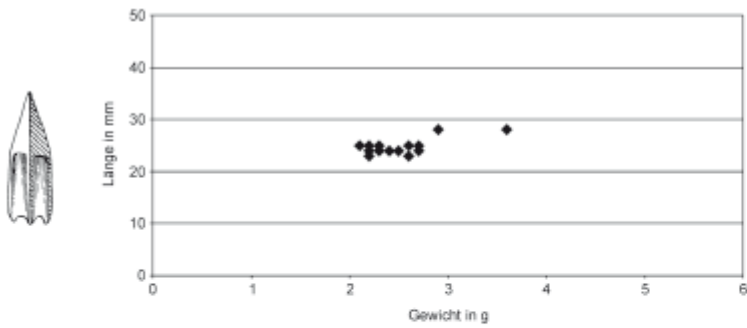


Abb. 2. Korrelation von Größe und Gewicht von Pfeilspitzen aus der Nekropole von Chotín.

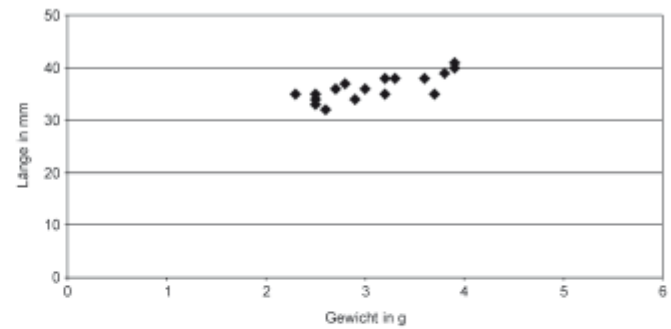


Abb. 8. Korrelation von Größe und Gewicht der dreiflügeligen Pfeilspitzen der Gruppe II E aus Smolenice-Molpír.

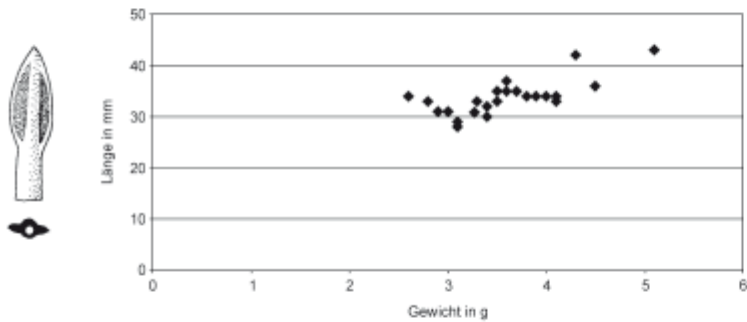


Abb. 3. Korrelation von Größe und Gewicht der zweiflügeligen Pfeilspitzen aus Smolenice-Molpír.

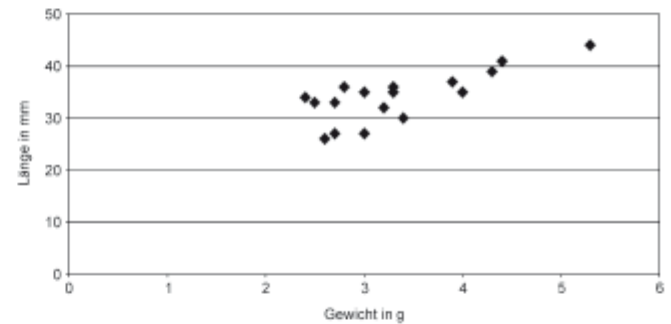
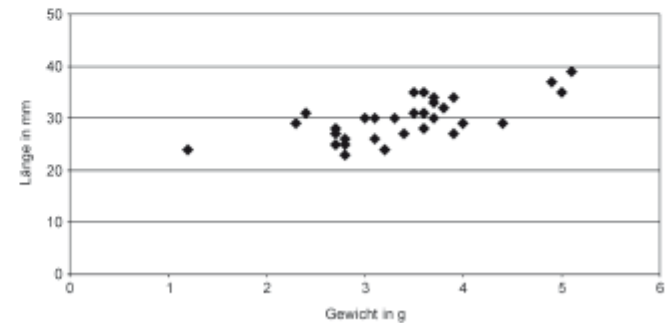
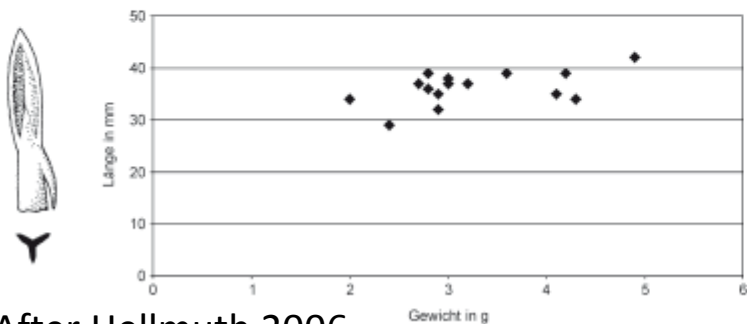


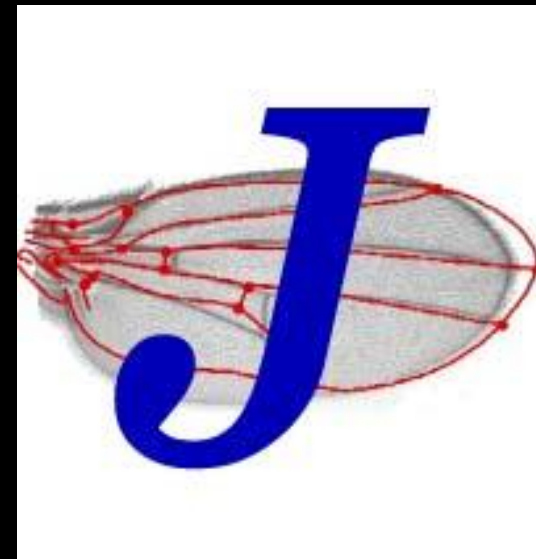
Abb. 9. Korrelation von Größe und Gewicht der dreiflügeligen Pfeilspitzen der Gruppe II F aus Smolenice-Molpír.



After Hellmuth 2006

Length and weight of arrowheads showed no correlation by types itself, the same result could be observed by XRF analyses – no correlation between types and native elements composition.

Perspectives





Populus

Salix



In some cases of arrowheads it is still possible to find the rests of wood inside the socket.

Archaeobotanical analysis did by Ing. J. Mihályiová



Betula sp.



Conclusion

- There are observable traces of the imperfections of the casting process, grinding to final use and various forms of distortion on most of them.
- XRF method for analyzing the composition of larger groups of arrowheads opens many questions, including problem of verifying copper alloys and bronze itself.
- Previous characteristics can be used for comparison of data within the existing typological classification of arrowheads and detailed morphometric research.

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