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Michał Duch

LEGIO I MINERVIA AND LEGIO XI CLAUDIA STAMPS ON BUILDING CERAMICS FROM SECTOR XII AT NOVAE — A CONTRIBUTION TO STUDIES OF MILITARY BUILDING MATERIAL PRODUCTION CENTRES

Abstract: The paper analyses 29 specimens of stamps of *legio I Minervia* and *legio XI Claudia*, discovered in Sector XII at Novae. Based on the artefacts, the author revisits the theses concerning so-called production centres of building ceramics. Furthermore, the author suggests a reinterpreted reading of TRA'EX and supplements the typology of such relics from Novae.

Keywords: Novae, Moesia, *legio I Italica*, *legio I Minervia*, *legio XI Claudia*, bricks, roof tiles, stamps, building ceramics, military production centres

The year 2011 saw the launch of archaeological research in Sector XII at Novae (Bulgaria).[1] The sector in question is located south of the *via principalis* and east of the *principia* [Fig. 1]. Features determined in that location with the greatest degree of certainty include the tabernae, barracks of *legio VIII Augusta* and *legio I Italica*, a "centurion's house" and late-antique civilian buildings constructed on the site of the latter.[2]

Since the beginning of excavations, Sector XII has yielded numerous valuable finds. Stamped bricks and roof tiles stand out among them in terms of quantity, with a total of 903 items (more than in other currently studied sectors at Novae). This is due to the fact that excavations revealed several large ceramic conduits, as well as pools, latrines, bath interiors, cisterns and ceramic walkways. A decided majority of the 903 artefacts bear the imprint of a stamp of *legio I Italica*, with its brief inscription reading: LEG I ITAL. However, stamps of other legions, such as *XI Claudia* and *I Minervia*, are by no means lacking. Consequently, this paper discusses structural ceramics from Sector XII stamped by these two units. There are 29 such finds, 17 of which came from the brickyard of *legio I Minervia*, while 12 were made by *legio XI Claudia*.

State of research

Roof tiles and bricks marked by *legio I Minervia* and *legio XI Claudia* began to be discovered at Novae in more substantial numbers in the 1980s, when archaeologists working in Sector IV embarked on the exploration of the ruins of the legionary hospital. Being different from artefacts

[1] The project has been financed with resources provided by the National Science Center, Poland, allotted on the basis of decisions: DEC-2015/19/B/HS3/00547.

[2] Dyczek 2016, pp. 405–406; 2018a, p. 195; 2018b, pp. 530–536.

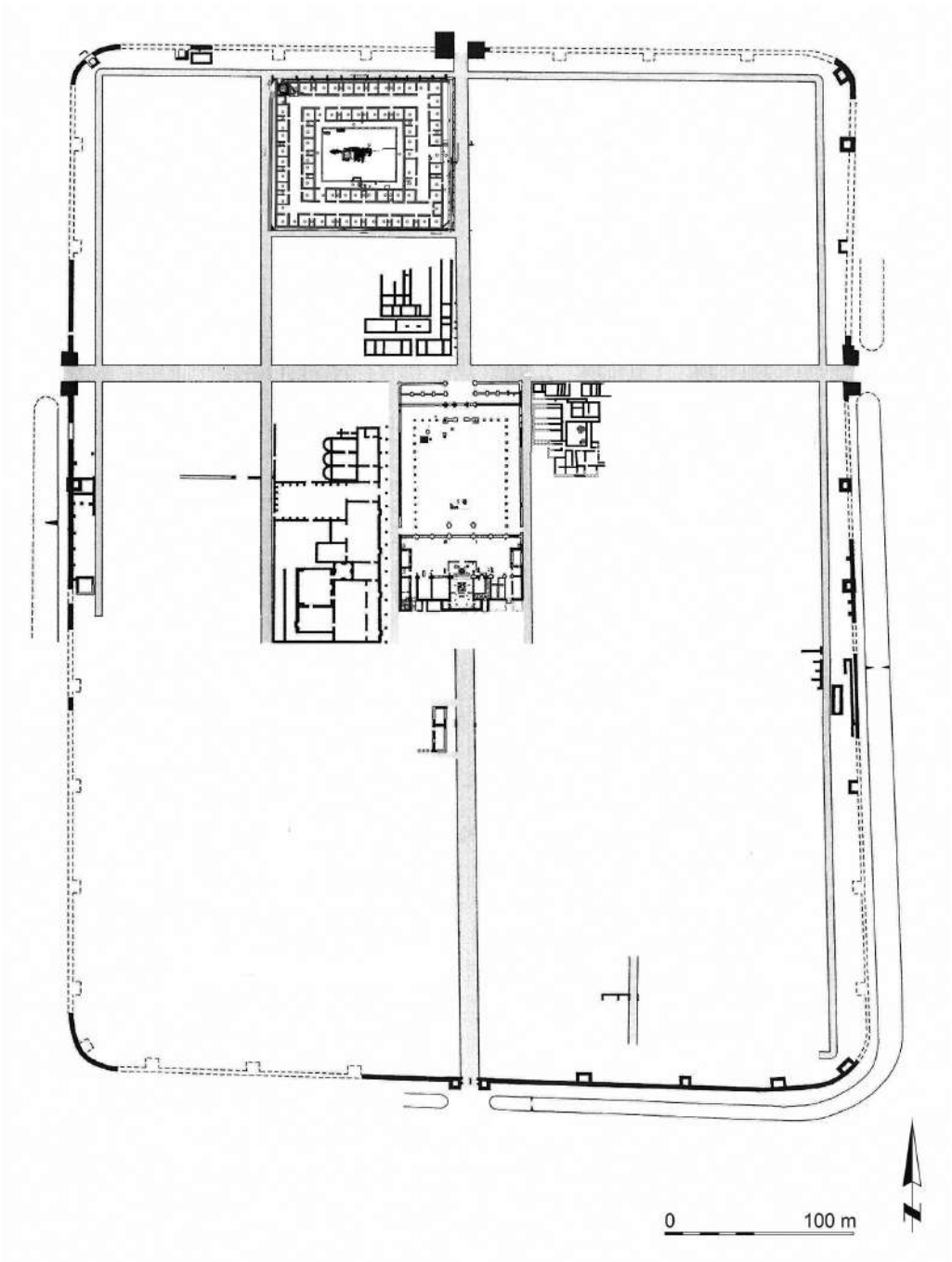

Fig. 1. Plan of Novae. Sector XII (barracks of the I cohort) (after Dyczek 2018b)

stamped by *legio I Italica*, the finds drew attention of Tadeusz Sarnowski, who included those originating from *legio XI Claudia* in an article about the typology of stamps on roof tiles and bricks from Novae. Later on, he discussed them in a separate, extensive paper, in which he additionally classified two types of stamps of *legio I Minervia*, which had not been taken into consideration in the 1983 typology. The roof tiles marked LEG I M PF, which he examined in 1987, originated chiefly from the structure of the latrine and the legionary hospital, where LEG XI CPF roof tiles were found as well. Interestingly enough, building material stamped by *legio XI Claudia* was used

to construct conduits[3] (as in the Sector XII discussed in this paper). Relying on such finds, Tadeusz Sarnowski concluded that neither legion (*I Minervia* and *XI Claudia*) was permanently stationed at Novae,[4] but merely participated in manufacturing and supplying bricks needed to expand the fortress of *legio I Italica* at Novae. Since it is located on the southernmost arc of the Danube, it offered armies hostile to Romans a natural gateway through which to penetrate into the Balkan Peninsula. During Trajan's wars with Dacians the camp at Novae was at risk of being seized by barbarians skilled in the art of siege, and had to be substantially fortified, just as the entire Lower Moesian stretch of the limes. Major works were indeed carried out at the fortress, providing it with better defences against potential capture, such as the gates extending beyond the line of the walls. This was a large-scale undertaking, as next to fortifications the inner area perimeter saw changes as well. The brickyards of *legio I Italica* were unable to produce sufficient volumes of building ceramics, especially for the construction of the military hospital. External supply was necessary, which is why the *vexillationes legionis I Minerviae et legionis XI Claudiae* were engaged to help. The limited number of types and variants of stamps of both legions demonstrates that this was not any long-term arrangement.[5] Considering the fact that building ceramics was produced in October as well, the roof tiles provided with the stamps of both legions may have been supplied in October or November 101 CE.[6] Furthermore, Tadeusz Sarnowski argued that *legio I Italica*, *legio I Minervia* and *legio XI Claudia* worked jointly in one brickyard, which may be inferred from the similar mineral composition of the roof tiles manufactured by those legions.[7] This assertion was challenged by e.g. Karl Strobel, who maintained that no such brickyard had existed, while *legio I Minervia* had not supplied building materials in autumn 101 but in the period between the two Dacian wars.[8] However, most recent research appears to corroborate the concept advanced by Tadeusz Sarnowski. At the same time, there are reasons to conjecture that construction of the legionary hospital began already in autumn 100 and may have been completed as early as spring the following year.[9]

Isolated but eloquent examples demonstrate that brickmaking teams did not have to be very numerous; for instance, inscription on a brick discovered in a structure in Drobeta speaks of an *in figlinis magister Aurelius Mercurius* who commanded 60 soldiers.[10] Assuming — also on the basis of an inscription — that 220 roof tiles were a daily norm of production,[11] then a team of several dozen people were able to turn out a substantial number. Naturally, it needs to be remembered that manufacture of building material involved an entire logistical framework, including supply of wood (fuel) for kilns, clay, and transportation of the final product to its destination[12] (shipped by the Moesian fleet, for instance). It is difficult to estimate how many people were needed to carry out those tasks, but one should not expect whole cohorts. Still, there were no apparent obstacles to sending a small brickmaking team of *legio I Minervia* from Bonna to the Lower Danube in 100 or 101 to assist in the production of bricks and roof tiles that the construction undertakings at Novae required. After all, as attested by the so-called *pridiana*, the mobility of various groups of specialists between units deployed at different locations was a routine occurrence.[13]

[3] Sarnowski 1987, p. 107.
[4] Sarnowski 1987, p. 107.
[5] Sarnowski 1987, pp. 110–117.
[6] Sarnowski 1987, p. 112.
[7] Sarnowski 1987, p. 112.
[8] Strobel 1988, pp. 502, 510.
[9] Ciołek, Dyczek 2011, p. 16.
[10] *IDR* II 1, 107: "Aurelius Mercurius milis c(ohor)tis I Sagitt(ariorum) in figlinis magister super milites LX". Authors of *IDR* II admit that "LX" may also be read as "IX", which would mean 9 persons instead of 60.
[11] *CIL* III 11381, 11383; Duch 2012, p. 278.
[12] Duch 2017, p. 200.
[13] For example, it follows from *RMR* 63 that soldiers of *cohors I Hispanorum Veterana* were dispatched to Gaul to fetch clothing and grain, as well as to Dardania to work at a mine (*in dardania ad metella*).

Building material of *legio I Minervia* and *legio XI Claudia* from Sector XII at Novae

The roof tiles and bricks produced by *legio I Minervia* [Fig. 2] (inventoried as 197-13c, 206-13c, 210-13c) and *legio XI Claudia* [Fig. 3] (46-12c, 52-12c, 56-12c, 86-12c, 89-12c; see catalogue provided at the end of the paper) were discovered as structural components of a ceramic conduit, built by the legionaries of *legio I Italica* in the Flavian period (as indicated by the characteristic ligatured stamps).[14] It was then renovated shortly before or during the First Dacian War, as may be surmised from the roof tiles stamped by *I Minervia* and *XI Claudia* which were found there.

Fig. 2. The places of discovery of *legio I Minervia* stamps in Sector XII at Novae (compiled by B. Wojciechowski)

[14] Cat. nos. 49-12c, 65-12c; on the dating of the stamps, cf. Duch 2012.

The canal itself was a part of a distinctive building which was provisionally defined as a "centurion's house" for the purposes of ongoing research. It was built on the site of earlier legionary barracks constructed of timber and clay. The *legio I Minervia* roof tiles were used to cover the conduit (197-13c, 210-13c) and line the fourth level of bottom paving (206-13c). The roof tiles of *legio XI Claudia* were used to renovate the bottom of the canal, as 56-12c was found at a higher level of paving and in the side walls (46-12c, 52-12c). Apart from that, other roof tiles were recovered near the conduit, which most likely had either been a part of its structure or the flooring above it. These are: 53-11c, 87-11c, 88-11c, 129-12c produced by *legio I Minervia* as well as 94-13c and 113-13c made by *legio XI Claudia*.

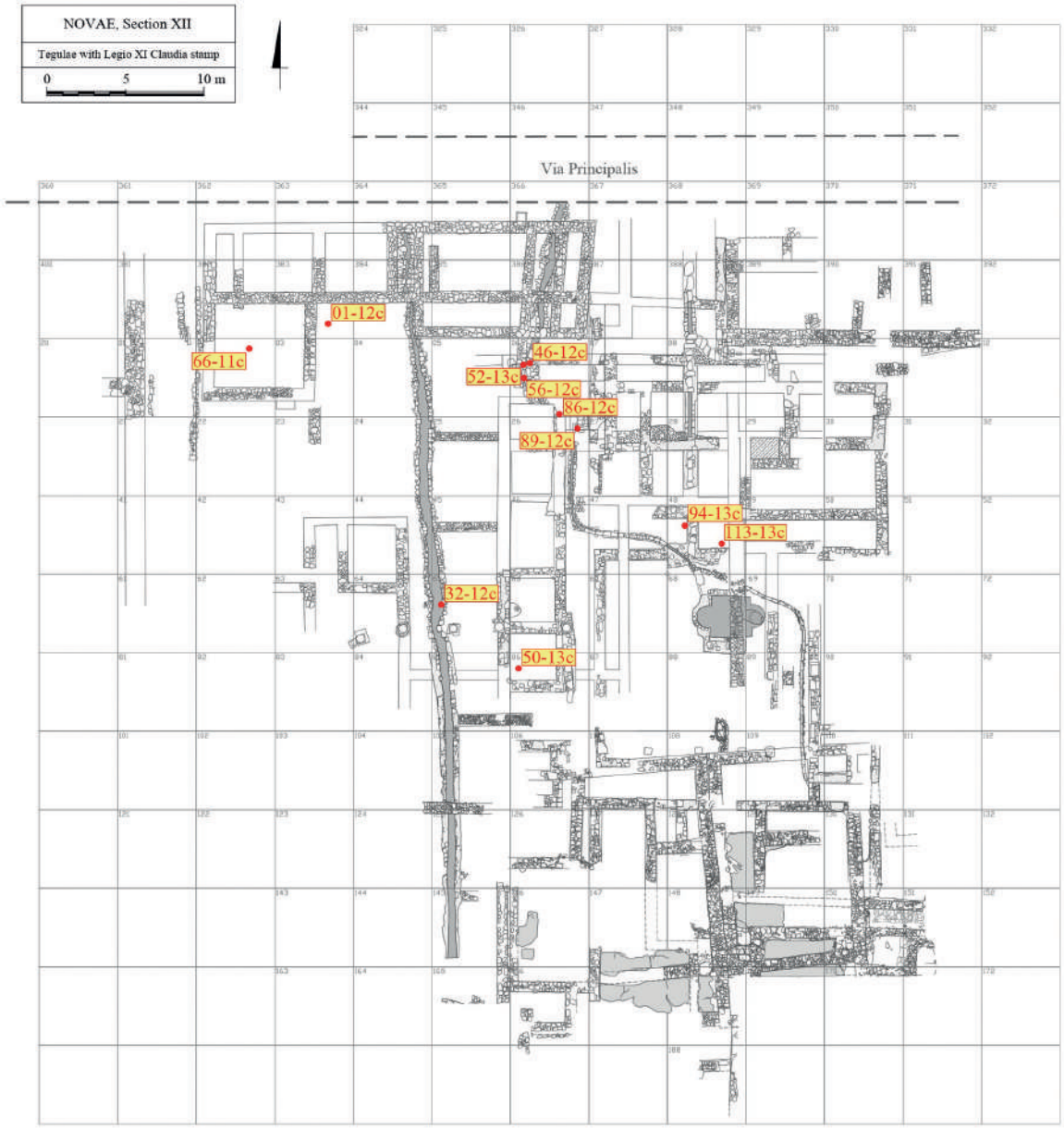

Fig. 3. The places of discovery of *legio XI Claudia* stamps in Sector XII at Novae (compiled by B. Wojciechowski)

Tegulae numbered 01-18c and 10-18c were found on the bottom of a small pool in the south-eastern sector of the "centurion's house". Tegula 66-11c was located in the layers of charred material, suggesting a source of intense heat; the proximity of the *via principalis* may be indicative of tabernae or utility interiors of the "centurion's house". The tegula 71-12c was used to fill a gap between the stones of a canal running along a N-S axis, while a column base situated nearby lay on the roof tile 70-12c. Roof tile 54-16c was discovered in the impression of the wall of the "centurion's house". The remainder — roof tiles for the most part — were recovered from the rubble layers that were left of the so-called "centurion's house".

The *legio I Minervia* and *legio XI Claudia* bricks and roof tiles from Sector XII offer a supplement to the typology of such relics from Novae developed by Tadeusz Sarnowski and Marta Matuszewska, as they add to the pool of the already known variants [Figs. 4–5].[15] Tadeusz Sarnowski distinguished two types stamp impression used by *legio I Minervia*.[16] The first shows distinctive spaces between the individual parts of the inscription. In Sector XII, that type is represented by 70-12c, 71-12c, 72-17c, 01-18c, 05-15c, and 15-15c. Finds belonging to the second type are more numerous, including 53-11c, 87-11c, 88-11c, 129-12c, 52-13c, 197-13c, 206-13c, 210-13c, 54-16c, 61-16c.

Differences between the stamps of the two types above are evident at first glance. The first most often measures *ca.* 15.0–15.2 cm in length and 3.9–4.1 cm in height. Type two reaches a length of 17.0–17.5 cm and usually a height of 3.4–3.8 cm.

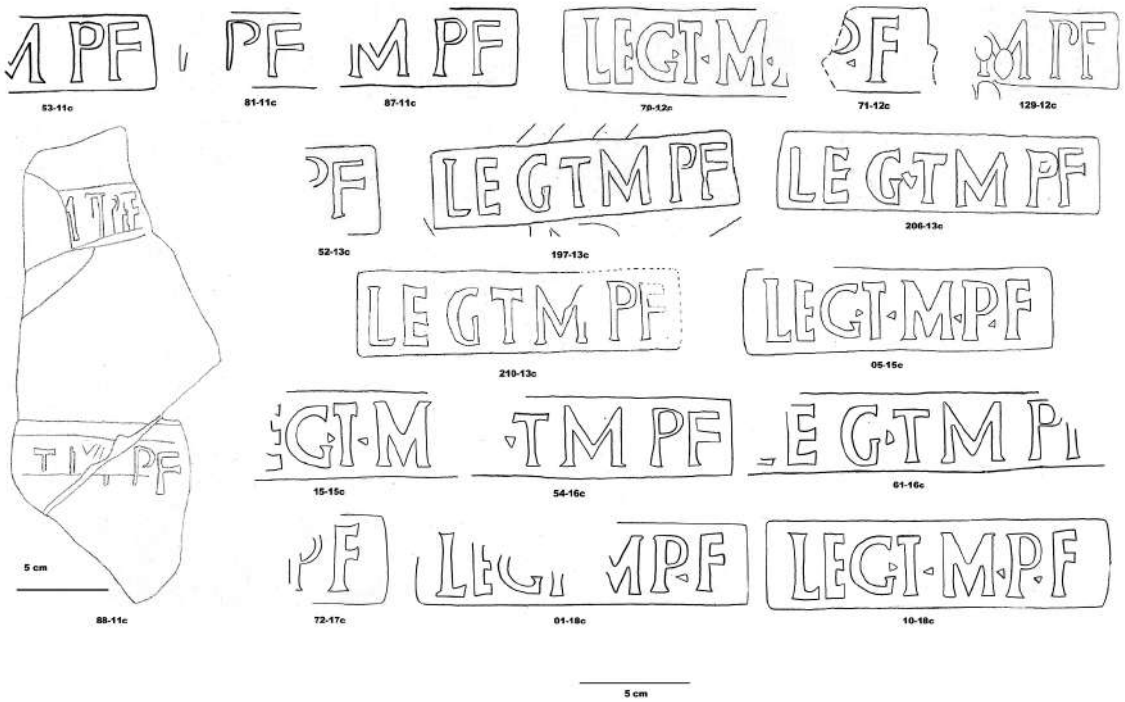

Fig. 4. Stamps of *legio I Minervia* from Sector XII at Novae (compiled by M. Duch)

[15] Stamps of *legio I Minervia* were not included in Sarnowski's typology (Sarnowski 1983, p. 39, pl. VII); Matuszewska does not refer to the stamps of that legion either (Matuszewska 2006). However, both typologies do feature impressions of *legio XI Claudia* stamps.

[16] Sarnowski 1987, p. 110.

Fig. 5. Stamps of *legio XI Claudia* from Sector XII at Novae (compiled by M. Duch)

As regards the stamps of *legio XI Claudia*, Tadeusz Sarnowski discerned three variants of one type, while Marta Matuszewska seven variants of one type (therefore the latter is referred to in this part of the text).[17] Type XXI-2/a from Sector XII at Novae overlaps with cat. no. 89-12c. Type XXI-3/a imprints, known only from a small fragment in Matuszewska's typology, appear to correspond with the better preserved relics from Sector XII, namely 01-12c and 52-12c. Type XXI-4/a is represented by 32-12c, 86-12c, 50-13c, 94-13c. Other impressions of *legio XI Claudia* stamps from Sector XII have survived only partially and, being considerably worn, cannot be assigned to any specific variant. Only 15-12c appears to constitute a new variant, with its preserved lettering "PF" (*Pia Fidelis*), as opposed to the erroneous "PP".

Production centres of building ceramics

The existence of joint military production centres dedicated to manufacture and distribution of building ceramics in Lower Moesia was suggested by Tadeusz Sarnowski, who relied e.g. on the similarity of clay used in the production of roof tiles by *legio I Italica*, *I Minervia* and *XI Claudia*.[18] Apart from that, he drew attention to a brick from Aliobrix, bearing the stamp of *classis Moesica* and graffito *le*(*gionis*) *vex*(*illatio* or *-illationi*), as well as a roof tile from Buridava (Dacia), with the stamps of *legio I Italica* and *legio V Macedonica*.[19] The existence of centres producing building ceramics in Lower Moesia also appears to be borne out by a section of ceramic pipe, discovered in 1961 during excavations *extra muros* of Novae in a pool or *castellum aquae*?;[20]

[17] Sarnowski 1983, p. 39, pl. VII; Matuszewska 2006, p. 60, pl. XII.
[18] Sarnowski 1987, p. 112.
[19] Sarnowski 2016–2017, p. 62; *IDR* III 559.
[20] Majewski 1962, pp. 99–104.

the relic in question is marked by a stamp which reads "*TRA'EX*" [Fig. 6].[21] Jerzy Kolendo and Tomasz Kowal advanced several interpretations of the enigmatic imprint, but none of them is satisfactory.[22] Tadeusz Sarnowski's (*tegularia* or *figlina*) *Tra(nsdanubiana*) *ex*(*ercitus*) (*Moesiae* or *Moesiae inferioris*)[23] is more convincing, particularly in the light of an analogous relic from Germania, which suggests the existence of a *tegularia Transrhenana*[24] — a centre where building ceramics were produced — but it does involve a certain measure of risk. The inscription from Germania is more precise and elaborate, and above all it was found to recur on numerous roof tiles. TRA'EX may also be read as (*tegularia* or *figlina*) *Tra*(*ciae*) *ex*(*ercitus*). Given speculations of Kolendo and Kowal, who surmised that the pipe with the *ARRIUS* stamp from Sector IV in Novae may have been made near Butovo, an area known for its deposits of high-quality clay, forests located in the vicinity and access to water (with thriving *villae rusticae* which produced pottery); it may also be noted that during the reign of the Flavii (the pipe with the inscription is dated to that period)[25] remained within the territory of the province of Thrace, not Lower Moesia.[26] The *ARRIUS* stamp and *TRA'EX* demonstrate certain analogous features (planta pedis, the size of the ceramic pipe), therefore the *TRA'EX* pipe may have also originated from the vicinity of Butovo. Furthermore, the antique name of Tegulicium, located some 20 km away from Durostorum, may indicate that a centre manufacturing building ceramics did exist in Lower Moesia.[27]

Such military production facilities did not have to be situated in the immediate neighbourhood of a legionary camp. However, in view of the widespread occurrence of clay, it is believed that production of bricks and roof tiles took place near the sites where they were needed.[28] Clay is indeed widely available, but it must be remembered that not every type is well suited for high-quality structural ceramics, especially in heating systems operating at high temperatures and humidity (*hypocaustum*). Also, fuel to fire the kilns and maintain high temperature is an important element of the production process. In this respect, high-calorific wood types — such as oak — ensure the best performance. Thirdly, proximity of a waterway to enable transportation of the material is vital

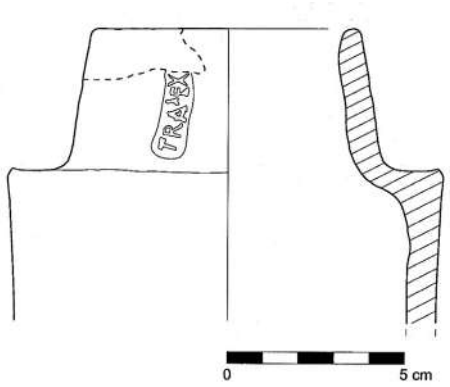

Fig. 6. TRA'EX stamp on ceramic pipe from Novae
(after Kolendo, Kowal 2011, p. 72, fig. 8)

[21] Kolendo, Kowal 2011, p. 72, figs. 7–8; Sarnowski 2016–2017, p. 62.
[22] Sarnowski 2016–2017, p. 62; Sarnowski forthcoming.
[23] Sarnowski 2016–2017, p. 62.
[24] Hanel 2002: "[TR]A(n)SR(h)ENAN[A] / C(aius) SEC (---) NAT(---) / COH(ortis) XV VOL(untariorum)".
[25] Kolendo, Kowal 2011, p. 72.
[26] It terms of its territory, Lower Moesia in the Flavian period was very much extended along the Danube, but its breadth reached mere several dozen kilometres; see Gerov 1998.
[27] Sarnowski 2016–2017, p. 62.
[28] Królczyk, Trynkowski 2001, p. 220.

for logistical reasons.[29] Thus, in the period when military installations in Lower Moesia underwent large-scale conversions, e.g. under Trajan and Hadrian,[30] there were specialized production and distribution centres supplying building ceramics to particular military camps. It was thus easier to concentrate manufacture in several (or several dozen) locations where production conditions were favourable rather than disperse it, with many facilities which would have been closer to the destination sites but had lower output capacity. To date, archaeological remnants of military kilns have been discovered in Vrav (near Vidin, *ca*. 3 km from the ruins of the fort of Dorticum), Novae (Svištov), *vicus* Gavidina (Ostrov; 2.5 km from the legionary camp of Durostorum), Lešnica near the antique Sostra, as well as in Gigen, Arčar and Harlec.[31]

The existence of centres where the army produced building ceramics calls into question the widely adopted interpretation that the site of discovery of ceramics stamped by a particular unit of the Roman military attests to its being stationed there. One should take into account that potentially one unit merely supplied its products to another unit which was actually stationed at a particular site and undertook construction there. Such an eventuality cannot be ignored, as there is no other evidence than building ceramics to confirm the presence of a military detachment in a given location.

Conclusions

This paper analyzes 29 specimens of building ceramics stamped by *legio I Minervia* and *legio XI Claudia*, which were discovered in Sector XII at Novae. Those artefacts made it possible to revisit and reassess the arguments advanced by Tadeusz Sarnowski in relation to the so-called production centres for building ceramics. I am convinced that such an interpretation is correct. It has also been surmised in the paper that a brickmaking team from *legio I Minervia* may have been employed on the Lower Danube in 100 or 101, having been dispatched from their home base at Bonna. I would also argue that the inscription *TRA'EX*, impressed on a ceramic pipe may be interpreted as (*tegularia* or *figlina*) *Tra*(*ciae*) *ex*(*ercitus*), because it had most likely been produced in Butovo near Nicopolis ad Istrum, an area within the administrative jurisdiction of the province of Thrace as opposed to Lower Moesia. Moreover, finds from Sector XII extend and supplement the range of types and variants known from two typologies of stamps on building ceramic from Novae.[32] Finally, it may be stressed that finding ceramic relics stamped by a military unit in a particular location does not mean that its manufacturer was stationed there. In all likelihood, this was associated with the production and subsequent supply of bricks and roof tiles to a military installation where they were needed.

Catalogue

Legio I Minervia

1. Fragment of a roof tile (tegula). Cat. no. 53-11c. Dimensions [14.5] × [22.9] × 4.1 cm. Stamp imprint dimensions [7.0] × 3.4 cm. Find location: Sector XII, Hectare XI, Square 366, depth 46.88 m a.s.l., rubble.
   [LEG(ionis) I] M(inerviae) P(iae) F(idelis)

[29] I previously expressed the view that bricks and roof tiles were produced exclusively near their site of destination, but I also refer to the existence of production centres; cf. Duch 2017, p. 200.

[30] More on the construction works along the *limes*: Ivanov 2012, p. 23.

[31] Harizanov 2015, pp. 34–35.

[32] Sarnowski 1983; Matuszewska 2006.

2. Fragment of a roof tile (tegula). Cat. no. 87-11c. Dimensions [38.5] × [34.4] × 3.5 cm. Stamp imprint dimensions [8.3] × 3.2 cm. Find location: Sector XII, Hectare XVIII, Square 6, depth 46.71 m a.s.l., tiling level.
   [LEG(ionis) I] M(inerviae) P(iae) F(idelis)
3. Fragment of a double-stamped roof tile (tegula). Cat. no. 88-11c. Dimensions [43.1] × [30.5] × 3.7 cm. Stamp imprint dimensions: I Minervia [5.1] × 3.4 cm; I Minervia [13.6] × 3.4 cm. Find location: Sector XII, Hectare XVIII, Square 26, depth 46.87 m a.s.l., tiling level.
   [LEG(ionis) I M(inerviae)] P(iae) F(idelis)
   [LEG(ionis) I M(inerviae)] P(iae) F(idelis)
4. Fragment of a roof tile (tegula). Cat. no. 70-12c. Dimensions [16.5] × [16.5] × 3.7 cm. Stamp imprint dimensions [12.5] × 4.0 cm. Find location: Sector XII, Hectare XVIII, Square 65, depth 48.36 m a.s.l., near the base of a column from a late Roman civilian structure.
   LEG(ionis) I M(inerviae) [P(iae) F(idelis)]
5. Fragment of a roof tile (tegula). Cat. no. 71-12c. Dimensions [17.0] × [13.0] × 2.5 cm. Stamp imprint dimensions [4.0] × [2.4] cm. Find location: Sector XII, Hectare XVIII, Square 65, depth 46.96 m a.s.l., ceramic conduit.
   [LEG(ionis) I M(inerviae)] P(iae) F(idelis)
6. Fragment of a roof tile (tegula). Cat. no. 129-12c. Dimensions [12.9] × [10.8] × 4.8 cm. Stamp imprint dimensions [7.8] × 3.5 cm. Find location: Sector XII, Hectare XVIII, Square 46, depth 46.97 m a.s.l., rubble.
   [LEG(ionis) I] M(inerviae) P(iae) F(idelis)
7. Fragment of a roof tile (tegula). Cat. no. 52-13c. Dimensions [17.2] × [15.1] × 3.6 cm. Stamp imprint dimensions [3.2] × 3.6 cm. Find location: Sector XII, Hectare XVIII, Square 86, depth 46.98 m a.s.l., at floor level.
   [LEG(ionis) I] M(inerviae) P(iae) F(idelis)
8. Roof tile (tegula). Cat. no. 197-13c. Dimensions 57.5 × 44.5 × 2.4 cm. Stamp imprint dimensions 17.9 × 3.4 cm. Find location: Sector XII, Hectare XI, Square 46, depth 46.87 m a.s.l., used as a cover of a ceramic conduit.
   LEG(ionis) I M(inerviae) P(iae) F(idelis)
9. Fragment of a roof tile (tegula). Cat. no. 206-13c. Dimensions [48.5] × 45.0 × 3.2 cm. Stamp imprint dimensions 17.1 × 3.8 cm. Find location: Sector XII, Hectare XVIII, Square 46, depth 46.67 m a.s.l., bottom of a ceramic conduit.
   LEG(ionis) I M(inerviae) P(iae) F(idelis)
10. Fragment of a roof tile (tegula). Cat. no. 210-13c. Dimensions [35.0] × [31.0] × 3.4 cm. Stamp imprint dimensions 17.3 × 3.6 cm. Find location: Sector XII, Hectare XVIII, Square 47, depth 46.88 m a.s.l., cover of a ceramic conduit.
    LEG(ionis) I M(inerviae) P(iae) F(idelis)
11. Fragment of a roof tile (tegula). Cat. no. 05-15c. Dimensions 56.5 × [31.0] × 3.5 cm. Stamp imprint dimensions 15.1 × 3.9 cm. Find location: Sector XII, Hectare XVIII, Square 109, depth 48.33 m a.s.l., rubble.
    LEG(ionis) I M(inerviae) P(iae) F(idelis)
12. Fragment of a roof tile (tegula). Cat. no. 15-15c. Dimensions [11.5] × [13.1] × 2.9 cm. Stamp imprint dimensions [10.0] × 3.9 cm. Find location: Sector XII, Hectare XVIII, Square 106, depth 47.77 m a.s.l., rubble (fragmented stone and shards of building ceramics).
    [L]EG(ionis) I M(inerviae) [P(iae) F(idelis)]

13. Fragment of a roof tile (tegula). Cat. no. 54-16c. Dimensions [26.0] × [38.0] × 3.8 cm. Stamp imprint dimensions [11.8] × 3.4 cm. Find location: Sector XII, Hectare XVIII, Square 85, depth 46.88 m a.s.l., wall impression.
[LEG(ionis)] I M(inerviae) P(iae) F(idelis)
14. Fragment of a roof tile (tegula). Cat. no. 61-16c. Dimensions [29.3] × [29.0] × 3.6 cm. Stamp imprint dimensions [16.5] × 3.7 cm. Find location: Sector XII, Hectare XVIII, Square 129, depth 47.58 m a.s.l., rubble containing building ceramics.
[L]EG(ionis) I M(inerviae) P(iae) [F(idelis)]
15. Fragment of a roof tile (tegula). Cat. no. 72-17c. Dimensions [8.5] × [10.5] × 2.9 cm. Stamp imprint dimensions [4.5] × 4.1 cm. Find location: Sector XII, Hectare XVIII, Square 148, depth 47.25 m a.s.l., rubble above floor level.
[LEG(ionis) I M(inerviae)] P(iae) F(idelis)
16. Fragment of a roof tile (tegula). Cat. no. 01-18c. Dimensions [24.5] × [13.2] × 3.9 cm. Stamp imprint dimensions 15.3 × 3.9 cm. Find location: Sector XII, Hectare XVIII, Square 108, depth 47.11 m a.s.l., bottom of a small pool at the "centurion's house".
[LEG(ionis) I] M(inerviae) P(iae) F(idelis)
17. Fragment of a roof tile (tegula). Cat. no. 10-18c. Dimensions [25.1] × [23.8] × 3.1 cm. Stamp imprint dimensions 15.6 × 4.0 cm. Find location: Sector XII, Hectare XVIII, Square 88, depth 47.13 m a.s.l., bottom of a small pool at the "centurion's house".
[LEG(ionis) I M(inerviae)] P(iae) F(idelis)

Legio XI Claudia

1. Brick fragment (*bessalis*). Cat. no. 66-11c. Dimensions [16.4] × [12.8] × 8.6 cm. Stamp imprint dimensions [7.6] × [3.2] cm. Find location: Sector XII, Hectare XVIII, Square 2, depth 46.22 m a.s.l., bottom of a dark-brown layer with containing charcoal and crushed building ceramics.
LEG(ionis) XI C(laudiae) [P(iae) F(idelis)]
2. Brick fragment. Cat. no. 01-12c. Dimensions [28.3] × [22.2] × 7.0 cm. Stamp imprint dimensions [9.0] × 3.2 cm. Find location: Sector XII, Hectare XVIII, Square 383, depth 46.22 m a.s.l., rubble.
[LEG(ionis)] XI C(laudiae) P(iae) P=F(idelis)
3. Brick fragment. Cat. no. 15-12c. Dimensions [10.7] × [13.5] × 7.8 cm. Stamp imprint dimensions [9.1] × 3.4 cm. Find location: Sector XII, relic found on the surface, location unspecified.
[L]EG(ionis) XI C(laudiae) P(iae) F(idelis)
4. Fragment of a roof tile (tegula)? Cat. no. 32-12c. Dimensions [17.0] × [15.1] × 3.3 cm. Stamp imprint dimensions [5.9] × 3.3 cm. Find location: Sector XII, Hectare XVIII, Square 65, depth 47.44 m a.s.l., rubble.
[LEG(ionis)] XI C(laudiae) P(iae) F(idelis)
5. Fragment of a roof tile (tegula)? Cat. no. 46-12c. Dimensions [25.1] × [18.5] × 3.5 cm. Stamp imprint dimensions [8.3] × 3.5 cm. Find location: Sector XII, Hectare XVIII, Square 6, depth 46.05 m a.s.l., element of a conduit structure (side wall).
[LEG(ionis)] C(laudiae) [P(iae) F(idelis)]
6. Fragment of a roof tile (tegula). Cat. no. 52-12c. Dimensions [58.0] × 47.3 × 3.0 cm. Stamp imprint dimensions [10.0] × [3.0] cm. Find location: Sector XII, Hectare XVIII, Square 6, depth 46.40 m a.s.l., element of a conduit structure (side wall).
LEG(ionis) XI C(laudiae) P(iae) P=F(idelis)

7. *Tegula mammata* (vertical heating system tile). Cat. no. 56-12c. Dimensions 53.8 × [31.5] × 3.0 cm. Stamp imprint dimensions [9.0] × 3.4 cm. Find location: Sector XII, Hectare XVIII, Square 6, depth 45.97 m a.s.l., bottom of a ceramic conduit.
   Impression considerably worn.
   [L]EG(ionis) XI C(laudiae) [P(iae) F(idelis)]
8. Fragment of a roof tile (tegula). Cat. no. 86-12c. Dimensions [23.5] × [19.5] × 6.5 cm. Stamp imprint dimensions [4.2] × [3.1] cm. Find location: Sector XII, Hectare XVIII, Square 6, depth 46.20 m a.s.l., structure of a ceramic conduit.
   [LEG(ionis) XI] C(laudiae) P(iae) F(idelis)
9. Brick fragment. Cat. no. 89-12c. Dimensions [22.5] × [13.8] × 6.3 cm. Stamp imprint dimensions [7.4] × 3.2 cm. Find location: Sector XII, Hectare XVIII, Square 26, depth 46.07 m a.s.l., ceramic conduit.
   LEG(ionis) XI C(laudiae) [P(iae) F(idelis)]
10. Brick fragment. Cat. no. 50-13c. Dimensions [16.0] × [17.0] × 3.9 cm. Stamp imprint dimensions [3.2] × 3.9 cm. Find location: Sector XII, Hectare XVIII, Square 86, depth 47.15 m a.s.l., ceramic floor.
   [LEG(ionis) XI] C(laudiae) P(iae) F(idelis)
11. Brick fragment. Cat. no. 94-13c. Dimensions [27.5] × [20.5] × 7.8 cm. Stamp imprint dimensions [8.8] × 3.2 cm. Find location: Sector XII, Hectare XVIII, Square 48, depth 47.53 m a.s.l., roof tile rubble.
   [LE]G(ionis) XI C(laudiae) P(iae) P=F(idelis)
12. Fragment of a roof tile (tegula). Cat. no. 113-13c. Dimensions [35.3] × [25.1] × 3.4 cm. Stamp imprint dimensions [5.2] × 3.3 cm. Find location: Sector XII, Hectare XVIII, Square 48, depth 47.46 m a.s.l., large roof tile rubble. LEG(ionis) X[I C(laudiae) P(iae) F(idelis)]

Abbreviations

CIL	*Corpus inscriptionum Latinarum*, Berlin.
IDR	*Inscriptiones Daciae Romanae*, vol. II: *Pars meridionalis inter Danuvium et Carpatos Montes*, ed. G. Florescu, C. Petolescu, Bucharest 1977.
RMR	R. O. Fink, *Roman Military Records on Papyrus*, London 1971.

Bibliography

Ciołek, Dyczek 2011	R. Ciołek, P. Dyczek, *Coins from Sector IV* (= *Novae. Legionary Fortress and Late Antique Town* 2), Warsaw.
Duch 2012	M. Duch, "'Flawijskie' stemple na cegłach i dachówkach łaźni legionowej w Novae (Moesia Inferior)", [in:] *Studia Flaviana*, vol. II, ed. L. Mrozewicz, Poznań, pp. 259–282.
Duch 2017	M. Duch, *Economic Role of the Roman Army in the Province of Lower Moesia (Moesia Inferior)*, Gniezno.
Dyczek 2016	P. Dyczek, "Novae, sektor XII. Baraki na I kohorta na VIII Augustov i na I Italijski legion", [in:] *Arheologičeski otkritiâ i proučvaniâ za 2015 godina*, Sofia, pp. 338–440.

Dyczek 2018a — P. Dyczek, "Nove, sektor XII: barakite na I kohorta na VIII Augustov i na I Italijski legion, [in:] *Arheologičeski otkritiâ i proučvaniâ prez 2017 godina*, Sofia, pp. 195–196.

Dyczek 2018b — P. Dyczek, "Wooden barracks of the First Cohort of the *legio VIII Augusta* from Novae (Moesia Inferior)", [in:] *Limes XXIII. Proceedings of the 23rd International Congress of Roman Frontier Studies, Ingolstadt 2015*, ed. C. S. Sommer, S. Matešić (= *Bayerisches Landesamt für Denkmalpflege. Sonderband* 4/1), Mainz, pp. 530–536.

Gerov 1998 — B. Gerov, "Die Grenzen der römischen Provinz Thracia bis zur Gründung des Aurelianischen Dakien", [in:] *Beiträge zur Geschichte der römischen Provinzen Moesien und Thrakien*, vol. III, ed. B. Gerov, Amsterdam, pp. 437–467.

Hanel 2002 — N. Hanel, "Ein Ziegelstempel der cohors XV voluntariorum c. R. aus der tegularia transrhenana im Flottenlager Köln-Marienburg (Alteburg)", *Zeitschrift für Papyrologie und Epigraphik* 139, pp. 293–296.

Harizanov 2015 — A. Harizanov, *Peŝi za keramika v dnešnite bălgarski zemi prez I–VI vek*, PhD thesis, Sofia.

Ivanov 2012 — R. Ivanov, "The Roman *limes* in Bulgaria (1st–6th c. AD)", [in:] *The Lower Danube Limes (1st–6th C. AD)*, ed. L. Vagalinski, N. Sharankov, S. Torbatov, Sofia, pp. 23–42.

Kolendo, Kowal 2011 — J. Kolendo, T. Kowal, "Stamps on ceramic pipes from Novae (Moesia Inferior)", Novensia 22, pp. 67–76.

Królczyk, Trynkowski 2001 — K. Królczyk, J. Trynkowski, "Napisy na cegłach i dachówkach", [in:] *Vademecum historyka starożytnej Grecji i Rzymu*, ed. E. Wipszycka, vol. I–II, Warsaw, pp. 219–220.

Majewski 1962 — K. Majewski, "Novae 1961. Tymczasowe sprawozdanie z wykopalisk Ekspedycji Archeologicznej Uniwersytetu Warszawskiego", *Archeologia* (Warsaw) 13, pp. 65–133.

Matuszewska 2006 — M. Matuszewska, "Bemerkungen zur Typologie der Ziegelstempel aus Novae (Moesia Inferior)", *Archaeologia Bulgarica* 10, pp. 45–63.

Sarnowski 1983 — T. Sarnowski, "Die Ziegelstempel aus Novae, I: Systematik und Typologie", *Archeologia* (Warsaw) 34, pp. 17–61.

Sarnowski 1987 — T. Sarnowski, "Zur Truppengeschichte Dakerkriege Traians. Die Bonner Legio I Minervia und das Legionslager Novae", *Germania* 65, pp. 107–122.

Sarnowski 2016–2017 — T. Sarnowski, "Novae und die Legio I Italica unter Trajan und Hadrian", *Archeologia* (Warsaw) 67, pp. 57–71.

Sarnowski forthcoming — T. Sarnowski, "Brick and tile stamps", [in:] *Living with the Army*, vol. II: *The Results of Remote Sensing and Fieldwalking Surveys in Novae (Lower Moesia)*, ed. A. Tomas, Warsaw.

Strobel 1988 — K. Strobel, "Anmerkungen zur Truppengeschichte des Donauraumes in der hohen Kaiserzeit, I: Die neuen Ziegelstempel der Legio I Minervia aus dem Lager der Legio I Italica in Novae in Moesia Inferior", *Klio* 70, pp. 501–511.

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LOTS OF PLUMBING, LITTLE *PLUMBUM*. THE LEAD PIPING IN NOVAE REVISITED ON THE OCCASION OF A NEW FIND FROM SECTOR 12

Abstract: In 2016, the remains of a lead pipeline in the form of two fistulae still linked together with a mortar sleeve were found at Sector 12 in Novae. This contribution discusses the use of lead piping in Novae in general and the water supply at Sector 12 in particular. The chemical analysis and context of the finds allow for considerations regarding the features of the legionary fortress in Flavian times.

Keywords: Novae, *legio I Italica*, Roman military water supply, lead piping, *fistulae*

Introduction

Strolling through Pompeii, even the untrained eye will spot lead piping sticking out at every corner: in the streets, in the houses, in the museum. Looking at the aqueducts of Novae[1] in turn, a legionary fortress in the province of Moesia Inferior located on the Danube in northern Bulgaria, not far from modern Svištov, once home for the *legio I Italica*,[2] one can easily discern a discrepancy in the remains: in virtually every fieldwork section, there are sewage/drainage canals, but there are far fewer conduits identified as supplying fresh water. There are several reasons for this, a major one being the fact that potential wooden conduits[3] would have decayed, while lead and terracotta[4] pipelines were easier to remove than canals dug into the ground (which in turn could quickly be refilled) and the lead — like any other metal — could be harvested and reused. Thus from the entire legionary camp and civil town we have a grand total of little more than 20 lead pipes or fragments thereof,[5] as well as some lead sheets for tightening conducts.[6] Novae is no exception in this regard, even though there exist Roman army forts with at least some intact lead conduits.[7] Apart from the archaeological context a given conduit is attributed to, the lead used for

[1] For an introduction to the topic of water supply in Novae with further literature, see Lemke 2018b.

[2] Research at Novae, Sector 12, is kindly supported by the National Science Centre (Narodowe Centrum Nauki), within the project: "Novae. Obóz legionowy i miasto późnoantyczne — kontynuacja badań. Baraki I kohorty legionu VIII *Augusta* i legionu I Italskiego", 2018/31/B/HS3/02593. Novae is being investigated since the 1960s, for further literature, see Sarnowski *et alii* 2012.

[3] Attested for instance in Germania: Jacobi 1934, pp. 52–53.

[4] Lemke 2021.

[5] Cf. Recław 2003. It is conceivable that a piece or two were discovered by colleagues and not (yet) published. See also Stefanov 1930–1931 and Biernacka-Lubańska 1997, p. 17, for the theory, that one of the two aqueducts supplying water from the area of modern Svištov over a length of *ca.* 6 km was entirely made of lead and included an elaborate reservoir.

[6] Biernacka-Lubańska 1997, p. 11.

[7] Stephens 1985.

piping and the mortar used in masonry canals can be analyzed on their own and provide useful information on the conduit and its chronology, especially when there are no stamps or inscriptions connected to the given object.

Sector 12

Since 2011, fieldwork is underway at Sector 12 in Novae [Fig. 1],[8] and the recent discoveries there gave the impulse for this paper. After almost a decade, the main task is still to establish the nature of the principal structure of the late first and second century. The *praetorium*, which should be expected East, West or South of the *principia* is an attractive candidate,[9] not only because of the layout of the courtyard-centered edifice, but also because the areas West and South of the *principia* are occupied by the second-century *thermae*[10] and the *via decumana*[11] respectively. The alternative

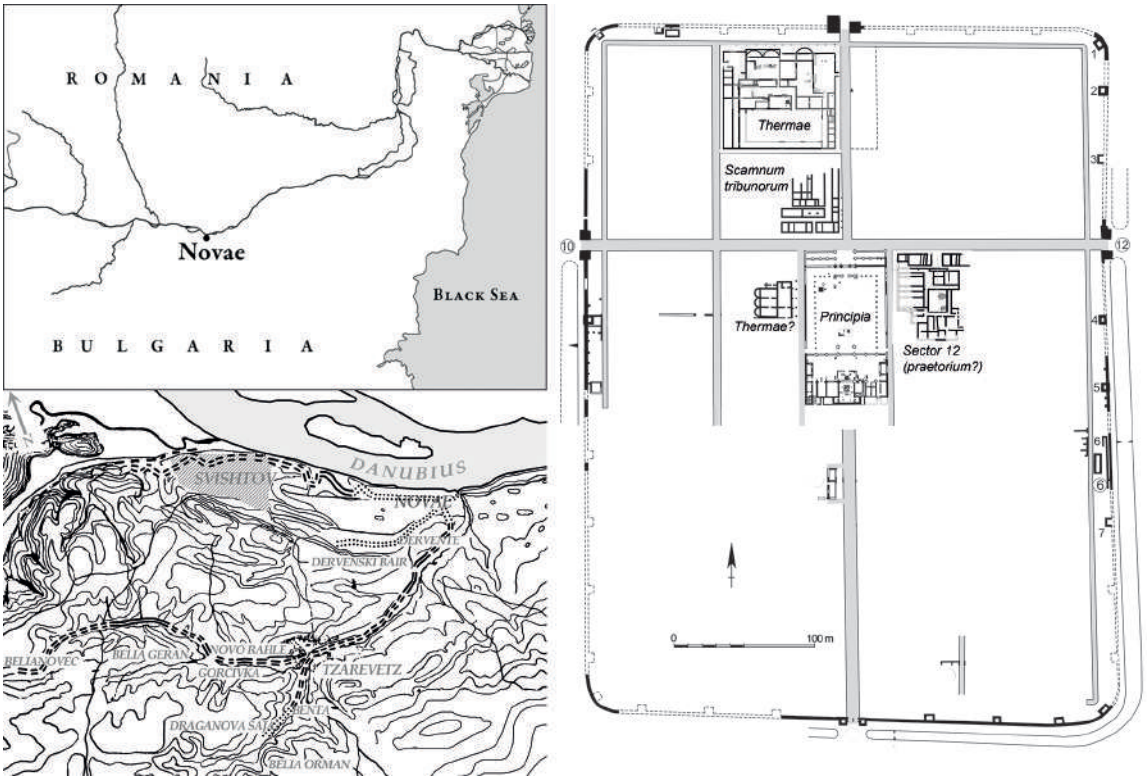

Fig. 1. Novae. Left: general location and aqueducts (compiled by M. Różycka).
Right: the legionary fort in Flavian times (slightly diachronic sketch plan, compiled by M. Lemke based on earlier plans made by J. Kaniszewski, T. Sarnowski, L. Kovalevskaâ, P. Zakrzewski, A. Biernacki, P. Dyczek, M. Lemke, B. Wojciechowski)

[8] For the given campaigns and further reading on Novae, see Lemke 2011; 2012; 2013; 2014; 2015; 2015–2016a; 2015–2016b.
[9] Lemke 2015–2016b, p. 337.
[10] Biernacki *et alii* 2016.
[11] Sarnowski *et alii* 2005, pp. 145–149. In spite of uncovering the *via decumana*, Sarnowski proposed the "not fully convincing conjecture" that the *praetorium* was located south of the *principia*, based on a contextless senatorial inscription (*ibidem*, p. 148).

idea of stone barracks with a centurion's house located at Sector 12 has also been proposed.[12] As mysterious as the building still may be, it has provided lots of useful information already, and there is no doubt the system of aqueducts and sewage channels visible here is quite intricate [Fig. 2].

The layout of these conduits is interesting not only because of its complexity, but also for the visible rearrangements undertaken during the late first / early second century. Along the western edge of the excavation area, adjacent to the eastern wall of the *principia*, runs directly from the south to the north a large canal without traces of a covering, possibly designed for rain-water, while the main sewage canal for the legionary building in Flavian times — whatever it was — runs closer to the current eastern edge, also precisely on a north-south axis. There is also a third smaller canal meandering southeast-northwest across a significant portion of the sector, draining water from a small basin added later to the courtyard of the edifice.

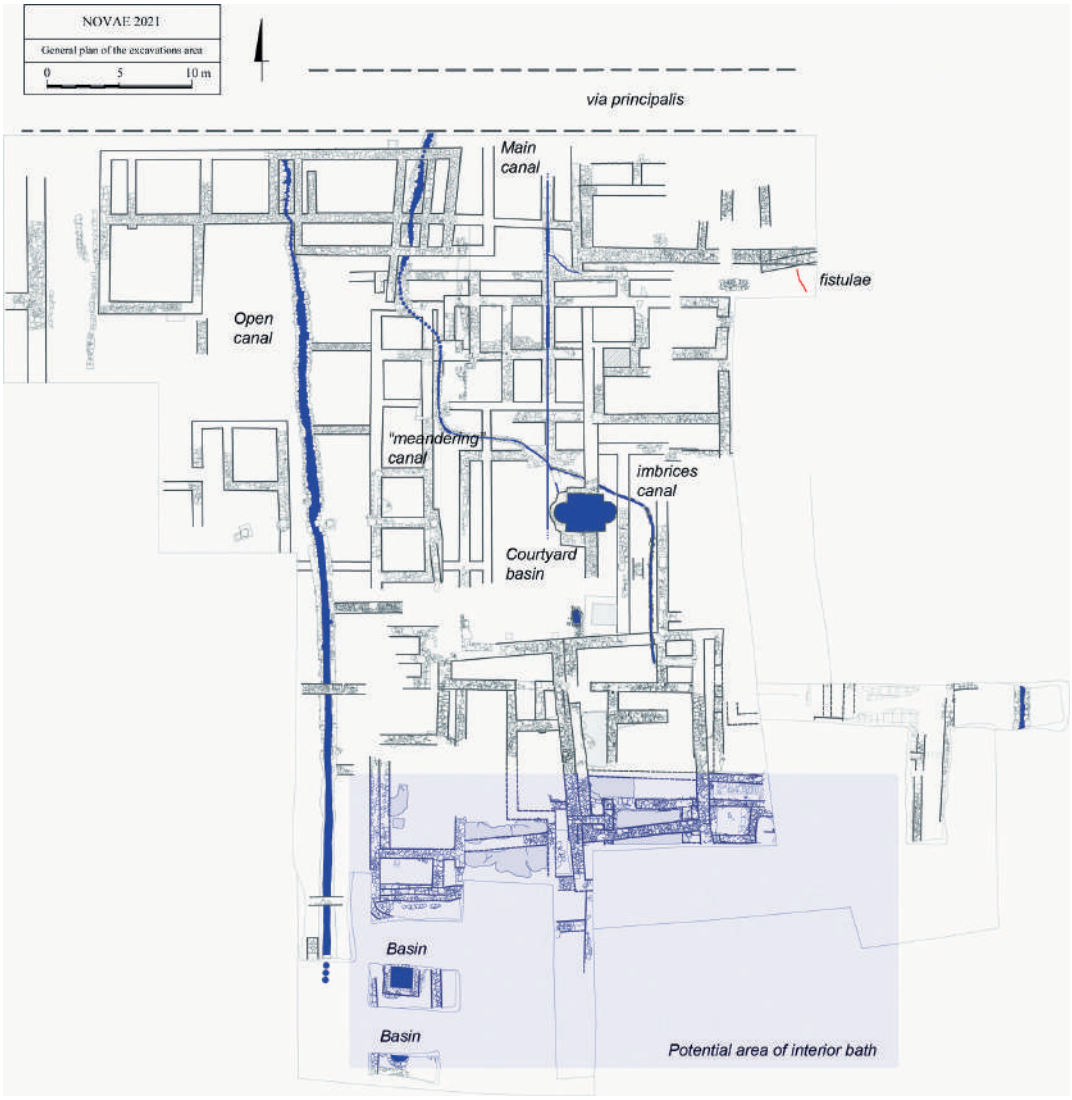

Fig. 2. Sector 12 and its system of aqueducts. The potential extent of the internal bath, the courtyard basin and the various conduits have been marked in blue in a diachronic fashion, the finding spot of the fistulae in red (compiled by B. Wojciechowski, M. Lemke)

[12] Dyczek 2018.

The main sewage channel passes under several walls. It was solidly built, consisting of medium-sized stones and bricks, which had been dug into the loess soil and were held together by white hydraulic mortar.[13] The last layer of the side walls, underneath the covering stones, consists of a row of flat tiles. The covers are big stone slabs while the bottom comprised *tegulae*. The depth measures *ca.* 0.6 m, the internal width 0.2 m, while the entire construction is 0.6 m wide. Towards the northern end of the trench, an additional tributary channel of similar build directed its waters into this drain, while at the southern edge of the excavated area a ceramic pipeline made of linked *imbrices* set in virgin soil and feeding into the main channel was discovered. The latter, somewhat unusual conduit must have been built in Flavian times, too, before the creation of the small courtyard pool which rendered the main canal obsolete (at least the stretch of it uncovered at Sector 12).

At several other locations in Novae, canals of identical build have been found,[14] hinting at an encompassing, synchronic drainage layout established in Flavian times, i.e. the construction phase of the fortress.[15] The canal was intersected when a basin unearthed in what in 2020 is the central part of the trench was built. Water from this basin, added to the courtyard of the building (which may have had another function at that point in time), was drained via a „meandering" channel with a depth of *ca*. 0.35 m. Its walls are made of large stones and a layer of bricks beneath the covering and its width gradually decreases on the excavated stretch from 25 to 12 cm (possibly to increase water pressure before reaching a latrine). Interestingly, the cover slabs are *tegulae* of *legiones I Italica* and *I Minervia pia fidelis*.[16] The bottom also consists of *tegulae*, sometimes stamped *LEG I ITAL*, but also with a number of stamps of *legio XI Claudia*.

Apparently, these new features were added at a time of reorganization within the fortress, perhaps in the early second century, when after Trajan's Dacian Wars Moesia enjoyed a period of intensive building activity. The Flavian bath had been torn down earlier and the new *thermae* were built west of the *principia*.[17] The availability of both spare material from the disassembled baths, as well as professionals specialized in building hydraulic constructions might have been taken advantage of to also construct smaller features, like this basin, which had no visible water inlet and was likely filled with rain water. A hint supporting this theory is the fact that the stamps on the base tiles of the channel, bearing stamps of the first legion, represent early, Flavian types[18] — like those used in the Flavian *thermae*. But the feature may also have been built at a later date. Either way, it seems likely that the bath was an outdoor structure on the courtyard with a hanging roof attached to the main roof but otherwise open.[19]

However, as fieldwork progresses towards the south at Sector 12, the recent discovery of a small internal bath occupying the southern wing of the principal edifice is just as important for understanding the drainage scheme here. This feature, unearthed since 2018, was oriented along an East-West axis with at least two rooms equipped with a hypocaust heating system. All rooms apparently had a floor made of hydraulic mortar. Even a bath as modest as this still generated lots of sewage water, but so far, the points where the drainage system attached to the bath have not been detected. However, it seems likely that one of the aforementioned canals running straight towards the north is a likely candidate, or even both. This leads to chronological ramifications: the covered channel was interrupted by the courtyard basin in Trajanic times or later. This would suggest that the roofed bathhouse was a feature of the building (*praetorium*?) in Flavian times.

[13] The mortar from this and several other masonry conduits has been sampled and will be published soon (Lemke, Daszkiewicz forthcoming). The analysis is possible thanks to a microgrant within the Excellence Initiative programme of the University of Warsaw (PSP 501-D356-20-0004316).

[14] Lemke 2018b; Kowal 2009; Tomas 2017.

[15] Lemke 2018a.

[16] Lemke 2014, p. 193.

[17] On the Flavian *thermae*, see Lemke 2011; Dyczek 2009. On the second-century *thermae*, see Biernacki *et alii* 2016.

[18] Duch 2012; 2019.

[19] Lemke 2015–2016a, p. 329.

After the addition of the courtyard basin, the water needed to be disposed of another way, perhaps using the open canal in the western part of the sector. Alternatively, the bathhouse could have been another exclusively "Flavian *thermae*" at Novae, albeit far smaller than the big one at Sector 4, in which case it fell out of use in Trajanic times, the space was arranged in a different manner and the legate could take a bath in fresh air on his courtyard or alternatively join his soldiers in the large bathhouse just across the *principia*.

The lead pipes

Not far to the northeast from this private bath and quite close to the main canal of the first phase at Sector 12, a particular discovery was made in 2016: the remains of a lead pipeline in the form of two *fistulae* still linked together with a mortar sleeve/ferrule [Fig. 3]. The piping was aligned towards the north-west but not in its original position. The total length is 242 cm, making it one of the longer stretches of lead piping discovered at Novae. The single pipes measure 129 and 113 cm respectively, their walls are 4 mm thick and shaped to form a circumference of 14 cm and inner diameter of *ca.* 3 cm. The mortar sleeve/ferrule is 3 cm thick, its original length must have been around 12 cm. The lead sheets had been bent, and then hot-pressed from the top and from the side, with some flat tool [Fig. 4].

The pipes likely belonged to a conduit from the late first or early second century AD and were discarded not too long afterwards, given the stratigraphic position of the pit they were deposited in and the fact they were not used as scrap metal. Most of the few *fistulae* found in Novae that could be connected to any structure at all were delivering water to a bath, so it appears likely these two pipes were part of the conduit that once provided water to the aforementioned small *thermae* some 40 m to the south.

Fig. 3. The lead fistulae upon discovery (photo by M. Lemke)

Fig. 4. Close-up of the fistulae: section, folding seam and the ferrule/sleeve (photo by P. Dyczek)

A sample from the pipes found in 2016 was examined in a laboratory, including the external surface and the internal sediment. The analysis showed that the pipe was made of high percentage lead (93.44%), with the surface slightly contaminated with silicon (2.14%), phosphorus (1.36%), clay (0.78%) and iron (0.50%), all of which probably originated from the object's deposit in the ground. Therefore, it should be assumed that the original *plumbum* share oscillated above 98%. On the other hand, the internal sediment showed, apart from the presence of lead (64.02%), significant amounts of silicon (19.63%), clay (5.85%), iron (4.54%) and phosphorus (3.89%), all elements that were probably in the flowing water and gradually deposited on the pipe,[20] an incrustation effect commonly known as sinter.[21] The analysis is generally in line with the results of previous investigations conducted on lead pipes from Novae,[22] such as a piece of piping from the *scamnum tribunorum*, dated by context to the turn of the first/second century. Apart from the contamination, a low silver and sulphur, but high copper content is characteristic. The lead used for a pipe in the *piscina* of the *frigidarium* of the Flavian baths has exactly the same characteristics.[23]

These and the other few sections of lead pipes discovered earlier in Novae are generally short. The longest ones, excavated from debris layers in *principia*, measured between 64 and 130 cm. Two sections, with a total length of 198 cm, have identical parameters: a width of 4.6–4.9 cm and a thickness of 0.8 cm. Another piece, over 70 cm long, has a larger width of 11.4 cm but in turn a wall thickness of only 0.6 cm. Another example with the same wall thickness was slightly higher: 6.4 cm. The relative thickness of the walls is a clear hint that water must have flowed under some pressure,[24] a necessity at least for the baths with their considerable requirements.

[20] The analysis was performed by Marcin Biborski, head of the Laboratory of Archaeometallurgy and Monument Conservation in Cracow. I express my gratitude to Piotr Dyczek for the possibility to publish these results here.

[21] Sinter has been found to be a valuable source of information on the relative chronology of Roman aqueducts: Schulz 1986; Sürmelihindi *et alii* 2013. Cf. Hodge 2002, pp. 227–232.

[22] Biernacka-Lubańska 1998; Dyczek 2002.

[23] Dyczek 2002, p. 274.

[24] Recław 2005, p. 44.

A pipe found near the *sacellum* of the military hospital (Sector 4), preserved to a length of 24.6 cm, had a smaller width, 3.3 cm while being also 0.6 cm thick. The parameters of pipes uncovered in the second-century baths (Sector 10) were comparable: a width from 6.5 to 7.0 cm and their walls 0.5 cm thick. However, based on the more differentiated length of the preserved sections, ranging from 20 to 107 cm, it has been suggested that they were part of the internal water system of the *thermae* and not the aqueduct that provided the water in the first place.[25] Thus by comparison the recently discovered *fistulae* fit in well, albeit being on the thin side with 0.4 cm.

Lead in Roman aqueducts

Lead, really a by-product of the ancient silver smelting process, was produced in the Roman Empire with an estimated peak production of 80,000 metric tons per year — a truly industrial scale.[26] The metal was used in many ways, but particularly for urban plumbing. Lead was so popular in water supply for the relative ease it could be worked with and its durability, and even though the Romans had at least some idea of its poisonous effect,[27] no other material came close in terms of resisting water pressure.[28] The method of manufacturing lead pipes is recorded by Vitruvius and Frontinus. The lead was poured into sheets of a uniform length, which were bent to form a cylinder and soldered at the seam. The lead pipes could range in size from approximately 1.3 cm up to 57 cm diameter depending on the required rate of flow. The production process of lead was described in detail by M. Biernacka-Lubańska,[29] while T. Hodge pointed out that the difficult part was not so much producing a single *fistula*, but in connecting them to form a conduit, without the convenience of a mobile blowtorch.[30]

Lead in Novae

Knowing where lead found at a given site came from is interesting, since the transport of this material in large quantities could be "ruinously expensive".[31] Dyczek suggests that in the first period of occupation, lead was brought in to Novae from a single source not far from the fortress.[32] Even though this may have been the preferable solution, it appears questionable that at a time, when due to the limitations of the local economy a large part of supplies and resources had to be imported from far away,[33] this cumbersome commodity could be harvested and pre-processed in the vicinity. It would also contrast with the data we have on the provenance of lead in Late Antiquity, when in spite of the advanced development, lead would still be imported from outside the province. At least some significant part of the lead in Novae was brought in from the mines of *metalla Triconensia* in Moesia Superior / Moesia Prima (Kosmaj in modern Serbia), as we know from the find of a lead ingot, a semi-product pending further processing.[34] This *massa plumbea*

[25] Recław 2005, p. 44.
[26] Hodge 2002, p. 156.
[27] Vitruvius recommended the use of ceramic pipes because these delivered more wholesome water than lead pipes (*De arch.* 8.6.10–11). His general recommendation was repeated by other ancient authors. Cf. Paprocki 2012.
[28] An interesting side note regarding water pressure is the consideration that the enormous Roman aqueduct bridges, as glorious as they may appear today, were built as the cheaper option as opposed to building a syphon across the slopes and bottom of a valley, since the amount of lead required to withstand the amassed water pressure and the relevant sum of money would have been exorbitant: Hodge 2002, pp. 147–157.
[29] Biernacka-Lubańska 1998.
[30] Hodge 2002.
[31] Hodge 2002, p. 156.
[32] Dyczek 2002, p. 279.
[33] Lemke 2016, p. 19.
[34] Dušanić 1989–1990; Kolendo 1986; 1994; Recław 2005, p. 42; Dyczek 2002, p. 271.

was dated on the basis of its inscriptions to the years 364–395.[35] A sample from this ingot was analyzed and compared to 88 other lead pieces of various function from Novae.[36] It turned out that all objects from the time when Novae was supplied from Upper Moesia display a homogenous profile with a predominance of copper, similar standards of silver, bismuth, sulfur and antimony.[37] Based on the data it was also suggested that in the first and early second century, the lead brought to Novae all came from a single unidentified *plumbaria*, and that the source for lead changed over the course of the second century.[38]

In spite of the general scarcity of lead piping found in Novae, there is one object that has served to highlight the capabilities of Roman hydraulic engineering overall, even though it is not preserved and the remaining description of it has to be considered semi-legendary. The object in question is the spectacular lead tank (*caput aquae*) allegedly once located at the beginning of the aqueduct supplying Novae with water from the area of modern day Svištov.[39] The "particularly striking"[40] device was notable for being shaped in an upright fashion and extremely large (7 × 1.2 × 1.2 m) for a lead tank. Unfortunately, the object was disassembled in 1915 and there is no possibility to verify the anecdotal details provided by S. Stefanov[41] that entered scientific canon since.

Conclusion

The two fistulae from Sector 12 bring nothing fundamentally new to the discussion, although they do underline the connection between the special hydraulic requirements of Roman baths and the use of lead piping. But even with this small case study, I am very confident that in the greater scheme of things one should take for granted lots of lead piping in Novae during the operation period of the legionary fort,[42] if not on a Pompeiian scale then at least in significant amounts across the main clients of the plumbing grid: the baths for the soldiers and all smaller, private baths, mostly in the houses of high officers. As so often, in future fieldwork lies the hope of finding a larger intact portion of plumbing with more *plumbum*.

Bibliography

Biernacka-Lubańska 1997 — M. Biernacka-Lubańska, "System wodociągowy w Novae" [The water supply system at Novae], *Novensia* 9, pp. 5–80.

Biernacka-Lubańska 1998 — M. Biernacka-Lubańska, "Roman lead pipe production technology", *Novensia* 10, pp. 31–45.

Biernacki *et alii* 2016 — A. Biernacki, M. Budzyńska, E. Gencheva, A. Jasiewicz, E. Yu. Klenina, S. Mihajlov, Ł. Różycki, P. Vladkova, *The Large Legionary Thermae in Novae (Moesia Inferior)* (= *Novae. Studies and Materials* 5), Poznań.

Duch 2012 — M. Duch, "„Flawijskie" stemple na cegłach i dachówkach łaźni legionowej w Novae (Moesia inferior)", [in:] *Studia Flaviana II*, ed. L. Mrozewicz, Poznań, pp. 259–282.

[35] Kolendo 1994, p. 91.
[36] Dyczek 2002, p. 271.
[37] Dyczek 2002, p. 273.
[38] Dyczek 2002, pp. 274–275. Cf. Recław 2005, pp. 42–43.
[39] Biernacka-Lubańska 1997, pp. 19–22; Tsarov 2012, pp. 203–205.
[40] Hodge 2002, p. 301.
[41] Stefanov 1930–1931, pp. 270–271.
[42] For the story about 10 m of intact piping found during agricultural works and its pitiful fate, see Majewski 1962, p. 104.

Duch 2019 — M. Duch, "*Legio I Minervia* and *legio XI Claudia* stamps on building ceramics from Sector XII at Novae — a contribution to studies of military building material production centres", *Novensia* 30, pp. 7–19.

Dušanić 1989–1990 — S. Dušanić, "Notes on Late Roman mining in Šumadija", *Starinar* 40–41, pp. 217–224.

Dyczek 2002 — P. Dyczek, "Physico-chemical analyses of lead objects from Novae", [in:] *I bronzi antichi: Produzione e tecnologia. Atti del XV Congresso Internazionale sui Bronzi Antichi*, ed. A. R. Giumlia-Mair (= *Monographies Instrumentum* 21), Montagnac, pp. 269–280.

Dyczek 2009 — P. Dyczek, "Flavian baths of *legio I Italica* from Castrum Novae", [in:] *Limes XX. XX Congreso Internacional de Estudios sobre la Frontera Romana. XXth International Congress of Roman Frontier Studies, Léon (España), Septiembre, 2006*, ed. A. Morillo, N. Hanel, E. Martín (= *Anejos de Gladius* 13), Madrid, pp. 1477–1485.

Dyczek 2018 — P. Dyczek, "Novae — Western Sector (Section XII), 2011–2018. Preliminary report on the excavations of the Center for Research on the Antiquity of Southeastern Europe, University of Warsaw", *Novensia* 29, pp. 27–71.

Hodge 2002 — A. T. Hodge, *Roman Aqueducts & Water Supply*, Duckworth.

Jacobi 1934 — H. Jacobi, "Die Be- und Entwässerung unserer Limeskastelle", *Saalburg-Jahrbuch* 8, pp. 32–57.

Kolendo 1986 — J. Kolendo, "Le lingot de plomb trouvé à Novae et ses inscriptions", *Archeologia* (Warsaw) 37, pp. 87–98.

Kolendo 1994 — J. Kolendo, "Suite sur le lingot de plomb portant des inscriptions mis au jour à Novae", *Archeologia* (Warsaw) 45, pp. 91–93.

Kowal 2009 — T. Kowal, "Skupisko amfor odkryte w sondażu 2/2007 na odcinku IV" [The assemblage of amphorae in trial trench 2/2007 at Sector IV], *Novensia* 20, pp. 109–124.

Lemke 2011 — M. Lemke, "Fieldwork at Novae (Bulgaria) in 2009 and 2010", *Światowit* 8 (49), fasc. A, pp. 191–194.

Lemke 2012 — M. Lemke, "Fieldwork at Novae 2011", *Światowit* 9 (50), fasc. A, pp. 195–200.

Lemke 2013 — M. Lemke, "Fieldwork at Novae 2012", *Światowit* 10 (51), fasc. A, pp. 151–156.

Lemke 2014 — M. Lemke, "Fieldwork at Novae 2013", *Światowit* 11 (52), fasc. A, pp. 189–196.

Lemke 2015 — M. Lemke, "Fieldwork at Novae 2014", *Światowit* 12 (53), fasc. A, pp. 193–203.

Lemke 2015–2016a — M. Lemke, "Fieldwork at Novae 2015", *Światowit* 13–14 (54–55), fasc. A/B, pp. 329–335.

Lemke 2015–2016b — M. Lemke, "Fieldwork at Novae 2016", *Światowit* 13–14 (54–55), fasc. A/B, pp. 337–342.

Lemke 2016 — M. Lemke, "Danube, limes & logistics. Some thoughts on Roman army supply chains in Moesia inferior", *Novensia* 27, pp. 9–38.

Lemke 2018a — M. Lemke, "Advocatus diaboli — What if it was not the Eighth Legion that built Novae?", *Novensia* 29, pp. 73–86.

Lemke 2018b — M. Lemke, "The water supply of the legionary fortress Novae (Bulgaria)", [in:] *Limes XXIII: Proceedings of the 23rd International Limes Congress, Ingolstadt 2015 / Akten des 23. Internationalen Limeskongresses in Ingolstadt 2015*, ed. S. Matešić, C. S. Sommer, Mainz, pp. 1015–1023.

Lemke 2021 — M. Lemke, "Wasserversorgung mit einem Hauch von Selbstdarstellung. Zu den gestempelten flavischen Tonrohren aus Novae", [in:] *Antiquitas Aeterna. Classical Studies Dedicated to Leszek Mrozewicz on his 70th*

Birthday, ed. K. Balbuza, M. Duch, Z. Kaczmarek, K. Królczyk, A. Tatarkiewicz (= *Philippika* 153), Wiesbaden, pp. 185–197.

Lemke, Daszkiewicz forthcoming — M. Lemke, M. Daszkiewicz, "Mixing it up. An analysis of hydraulic mortars used in the conduits and sewage canals of the Roman legionary fortress Novae (Bulgaria): composition and context", *Prähistorische Zeitschrift*.

Majewski 1962 — K. Majewski, "Novae 1961. Tymczasowe sprawozdanie z wykopalisk Ekspedycji Archeologicznej Uniwersytetu Warszawskiego" [Novae 1961. Preliminary report on the excavations of the Archaeological Expedition of the University of Warsaw], *Archeologia* (Warsaw) 13, pp. 65–133.

Paprocki 2012 — M. Paprocki, "*De plumbo pestilenti*. Kwestia zatruć ołowiem w starożytnym Rzymie" [On lead poisoning in ancient Rome], *Starożytności* 3/1, pp. 45–62.

Recław 2003 — J. Recław, "Remarks on the lead waterworks at Novae", *Novensia* 14, pp. 85–96.

Recław 2005 — J. Recław, "Wykorzystanie ołowiu w Novae" [The use of lead at Novae], *Novensia* 16, pp. 41–50.

Sarnowski *et alii* 2005 — T. Sarnowski, L. Kovalevskaja, J. Kaniszewski, "Novae — *castra legionis*, 2003–2005. Preliminary report on the excavations of the Warsaw University Archaeological Expedition", *Archeologia* (Warsaw) 56, pp. 141–162.

Sarnowski *et alii* 2012 — T. Sarnowski, A. B. Biernacki, M. Lemke, A. Tomas, P. Vladkova, *Novae. An Archaeological Guide*, Warsaw.

Schulz 1986 — D. Schulz, "Schichtungen im Kalksinter der römischen Wasserleitung nach Köln. Eine Hilfe zur relativen Datierung", [in:] *Atlas der römischen Wasserleitungen nach Köln*, ed. K. Grewe, Cologne, pp. 263–268.

Stefanov 1930–1931 — S. Stefanov, "Rimskite vodoprovodi na Novae" [The Roman aqueducts of Novae], *Izvestiâ na Bălgarskiâ arheologičeski institut* 6, pp. 269–279.

Stephens 1985 — G. Stephens, "The Roman aqueduct at Chester", *Journal of the Chester Archaeological Society* 68, pp. 59–69.

Sürmelihindi *et alii* 2013 — G. Sürmelihindi, C. Passchier, C. Spötl, P. Kessener, M. Bestmann, D. Jacob, O. Baykan, "Laminated carbonate deposits in Roman aqueducts: origin, processes and implications", *Sedimentology* 60, pp. 961–982.

Tomas 2017 — A. Tomas, "Arheologičeski proučvaniâ na ukrepitelnata sistema i razširenеto na Nove", *Arheologičeski otkritiâ i razkopki* 2017, pp. 272–274.

Tsarov 2012 — I. Tsarov, "The aqueducts of the Roman camps on the Lower Danube", [in:] *The Lower Danube Roman Limes (1st–6th c. AD)*, ed. L. F. Vagalinski, N. Sharankov, S. Torbatov, Sofia, pp. 195–210.

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IN SEARCH OF THE ORIGINS OF THE ROMAN CBM FOUND AT NOVAE

Abstract: The aim of the extensive research project on ceramic raw materials found in the vicinity of the Roman *castrum* of Novae was to test the hypothesis put forward by Prof. Piotr Dyczek (Antiquity of Southeastern Europe Research Center University of Warsaw) that most of the ceramic building material (CBM) used at Novae was made in workshops local to the Novae region — workshops whose output relied on ceramic raw materials locally available within that region. The results from the analysis of nineteen raw material samples were compared with the results of CBM analysis as well as the results of analysis of common ware, table ware and legionary pottery. The sampled ceramic fragments were subjected to various laboratory analyses. These included: chemical analysis by WD-XRF, thin-section studies, X-ray diffraction, MGR-analysis, estimation of physical ceramic properties (open porosity, water absorption and apparent density) and K-H analysis. Raw material analyses included: estimation of water of plasticity, a firing test, an *à la* ceramics test (MGR-analysis), chemical analysis by WD-XRF, thin-section studies, X-ray diffraction (XRD) of material at the green stage (natural sample, complexed with glycerol, calcined at 500°C) and X-ray diffraction after firing *à la* ceramics at various temperatures. Of the 54 analysed CBM samples only five are outliers from beyond the region. The remaining CBM samples represent products made at workshops local o the Novae region.

Keywords: ceramic building material, legionary pottery, common ware, table ware, Novae, WD-XRF, MGR-analysis, thin-section studies, firing test, *à la* ceramics test, X-ray diffraction

Introduction

The aim of the extensive research project on ceramic raw materials found in the vicinity of the Roman *castrum* of Novae was to test the hypothesis put forward by Prof. Piotr Dyczek (Center for Research on the Antiquity of Southeastern Europe, University of Warsaw) that most of the ceramic building material (CBM) used at Novae was made in workshops local to the Novae region — workshops whose output relied on ceramic raw materials locally available within that region.

Fifteen raw material samples were collected during a field survey. Also available were a further two samples of raw material collected from the Novae site and analysed in 2007 (clay samples taken from a geological stratum beneath the *porta Praetoria*, and from beneath the floor of feature 9/2007), and two samples taken from the side of an escarpment. The map in Fig. 1 shows the underlying geology[1]

[1] Geological map after Vangelov *et alii* 2013 with changes by M. Daszkiewicz and G. Schneider.

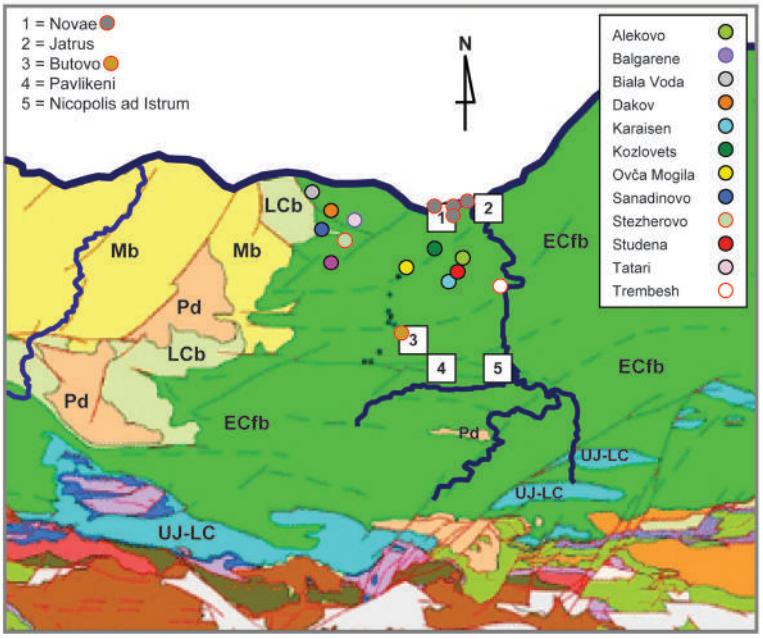

Fig. 1. Map with the underlying geology and the locations from which clay samples were taken (geological map after Vangelov *et alii* 2013 with changes by M. Daszkiewicz and G. Schneider).
Mb = Miocene basins; Pd = Paleogene deposits on the Moesian Platform;
LCb = Late Cretaceous basins on the Moesian Platform;
Ecfb = Early Cretaceous foreland basin;
UJ-LC = Upper Jurassic-Lower Cretaceous

and the locations from which samples were taken. The results from the analysis of nineteen raw material samples were compared with the results of CBM analysis. A total of 54 CBM fragments were examined.[2] Roof tiles (including two *imbrices*) were predominant among the analysed CBM, but bricks (including two *bessales* and one *sesquipedalis*), pipes, one *tubulatio* and a fragment of floor tile were also analysed. Sixteen CBM fragments came from features dated to the Flavian period, seven were dated to the early Antonine dynasty (Trajan period), thirteen to the latter half of the second / early third century, fourteen to the third century and three of the analysed CBM samples came from features dated to the fourth century. In addition, the results of both the CBM and raw material analyses were compared with the results obtained in 2007 from the analysis of pottery vessels: thirteen sherds of common ware dated to the Flavian period (recovered from hospital and bathhouse contexts) and nine sherds representing Flavian legionary pottery.

Because CBM, like most other categories of archaeological ceramics (various types of pottery, terracotta, lamps), was always made with the use of aluminosilicates and silicates as well as clay-carbonate raw materials,[3] the basic ingredient of the ceramic body consisted of various types of clay. The fabrics of the CBM used in Novae, which were analysed in this study, were made from bodies consisting of both a plastic and a non-plastic part. Each part comprises a raw material characterised by a specific chemical composition and mineralogical (petrographic) composition. This binary nature of the ceramic body composition had to be taken into account during the analysis

[2] The first series was performed in 2007, when four samples of CBM were analysed (none of the results have previously been published). A further 50 CBM samples were analysed in 2020.

[3] Only a small proportion of ancient ceramics are made from raw materials with a clay mineral content of less than 40%. Examples include quartz ceramics (Egyptian faience, Islamic quartz pottery), frit, and bone china.

of the CBM. The same was true when analysing the raw materials, i.e., the composition of the plastic as well as the non-plastic parts of both ceramics and raw materials had to be determined. To this end, the sampled ceramic fragments were subjected to various laboratory analyses. These included: chemical analysis by WD-XRF, thin-section studies, X-ray diffraction, MGR-analysis, estimation of physical ceramic properties (open porosity, water absorption and apparent density) and K-H analysis. Raw material analyses included: estimation of water of plasticity, a firing test, an *à la* ceramics test (MGR-analysis), chemical analysis by WD-XRF, thin-section studies, X-ray diffraction (XRD) of material at the green stage (natural sample, complexed with glycerol, calcined at 500°C) and X-ray diffraction after firing *à la* ceramics at various temperatures.[4] Not all of these analytical methods were used on each sample. Analyses were performed according to a *step-by-step* strategy (both for the ceramic fragments and the raw material samples). The use of a *step-by-step* strategy greatly increased the time needed to perform all of the analyses and evaluate their results; however, it was essential to adopt this strategy in order to keep the cost of analysis to the required minimum.

The results of MGR-analysis, the firing test and *à la* ceramics test are presented at the end of this article in Pls. 1–15. Micrographs of typical fabric images seen in the polarising microscope can be seen in Pls. 16–28.

Terminology

Objects made from ceramic materials are produced by shaping and firing a ceramic mass. A ceramic material is defined as an inorganic, non-metallic material formed from a raw material at room temperature and converted into a permanent solid mass by firing. Contemporary ceramics are made from a broad range of materials.[5] However, archaeological ceramics, with only a few exceptions (see footnote 2), are clay-based ceramics referred to as "pottery" (pottery = all ceramic wares that contain clay when formed, except technical, structural, and refractory products). Thus, in the case of clay-based ceramics it is essential to define the term "clay".

The word "clay" is used as a textural term (referring to grain size) and as a material term (referring to a material with specific properties).

In addressing the definition of the word "clay" as a textural term, Anne D. Wilkins noted that "Various size terms are in common use and have been adopted by geologists, but due to the lack of standardisation, the terms often mean different things to different people".[6]

In sedimentology, the most commonly used grain-size scale for clastic sediments is the one which was introduced by Udden in 1914,[7] and modified by Wentworth in 1922[8] (known as the Udden-Wentworth scale). In this scale the clast diameter in millimetres is used to define the different sizes on the scale [Fig. 2a]. Gravel is defined as clasts of grain size larger than 2 mm in diameter (these are divided into granules, pebbles, cobbles and boulders depending on their size). Sand is material with a grain size ranging from 0.0625 mm to 2 mm in diameter. Sand grains can be further divided into five classes: very coarse, coarse, medium, fine and very fine. Silt is the term for clastic material with a grain size of between 0.0039 mm and 0.0625 mm in diameter, which can

[4] Literature to methods, see, e.g., Daszkiewicz 2014; Daszkiewicz, Schneider, Bobryk 2021; Daszkiewicz, Maritan 2017; Daszkiewicz *et alii* 2016.

[5] It is worth noting that the Anglo-Saxon term "ceramics" can be used to refer to a variety of inorganic materials, including glass, enamel, and glass-ceramics as well as plaster, lime and cement.

[6] Wilkins 2010, pp. 2–12.

[7] Udden 1914.

[8] Wentworth 1922.

be divided into coarse, medium, fine and very fine silt. "Clay" is the term used for the finest grade of clastic particles, namely particles smaller than 0.0039 mm in diameter (1/256 mm). In addition to this size limit for clay particles, other size limits are also used to separate clay particles from silt particles. An upper size limit of 1 μm in diameter for clay-sized particles is used by colloid chemists, whilst an upper size limit of 2 μm for clay-size material is currently used by engineers who have to adhere to the European Standard.[9]

Clay-sized particles consist primarily of a group of minerals known as clay minerals. The size of common clay minerals[10] is shown in Fig. 2b (the size of clay minerals is given in nanometres). The properties of clay minerals can make it difficult to correctly assess the content/distribution of silt-sized and clay-sized particles in a given material. This is due to the fact that clay minerals can form flocculants of 10–20 μm[11] that are resistant to disaggregation.[12]

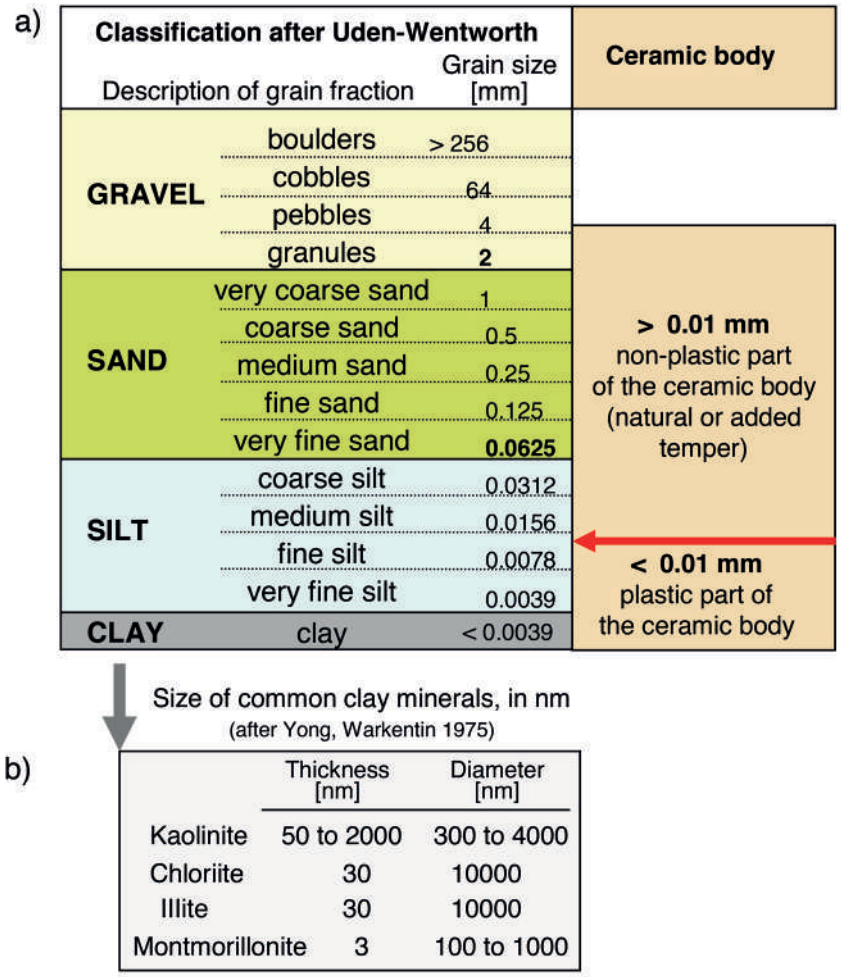

Fig. 2. Grain size classification: a = grain-size scale for clastic sediments and size of common clay minerals; b = size of common clay minerals

[9] Standard EN ISO 14689-1: 2003: Geotechnical investigation and testing — Identification and classification of rock — Part 1: Identification and description.

[10] Yong, Warkentin 1975, after Holtz, Kovacs 1981, p. 104.

[11] Sometimes 50–500 μm microflocs of clay minerals are also observed (Tan *et alii* 2017).

[12] Tan *et alii* 2017.

Unlike fine and very fine silt, coarse and medium silt can be seen with the naked eye or with a hand lens. However, individual clay-sized particles can be seen neither with the unassisted eye nor with a hand lens. Macroscopically, fine and very fine silt can be distinguished from clay particles using sensory analysis involving the tongue, teeth and palate: silt feels gritty, whilst clay feels smooth. The size of these grains is generally too small for optical techniques to be of any use in their identification. Scanning electron microscopy and X-ray diffraction can be used to identify minerals in these fractions.

In the case of textural classification of indurated fine-grained rocks, a popular means of classifying clay-silt-sand-grained rocks based on ternary diagrams is that proposed by Folk in 1974;[13] this classification system is shown in Fig. 3. Rocks in which most of the particles are clay-sized are classified as claystone. If silt-sized particles predominate, the rock is classified as siltstone; mixtures of more than one-third clay-sized and silt-sized particles are referred to as mudstone.[14] According to this classifications, claystone, mudstone and siltstone can also include up to 10% sand-size particles. If there is 10–50% sand-sized particles in any of these rocks then they are referred to respectively as sandy claystone, sandy mudstone and sandy siltstone.

Another term which is also used in the terminology of indurated fine-grained rocks is shale. According to Nichols: "The term shale is sometimes applied to any mudrock (e.g., by drilling engineers) but it is best to use this term only for mud rocks that show a fissility, which is a strong tendency to break in one direction, parallel to the bedding. (Note the distinction between shale and slate: the latter is a term used for fine-grained metamorphic rocks that break along one or more cleavage planes)".[15]

In the case of textural classification of unconsolidated fine-grained sediments, there are many types of classifications that are based on ternary diagrams in which the vertices of the triangles are clay, silt and sand. Fig. 4a shows the classification of sediment based on sand-silt-clay ratios after

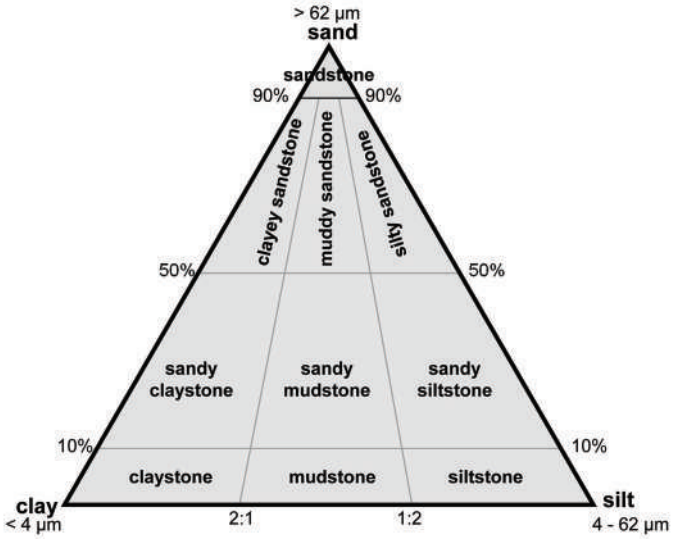

Fig. 3. Classification of fine grained rocks (after Folk 1974)

[13] Folk 1974.
[14] For a discussion on the classification of mudstones, see
Al-Rawas, Cheema, Al-Aghbari 2000.
[15] Nicols 1999, p. 21.

Shepard,[16] Fig. 4b shows the classification after Pettijohn[17] and Fig. 4c shows a simplified version of soil texture classifications of the United States Department of Agriculture (USDA).[18] As can be seen from these classifications, the term "clay" does not denote only particles of clay size. Clay may contain of up to 25% [Fig. 4a] or 20% [Fig. 4b] or up to 40% [Fig. 4c] sand or silt grains (or a mixture of sand and silt grains).

Generally, when clay-sized particles predominate in sediments, unindurated (unconsolidated) fine-grained sediment is called "clay" or "clayrock", and indurated (massive) fine-grained sediment is called claystone or clayshale if it is fissile.

In addressing the definition of the word "clay" as a term for a particular material, it should be noted that the fundamental property of a clay is that it comprises sediments of clay-sized particles that are sufficiently plastic when wet to allow the material to be formed into a desired shape, which is retained upon drying. The material becomes hard, brittle and non-plastic when fired, all the while retaining the shape into which it was formed.

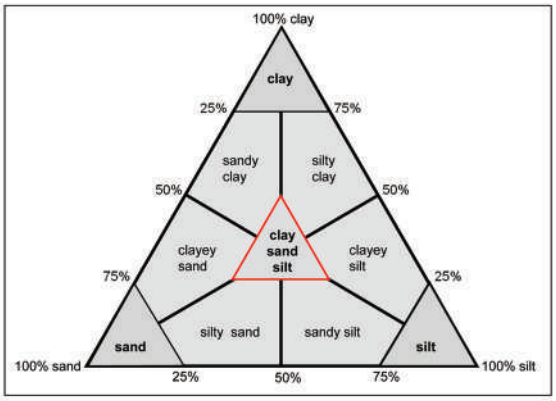

Fig. 4a. Classification of sediment based on sand-silt-clay ratios (after Shepard 1954)

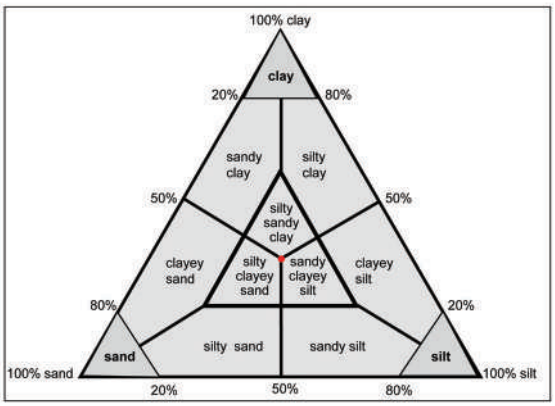

Fig. 4b. Classification of sediment based on sand-silt-clay ratios (after Pettijohn 1975)

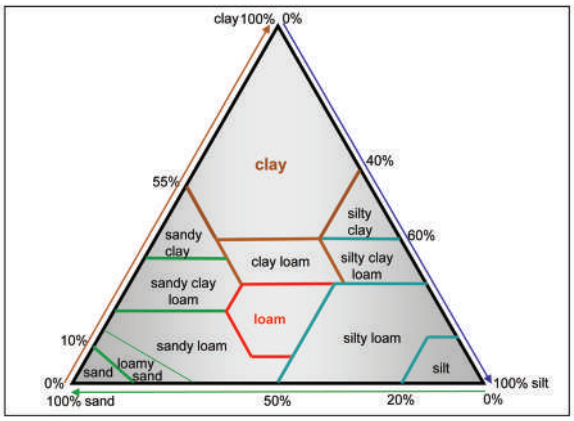

Fig. 4c. Simplified version of soil texture classifications of the United States Department of Agriculture (USDA)

[16] Shepard 1954.
[17] Pettijohn 1975.
[18] Source: http://soils.usda.gov/technical/manual/print_version/complete.html.

As a general rule, clay is used as a raw material (clay raw material) to make clay-ceramics. However, it must be remembered that plastic ceramic raw materials (i.e., those that are readily formed) are all types of particles with a grain size of less than 0.01 mm in diameter, in other words materials with clay-sized particles as well as fine and very fine silt-sized particles: these fractions form the plastic part of the ceramic mass (particles of more than 0.01 mm in diameter comprise the non-plastic components [Fig. 2a]).

Clay minerals, which constitute the main clay-sized particles (i.e., they form the basis of the plastic part of every ceramic body in clay pottery), commonly develop as a result of the breakdown of feldspars and other silicates. Clay minerals are hydrated Al, Mg and Fe aluminosilicates belonging to the phyllosilicates (sheet silicates). Some clay minerals are rare, while others are common or very common. Depending on the layer structure of the octahedral and tetrahedral sheets, phyllosilicates can be divided into two-layer silicates (1:1 structure, an octahedral sheet is permanently bound on one side to a tetrahedral sheet), three-layer silicates (2:1 structure, an octahedral sheet is sandwiched between two tetrahedral sheets) and four-layer silicates (2:1:1 structure). Amorphous clay is known as allophane ($Al_2O_3 \cdot SiO_2 \cdot nH_2O$).

Two-layer silicates include clay minerals of the kaolinite group (1:1 layer silicates):

- kaolinite $Al_2(Si_2O_5)(OH)_4$
- dickite $Al_2(Si_2O_5)(OH)_4$
- nacrite $Al_2(Si_2O_5)(OH)_4$
- halloysite $Al_2(Si_2O_5)(OH)_4$.

Three-layer silicates include clay minerals (2:1 layer silicates):

- of the smectite group: montmorillonite $(Na,Ca)_{0.33}(Al,Mg)_2(Si_4O_{10})(OH)_2 \cdot nH_2O$
  beidelite $(Na,Ca_{0.5})_{0.3}Al_2((Si,Al)_4O_{10})(OH)_2 \cdot nH_2O$
  nontronite $Na_{0.3}Fe_2((Si,Al)_4O_{10})(OH)_2 \cdot nH_2O$
  saponite $Ca_{0.25}(Mg,Fe)_3((Si,Al)_4O_{10})(OH)_2 \cdot nH_2O$
- verniculite $Mg_{0.7}(Mg,Fe,Al)_6(Si,Al)_8O_{20}(OH)_4 \cdot 8H_2O$
- hydromicas: illite $K_{0.65}Al_{2.0}[Al_{0.65}Si_{3.35}O_{10}](OH)_2$.

Four-layer silicates include clay minerals of the chlorite group (2:1:1 layer silicates):

- clinochlore $Mg_5Al(AlSi_3O_{10})(OH)_8$
- chamosite $(Fe^{2+},Mg,Al,Fe^{3+})_6(Si,Al)_4O_{10}(OH,O)_8$
- nimite $(Ni,Mg,Al)_6((Si,Al)_4O_{10})(OH)_8$
- pennantite $Mn^{2+}{}_5Al(AlSi_3O_{10})(OH)_8$ (all formulas source: www.mindat.org).

There are also mixed-layer minerals: kaolinite-illite, illite-smectite, and smectite-chlorite. All this shows that the ceramic raw material known as clay is a very mineralogically complex sedimentary rock.

In summary, the term clay refers to fine-grained sediments comprising a predominance of variable amounts of clay-size grains (the majority of which are clay minerals) and of variable amounts of silt-size and/or sand-size particles (silt- and sand-sized grains = natural temper of non-plastic particles). It must be borne in mind that there are a multitude of clay minerals, and that a clay raw material is made up of more than one clay mineral. Clays often contain a mixture of numerous clay minerals, and the relative percentages of clay minerals within a single deposit of the same geological provenance is not necessarily constant. Because each clay mineral has different technological properties, changes in the proportions of individual clay minerals, especially those belonging to different groups, affect the thermal properties (e.g., fire resistance, shrinkage, swelling) and chemical composition of a ceramic raw material. Furthermore, the properties of a raw material are also affected by the type and quantity of silt and sand-sized grains. Therefore, the terms “typical clay” or “behaviour of typical clay” (which, unfortunately, appear in the archaeometric literature) should not be used — there is no such thing as typical clay; there is only

"this particular clay" and we can determine the properties and specific chemical and mineralogical composition of "this particular clay".

Pottery is made of clay, hence unconsolidated fine-grained sediments containing grains in the clay-silt fraction or material with grains in the clay-silt-sand fraction. This material must contain a percentage of clay-sized clastic particles that will make it sufficiently plastic for a given forming technique. Intentional non-plastic temper usually comprises sand-sized grains (in some cases fine gravels occur). If the raw material for pottery making consists of indurated fine-grained sediments they will need to be crushed to make the material suitable for use.

In this article the term "ceramic raw materials" is used in reference to clay raw materials that are suitable for making clay-ceramics immediately after extraction, whilst the term "clay raw materials" is used in a broader sense, encompassing both "ceramic raw material" as well as raw materials that need to be processed before they can be used for pottery making.

Searching for a raw material — methodological approach

There are four approaches to analysing clay raw material: analyses performed by a sedimentologist, analyses carried out by a potter, analyses conducted for the requirements of modern ceramics production, and analyses for the needs of archaeometric research (analysis of archaeoceramics).

Sedimentology, a branch of geology concerned with the study of sedimentary rocks, deals with defining the texture and structure of rocks and identifying the minerals from which they are built. When analysing sedimentary rocks such as clays, the main laboratory techniques used in order to accurately identify clay minerals and minerals found in clay in fractions > 0.0039 mm are: X-ray diffraction, TG-DTG-DTA, heavy minerals analysis, optical microscopy, and electron microscopy. In the field, simplified identification of detritus can be performed using the hardness or HCl test.

A potter who produces wares in the traditional way will perform a test after obtaining a new clay to assess whether it is fat or thin and whether it needs tempering (and to determine what type of temper should be added and in what proportion) or slurrying, or whether it can be used as it is for the chosen forming method. The potter also does a firing test to assess the thermal behaviour of the ceramic body: to see the colour of the finished product and assess its shrinkage (i.e., the difference in size between the formed and dried product and the fired product) and to determine the optimal firing temperature for the given function of the product. The tests carried out by the traditional potter are classed as non-laboratory empirical analyses and have been performed by potters since ceramics were first produced.

Modern ceramics production based on technologies that use natural raw materials such as clays relies on a strictly defined technology which, as in the case of the traditional potter, is determined based on empirical analyses, but empirical analyses carried out in laboratories. However, just like potters across the millennia, a modern technologist must gain a good understanding of the thermal behaviour of the raw materials being used and the thermal behaviour of the given ceramic body. In current standardised production, it is important to define the dimensional tolerance of a product (standards are set for permissible deviations from shape depending on the accuracy class). The properties of a product made from a given raw material (ceramic body), fired at a given temperature, are analysed. These properties include: mechanical properties (hardness, resistance to compression, stretching and crushing), thermal properties (thermal conductivity), chemical properties (chemical reactivity), physical properties (density, porosity, water absorption) and functional properties (frost resistance, water resistance, resistance to thermal shock). Laboratory analysis of ceramic raw materials encompasses analysis of green raw materials as well as model tests of fired raw materials (de facto ceramics). They cover a wide spectrum of methods and techniques,

such as sieve analysis, rheological analysis, TG-DTG-DTA analysis, dilatometric tests, chemical composition analysis, microscopic examinations (using optical and scanning microscopy), X-ray diffraction, Raman spectroscopy, and Moesbauer spectroscopy.

When analysing clay raw materials for the purposes of archaeoceramology, the aim of the analysis is in essence a 180-degree reversal of the analytical objectives of sedimentologists, potters and technologists in modern ceramics factories. The latter three all proceed from point A (raw material) to point B (end product), while the archaeoceramologist goes from point B to point A. This is a much more difficult task, even when attempting to recreate a recipe that is recorded in writing and uses a known raw material deposit, as in the case of some post-medieval wares or when attempting to recreate a ceramic body based on a known recipe and known clay extraction sites used by contemporary workshops (e.g., a pottery workshop in Mazzaro di Vallo[19]).

Thus, the first step in identifying the raw material used for making CBM was, as strange as it may sound, to analyse samples of CBM found at the Novae site. Knowing the thermal behaviour and original firing temperature of a ceramic product means that from the outset of the raw material analysis it is possible to select clay samples that can be taken into consideration as potential raw materials used in the production of CBM, legionary pottery (LegP) or common wares (CW).

In looking for the raw materials from which ancient CBM or indeed any other ancient ceramic product was made, it must be remembered that the fragment (or complete object) recovered during excavation is the end result of a *chaîne opératoire*.[20]

The *chaîne opératoire* begins with the procurement of raw materials, encompasses the technological process and does not end with the removal of the finished product from the potter's kiln, nor even with the effects that usage has on the given ceramic product. It also incorporates all of the changes that take place within the ceramic object during its existence from the moment it ceased fulfilling its functional purpose to the moment it reached the laboratory. Each component and each activity, starting with the acquisition of the raw material and ending with the submission of the sample to the laboratory, affects the analysed item to a different extent [Fig. 5].

Raw materials

Ceramic products can be made using clay without any additional refining processes (if such a raw material is available) or alternatively the raw materials can be specially treated by washing or levigating, or ceramic bodies can be made by adding non-plastic temper of certain grain sizes, or by mixing with other types of clay. This first important element of ceramic technology determines the properties of the final product.

Processing a ceramic body

a) Preparation of a ceramic body, stage 1 (plastic raw material + non-plastic raw material[21])

Combining raw materials results in a mixture that is characterised by a specific chemical composition as well as mineralogical and petrographic composition depending on the raw materials used and the recipe (the ratio of the individual components used in the mixture). This means that products made of clay[22] differ in chemical composition and mineralogical and petrographic composition from products made using a ceramic body[23] based on the same clay.

[19] Daszkiewicz, Schneider forthcoming.

[20] Projektgruppe Keramik 1989.

[21] The non-plastic part consists of those ingredients of the ceramic body with a particle size fraction greater than 0.01 mm (various minerals, rock fragments, bioclasts, phytogenic matter, grog). The non-plastic part (temper) can be an integral component of the raw material deposit, but it can also be an intentional temper added to meet the needs of the technological process.

[22] Meaning the natural raw material.

[23] This term is used to describe blends of clay or clays and any non-plastic inclusions — the effect of the technological process.

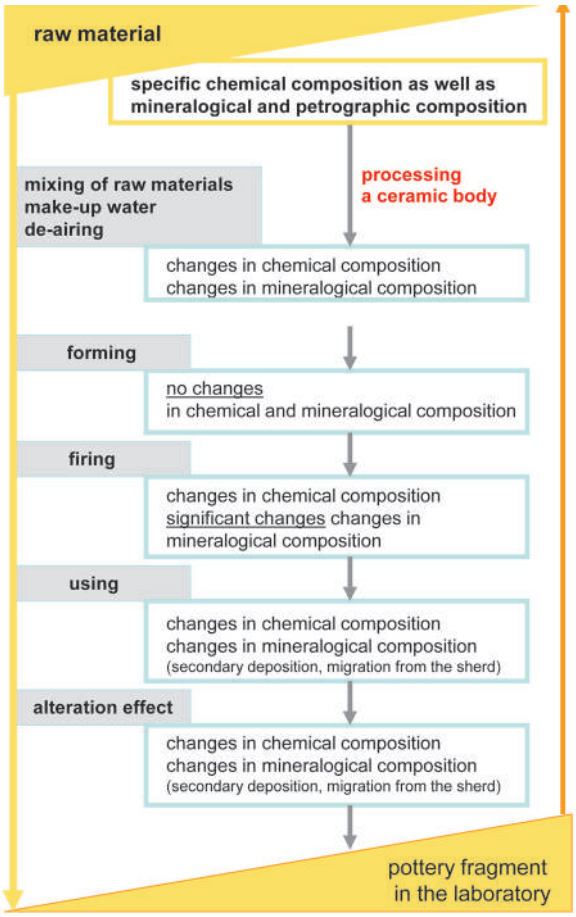

Fig. 5. The *chaîne opératoire* begins with the procurement of raw materials and ending with the submission of the sample to the laboratory. Each component and each activity affects the analysed item to a different extent

b) Preparation of a ceramic body, stage 2 (plastic raw material[24] *+ non-plastic raw material + make-up water)*

In order to obtain a plastic ceramic body of a consistency appropriate for the chosen forming method, an amount of water appropriate for a given raw material is needed. Depending on its mineralogical composition, this make-up water can affect the melting point temperature and cause changes in the mineralogical composition of the ceramic body (e.g., the presence of NaCl and/or KCl_2 can be observed) and also has an impact on the chemical composition of the ceramic body (increased levels of sodium, chlorine, potassium, and magnesium, among others). Notably, the chemical composition of the make-up water also has a significant effect on the colour of the ceramic product.[25]

[24] The plastic part is composed chiefly of clay minerals, while the matrix is deemed to consist of all minerals with a particle size fraction less than 0.01 mm. The plastic part of the ceramic body hardens during the firing process and becomes the non-plastic matrix.

[25] In the case of pottery made from marly clay, the use of sea water or water from salt lakes causes it to change colour from red to white (Daszkiewicz 2014). In contemporary workshops at Djerba (Tunisia), potters use either sea or freshwater as make-up water depending on what colour they want the pottery to be.

c) Preparation of a ceramic body, stage 3

The way in which the ceramic body is processed (mixing of ingredients, de-airing) affects the size and number of pores, the distribution of the non-plastic particles, and the heterogeneity of the matrix, and thus leaves a mark on the end product in the form of a specific structure and texture. Different approaches to mixing and de-airing can result in products made according to the same recipe having very different structures and textures.

Forming

The shaping and forming process causes changes in the pores (shape, distribution, additional pores) and affects the relative density.[26]

Firing

During the firing process a series of changes occur within the ceramic product. Depending on the temperature and gas conditions of the firing, products made from the same ceramic body may differ in: colour, extent of linear changes (shrinkage, expansion), degree of vitrification, open porosity (as well as closed and total porosity), apparent density and water absorption, functional properties (permeability, thermal shock resistance), magnetic and mechanical properties (e.g., resistance to compression and crushing). Significant changes in mineralogical composition and changes in chemical composition will also occur.

Usage

Changes occur to the inner and outer surfaces, such as surface matting, and loss of slip/glaze. Soot can be deposited on the outer surfaces of cooking vessels and organic matter (residues of food cooked or stored inside the vessel) can be deposited in the open pores of the ceramic fabric, mostly those open on the internal surface of the vessel walls. In technical ceramics such as salt evaporation vessels, remnants of salt can be observed in the open pores and on the sides of these vessels.

Deposition in archaeological context (the alteration effect[27])

The chemical composition of ceramic fragments can differ markedly from their original composition due to the secondary deposition of phosphorus, which is most often accompanied by the secondary deposition of strontium and barium. This effect is often associated with the migration from the ceramic body of elements such as rubidium, potassium, sodium, calcium, and sometimes magnesium, manganese, and silicon. In consequence, the content of elements that occur in more stable compounds, such as titanium, aluminium, iron, and chromium, is exaggerated. Furthermore, secondary deposits of calcium carbonates, gypsum and iron compounds are also very frequently observed in the pores of the ceramic material, which results in elevated concentrations of calcium, sulphur, iron and manganese and causes changes in the content of geochemically correlated trace elements (e.g., calcium is geochemically correlated with strontium, and iron is correlated with vanadium). Ceramics that have been exposed to seawater (recovered from underwater excavations or shipwrecks) have exaggerated magnesium levels. Changes in concentrations of lead, copper and tin are also observed as a result of the migration of these elements from metal artefacts deposited in the vicinity of the pottery. In addition to changes in the chemical composition, changes may also occur in the phase composition: partial rehydroxylation of clay minerals, reconstruction of thermally decomposed carbonates, changes in the diopside-gehlenite-calcite system, deposition of gypsum and/or secondary calcite in the pores.

[26] Daszkiewicz, Bobryk, Wetendorf 2017.

[27] On the subject of the alteration effect in archaeological pottery, see Schneider 2017.

Later changes
Changes associated with the cleaning and storage of artefacts. (e.g., a decrease in CaO content in surface layers, new phases in open pores, surface weathering).

In conclusion, there is no such simple equation as raw material = product = laboratory sample. The artefact at the end of the *chaîne opératoire*, the sample in the laboratory, is characterised by a chemical composition and mineralogical composition that differs to a greater or lesser degree from the chemical composition and mineralogical composition of the raw materials used to make the ceramic product represented by the sample that reached the laboratory [Fig. 5]. When analysing samples of ancient pottery and looking for the raw materials from which a given ceramic product was made, we seldom encounter a situation like that presented, for example, by the Roman ceramic workshop at Rheinzabern.[28] More often the story is one of various researchers spending many years trying, and ultimately failing, to find raw material sources and places of production (as, for example, in the case of Italian sigillata[29]).

Measurement strategy and analysis results — CBM, CW and LegP

Abridged MGR-analysis (refiring at 1100, 1150 and 1200°C)[30] and chemical analysis by WD-XRF were performed for each of the 54 CBM fragments as well as for each of the nine LegP fragments and 13 CW samples. After the samples had been classified on the basis of these results, some of them were selected for K-H analysis (9 CBM samples), and thin sections were made from 14 samples (five LegP samples, three CW samples and six CBM samples). Additionally, XRD analysis was carried out on one CBM fragment.

Pls. 1–10 show the results of MGR-analysis for all 76 samples, while MGR-groups are listed in the first column of Table 1 and Table 2. The results of chemical analysis are also detailed in these tables.[31] Micrographs of typical fabric images seen in the polarising microscope are presented in Pls. 16–24. The original firing temperature of the CBM was determined based on the results of K-H analysis (results for six of the samples are shown in Fig. 6); the diffractogram of one of these CBM samples is shown in Fig. 7.

Generally speaking, CBM, CW and LegP fabrics differ sufficiently to allow even small non-diagnostic sherds to be attributed to one of these three groups based on macroscopic analysis of a fresh fracture surface, with only one exception. One sample of CBM (MD7241) can be classified as LegP. The results of MGR-analysis showed that differences in the macro-fabric are not related to the original firing temperature or solely to different recipes, but to the use of decidedly different types of plastic raw material in the manufacture of CBM, CW and LegP. CBM was made of mixed clays of the NC-CC type with no deliberate addition of non-plastic particles (with the exception of sample MD7241), CW was made of MC clays with the intentional addition of various medium-coarse grains, whilst LegP was made of NC clays or NCcc+

[28] Schneider 1978.
[29] Schneider, Daszkiewicz 2020a; 2020b.
[30] Thin slices were removed from each sample in a plane at right angles to the vessel's main axis. Firing was done in a Carbolite electric laboratory resistance furnace, in static air, at a heating rate of 5°C/min, a soaking time of 1 hour at the peak temperature, a cooling rate of 5°C/min up to 500°C and then cooling with the kiln for 1 hour.
[31] The contents of major elements listed in table 1 are calculated as oxides and normalized to a constant sum of 100%. Si = silicon, calculated as SiO_2; Al = aluminium, calculated as Al_2O_3; Ti = titanium, calculated as TiO_2; Fe = iron, total iron calculated as Fe_2O_3; Mn = manganese, calculated as MnO; Mg = magnesium calculated as MgO; Ca = calcium calculated as CaO; Na = sodium calculated as Na_2O; K = potassium calculated as K_2O; P = phosphorus calculated as P_2O_5.The element concentrations determined are valid for samples ignited at 900°C (measurements were performed on specimens melted after ignition).

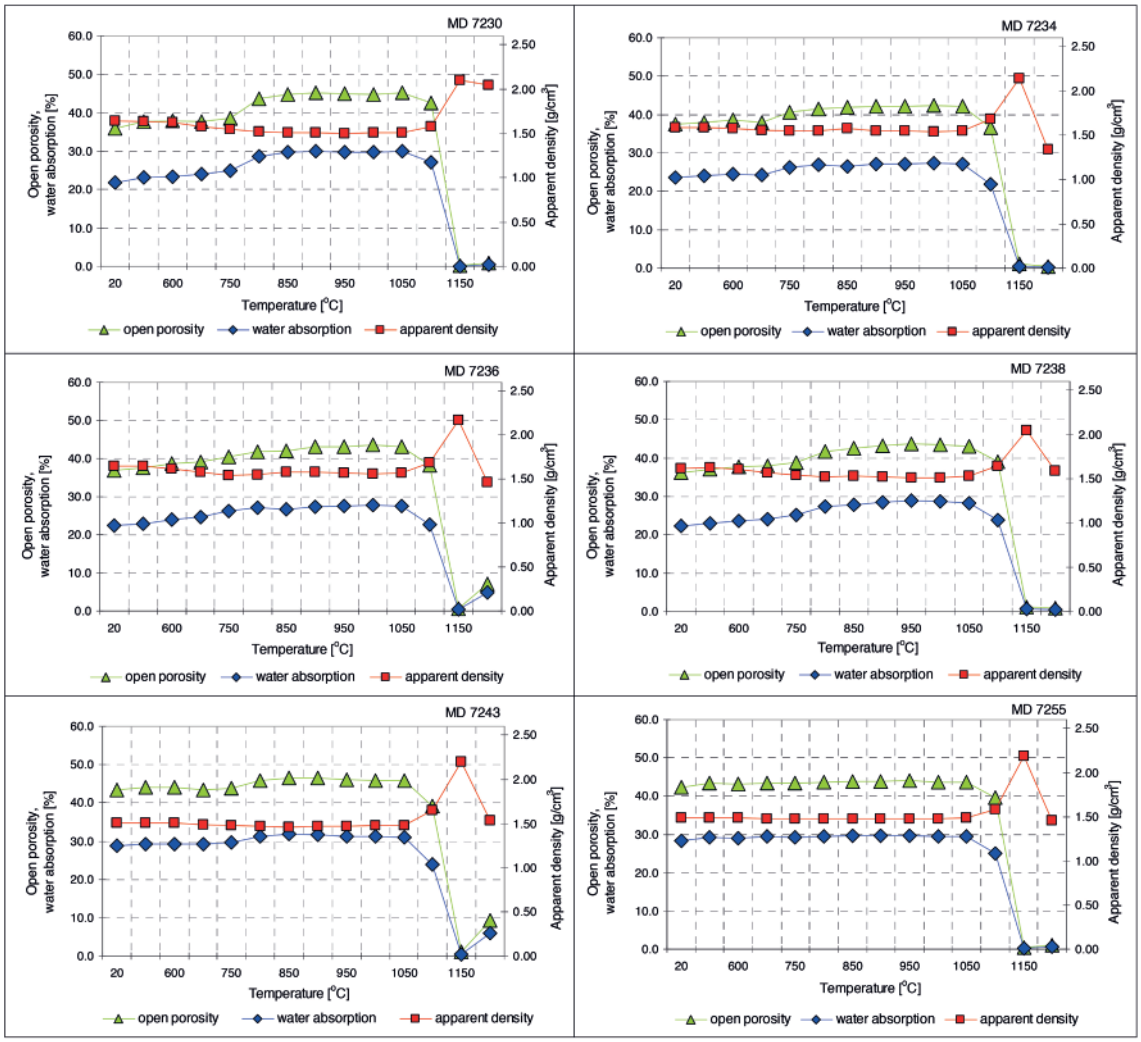

Fig. 6. Results of K-H analysis for six of the CBM samples. Curves showing the values of open porosity, water absorption and apparent density vs. refiring temperature (compiled by H. Baranowska)

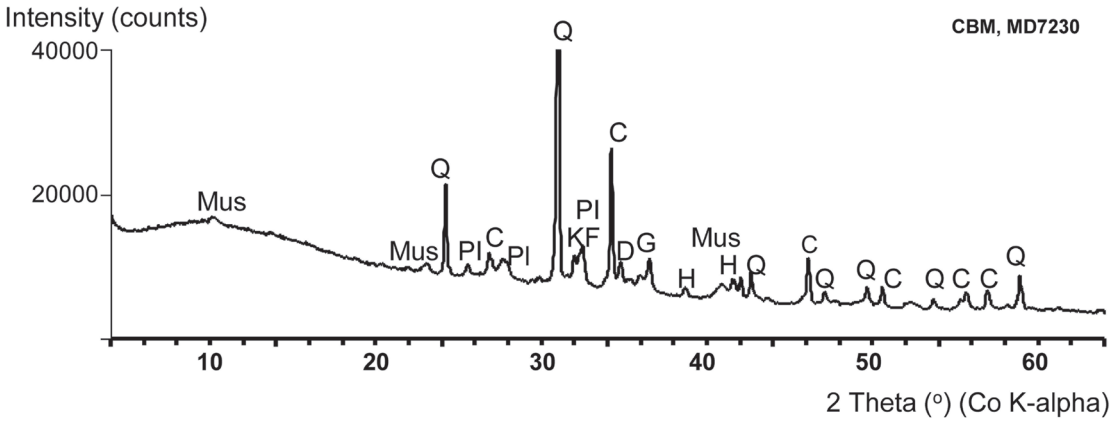

Fig. 7. Diffractogram of CBM sample MD7230

clays. Various clays were used within each group, as evidenced by the number of MGR-groups [Table 1, first column]. In the case of CBM samples, 41 MGR-groups were identified among 54 samples [Table 2, first column], meaning that 35 CBM samples each represent a different MGR-group,[32] LegP fragments represent four MGR-groups, and CW samples represent nine MGR-groups. In addition, the largest of the MGR-groups were further divided into MGR-subgroups. All CBM samples and CW samples attain melting point at temperatures < 1200°C, resulting in the total deformation of the sample with surface vitrification after refirng at 1200°C. After refiring at this temperature CBM samples (with four exceptions) have a semi-melted (sMLT[33]) or melted (MLT[34]) matrix type. A floated (FL[35]) matrix type predominates among the CW samples (only three samples have an sMLT or MLT matrix type). However, even refiring at 1150°C already causes the breakdown of the matrix of all CW samples and CBM samples (except for two: MD7241 and MD3892). LegP samples differ very distinctly from CBM and CW samples because at 1200°C they have a sintered matrix type (SN[36]), the only exceptions being two samples attributed to the LegP-2 MGR-group [Table 1], which have an over-melted matrix type.[37]

The results of chemical analysis confirm the groupings resulting from MGR-analysis. CW pottery is especially distinctive due to its high CaO content [Table 1], which MGR-analysis shows is related to the matrix and not to carbonates in the > 10 µm fraction (non-plastic particles). Eight of the LegP samples are also distinctive due to their CaO content — in this case a low CaO content. The ninth of the analysed LegP samples (MD3872) differs very markedly (from the CBM and CW samples also) in having high levels of Al_2O_3, a very high Sr/CaO ratio, a high cerium (Ce) content and a very low chromium (Cr) content.

MGR group	Dat.	Lab. No.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	La	Ce	Pb	Th	l.o.i.
			% by weight										ppm															%
Legionary pottery																												
LegP-1	1	MD3866	76.65	0.520	11.74	3.41	0.050	1.18	4.23	0.56	1.44	0.22	85	112	41	24	52	63	110	19	151	10	374	29	56	50	20	3.3
LegP-1	1	MD3870	75.84	0.522	12.09	3.29	0.053	1.23	4.62	0.60	1.50	0.25	78	122	43	19	51	62	118	18	156	11	357	18	53	23	19	3.8
LegP-3.1	1	MD3867	74.04	0.505	15.46	6.54	0.015	1.06	0.32	0.17	1.77	0.12	127	94	44	23	68	101	55	17	167	11	248	24	45	33	19	0.5
LegP-3.2	1	MD3869	77.11	0.503	12.72	5.08	0.019	0.99	1.48	0.22	1.76	0.12	110	127	40	42	59	87	70	18	180	10	348	15	52	161	21	1.8
LegP-3.4	1	MD3874	76.35	0.492	13.17	5.60	0.017	1.06	1.24	0.24	1.73	0.10	114	93	38	19	62	94	67	19	167	11	256	15	51	80	21	0.7
LegP-3.3	1	MD3873	72.92	0.490	14.62	5.79	0.018	1.05	3.01	0.27	1.68	0.16	92	110	44	31	64	92	88	17	178	11	256	20	45	47	23	3.1
LegP-2	1	MD3871	70.40	0.677	13.00	5.06	0.044	1.58	5.89	0.55	2.32	0.48	121	107	47	29	103	89	210	24	200	12	400	26	77	25	16	2.8
LegP-2	1	MD3868	69.49	0.690	13.62	5.39	0.068	2.04	4.64	0.88	2.30	0.90	113	114	60	34	77	86	171	28	189	13	501	31	68	26	18	4.7
LegP-4	1	MD3872	62.45	0.725	22.68	5.77	0.085	0.97	2.13	2.61	2.45	0.13	115	47	24	10	63	113	609	33	286	15	932	67	127	27	35	0.4
Common Ware																												
CW-1.1	1	MD3875	50.99	0.631	12.91	5.22	0.149	1.67	24.98	0.85	2.22	0.39	126	117	56	37	74	70	435	29	138	13	432	27	72	22	10	12.5
CW-1.1	1	MD3877	53.31	0.714	12.01	5.22	0.129	1.88	23.00	0.87	2.39	0.48	122	126	47	51	74	67	413	23	161	13	396	16	63	958	27	12.6
CW-1.1	1	MD3878	52.29	0.757	13.42	5.53	0.125	1.82	22.60	0.99	2.12	0.34	140	102	50	35	75	71	448	28	156	13	403	25	57	32	15	10.2
CW-1.2	1	MD3876	49.30	0.796	12.57	5.55	0.121	2.31	25.76	1.13	1.94	0.52	137	82	35	27	71	69	470	20	144	12	434	8	41	<5	15	11.5
CW-1.3	1	MD3887	48.58	0.699	12.72	5.78	0.147	2.25	25.73	0.63	2.35	1.11	131	138	56	26	76	67	504	26	145	11	493	22	63	21	17	11.5
CW-2	1	MD3879	54.90	0.715	12.71	5.10	0.129	1.60	21.75	0.80	2.10	0.19	123	102	46	31	69	65	386	27	166	16	436	23	55	24	12	11.4
CW-3	1	MD3880	55.89	0.842	13.78	5.77	0.115	2.02	17.58	1.25	2.39	0.37	150	96	34	29	63	63	335	21	153	13	396	9	41	75	16	7.9
CW-4	1	MD3881	49.49	0.766	10.92	5.82	0.143	3.42	26.02	0.63	2.48	0.30	148	166	57	35	73	60	375	24	147	14	461	16	57	31	13	19.3
CW-5	1	MD3882	52.06	0.710	13.84	5.44	0.114	2.08	22.53	0.67	2.19	0.37	102	120	51	34	65	71	393	26	147	14	359	18	65	20	13	9.6
CW-6	1	MD3883	50.94	0.813	11.78	5.69	0.158	2.71	24.99	0.52	1.88	0.52	140	171	59	37	72	69	464	28	167	13	415	30	55	12	16	10.6
CW-7	1	MD3884	55.64	0.759	14.31	6.03	0.125	2.14	17.60	0.75	2.31	0.34	131	132	63	43	87	77	349	32	162	14	392	26	69	20	16	7.5
CW-8	1	MD3885	49.61	0.712	10.72	5.27	0.177	2.55	27.45	0.77	2.23	0.51	116	144	47	32	64	65	484	24	193	9	450	27	46	10	15	14.1
CW-9	1	MD3886	51.05	0.718	12.98	5.38	0.146	2.02	24.20	0.71	2.34	0.45	126	131	48	33	76	69	427	26	153	13	337	12	60	24	13	11.1

Table 1. The results of chemical analysis by WD-XRF. Concentration of major elements normalised to 100%, measurement of melted, ignited samples; l.o.i. = loss on ignition at 900°C

[32] It is unlikely that only one product was made from one ceramic body, therefore it is assumed that any sample submitted by archaeologists for analysis represents a group of products made from a given ceramic body. Therefore, the term "group" is used even in cases where the so-called group comprises only one of the analysed samples.

[33] sMLT = semi-melted: over-melting of the surface occurs, changes in sample shape are noted (not just rounded edges) but no bloating.

[34] MLT = melted: the sample becomes spherical or almost spherical in shape.

[35] FL = flowed: the sample flows into a thin layer.

[36] SN = sintered: the sherd is well compacted, it may or may not become smaller in size in comparison to the original sample, whilst its edges remain sharp.

[37] ovM = over-melted: the surface of the sample becomes over-melted and its edges rounded.

MGR group	Dat.	Lab. No.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	La	Ce	Pb	Th	l.o.i.
			% by weight										ppm															%
CBM-1.1	1	MD7206	56.79	0.637	14.75	5.27	0.058	2.06	17.04	0.66	2.58	0.15	101	82	54	28	87	125	340	26	183	14	316	25	60	27	5	6.7
CBM-1.2	1	MD7222	59.82	0.663	14.62	5.32	0.060	2.02	13.77	0.65	2.87	0.21	93	86	53	36	87	127	312	24	188	14	332	33	60	28	7	5.9
CBM-1.3	1	MD7228	59.96	0.662	14.57	5.12	0.045	2.12	13.89	0.77	2.75	0.12	98	80	53	34	84	127	321	26	193	15	316	40	64	43	7	2.5
CBM-1.4	1	MD7238	59.47	0.649	14.49	5.19	0.049	1.96	14.46	0.69	2.92	0.12	98	91	55	37	81	125	303	25	184	15	338	<5	42	39	<5	6.8
CBM-1.5	1	MD7230	59.31	0.650	14.67	5.23	0.056	2.11	14.31	0.67	2.78	0.19	103	78	55	43	92	127	322	27	188	12	329	20	49	32	6	6.1
CBM-1.6	1	MD7253	57.74	0.634	14.67	5.17	0.064	2.05	15.45	0.69	2.65	0.88	94	82	53	37	109	123	372	25	180	15	355	45	39	31	<5	5.6
CBM-2	3	MD7207	61.12	0.688	14.74	5.23	0.050	2.06	11.99	0.64	3.28	0.20	100	75	54	31	87	120	305	26	191	15	369	35	57	37	<5	6.3
CBM-3	1	MD7208	63.81	0.743	14.27	5.17	0.058	2.47	9.51	0.87	2.75	0.36	78	94	53	36	111	119	302	28	222	14	380	39	65	38	7	3.5
CBM-4	4	MD7209	59.24	0.673	14.55	6.00	0.071	2.35	12.88	0.66	2.89	0.69	85	76	61	39	90	126	369	26	192	14	424	40	68	41	7	6.8
CBM-5	4	MD7210	58.77	0.681	15.22	5.49	0.059	2.12	13.64	0.65	3.02	0.34	100	88	59	37	96	134	314	26	192	14	343	23	50	32	8	6.1
CBM-6	4	MD7211	62.21	0.712	15.19	5.36	0.061	2.19	10.09	0.79	2.90	0.50	83	93	62	58	136	135	336	27	197	15	370	35	45	20	5	3.0
CBM-7	1	MD7212	62.12	0.666	14.24	5.04	0.051	2.01	12.38	0.69	2.61	0.20	81	72	51	43	89	124	342	25	196	13	347	37	62	32	7	4.7
CBM-7	4	MD7213	62.74	0.664	13.95	5.09	0.055	2.12	11.72	0.73	2.68	0.25	68	79	53	32	92	123	292	29	194	14	330	28	60	29	11	4.7
CBM-8	?	MD7214	60.01	0.660	14.40	5.22	0.054	2.03	13.93	0.66	2.79	0.24	105	70	53	71	91	127	320	24	194	15	368	49	70	33	6	6.2
CBM-9	4	MD7215	61.20	0.694	14.96	5.61	0.057	2.11	10.87	0.78	3.28	0.43	128	85	48	47	100	130	314	26	191	15	349	16	72	44	9	6.3
CBM-10.1	3	MD7216	61.56	0.715	15.29	5.65	0.055	2.22	10.83	0.80	2.74	0.15	114	96	55	34	97	133	332	27	194	14	324	20	74	46	7	2.1
CBM-10.2	3	MD7221	61.84	0.711	14.68	5.41	0.049	2.26	11.34	0.81	2.75	0.15	103	93	55	28	92	129	351	25	209	14	318	48	62	32	6	2.4
CBM-11	4	MD7217	61.61	0.705	14.88	5.39	0.074	2.25	11.22	0.68	2.90	0.29	96	84	54	53	123	134	309	30	199	13	347	9	61	32	5	4.3
CBM-12	3	MD7218	61.27	0.704	15.16	5.48	0.056	2.32	10.92	0.71	3.13	0.25	101	85	58	43	97	135	309	29	194	15	318	19	59	35	5	4.6
CBM-13	4	MD7219	63.47	0.729	14.95	5.45	0.051	2.03	9.40	0.78	2.93	0.22	115	98	57	28	84	132	356	25	207	16	409	9	39	52	7	3.9
CBM-14	2	MD7220	62.09	0.688	14.48	5.39	0.050	2.17	11.25	0.76	2.89	0.23	90	86	54	36	92	126	278	26	201	15	341	42	79	36	4	5.0
CBM-15	3	MD7223	59.20	0.727	16.48	6.16	0.061	2.33	11.22	0.75	2.91	0.16	103	95	62	44	98	142	337	27	182	17	347	41	73	37	7	3.2
CBM-16	3	MD7224	59.25	0.725	16.04	6.05	0.066	2.50	11.36	0.69	3.05	0.27	101	96	62	35	90	141	340	27	187	16	389	38	70	30	8	4.8
CBM-17	3	MD7225	58.85	0.716	16.31	6.07	0.061	2.30	11.62	0.74	2.81	0.52	106	93	62	48	99	135	364	28	185	16	388	33	55	39	6	3.5
CBM-18	1	MD7226	60.59	0.678	14.64	5.12	0.055	3.06	11.84	0.62	3.23	0.16	96	65	61	37	94	121	254	24	189	14	262	30	52	47	8	7.9
CBM-19	4	MD7227	61.28	0.706	14.87	5.25	0.044	2.31	11.92	0.78	2.68	0.16	98	88	52	41	93	125	334	27	206	15	332	33	78	35	5	3.2
CBM-20	4	MD7229	60.82	0.710	15.23	5.38	0.054	2.22	11.69	0.77	2.86	0.27	90	97	62	45	100	133	343	26	201	16	358	60	71	45	8	3.6
CBM-21.1	4	MD7231	64.59	0.746	14.90	5.21	0.047	2.13	8.32	0.72	3.08	0.26	89	85	55	33	93	134	300	27	201	15	374	20	52	37	5	3.5
CBM-21.2	2	MD7234	65.22	0.744	14.81	5.23	0.044	2.24	7.93	0.87	2.79	0.13	98	88	57	59	103	120	303	27	204	14	310	30	59	39	8	2.4
CBM-22.1	4	MD7239	65.04	0.747	14.53	5.23	0.056	2.26	7.84	0.90	2.92	0.49	86	93	56	32	162	130	311	29	217	16	362	25	53	23	5	1.7
CBM-22.1	4	MD7240	60.96	0.729	15.44	5.73	0.054	2.16	9.87	0.67	3.09	1.28	89	83	58	112	160	138	359	26	196	15	418	44	59	48	10	3.2
CBM-22.2	5	MD7237	62.48	0.746	15.06	5.31	0.049	2.52	9.82	0.89	2.90	0.23	95	92	54	35	103	131	316	30	220	16	341	20	73	39	6	4.2
CBM-22.3	1	MD7232	62.84	0.711	14.79	5.30	0.051	2.13	10.39	0.76	2.87	0.16	92	90	52	33	87	128	294	28	200	14	350	48	80	26	6	3.4
CBM-22.4	3	MD7235	63.97	0.733	14.84	5.26	0.048	2.11	8.10	0.76	3.42	0.77	119	77	58	31	97	130	278	26	198	16	346	29	68	33	4	5.9
CBM-23	3	MD7233	63.74	0.691	13.95	5.27	0.064	1.98	10.31	0.78	2.91	0.32	108	88	54	35	91	123	272	29	211	12	405	46	59	47	5	6.3
CBM-24	4	MD7236	64.39	0.672	13.53	4.97	0.059	1.87	10.33	0.79	3.05	0.33	108	80	49	42	95	112	244	25	199	14	379	13	43	31	5	8.2
CBM-25	4	MD7241	63.87	0.754	15.48	5.93	0.102	2.82	6.49	1.25	3.02	0.28	106	119	80	43	94	118	175	34	209	15	510	26	69	38	<5	5.7
CBM-26	1	MD7242	61.75	0.702	14.88	5.20	0.052	2.25	11.17	0.72	3.11	0.16	106	116	51	33	94	130	297	27	194	15	351	49	55	34	9	5.2
CBM-27	3	MD7243	62.79	0.735	15.01	5.53	0.047	2.46	9.41	0.92	2.92	0.17	106	97	54	37	99	130	364	24	207	15	335	<5	62	36	<5	1.2
CBM-28	2	MD7244	63.55	0.715	14.65	5.28	0.050	2.34	9.52	0.72	3.00	0.18	107	73	56	31	91	129	313	25	199	15	351	38	53	29	6	4.6
CBM-29	2	MD7245	61.52	0.734	14.88	5.47	0.057	2.17	11.26	0.87	2.84	0.18	101	92	54	34	94	129	350	28	219	14	346	47	60	32	8	4.0
CBM-30	5	MD7246	63.95	0.732	15.09	5.35	0.067	2.05	8.37	0.78	3.37	0.25	116	84	62	34	96	129	261	26	197	16	389	7	81	35	10	5.9
CBM-31	5	MD7247	64.03	0.716	14.63	5.25	0.049	2.19	9.36	0.71	2.91	0.16	93	80	55	30	91	130	294	26	203	15	340	56	61	35	<5	3.8
CBM-32	3	MD7248	62.99	0.732	14.83	5.64	0.052	2.08	9.68	0.80	2.94	0.26	107	86	52	22	87	129	343	28	205	14	338	42	65	45	5	3.8
CBM-33	3	MD7249	63.68	0.710	14.40	5.20	0.056	2.12	9.56	0.83	3.24	0.20	125	89	56	34	92	126	238	25	203	16	360	35	69	38	8	6.5
CBM-34	2	MD7250	62.71	0.716	14.71	5.31	0.049	2.23	10.32	0.79	2.90	0.26	88	97	55	33	99	132	288	24	210	16	359	17	64	33	<5	4.0
CBM-35	3	MD7251	60.39	0.731	16.15	6.05	0.060	2.16	10.36	0.71	3.20	0.18	127	80	61	31	91	140	293	28	182	15	379	43	67	35	7	4.0
CBM-36	1	MD7252	60.86	0.709	15.14	5.60	0.053	2.26	11.61	0.82	2.79	0.15	90	93	58	25	94	131	327	27	195	15	400	<5	86	41	8	3.2
CBM-37	2	MD7254	61.65	0.705	14.77	5.41	0.062	2.31	11.18	0.78	2.89	0.24	107	94	59	29	91	129	351	28	200	16	386	20	87	31	7	4.5
CBM-38	2	MD7255	63.83	0.751	15.19	5.30	0.045	2.19	8.90	0.83	2.82	0.15	91	98	54	30	94	133	303	26	202	16	326	17	59	36	<5	1.7
CBM-39	1	MD3892	62.12	0.809	12.85	4.90	0.135	2.75	11.99	1.12	3.06	0.28	112	94	53	23	69	89	270	31	273	13	419	24	79	24	21	7.6
CBM-40	1	MD3893	63.72	0.808	15.38	5.95	0.093	3.00	6.88	1.01	2.95	0.22	118	121	79	27	96	104	176	31	215	16	419	35	70	28	25	4.2
CBM-40	1	MD3894	63.46	0.816	15.59	6.11	0.108	3.36	6.37	1.02	2.94	0.23	116	131	85	46	121	106	180	32	217	14	454	29	89	83	20	4.0
CBM-41	1	MD3895	63.72	0.887	15.61	6.02	0.107	3.29	6.26	1.42	2.51	0.19	133	159	78	35	103	110	164	36	250	15	461	36	86	38	25	2.6

Table 2. The results of chemical analysis by WD-XRF. Concentration of major elements normalised to 100%, measurement of melted, ignited samples; l.o.i. = loss on ignition at 900°C

The next analytical step was a thin-section study (as a reminder, the term "matrix" refers to all grains < 10 μm, while inclusions observed "in the matrix" refers to non-plastic particles, hence those > 10 μm).

Five fragments of LegP were selected to make thin sections. Two LegP samples (MD3866 and MD3870) represent the same chemical group and MGR-group, while the remaining samples (MD3871, MD3872 and MD3873) represent various chemical groups and various MGR-groups.

Samples MD3866 and MD3870 are very similar to each other in terms of petrofabric [Pl. 16]. They contain angular to subangular grains of quartz and polycrystalline quartz of up to 2 mm in size (in MGR slices some grains are up to 4 mm). It is not clear whether these grains represent an intentional temper added as part of the technological process. The matrix of these samples contains some quartz and pale mica in very fine silt fraction and fine silt up to 10 μm in size. In both samples fine inclusions, mostly up to 0.15 mm (sparse inclusions up to 0.4 mm), of cryptocrystalline carbonate aggregates are observed, as is one bioclast. Carbonates are not homogenously distributed in the matrix. One large inclusion (1 mm in diameter) in MD3870 is a piece of micaceous siltstone.

Sample MD3871 [Pl. 16] has a matrix containing many very fine opaque minerals (iron compounds) and carbonates finely distributed in the matrix. Non-plastic particles include iron-rich minerals and cryptocrystalline carbonate aggregates of up to 0.2 mm. The large inclusions are of polycrystalline quartz of up to coarse-sand size, but in a much smaller quantity than in the two previous samples.

Sample MD3872 [Pl. 17] has a matrix that differs very much from the other samples of LegP and was undoubtedly made using a different clay. Crushed inclusions of up to 1mm are observed among the non-plastic material. There are more plagioclase than quartz inclusions. This probably explains the high Na content of this sample's chemical composition.

It is equally certain that another clay was used to make sample MD3873 [Pl. 17]. In comparison to the other LegP samples, the matrix of this sherd is characterised by a near total absence of inclusions [Pl. 17d]. The non-plastic material visible in the matrix is dominated by grains of subangular quartz; plagioclases are rarely observed [Pl. 17c]. The hiatus in grain sizes suggests that the non-plastic particles were probably added intentionally to the clay (fat clay needs a temper to make it more workable). Some inclusions of carbonate aggregates are observed which seem to be secondarily recarbonized after thermal decomposition [Pl. 17d].

Further thin sections [Pls. 18–20] were made from three sherds of common ware (MD3876, MD3879, MD3886). Each of these sherds was made from calcareous clays, and microfossils (foraminifera) are observed in all three thin sections; in some cases they can be better seen with parallel polarisation filters [Pls. 18e–f, 19f, 20f]. In all three thin sections the non-plastic inclusions consist of volcanic material. Abundant hornblende, orto- and clinopyroxene (mostly clinopyroxene), plagioclase and volcanic rock fragments (andesite/ basalt) can be seen. Rare inclusions of quartz and sedimentary rocks such as fine sandstone or siltstone are also observed. Most of the volcanic inclusions are between 0.1 mm and 0.6 mm in size, with only isolated grains in the fine fraction (up to 0.1 mm). The < 0.1 mm fraction is dominated by bioclasts and opaque minerals (most probably iron compounds) with some quartz. This grain size distribution suggests that the volcanic material represents ingredients that were added deliberately (intentional temper) to calcareous (with a high bioclast content) clays.

In contrast to common ware sherds, the table wares are characterised by a very fine material without any coarse temper. Only two[38] thin sections were available [Pl. 21]. The matrix of both samples contains very fine mica and opaque minerals [Pl. 21 a and d]. The non-plastic inclusions are of silt size (up to 0.06 mm) and consist mainly of quartz and mica and rare feldspar. Recarbonized carbonate aggregates and clay-carbonate aggregates are also observed as rare grains in fine sand fraction [Pl. 21c]. Microfossils are observed only very rarely, as seen in the example in Pl. 21f.

Five thin sections of CBM samples were studied. Samples MD3892 and MD3894 represent other clays. The raw material used for these two specimens of CBM obviously differ from each other and also from those of the other CMB, LegP and CW examined in thin section [Pl. 22]. The first one was made from a very silty clay (calcareous clay). The same inclusions are observed in the matrix and in the > 10μm fractions (up to *ca*. 100μm); they comprise: grains of quartz, pale and dark mica, few hornblende, few plagioclases, finely distributed carbonates as well as some opaque minerals. There are only rare grains of fine sand size (quartz and carbonate aggregates). In sample MD3894, which was made from a much less silty non-calcareous clay (parts of the matrix are enriched with carbonates), non-plastic inclusions observed in silt size comprise grains of quartz, pale and dark mica, opaque minerals and inhomogeneously distributed carbonates (crystalline and cryptocrystalline). In addition to grains of silt size, rare grains of sand fraction

[38] MD2544 — this sample was submitted for analysis by E. Klenina, see Daszkiewicz, Bobryk, Schneider 2006; sample MD3242 was submitted for analysis by M. Baranowski, see Baranowski, Daszkiewicz 2009.

(including medium sand) of polycrystalline quartz and crystalline carbonates are also observed. Secondary cryptocrystalline carbonates are also observed as a fill in some pores.

Two further CBM samples (MD7230 and MD7238) are similar to each other. They were made from a silty calcareous clay. The fine inclusions are predominantly quartz grains, with a few larger inclusions of fine sand size [Pl. 22]. Mica plates are not visible at high magnification, only quartz, opaque minerals and inclusions of foraminifera [Pl. 23 b and f] as well as some inclusions of small gypsum crystals (pore fill left by gypsum remnants [Pl. 25 e]). The presence of gypsum is reflected in the results of chemical analysis by elevated sulphur contents. Several clay aggregates strongly coloured by iron compounds are visible in sample MD7230 [Pl. 23 c and d].

Another CBM sample (MD7234) was made from a silty clay. Quartz, mica, and opaque minerals are observed in the matrix. Some feldspars and few bioclasts are also observed in the > 10 μm fraction. The sample is heterogeneous, and a chain of quartz grains of fine sand size can be seen [Pl. 24 c] dividing the sample into two parts: one with fine sand grains and the other featuring only silt-size grains. Parts of the matrix are also coloured by iron compounds to various degrees [Pl. 24 d–f] — these areas represent parts of the sample that exhibit different thermal behaviour in MGR-analysis.

The presence of few microfossils in the CBM samples MD7230, MD7234 and MD7238 [Pl. 25d] as well as in brick MD3455,[39] which has a similar petrofabric, possibly indicates that the clays used to make these products are of a similar provenance.

The equivalent original firing temperature (Teq) of CBM samples, as estimated by K-H analysis,[40] was no lower than 800°C (with one exception) and not much higher than 1050°C (<1100°C). Most CBM was fired at a Teq of 850–950°C. Curves showing the values of open porosity, water absorption and apparent density vs. refiring temperature for six examples of CBM are shown in Fig. 6. In theory, during refiring up to the original firing temperature these values should remain constant. The first changes should appear above a temperature higher than the original firing temperature. But, in several CBM samples, an increase in the value of open porosity and water absorption with a simultaneous decrease in the value of apparent density was observed after refiring at 750°C, which is related to the thermal decomposition of carbonates (secondary cryptocrystalline carbonates within the pores and/or recarbonised carbonates) and not to the original firing temperature having been exceeded. X-ray diffraction performed on CBM sample MD7230 confirms the conclusions drawn from K-H analysis and observation of thin sections, namely that both calcite as well as gehlenite and diopside are present in this sample [Fig. 7].

All CBM samples, which were subjected to K-H analysis, are characterised by high values of open porosity (35–45 vol.%), high values of water permeability (21–29 vol.%[41]) and apparent density values varying from 1.49 up to 1.69 g/cm^3. The highest value of apparent density (2.07–2.20 g/cm^3) was estimated after refiring at 1150°C.[42] After refiring at 1200°C most of the samples exhibited secondary porosity.

[39] This brick fragment was submitted for analysis in 2006 by T. Sarnowski (unpublished report).

[40] In K-H analysis values of open porosity, water absorption and apparent density were determined by hydrostatic weighing. These values were determined before and after refiring a fragment weighing 2–3 grams in controlled conditions at incremental temperatures (refiring carried out using the same procedure as for MGR-analysis, see footnote 30). After each refiring the samples were weighed for a third time in air. This process yielded three values: m_s – mass of dry sample; m_w – mass of wet sample weighed in air; m_{ww} – mass of sample weighed in water (with pores saturated by boiling in water). The values of physical ceramic properties were then calculated. Precision of the estimation of physical ceramic properties by hydrostatic weighing is about 1%.

[41] Given these high values of open porosity and water absorption, it would have been advisable to determine the water permeability of the roof tiles; however, this measurement could not be performed due to the size and shape of the briquettes submitted for analysis.

[42] MGR-analysis shows that maximum apparent density is attained in these sherds when they are fired at temperatures above 1100°C but below 1150°C.

The Teq determined for the majority of TW sherd samples fell within a range of 1000–1100°C; only two samples yielded a range of 700–800°C.[43] Estimation of original firing temperature was not performed on CW and LegP.

Measurement strategy and analysis results — clay raw materials

Regardless of its chemical and mineralogical-petrographic composition, the plasticity of the ceramic body from which all types of pottery and CBM are formed must be suitable for the given moulding technique, otherwise the end product will not retain the desired shape when it dries out. In light of this fact, analysis of clay raw materials began with a plasticity test, which was performed on all nineteen samples. This included an assessment of the water of plasticity (make-up water) content. This is calculated by determining how much water is needed for 100 grams of dry clay to become fully workable (i.e., the clay will not crack when shaped into a ball, and when pressure is applied to the ball it will become deformed but without developing any cracks). The analysed clay samples are characterised by a water of plasticity content that ranges from 24 g to 30 g H_2O/100g dry clay. Only one of the nineteen samples, the silty raw material (MD7195) with a content of 27 g H_2O/100g dry clay, could not be made into a plastic mass suitable for forming as required. The rest of the analysed raw materials could be made into a plastic mass that could be formed satisfactorily.

A firing test was performed as the next step in this study. The briquettes required for this test were made from a plastic mass (homogenised by hand) that was shaped in non-porous porcelain moulds. The resulting dome-shaped samples were dried in an electric laboratory dryer and then fired in a laboratory furnace.

The four clay samples from the series analysed in 2007 had been fired at eight temperatures: 400, 600, 700, 800, 900, 1000, 1100 and 1200°C [Fig. 8]. Firing at this range of temperatures (referred to as a full firing test) allows us to estimate the shrinkage on firing and colour of the

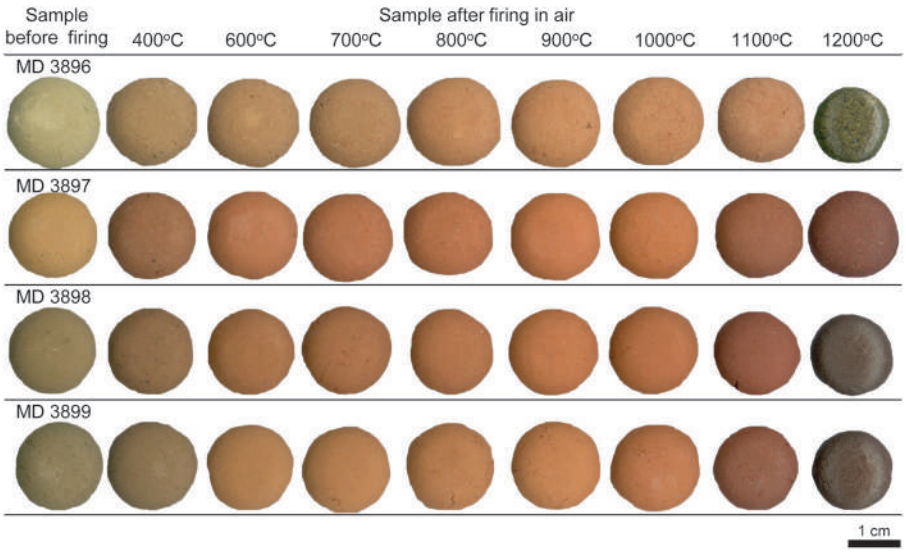

Fig. 8. Firing tests of four clay samples. The briquettes were made from a plastic mass (homogenised by hand) shaped in non-porous porcelain moulds (compiled by H. Baranowska)

[43] Elena Klenina and Andrzej Biernacki project, see Daszkiewicz, Bobryk, Schneider 2006.

end product and also allows us to check whether there is a range of firing temperatures at which a briquette made from a given raw material will exhibit macroscopically visible structural and textural properties (macrofabric) similar to those of the ceramics whose raw materials we are trying to identify.

The clay samples analysed in 2020 were fired at only five temperatures: 800, 900, 1100, 1150 and 1200°C [Pls. 28–30]. It was not possible to perform the firing test at eight temperatures, therefore the number of firings was reduced to the three temperatures needed for comparison with the results of the MGR-analysis of CBM, CW and LegP (1100, 1150 and 1200°C) plus an additional two temperatures: 800 and 900°C. These two temperatures were selected because 800–900°C is the lowest probable temperature range at which the roof tiles that made up the bulk of the analysed CBM could have been fired. The samples were fired in a Carbolite electric laboratory resistance furnace, in static air, at a heating rate of 5°C/min, and a soaking time of 1 hour at the peak temperature. After the firing process had been completed, the samples were not removed from the furnace immediately, but were left inside it until they had cooled to room temperature (thus simulating the original firing of ceramics). Of the two briquettes that were fired at each temperature, one was left whole, whilst a thin slice was cut out from the middle of the second briquette. The surface of the fired briquette corresponds to the surface of a ceramic product, and the surface of the thin slice corresponds to the cut-section of a ceramic product (cut-section taken in a plane perpendicular to the axis of the vessel). Thus, a slice removed from a sample of CBM, CW or LegP for the purposes of MGR-analysis (original samples shown in Pls. 6–15) will look the same as (or very similar to) a slice removed from a briquette, as long as that particular briquette is made of the same clay that was used in the production of the given CBM, CW or LegP, and is fired in similar kiln conditions (temperature and atmosphere). At this stage, it is already possible to carry out a preliminary classification of the clays based on their suitability as ceramic raw materials for making the analysed CBM, CW and LegP. Comparing the results of MGR-analysis for samples of CW and LegP with the clay samples after the firing test revealed that only one raw material sample (clay MD3897) has a firing behaviour similar to the thermal behaviour of some of the refired LegP samples. In contrast to CW and LegP, at this stage of research fourteen raw materials can be considered as potential clay raw materials for the production of CBM.

As MGR-analysis consists of refiring slices removed from ceramic sherds, its results cannot be compared directly with the firing test results for clay raw materials. In MGR-analysis the thermal behaviour of the surface of a cut-section is observed, whilst in a firing test it is the behaviour of ceramic bodies (surface effect as well as texture and structure of cut-section of fabric) that is observed. A direct comparison with MGR-analysis results can be achieved by performing an *à la* ceramics test on the raw material samples. The differences between the firing test and the *à la* ceramics test are shown in Fig. 9 using the example of Bâla Voda clay. Cut slices in the *à la* ceramics test lose the appearance of cut-sections from the firing test and exhibit thermal behaviour like that of the surfaces of the briquettes from the firing test. All of the samples were made from the same ceramic body, therefore the thermal behaviour of the refired slices is the same as the thermal behaviour of the briquettes in the firing test after refiring/firing at 1150 and 1200°C. An *à la* ceramics test was carried out on only fourteen raw material samples. Five samples that could not have been clay raw materials used for making CBM were excluded: four of them because their firing behaviour (as revealed by the firing test) was markedly different to the thermal behaviour of the CBM samples (clay samples MD3896–3899) and one (clay MD7195) because it was not even suitable for making bricks. At this point, twelve further briquettes were made from each clay, and these were fired in the same conditions as described above at 800 and 900°C. Samples fired in this way simulated ceramic goods fired in an oxidising atmosphere at 800 or 900°C. The fired samples (ceramic goods) were then treated like fragments of archaeological ceramics, hence they

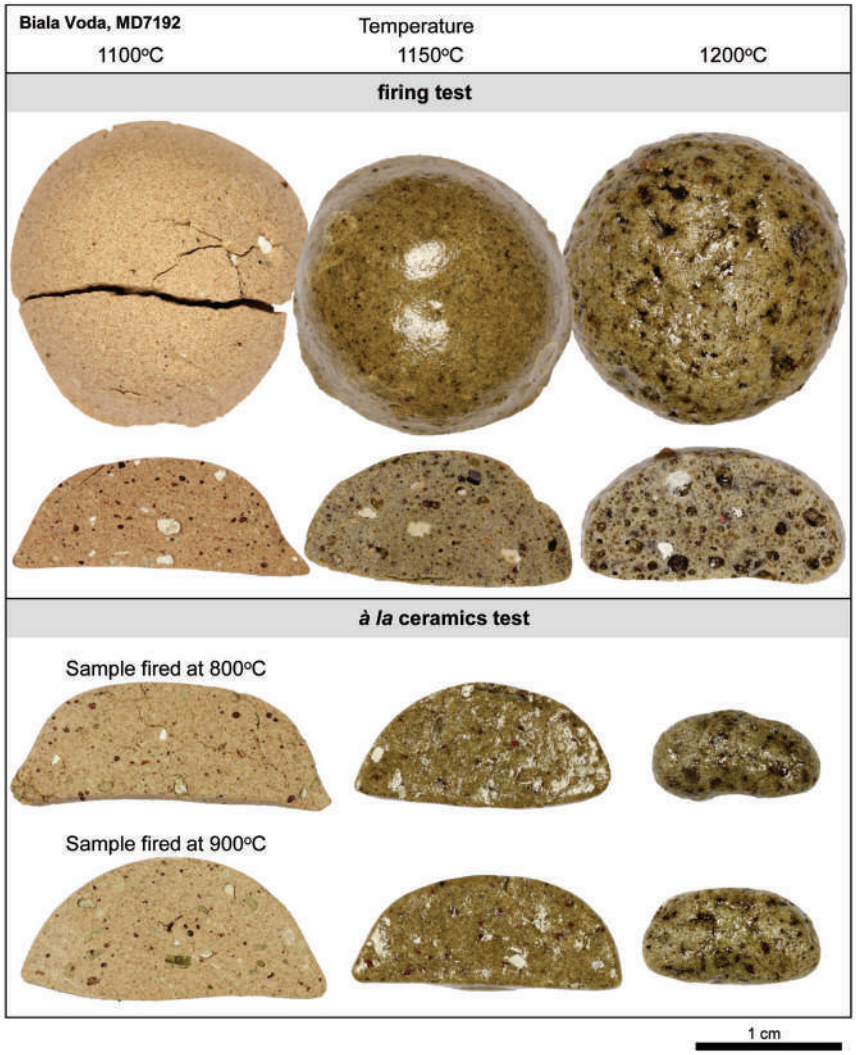

Fig. 9. Differences between the firing test and the *à la* ceramics tests
(briquettes made from Bâla Voda clay)
(compiled by H. Baranowska and M. Daszkiewicz)

were subjected to MGR-analysis in exactly the same way that MGR-analysis[44] is carried out on samples of pottery recovered from archaeological sites. This means that thin slices were removed from each briquette and these were subsequently refired at the standard range of temperatures for abridged MGR-analysis, namely at 1100, 1150 and 1200°C. Additional refiring was also performed at 800 and 900°C [Pls. 31–32]. After refring at these temperatures only minimal changes in the thermal behaviour of the surface of cut-sections were observed.

One of the clays (Bâla Voda clay, MD7192) is a calcareous clay with natural temper in the form of clay-carbonate aggregates (hereinafter referred to as grains of marl) measuring up to 1.5 mm. These grains undergo thermal decomposition during the firing process and cause cracks in the end product. However, clays of this type are used to make bricks after the marly grains have been neutralised. Marl can be neutralised in a variety of ways.[45] The mechanical method involves

[44] See footnote 30.
[45] Rybka 1963.

breaking down the marl grains to a harmless size by drying the clay, crushing it in specially adapted disintegrators and sieving it using vibrating sieves, which yields good results but is too expensive a method to use in small, traditional pottery workshops or brickmaking works (only manual strength is used). The thermal method involves firing products at a temperature high enough to produce CaO and SiO_2 compounds that do not undergo hydration. This method is effective at firing temperatures above 1100°C. There is also a chemical method, in which chemical compounds such as sodium, potassium or calcium chlorides are added to the ceramic body, and a mechanico-chemical method, which involves immersing fired ceramic products in water immediately after they have been removed from the kiln and while they are still warm.

In traditional pottery/brickmaking it is fairly common to add table salt to the ceramic mass (which leads to the formation of water-insoluble calcium silicates during firing), or to use saline make-up water. In brickmaking marly grains are also neutralised by quenching the product in a water bath.

Two methods of neutralising marly grains were investigated using model tests performed for the purposes of this study. These tests were conducted in order to assess whether Bâla Voda clay is suitable for making CBM without first removing / breaking down the natural temper of marly grains. Two series of briquettes were made with the addition of table salt (5 wt.% and 10 wt.%), and another series was made without any added salt. All series were fired at 800°C (in a firing test carried out the next day samples cracked after firing at 800°C). One part of the briquettes with added salt was cooled according to the same procedure as that used for briquettes in the firing test; however, the second part of the briquettes with added salt and the briquettes with no added salt were removed from the kiln after the temperature had dropped to 30°C and were immersed in water at room temperature. The model tests showed that both the addition of table salt and quenching in a water bath neutralised the marl grains. The briquettes were observed for four months after the marl grain neutralisation tests had been performed, after which time no carbonate blooms appeared on the samples, which were stored in an air-dry state, and no cracks were observed. However, crack propagation occurred and continues to occur in samples after the firing test: the samples shown in Pl. 11 fall apart into small pieces.

Model tests carried out on products made of Bâla Voda clay, in which the marl grains were neutralised using only a mechanico-chemical method (i.e., by quenching in a water bath), also revealed that the briquettes with no added salt were characterised by a uniform beige-red colour, in contrast to the briquettes with added salt, which fired unevenly and featured parts with a lower saturation of red. Thus, Bâla Voda clay is a clay raw material that can be used to make CBM if the appropriate technology is applied.

As shown by the firing test, only one of the clay raw materials is fireproof after firing at 1200°C (MD3897). Most of the other clay raw material samples analysed are not fireproof once they have been fired at 1150°C — just like 52 of the 54 CBM samples. Each of the analysed clay raw materials is characterised by a different thermal behaviour, which proves that the phase and chemical compositions of these materials are markedly different. Fig. 10 shows the cut-sections of briquettes fired at 1200°C. Given that all of the briquettes were the same shape and size before they were fired, the differences observed in thermal shrinkage and thermal expansion are significant, number and size of pores also exhibit equally marked differences. Fig. 11 shows cut-sections after the *à la* ceramics test for the same samples refired at 1150°C (the optimal temperature for comparing with refired CBM samples). After the *à la* ceramics test some of these samples exhibit similar thermal behaviour to that observed in CBM samples defined as mixed clays of the NC-CC type. Fig. 12 shows briquettes made of Bâla Voda Bis and Ovča Mogila Bis clays. In both cases a matrix of the "mixed clays of the NC-CC type" is clearly visible; however, this is not a result of the intentional mixing of two types of clay but a feature of the original raw material.

Fig. 10. Cut-sections of briquettes fired at 1200°C (firing test)
(compiled by H. Baranowska)

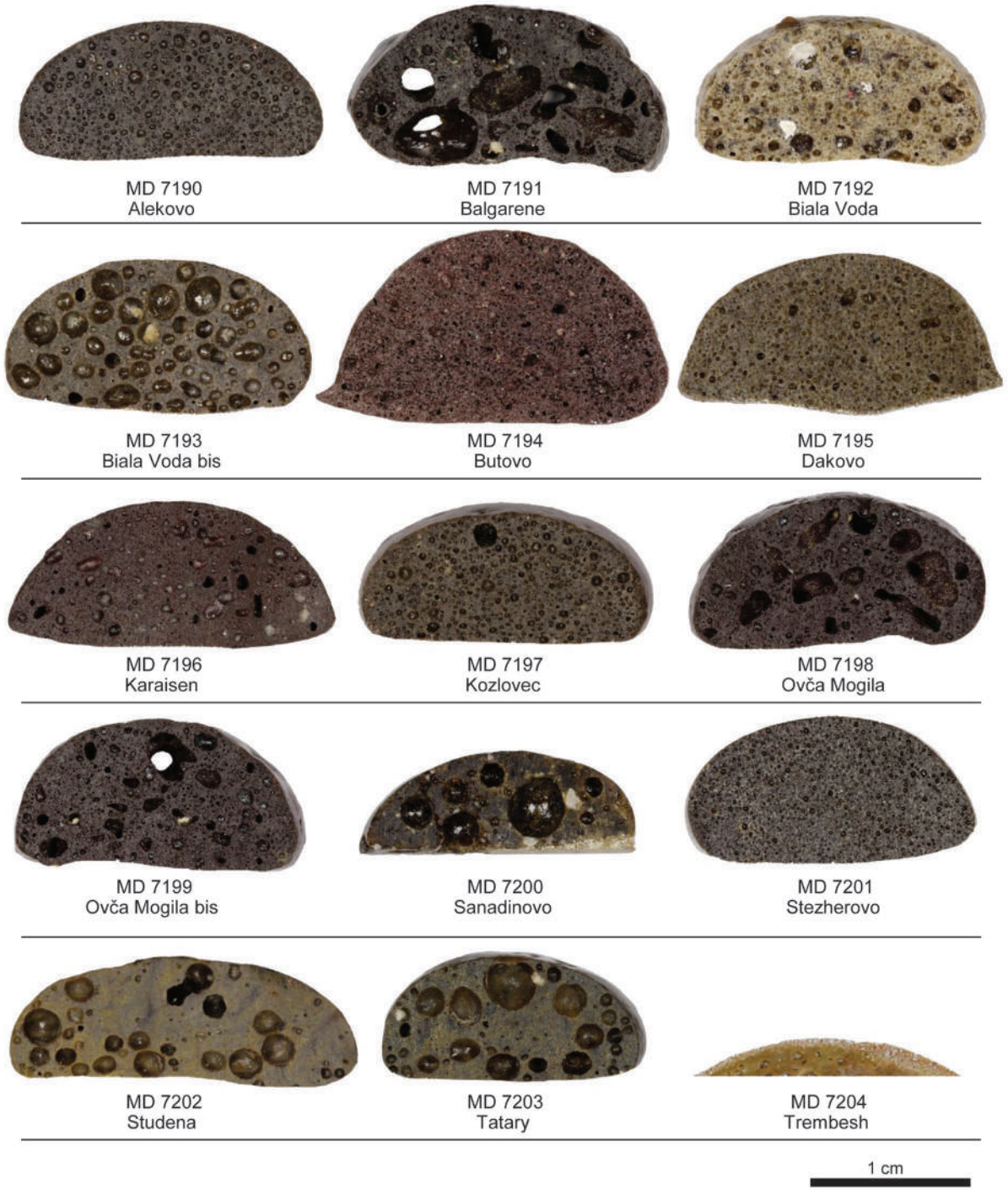

Fig. 11. Cut-sections of briquettes, refired at 1150°C of samples
beforehand fired at 900°C (*à la* ceramics test)
(compiled by H. Baranowska)

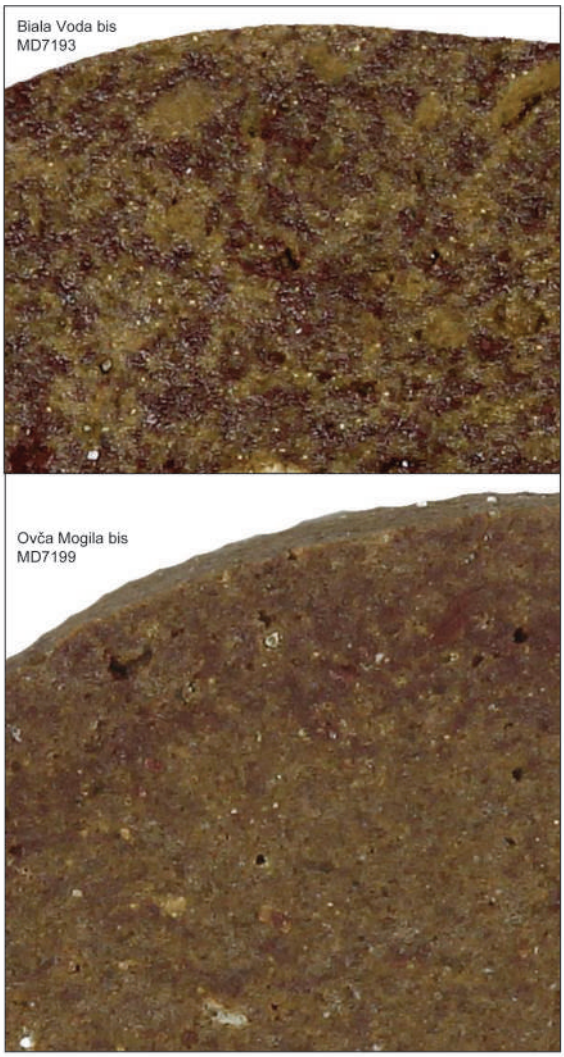

Fig. 12. Briquettes refired at 1150°C of samples made of Bâla Voda Bis and Ovča Mogila Bis clays beforehand fired at 900°C (*à la* ceramics test). In both cases a matrix of the "mixed clays of the NC-CC type" is clearly visible; however, this is not a result of the intentional mixing of two types of clay but a feature of the original raw material

Next, chemical analysis was conducted on all of the clay raw material samples [Table 3]. The chemical composition of the samples is just as diverse as their thermal properties [Figs. 10–11]. But, generally speaking, all of the clay raw materials are characterised by a low chromium content of 62–112 ppm (one clay sample, taken from a geological stratum beneath the *porta Praetoria*, has Cr content of 122 ppm) and a low nickel content of 25–70 ppm.

The only clay sample (MD3897) which is not over-fired at up to and including 1200°C, contains 80.9 wt.% of SiO_2, but with quartz grains not visible to the naked eye [Fig. 8] and in spite of its high silicon content is plastic.

Clay	Lab. No.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	V	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	La	Ce	Pb	Th	l.o.i.
		% by weight										ppm															%
Nov-clay-1	MD3896	65.23	0.900	13.36	4.86	0.094	3.44	7.92	1.73	2.29	0.16	115	112	46	16	69	89	196	36	342	12	430	37	85	20	19	9.1
Nov-clay-2	MD3897	80.88	0.486	10.30	3.87	0.048	0.91	1.66	0.19	1.57	0.09	92	62	35	18	54	74	46	19	155	10	203	24	50	85	16	3.8
Nov-clay-3	MD3898	71.58	0.958	14.30	5.85	0.064	1.88	1.15	1.59	2.48	0.17	135	122	54	25	83	104	138	39	354	13	406	36	93	21	22	3.4
Nov-clay-4	MD3899	73.63	0.922	13.46	5.04	0.100	1.58	0.88	1.37	2.82	0.21	125	111	50	20	65	94	99	36	355	12	375	34	95	18	23	3.4
Alekovo	MD7190	62.68	0.768	15.36	6.02	0.080	2.43	8.98	0.92	2.61	0.15	139	97	59	35	94	133	250	29	202	16	366	30	54	50	7	10.2
Balgarene	MD7191	65.66	0.741	14.49	5.63	0.076	1.93	7.95	0.86	2.54	0.14	127	90	53	29	85	125	267	28	224	16	311	38	62	47	6	8.6
Biala Voda	MD7192	70.47	0.566	8.02	4.27	0.039	1.47	12.75	0.47	1.81	0.14	76	66	25	9	49	87	236	27	322	13	205	6	46	17	<5	10.9
Biala Voda bis	MD7193	64.81	0.802	14.00	5.10	0.063	3.00	9.43	0.92	1.75	0.13	98	96	51	18	79	87	204	44	299	16	326	47	66	25	6	10.7
Butovo	MD7194	61.22	0.896	19.75	7.46	0.110	2.11	3.92	0.99	3.37	0.17	155	112	68	54	109	158	211	32	187	17	382	24	63	68	9	6.9
Dakov	MD7195	72.95	0.930	9.98	3.73	0.076	2.29	6.27	1.70	1.86	0.23	82	100	28	16	53	77	181	40	455	17	329	52	97	24	<5	7.0
Karaisen	MD7196	68.65	0.979	14.71	5.97	0.113	2.35	3.19	1.33	2.54	0.18	117	112	56	28	81	120	126	40	326	19	450	46	82	44	8	5.7
Kozlovets	MD7197	65.98	0.919	13.32	5.19	0.095	2.97	7.93	1.31	2.14	0.15	100	109	47	20	72	104	230	42	387	17	444	32	71	40	<5	9.1
Ovča Mogila	MD7198	62.99	0.791	16.24	6.16	0.080	2.06	7.85	0.86	2.84	0.14	141	98	61	34	93	142	249	30	210	16	289	33	80	43	7	9.2
Ovča Mogila bis	MD7199	62.15	0.781	16.79	6.13	0.075	2.11	7.99	0.87	2.95	0.15	148	100	63	35	92	144	245	30	198	16	312	52	60	46	8	9.2
Sanadinovo	MD7200	60.03	0.656	11.78	5.84	0.074	2.57	15.22	0.95	2.42	0.47	90	92	44	24	66	108	314	36	273	12	317	30	53	32	11	13.5
Stezherovo	MD7201	67.95	0.959	13.48	5.26	0.099	3.29	4.61	1.73	2.43	0.20	106	105	50	18	74	105	151	41	362	17	477	13	75	34	7	6.7
Studena	MD7202	54.33	0.660	16.82	6.05	0.057	2.41	15.82	0.91	2.74	0.21	157	103	69	47	113	149	355	31	172	13	335	49	44	39	7	14.9
Tatari	MD7203	53.88	0.668	16.52	7.00	0.068	2.11	16.20	0.65	2.76	0.13	136	95	70	25	107	140	565	26	183	14	308	20	67	33	<5	14.4
Trembesh	MD7204	50.86	0.584	15.05	5.14	0.072	2.22	22.72	0.79	2.44	0.12	121	84	54	31	90	122	742	26	175	13	301	14	54	31	<5	17.9

Table 3. The results of chemical analysis by WD-XRF. Concentration of major elements normalised to 100%, measurement of melted, ignited samples; l.o.i. = loss on ignition at 900°C

This sample is also characterised by a low Zr content and the highest SiO_2/Zr (0.52) ratio of all the analysed raw materials, as well as by low levels of Fe_2O_3, MgO and K_2O, and very low concentrations of TiO_2 and Na_2O. In contrast, the only non-plastic raw material, Dakot clay (MD7195), is characterised by a low Al_2O_3 content, a high Zr content, which is the highest among all of the analysed raw materials, but also by the lowest SiO_2/Zr (0.16) ratio. Bâla Voda clay (MD7192) is also distinctive, among other things because of having the lowest Al_2O_3 content of all 19 analysed raw material samples and the lowest SiO_2/Zr (0.11) ratio. These three clays also have very low levels of nickel (Ni 25–35 ppm). Butovo clay differs from all of the other raw material samples in having the highest concentration of Al2O3 and F2O3. Only six clay samples have a CaO content of up to 4.6 wt.%; three of these samples were collected from Novae. Five samples have a CaO content of 12.8–16.2 wt.% and the Trembeš sample (MD7204) has a CaO content of 22.7 wt.%. The high levels of CaO in these samples are attributable to carbonates connected with the matrix [Figs. 10–11]. Elevated CaO content is correlated with the proportion of the matrix that fires various shades of olive-green, and the intensity of these shades in the colour of the matrix, after the firing test [Fig. 10]. There is only one sample (Bâla Voda, MD7192) in which the CaO content is related to the matrix as well as to grains in coarse fraction, as shown by the results of the firing test [Pl. 11, and see description four paragraphs ago].

After comparing firing and refiring behaviour as well as chemical composition of clay raw materials with the thermal behaviour and chemical composition of the CBM, two clay samples were selected for XRD analysis [Figs. 13–16], and thin sections were made from green raw materials and fired briquettes [Pls. 37–39].

The decision to perform X-ray diffraction analysis on only two clay samples should come as no surprise given that this technique, which is widely used by geologists to determine mineral composition, is of limited use in the study of archaeological ceramics. X-ray diffraction analysis makes it possible to determine mineral phases in a clay sample. However, one recording is not enough to accurately identify clay minerals. In X-ray diffractograms of individual groups of layered silicates, the location of even the most intense reflexes is not characteristic of a single mineral. Accurate identification of clay minerals can be achieved by threefold recording on oriented preparations (after separating the clay fraction), using air-dry natural samples, samples saturated with glycerol and samples calcined at 500°C. The results obtained from three such measurements are used for a more precise interpretation of general diffractograms of the analysis of whole clay samples.

Figs. 13 and 14 show diffractograms of two clay samples: Ovča Mogila Bis clay and Studena clay.[46] For kaolinite and chlorite there is a coincidence of basal 001 (kaolinite) and 002 (chlorite) reflexes, and for smectites, a coincidence of basal 001 reflexes (chlorite and air-dry smectite) is possible. After calcination at 500°C, kaolinite is transformed into an amorphous phase (metakaolinite), and therefore the reflexes originating from this mineral "disappear" from the diffractogram. In a preparation saturated with ethylene glycol, the 001 smectite reflex changes position (swelling).

The following clay minerals were identified in Ovča Mogila Bis clay (MD7199): chlorite, a mixed-layer mineral of the chlorite-smectite type, illite (and/or mica), and kaolinite. The presence

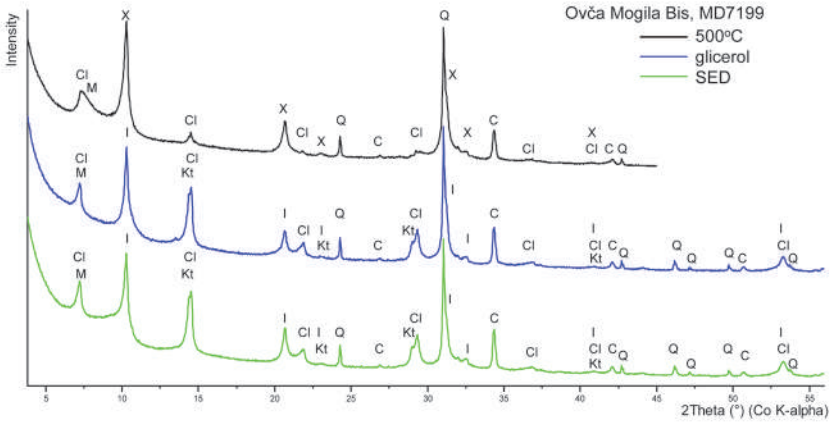

Fig. 13. X-ray diffractograms of Ovča Mogila Bis clay: 500°C = preparation after calcination at 500˚C for 3 hours; glicerol = air-dry preparation saturated with ethylene glycol; SED = air-dry natural sample; samples separated by the sedimentation method

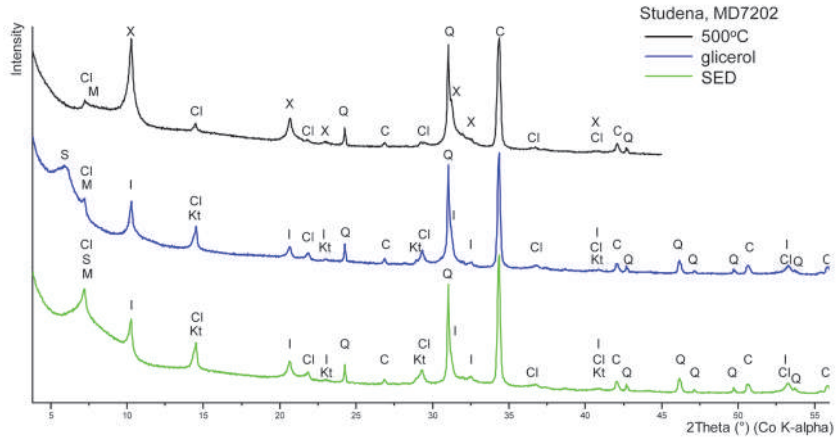

Fig. 14. X-ray diffractograms of Studena clay: 500°C = preparation after calcination at 500˚C for 3 hours; glicerol = air-dry preparation saturated with ethylene glycol; SED = air-dry natural sample; samples separated by the sedimentation method

[46] Oriented preparations were made from samples separated by the sedimentation method and recorded on a diffractometer using the Bragg-Brentano method in the following ranges: 3.8–56˚ 2θ (air-dry preparation saturated with ethylene glycol), 3.8–45˚ 2˚ (preparation calcined at 500˚C for 3 hours). The total measurement times of a single recording were: 1 hour 30 minutes (air-dry preparation saturated with ethylene glycol); 1 hour 12 minutes (preparation calcined at 500˚C for 3 hours). Measurement parameters: step 0.026˚ 2θ. Filtered CoKα radiation (Fe filter) with current parameters of 30 mA and 40 kV. Radiation detection — fast line PIXcel detector (analysis by G. Kapron, UW).

of quartz and calcite was also detected, and in the calcined preparation, a mica-like phase formed after heating of the clay minerals [Fig. 13].

The following clay minerals were identified in Studena clay (MD7202): smectite, chlorite, a mixed-layer mineral of the chlorite-smectite type, illite (and/or mica), and kaolinite. The presence of quartz and calcite was also detected, and in the calcined preparation, a mica-like phase was formed after calcination of the clay minerals [Fig. 14].[47]

Due to the thermal properties of clay minerals (i.e., their dehydroxylation and the formation of new phases produced by collapsed clay minerals depending on the firing temperature), as already mentioned, the application of XRD is of limited use in the analysis of archaeological ceramics. Figs. 15 and 16 show the results of XRD analysis of two raw material samples before and after firing. Six briquettes made of each clay were fired using the same procedure for preparing the briquettes and the same firing conditions as those used in the firing test. In the diffractograms of two different raw materials fired at 800°C, the clay mineral reflexes disappear, but in both cases a muscovite reflex is visible. A faint muscovite reflex is also visible after firing at 900°C; it is not visible in the diffractograms of the briquettes fired at 1000°C and at higher temperatures.

The most likely original firing temperature range for historic CBM is 800–1000°C. Comparing the diffractograms of the two raw materials fired at 800, 900 and 1000°C (which corresponds to ceramics made of these clays fired at these temperatures without the intentional addition of

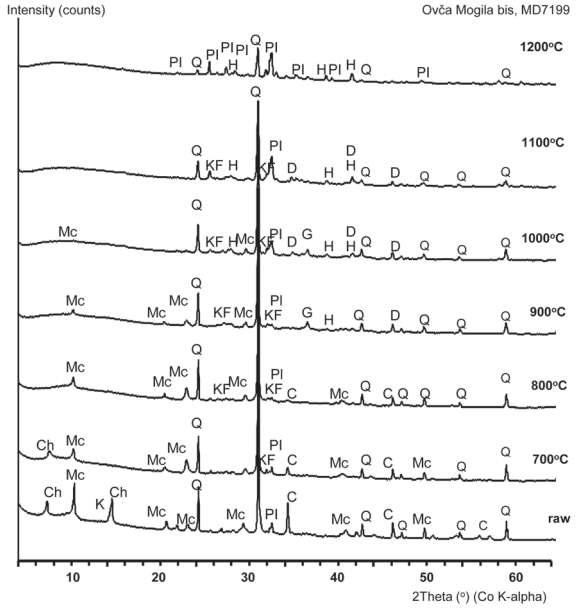

Fig. 15. X-ray diffractograms of briquettes made of Ovča Mogila Bis clay fired at various temperatures (Ch = chlorite, Mc = micas, K = kaolinite, Q = quartz, Pl = plagioclases, KF = K-feldspars, C = calcite, D = dolomite, H = hematite, W = wollastonite, G = gehlenite)

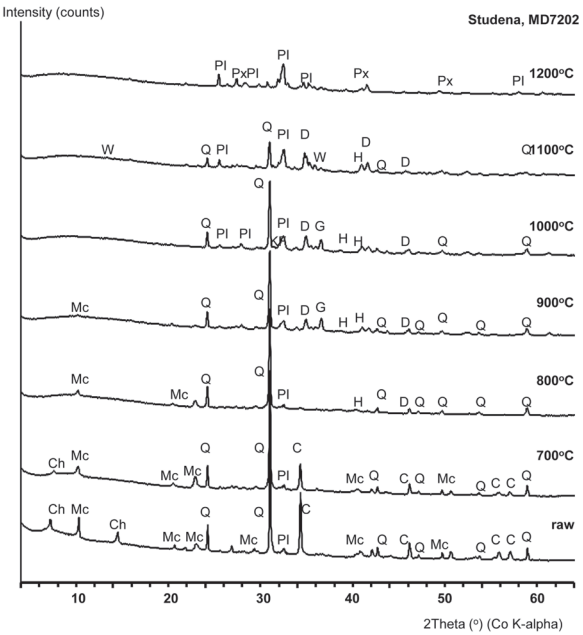

Fig. 16. X-ray diffractograms of briquettes made of Studena clay fired at various temperatures (Ch = chlorite, Mc = micas, K = kaolinite, Q = quartz, Pl = plagioclases, KF = K-feldspars, C = calcite, D = dolomite, H = hematite, W = wollastonite, G = gehlenite)

[47] The results correspond to the clay minerals identified in Regosols from Lom-Svištov region (Hristov, Atanasova, Teoharov 2010).

non-plastic particles) reveals that there is no reflex characteristic of clay minerals. The observed differences are related to the intensity of calcium aluminosilicate reflexes (new phases related to thermal changes of calcite). But if only XRD analysis is performed for a given ceramic product, it will not be possible to determine whether the carbonates are associated with the plastic or the non-plastic part (e.g., with an intentional temper of crushed carbonates) of the ceramic body. In order to correctly interpret the results, the necessary minimum required is the results of macroscopic ceramic fabric analysis, and preferably the results of MGR-analysis and/or thin-section studies.

Generally speaking, XRD analysis can be used to give a rough estimation of the original firing temperature,[48] but it is rarely (or even very rarely) useful in provenance studies. Determining the composition of the types of clay minerals present in a given raw material will not help in provenance studies when, for comparison with the phases present in the raw material, we have the phases present in the ceramic product. To some extent, it may be helpful to determine the mineral composition of the ceramic body by using rational analysis,[49] i.e., analysis of the rational composition, or in other words the hypothetical minerals that make up a given raw material determined on the basis of its chemical composition presented in the form of oxides, whose content was determined by classical chemical analysis. SEM/EDS analysis can be used to determine the matrix composition, but it must be borne in mind that rather than yielding comprehensive mineralogical data, this analytical method simply provides information about chemical elemental composition from which we can draw conclusions about mineralogical composition based on what we know about the given sample, including details of its shape, appearance, etc. (the same chemical composition does not equate to the same mineral).

If, for example, in a CBM sample we detect the presence of inclusions with a chemical composition corresponding to that of kaolinite, this does not unequivocally mean that there is any kaolinite in the sample, as after firing kaolinite undergoes structural collapse (at *ca*. 500°C), and kaolinite could not exist as a mineral phase in CBM (i.e., in a stable ceramic product). On the other hand, the presence of primary kaolinite (primary meaning the clay mineral in the raw material used for pottery making, not impurities connected with the secondary contamination of the sherd during its deposition in an archaeological context) would indicate firing at too low a temperature (a temperature so low that dehydroxylation of kaolinite and transformation into methakaolinite did not take place),[50] and such a pseudo-ceramic product would disintegrate on contact with water.

A water conditioning test was carried out on fifteen raw materials sampled in 2020, from which briquettes were made and fired at 500°C and then immersed in distilled water. Eleven of the briquettes regained plasticity in the water — a suspension formed either immediately after immersion or after several hours had elapsed, and after the evaporation of any excess water the samples regained plasticity to varying degrees. Four of the briquettes disintegrated (leaving small nodules) but did not regain plasticity (Karajsen, Kozlovec, Sanadivevo and Stežerovo clays).

The next step in analysing the raw materials was a thin-section study. When analysing clay, thin-sections should be prepared from green raw materials, and, in order to compare them with finished ceramic products, further thin sections should be prepared from briquettes made of a given clay that has been fired in various firing conditions. Fig. 17 shows micrographs of thin sections of Studena clay in the green stage[51] and fired at 800°C — the differences in the microscopic images, as expected, are very clear.

[48] This is one of the so-called static methods used for the estimation of original firing temperature. Static methods focus on analysing specific characteristics from which the firing temperature is then estimated. In the case of XRD analysis estimation of firing temperature is based on the presence or absence of particular mineral phases.

[49] The concept of rational composition was introduced by the German chemist Herman Bollenbach.

[50] In technological terms this is drying not firing.

[51] For the purposes of this study, one thin-section was prepared from green clay.

The thin sections described below were made from briquettes made from three samples of clay (Studena, Ovča Mogila Bis and Bâla Voda Bis clays) after they had been fired.

The Studena clay (MD7202) thin section was made from a briquette fired at 800°C (see description of firing test), thus the microscopic image should be like that of a ceramic product made without any intentional temper and fired in an oxidising atmosphere at 800°C. The matrix is unevenly coloured by iron compounds; small, randomly distributed patches of matrix very strongly coloured by iron compounds are clearly visible [Pl. 37a]. Only inclusions of silt size are observed in the field of view as well as some mica consisting of quartz [Pl. 37a–f]. Microfossils are also observed [Pl. 37d–f]. This makes this clay similar to CBM sample MD7230 and sample MD7238 [Pls. 23–24].

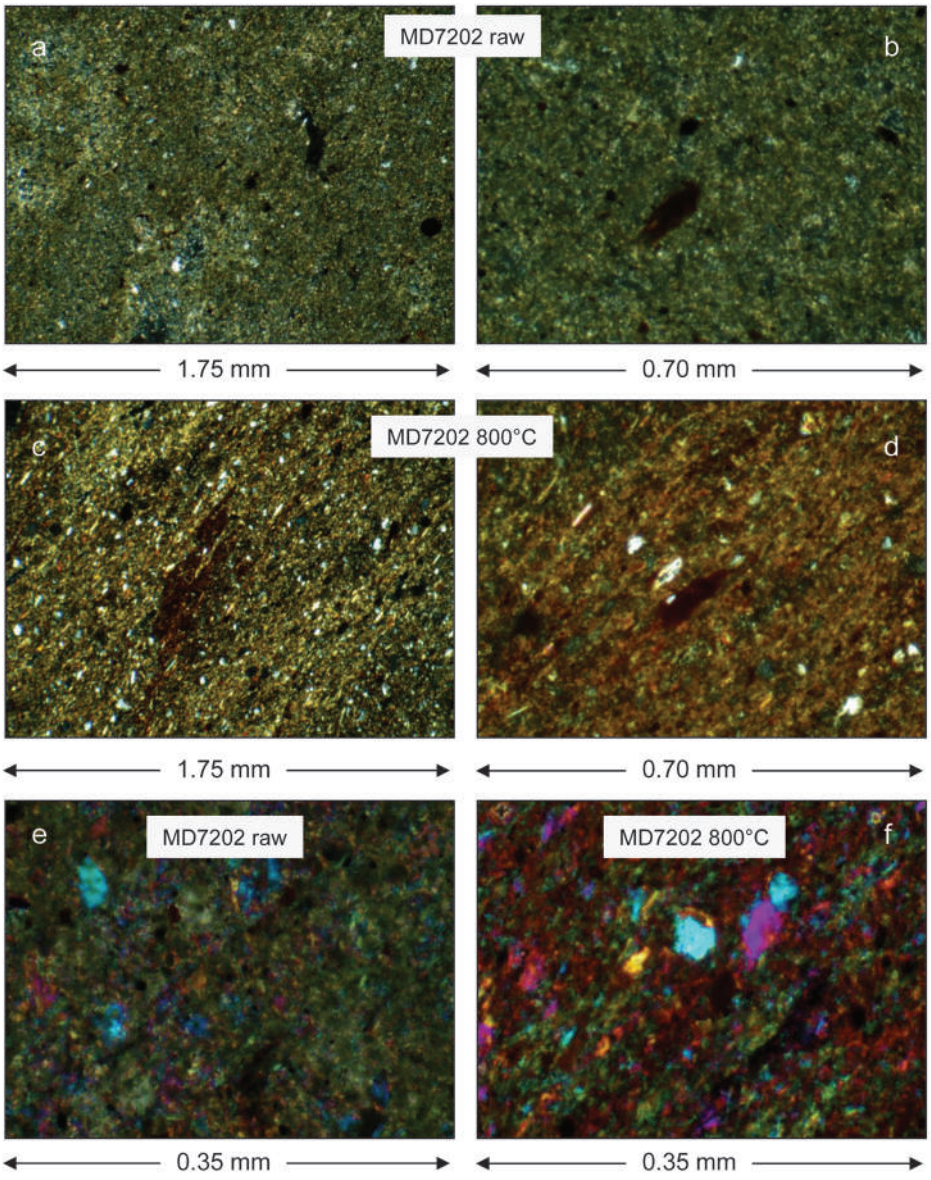

Fig. 17. Typical image of thin sections of Studena clay in the green stage and of briquettes made of Studena clay fired at 800°C (Micrographs, XPL, e and f with quartz plate)

The clay sample from Ovča Mogila Bis (MD7199), like the Studena clay, was examined in the form of a thin section taken from a briquette fired at 800°C. As with the Studena clay, all of the inclusions are of silt size and represent quartz and some mica, as well as opaque minerals (iron compounds) inhomogeneously distributed in the matrix [Pl. 38]. Only some inclusions of former gypsum crystals are larger than the quartz [Pl. 39a and c]. The gypsum content is confirmed by chemical analysis. This sample also features microfossils like the foraminifera in CBM samples [Pl. 39 e and f].

Two clay samples fired at 1150°C were also examined [Pl. 38a and b]. No shapes that would indicate the original presence of gypsum and bioclasts are observed in the briquette made from Ovča Mogila Bis clay. In contrast to the sample fired at 800°C, patches of matrix variously coloured by iron compounds are clearly visible, with a predominance of patches very strongly coloured by iron compounds. Those areas which are lightly coloured are small and finely distributed, which is easily visible macroscopically in the firing test. A similar effect can be seen in some of the CBM samples in MGR-analysis.

As in the case of the briquette made from Ovča Mogila Bis clay, no remains of microfossils are observed in the briquette made from Bâla Voda Bis clay (MD7193). Patches of matrix variously coloured by iron compounds are also clearly visible, but areas that are lightly coloured predominate and individual patches are larger [Pl. 38c–f]. The sample of Ovča Mogila Bis clay is somewhat different from the sample of Bâla Voda Bis clay (MD7193) which, however, is only very clear in the chemical data regarding K and Rb and in the firing test.

Combining the results obtained from analysis of CBM, CW, LegP and clay samples

The first step in writing up these analysis results was to group the samples according to their chemical composition using the finger method.[52]

This preliminary comparative analysis incorporates the results of chemical analysis performed on all of the ceramic sherds recovered from Novae that were submitted to the laboratory, including the various types of amphorae analysed in 1999.[53] This analysis revealed that several Zeest 64 amphorae[54] have a similar chemical composition to that of CW pottery, and therefore these amphorae were included in the second stage of the comparative study. Four major groups and six outlier samples were identified using the finger method. Several groups and subgroups can be distinguished within each major group, most of which in the case of CBM are represented by no more than one sample.[55]

Multivariate statistical analyses[56] were employed to confirm the groupings defined using the finger method. Firstly, to reliably assess which elements best distinguish samples from specific groups, a principal components analysis (PCA) was performed[57] on the results obtained by

[52] Or "by eye" as it is sometimes referred to.

[53] Daszkiewicz *et alii* 2000.

[54] These sherds were found during excavation of the *thermae legionis*, and the amphorae were dated to the late first century AD based on their archaeological context (Daszkiewicz *et alii* 2000).

[55] The term "group" is used even when that group is represented solely by one sample. Because it is improbable that only a single vessel would have been produced from one ceramic body, it is assumed that the analysed sample represents a group of vessels made from the same material. This is why the term "group" is used even in those cases where groups are represented by just a solitary sample.

[56] All multivariate clusters analysis, principal components analysis and discriminant analysis were carried out using a licensed copy of the SYSTEM Package obtained from the Weierstrass Institute for Applied Analysis and Stochastics, Leibniz Institute in Forschungsverbund Berlin e.V.

[57] Using concentrations of the following elements: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce.

WD-XRF. In the PCA, the two first components explain only 45% of the variation (component 1 [PComp1] explains 25.2% of the variation, and component 2 [PComp2] explains 19.8%,), component 3 (PComp3) explains 16.8.0% of the variation and the remaining seventeen components explain 38.2%. The results of PCA, PComp1 vs. PComp2 are shown in Fig. 18a — pottery types were defined as separate clusters[58] and all clay samples as one cluster. As can be seen from the loadings plot [Fig. 18b], combinations of positive and negative loadings (mixed loadings) are not prevalent; only two variables have mixed loadings where positive and negative loadings are similarly high — concentrations of calcium (CaO) and rubidium (Rb). Three variables have a similar correlation with PC1 as well as with PC2 — concentrations of magnesium (MgO), vanadium (V) and barium (Ba). The highest component positive loadings correlated with PComp1 have a concentration of Ca whilst the highest component loadings correlated with PCom2 have concentrations of silicon (SiO_2). Concentrations of aluminium (Al_2O_3), iron (Fe_2O_3), potassium (K_2O) and strontium (Sr) are present in the highest component loadings correlated with PComp3. The PCA results confirmed the groupings and the significance of particular chemical elements determined using the finger method. The PCA showed that the samples of CW, along with Zeest 64 amphorae and LegP sherds, are very distinct from all of the others ceramic fragments [Fig. 40a]. High CaO as well as high MnO and Sr concentrations and low SiO_2 concentrations play a significant role in distinguishing the cluster made up of CW and cluster of Zeest 64 amphorae.

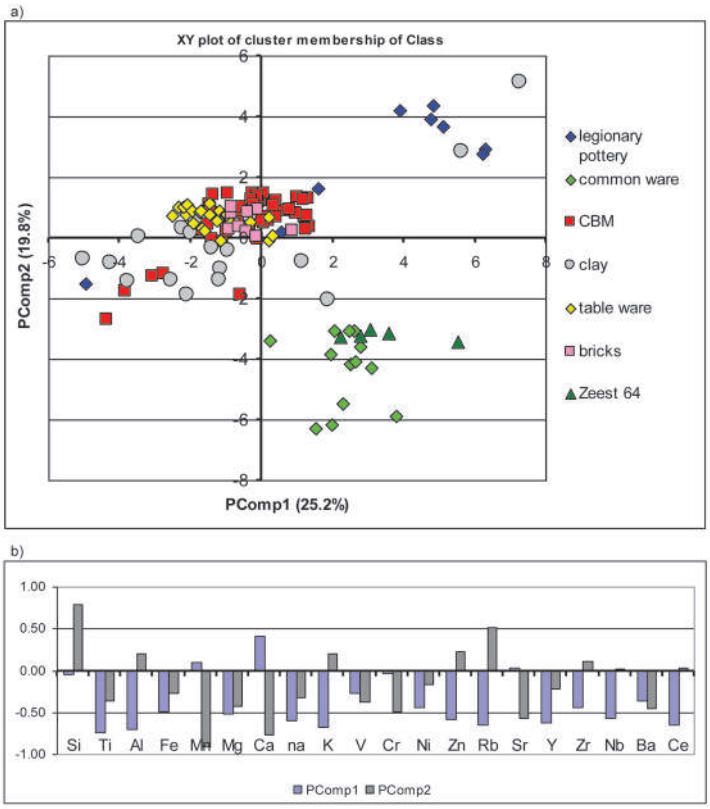

Fig. 18. Results of a PCA of chemical analysis results
(the concentration of the following elements were used:
Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce)

[58] Individual clusters encompass LegP, CW, CBM, TW, bricks submitted by T. Sarnowski (referred to as "bricks -TS" hereinafter) and Zeest amphorae found in Novae.

Concentrations of the same elements play a significant role in distinguishing the cluster consisting of LegP sherds (except for three samples), but there is an opposite correlation. In contrast, samples belonging to those groups of cluster LegP located almost symmetrically on the other side of the X axis are distinguished by a low concentration of CaO as well as MnO and Sr and a higher content of SiO_2.

In the PCA results, five CBM samples are outliers from the group of CBM samples. The remaining CBM samples, as well as bricks-TS and TW clusters form a relatively compact group in which most of the TW samples exhibit a clear shift towards lower PCom1 values [Fig. 18a]. Generally speaking, samples representing the TW cluster have a higher Al_2O_3 content than most CBM samples.

Multivariate cluster analysis was performed next. Fig. 19 presents the results of this analysis in the form of a dendrogram.[59] Eleven clusters were singled out (cluster numbers are given in column C), and most of them can be further divided into sub-clusters. These clusters can be grouped in five major groups of clusters: major cluster groups A, B, C, D and E. The first major cluster group, group A, consists of two clusters (clusters 1 and 2) jointly made up of six samples. Five of them are LegP samples, and one is a clay sample (MD3897, Nov-2, samples taken from the side of an escarpment). The second major cluster group, group B, comprises four clusters (clusters 3–6). These clusters contain all five CBM samples and two LegP samples that were outliers in the PCA results. The first cluster of group B (cluster 3) consists of two samples of LegP (MD3871 and MD3868) and four outliers of CBM samples (MD3893, MD3894, MD3895 and MD7241). The next cluster (cluster 4) features two clay samples, whilst cluster 5 is made up of seven clay samples and one outlier sample of CBM (MD3892). The last cluster of group B (cluster 6) comprises only one clay sample (Bâla Voda clay, MD7192). The next major cluster group (group C) consists of only one cluster (cluster 7) represented by a third LegP sample that was an outlier in PCA (sample MD3872 with an exceptionally high content of Al_2O_3 and Na_2O). Major cluster group D, divided into two clusters (8 and 9) is the most numerously represented of all the groups, comprising a total of 90 samples. Cluster 8 consists mostly of CBM samples, but also includes eight of the nine analysed bricks-TS samples, four TW samples and one sub-cluster made up of three clay samples (Studena, Trembeš and Tatari clays). Cluster 9 brings together the remaining TW samples, four CBM samples and one sub-cluster made up of four clay samples (Ovča Mogila, Ovča Mogila Bis, Alekovo and Bălgarene clays). The last major cluster group (group D) is also divided into two clusters (10 and 11), the first of which features eleven CW samples and one Zeest 64 amphora, the other consisting of another two CW samples and four Zeest 64 amphorae (amphora samples were not included in subsequent multivariate and bivariate analyses due to the fact that, despite their similarities with CW sherds, CW pottery does not belong to any of the groups determined for amphora samples[60]).

The next step was discriminant analysis. LegP, CW, CBM, TW, brick-TS and clays were defined as clusters in this discriminant analysis, and the same elements were used as in multivariate cluster analysis and PCA. Fig. 20 shows canonical variation 2 versus canonical variation 1. This result shows that the group discrimination is unequivocal. CBM, TW, bricks-TS and eighteen clay samples form a compact group. One clay sample is well separated (MD3897), as are the LegP samples, which do not form one compact group, and the CW pottery samples, which are well separated from other sample groups.

[59] Square Euclidean Distance, Ward clustering, using logged values of the concentrations of the following elements: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba, Ce and La.

[60] Daszkiewicz *et alii* 2000.

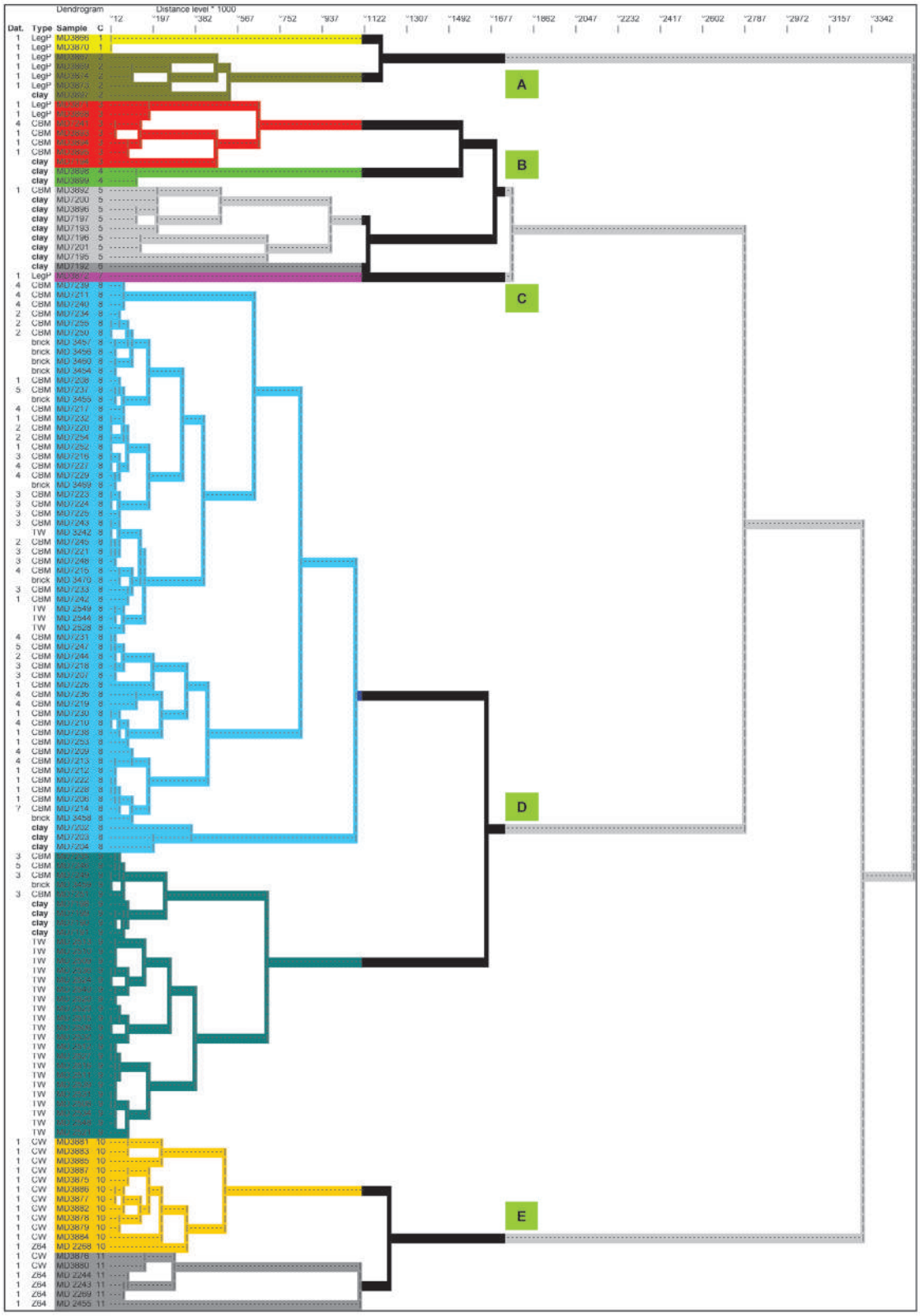

Fig. 19. Results of multivariate cluster analysis in the form of a dendrogram (Square Euclidean Distance, Ward clustering, logged values of the concentrations of the following elements were used: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce)

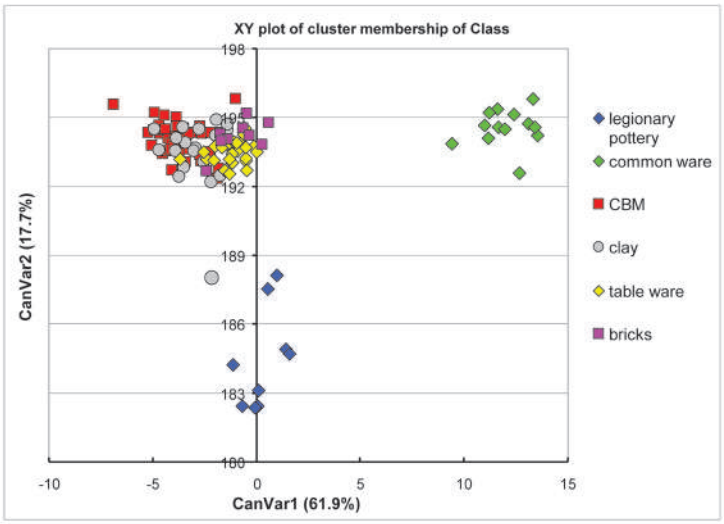

Fig. 20. Results of a discriminant analysis (the concentration of the following elements were used: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce)

Fig. 21 presents all of the analysed sherds and clay samples in the form of a biplot showing the ratio of Al_2O_3/SiO_2 versus Mn content (as MnO in wt.%). MnO content was one of the criteria that distinguished pottery produced in Butovo and Pavlikeni from pottery from Novae in work carried out as part of the IATRUS project.[61] In Fig. 21, the green ellipse shows the same field that that signified pottery production at Novae in the published diagram.[62] The black rectangle in Fig. 21 encompasses this field, and also includes all bricks-TS and most CBM samples as well as some clay samples. The only samples that do not fall within this area are five CBM samples that are outliers in all of the analyses, and clay samples that can be ruled out as raw materials for CBM.

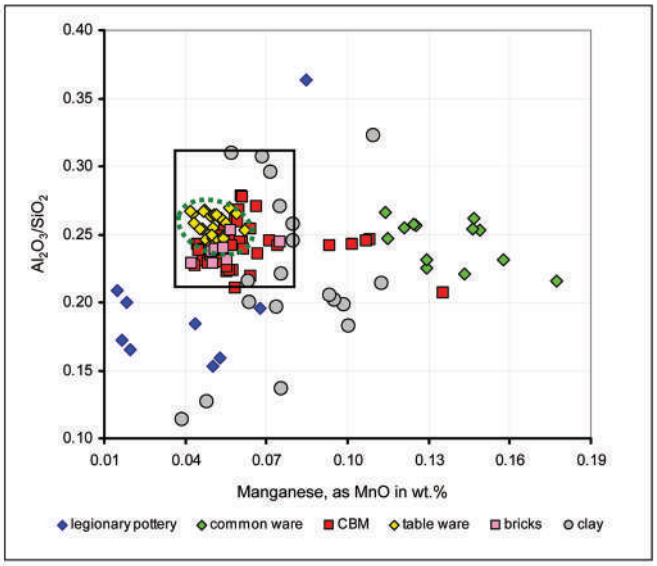

Fig. 21. Bivariate diagram of Al_2O_3/SiO_2 vs. MnO contents in wt% of various ceramics, clay and CBMs found in Novae

[61] Daszkiewicz, Schneider 2007.

[62] Daszkiewicz, Schneider 2007, p. 480.

In addition to determining which, if any, of the sampled clay raw materials could potentially have been the raw materials used for making CBM, an attempt was also made to establish whether there is a correlation between chemical composition and individual types of CBM: roof tiles, bricks, pipes, floor tiles. Fig. 22 shows the results of the PCA[63] in which these types of CBM were defined as clusters. They indicate that pipes were made at many different workshops. Checks were also made to see whether there was a correlation between chemical composition and dating. There is a clear tendency for some of the CBM samples dated to the Flavian Period to separate from the remaining samples [Fig. 23].

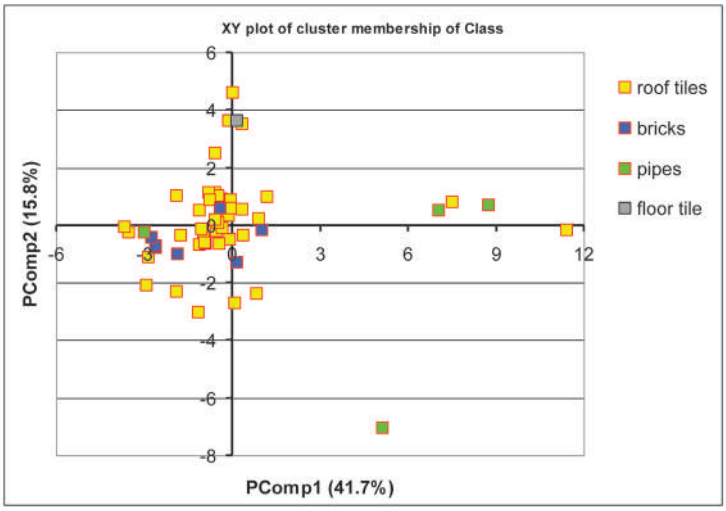

Fig. 22. Results of a PCA of chemical analysis results (the concentration of the following elements were used: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce). CBM types are defined as clusters

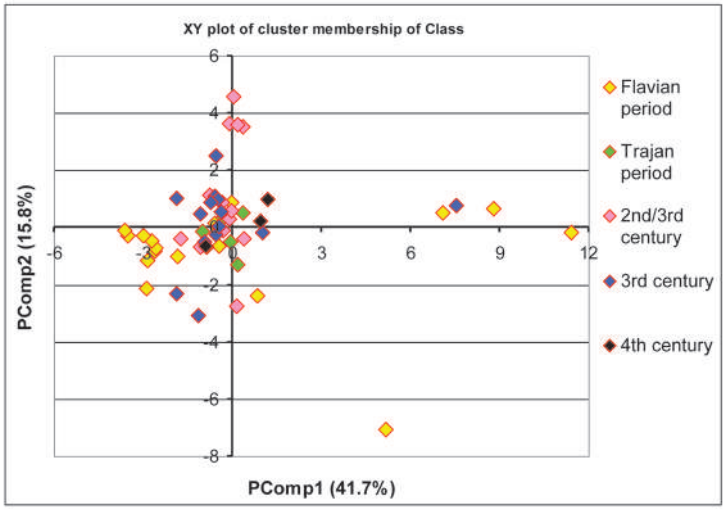

Fig. 23. Results of a PCA of chemical analysis results (the concentration of the following elements were used: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce). CBMs dating are defined as clusters

[63] The same elements were used in the PCA as in all of the multivariate analyses presented in this article.

Finally, there is one question left to answer: Which of the clay samples is the best match for the CBM used in Novae? Looking at the results of all analyses, Studena clay, Ovča Mogila and Ovča Mogila Bis clays are the ones that should be taken into consideration as potential raw materials. Naturally, it is not possible to say that this is exactly the same clay as the analysed sample, but we can say that these are clays "of the same family". Multivariate cluster analysis,[64] the results of which are shown in the form of a dendrogram in Fig. 24, was performed taking into account all

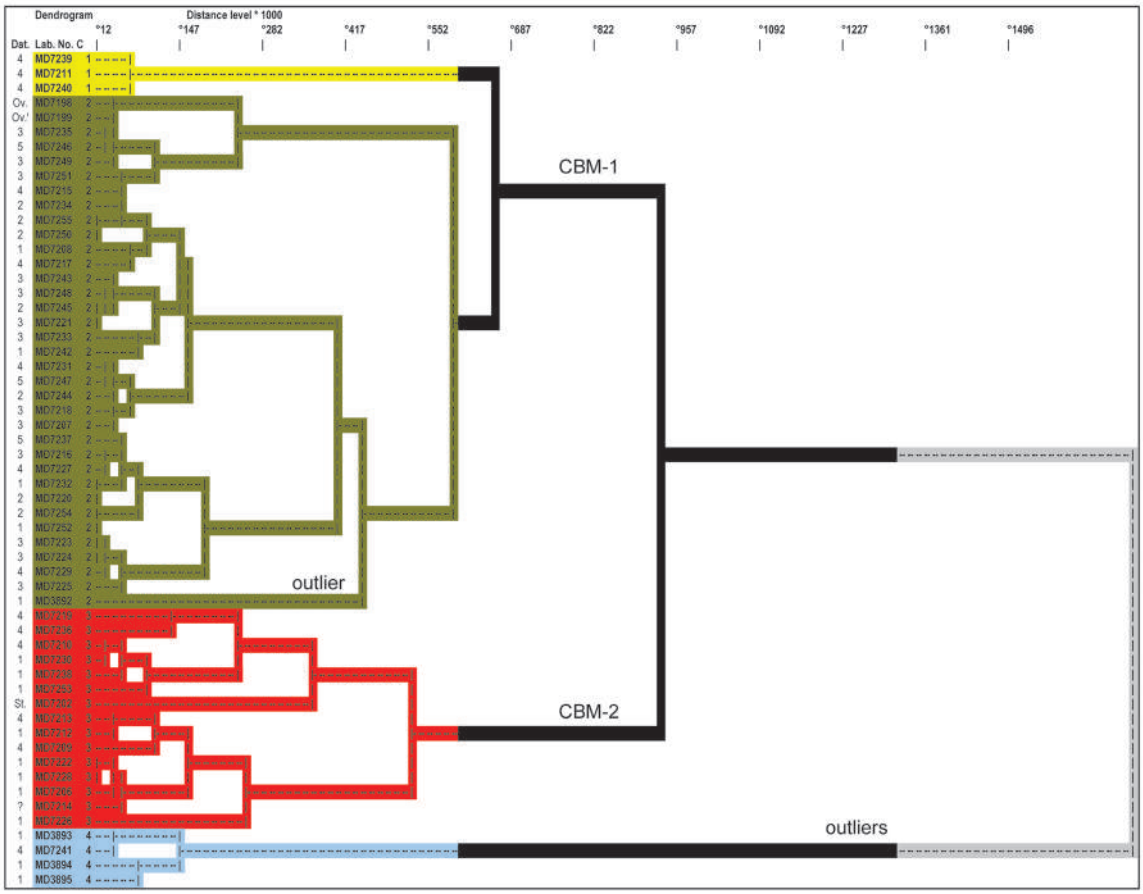

Fig. 24. Results of multivariate cluster analysis in the form of a dendrogram (Square Euclidean Distance, Ward clustering, logged values of concentrations of the following elements: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce). The numbers in the first column (dat.) mean that samples came from features dated to:
1 = Flavian period;
2 = early Antonine dynasty (Trajan period);
3 = latter half of the second / early third century;
4 = third century;
5 = fourth century

[64] Square Euclidean Distance, Ward clustering, using logged values of the concentrations of the following elements: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba, Ce and La..

CBM samples and the three aforementioned clay samples. Four clusters were singled out (cluster numbers are given in column C), each of which can be divided into sub-clusters, but three CBM groups can be distinguished: CBM-1, CBM-2 and outliers. The first group, CBM-1, is made up of 35 CBM samples as well as Ovča Mogila and Ovča Mogila Bis clays (sample MD3892 is excluded from this group). CBM-2 comprises 14 CBM samples and Studena clay. Cluster 4 consists solely of CBM outliers. Most of the CBM samples in CBM-2 represent wares dated to the Flavian Period [Fig. 24, first column]. The results of discriminant analysis confirm the groupings resulting from multivariate cluster analysis [Fig. 25], with the exception of sample MD7219, which is linked to its slightly lower CaO content and higher TiO_2 content. Figs. 26 and 27 show CBM samples divided according provenance and dating. A summary of all these analyses results is presented in the form of a diagram in Fig. 28. It shows the correlation between dating and product type and its provenance attribution. Each of the CBM samples is presented as a separate rectangle (colours indicate dating and the outline of each rectangle indicates the CBM type).

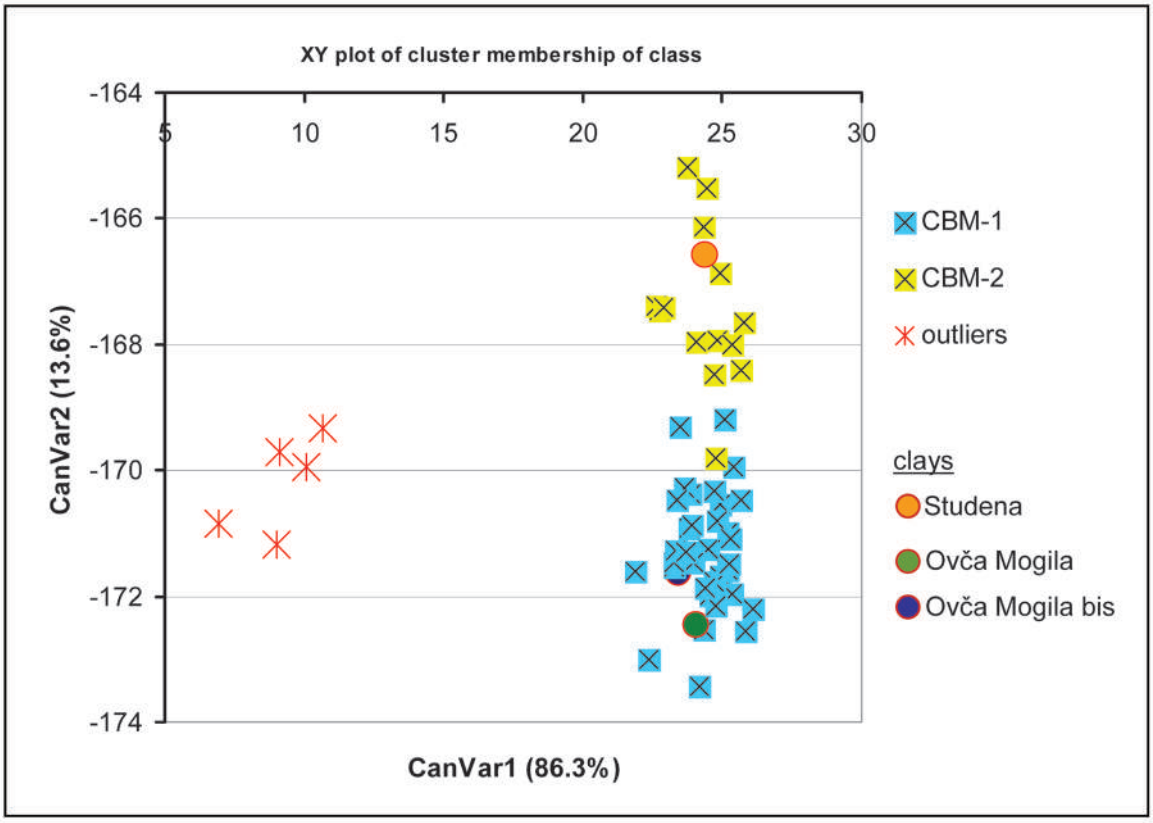

Fig. 25. Results of a discriminant analysis (concentrations of the following elements were used: Si, Ti, Al, Fe, Mn, Mg, Na, Ca, K, V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb, Ba and Ce). All CBM samples and clays from Ovča Mogila, Ovča Mogila Bis and Studena were included

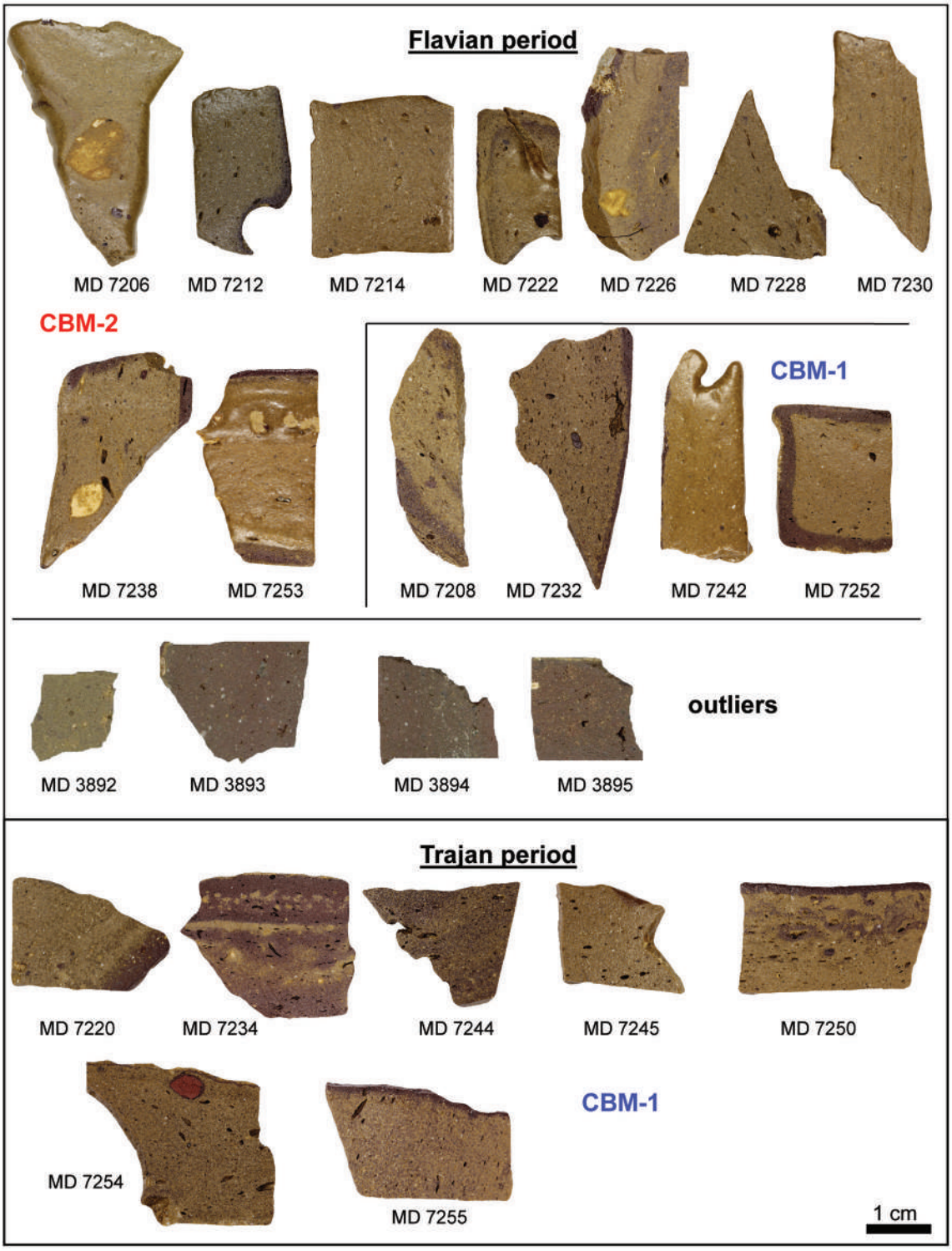

Fig. 26. CBM samples after refiring at 1150°C grouped according provenance and dating (compiled by H. Baranowska and M. Daszkiewicz)

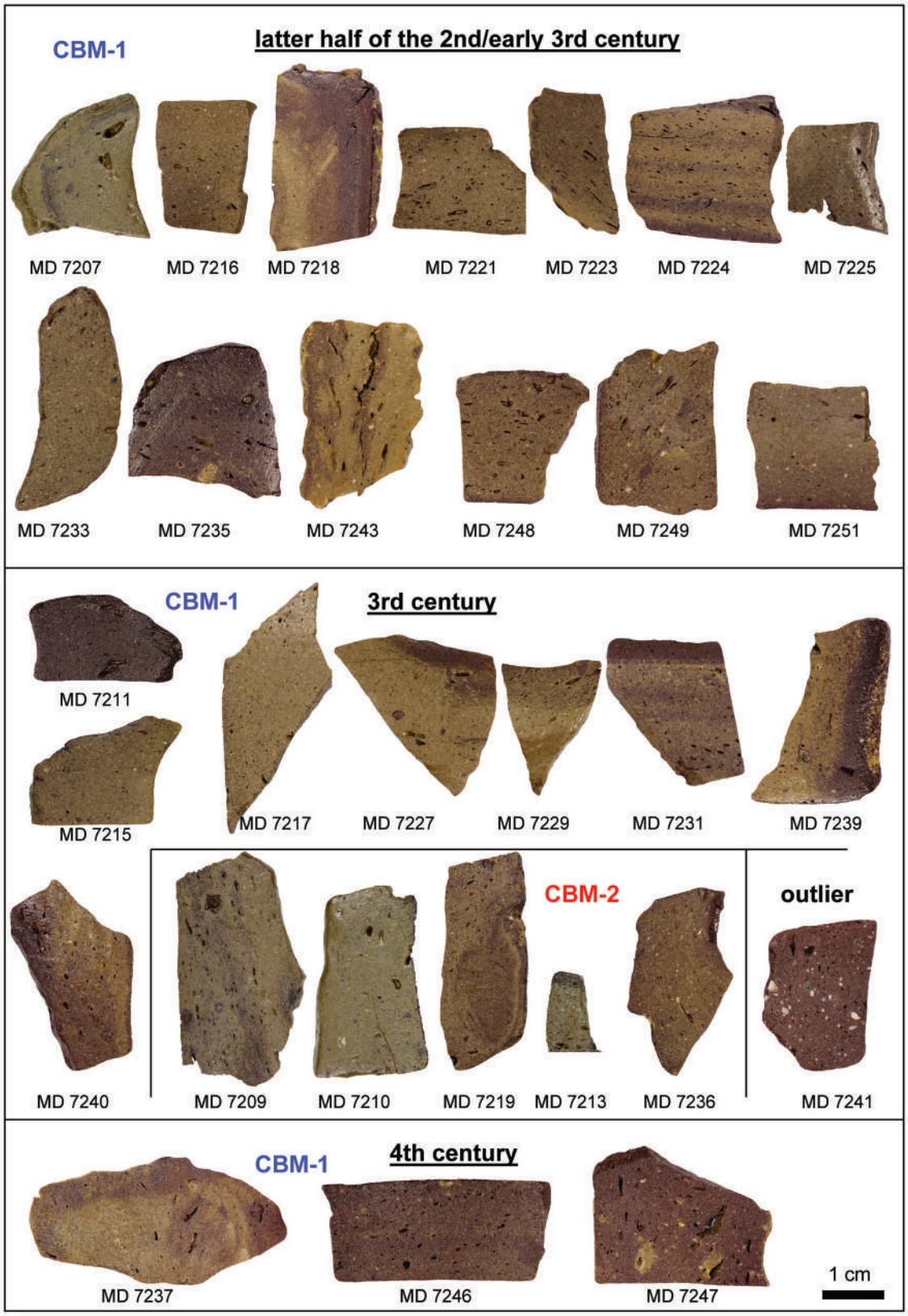

Fig. 27. CBM samples after refiring at 1150°C grouped according provenance and dating (compiled by H. Baranowska and M. Daszkiewicz)

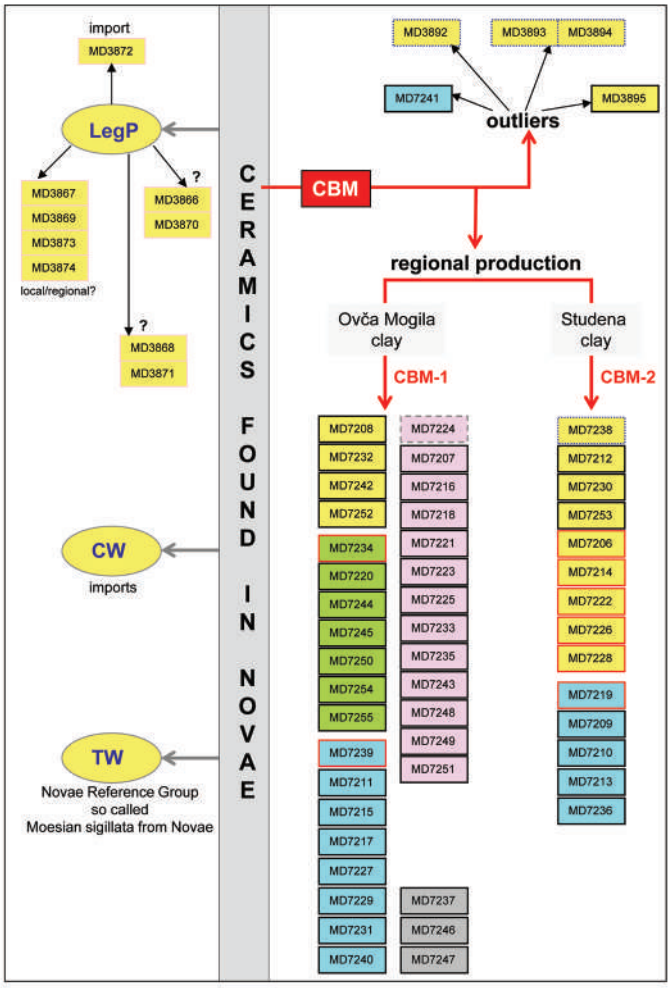

Fig. 28. Ceramics found in Novae, correlation of product type, dating and provenance attribution. Each of the CBM samples is presented as a separate rectangle, colours indicate dating (yellow = Flavian period; green = early Antonine dynasty [Trajan period]; violet = latter half of the second / early third century; blue = third century; grey = fourth century), the frame of each rectangle indicates the CBM type: points = pipes; black line = roof tiles; red line = bricks; dashed line = floor tile

Conclusions

Legionary pottery samples represent wares produced at various workshops, albeit four of the nine analysed fragments were made in the same provenance centre, probably connected with the Novae region. One clay (clay MD3897, samples taken from the side of an escarpment) has a firing behaviour similar to the thermal behaviour of these four refired LegP samples, and its chemical composition also shows some similarities.

Common ware pottery was made of marly clay (with some microbioclasts) intentionally tempered with volcanic rock fragments (andesite/basalt). According to the results of chemical composition analysis, refiring and thin-section studies, CW pottery exhibits not only a similar chemical composition but also a similar thermal behaviour and similar composition/size/distribution of non-plastic components to some amphorae. We can assume that CW pottery was made in the

same region as one group of Zeest 64 amphorae. The provenance of these amphorae is still in question. Given the available published data[65] these amphorae were not made at workshops in Sinope. However, there is no doubt that CW pottery must have been made in a region where both marly clay and volcanic rocks occur, both of which were used as temper. It is highly unlikely that these wares were made in the vicinity of Novae. Although marly clay (Trembeš clay, MD7204) suitable for making ceramics does occur there, volcanic rocks definitely do not (reusing items such as damaged andesite millstones as a source of temper would not have met the demands of mass production).

All analysed TW pottery fragments (red slipped fine wares — so-called Moesian sigillata from Novae) are a homogeneous group in terms of chemical composition representing wares deemed to be local to Novae — Novae Reference Group.[66]

Of the 54 analysed CBM samples only five are outliers from beyond the region. The remaining CBM samples represent products made at workshops local o the Novae region. Two groups associated with two different clay raw materials can be distinguished: CBM-1, associated with Ovča Mogila clay, and CBM-2, associated with Studena clay.

Analyses showed that two samples taken from the Ovča Mogila deposit at a depth of around 50 cm and from a depth of around 1.80 m exhibit identical firing behaviour and have the same chemical composition. This allows us to make a direct comparison between clay samples taken from this deposit and CBM samples used at Novae (a depth of *ca*. 1.80 m corresponds to the foundation level of Flavian Period buildings at Novae — height level *ca*. 47.20–47.30 m a.s.l.).

It is interesting to compare the location of the spots from which clay samples were taken with chemical composition and firing behaviour. Comparing three clay raw materials sampled from spots located close to one another revealed that each of these clay samples is significantly different in firing behaviour and chemical composition. However, clay samples taken from spots a long distance from one another differ slightly in chemical composition and the differences are more pronounced in the firing test. This should be borne in mind when looking for the raw materials from which ancient ceramics were made.

Translated by Barbara Gostyńska

Abbreviations

Projektgruppe Keramik 1989 — G. Schneider (ed.), "Naturwissenschaftliche Kriterien und Verfahren zur Beschreibung von Keramik. Publikation der Projektgruppe Keramik im Arbeitskreis Archäometrie der GDCH", *Acta Praehistorica et Archaeologica* 21, pp. 7–39.

Bibliography

Al-Rawas, Cheema, Al-Aghbari 2000 — A. Al-Rawas, T. Cheema, M. Al-Aghbari, "Geological and engineering classification systems of mudrocks", *Science and Technology. Special Review*, pp. 137–155.

[65] Türkmen 2003; Slusallek *et alii* 1983.
[66] Daszkiewicz, Bobryk, Schneider 2006; Daszkiewicz, Schneider 2007; Baranowski, Daszkiewicz, Schneider 2021

Baranowski, Daszkiewicz 2009 M. Baranowski, M. Daszkiewicz, "Macroscopic description and laboratory analysis of twelve pottery fragments from Novae", *Novensia* 20, pp. 125–152.

Baranowski, Daszkiewicz, Schneider 2021 M. Baranowski, M. Daszkiewicz, G. Schneider, "Chemical analysis using WD-XRF and p-ED-XRF and using macroscopic analysis of fabrics in studying Moesian sigillata", [in:] *Using pXRF for the Analysis of Ancient Pottery — An Expert Workshop in Berlin 2014*, ed. M. Hegewisch, M. Daszkiewicz, G. Schneider (= *Berlin Studies of the Ancient World* 75), pp. 111–155.

Daszkiewicz 2014 M. Daszkiewicz, "Ancient pottery in the laboratory — principles of archaeoceramological investigations of provenance and technology", *Novensia* 25, pp. 177–197.

Daszkiewicz, Bobryk, Schneider 2006 M. Daszkiewicz, E. Bobryk, G. Schneider, "Some aspects of composition, technology and functional properties of Roman and Early Byzantine pottery from Novae (Bulgaria)", [in:] E. Û. Klenina, *Stolovaâ i kuhonnaâ keramika III–VI vekov iz Nov (severnaâ Bolgariâ) / Ceramic Tableware and Kitchenware of the 3rd–6th Century from Novae (Northern Bulgaria)* (= *Novae. Studies and Materials* 2), Poznań – Sevastopol, pp. 189–211.

Daszkiewicz, Bobryk, Wetendorf 2017 M. Daszkiewicz, E. Bobryk, M. Wetendorf, "Experimental archaeology: To what extent is it possible to reconstruct ancient pottery forming techniques", *Novensia* 28, pp. 161–184.

Daszkiewicz, Maritan 2017 M. Daszkiewicz, L. Maritan, "Experimental firing and re-firing", [in:] *The Oxford Handbook of Archaeological Ceramic Analysis*, ed. A. Hunt, Oxford, pp. 487–508.

Daszkiewicz, Schneider 2007 M. Daszkiewicz, G. Schneider, "Naturwissenschaftliche Untersuchungen kaiserzeitlicher und spätantiker Keramik aus Iatrus", [in:] *Iatrus-Krivina — Spätantike Befestigung und frühmittelalterliche Siedlung an der Unteren Donau*, vol. VI: *Ergebnisse der Ausgrabungen 1992–2000*, ed. G. von Bülow *et alii* (= *Limesforschungen* 28), Mainz, pp. 467–482.

Daszkiewicz, Schneider forthcoming M. Daszkiewicz, G. Schneider, *Archäometrische Klassifizierung von Keramikproben aus Selinunt*.

Daszkiewicz, Schneider, Bobryk 2021 M. Daszkiewicz, G. Schneider (in cooperation with E. Bobryk), "Analyzes of archaeological ceramics, chapter 3", [in:] *Approaching Economic Spaces — Methods and Interpretation in Archaeometric Ceramic Analysis*, ed. M. Meyer (= *Berlin Studies of the Ancient World* 64), Berlin, pp. 25–49.

Daszkiewicz *et alii* 2000 M. Daszkiewicz, E. Bobryk, G. Schneider, P. Dyczek, "Chemical and mineralogical composition of Roman amphorae from Novae and some other sites in Bulgaria — first results", *Novensia* 12, pp. 23–41.

Daszkiewicz *et alii* 2016 M. Daszkiewicz, M. Wetendorf, E. Bobryk, G. Schneider, "Musawwarat es-Sufra — In search of ceramic raw materials", *Novensia* 27, pp. 181–220.

Folk 1974 R. L. Folk, *Petrology of Sedimentary Rocks* (3rd edition), Austin.

Holtz, Kovacs 1981 R. D. Holtz, W. D. Kovacs, *An Introduction to Geotechnical Engineering*, Englewood Cliffs, NJ.

Hristov, Atanasova, Teoharov 2010 B. Hristov, I. Atanasova, M. Teoharov, "Minerals in regosols from North Bulgaria", *Bulgarian Journal of Agricultural Science* 16/4, pp. 476–481.

Nichols 1999 G. Nichols, *Sedimentology and Stratigraphy* (2nd edition), Hoboken, NJ.

Pettijohn 1975 F. J. Pettijohn, *Sedimentary Rocks* (3rd edition), New York.

Rybka 1963 S. Rybka, "Ceramika budowlana", [in:] *Poradnik ceramiczny*, Warsaw, pp. 523–590.

Schneider 1978 — G. Schneider, "Anwendung quantitativer Materialanalysen auf Herkunftsbestimmungen antiker Keramik", *Berliner Beiträge zur Archäometrie* 3, pp. 63–122.

Schneider 2017 — G. Schneider, "Mineralogical and chemical alteration", [in:] *The Oxford Handbook of Archaeological Ceramic Analysis*, ed. A. Hunt, Oxford, pp. 62–180.

Schneider, Daszkiewicz 2020a — G. Schneider, M. Daszkiewicz, "Die Ergebnisse der chemischen Analysen italischer Sigillaten aus Iuvavum/Salzburg", [in:] S. Schmid, M. Gschwind, *Italische Terra Sigillata aus Iuvavum/Salzburg — Untersuchungen zur Siedlungs- und Handelsgeschichte des augusteischen vicus und des municipium Claudium Iuvavum*, Wiesbaden, pp. 29–37.

Schneider, Daszkiewicz 2020b — G. Schneider, M. Daszkiewicz, "Late Hellenistic and Roman tableware in the Aegean and Black Sea region — Why we need chemical analysis", *Rei Cretariae Romanae Fautorum Acta* 46, pp. 429–436.

Shepard 1954 — F. P. Shepard, "Nomenclature based on sand-silt-clay ratios", *Journal of Sedimentary Petrology* 24, pp. 151–158.

Slusallek *et alii* 1983 — K. Slusallek, A. Burmester, Ch. Börker, "Neutronenaktivierungsanalytische Untersuchungen an gestempelten griechischen Amphorenhenkeln: Erste Ergebnisse", *Berliner Beiträge zur Archäometrie* 8, pp. 261–276.

Tan *et alii* 2017 — X. Tan, F. Liu, L. Hu, A. H. Reed, Y. Furukawa, G. Zhang, "Evaluation of the particle sizes of four clay minerals", *Applied Clay Science* 135, pp. 313–324.

Türkmen 2003 — I. R. Türkmen, *Chemical Characterization and Provenance Studies of Archeological Samples*, a thesis submitted to the Department of Chemistry and the Institute of Engineering and Sciences of Bilkent University in partial fulfillment of the requirements for the degree of master of science.

Udden 1914 — J. A. Udden, "Mechanical composition of clastic sediments", *Bulletin of the Geological Society of America* 25, pp. 655–744.

Vangelov *et alii* 2013 — D. Vangelov, Y. Gerdjikov, A. Kounov, A. Lazarova, "The Balkan Fold-Thrust Belt: an overview of the main features", *Geologica Balcanica* 42/1–3, pp. 29–47.

Wentworth 1922 — C. K. Wentworth, "A scale of grade and class terms for clastic sediments", *The Journal of Geology* 30/5, pp. 377–392.

Wilkins 2010 — A. D. Wilkins, "Terminology and the classification of fine grained sedimentary rocks — is there a difference between a claystone, a mudstone and a shale?" (https://www.researchgate.net/publication/327285950).

Yong, Warkentin 1975 — R. N. Yong, B. P. Warkentin, *Soil Properties and Behaviour*, New York.

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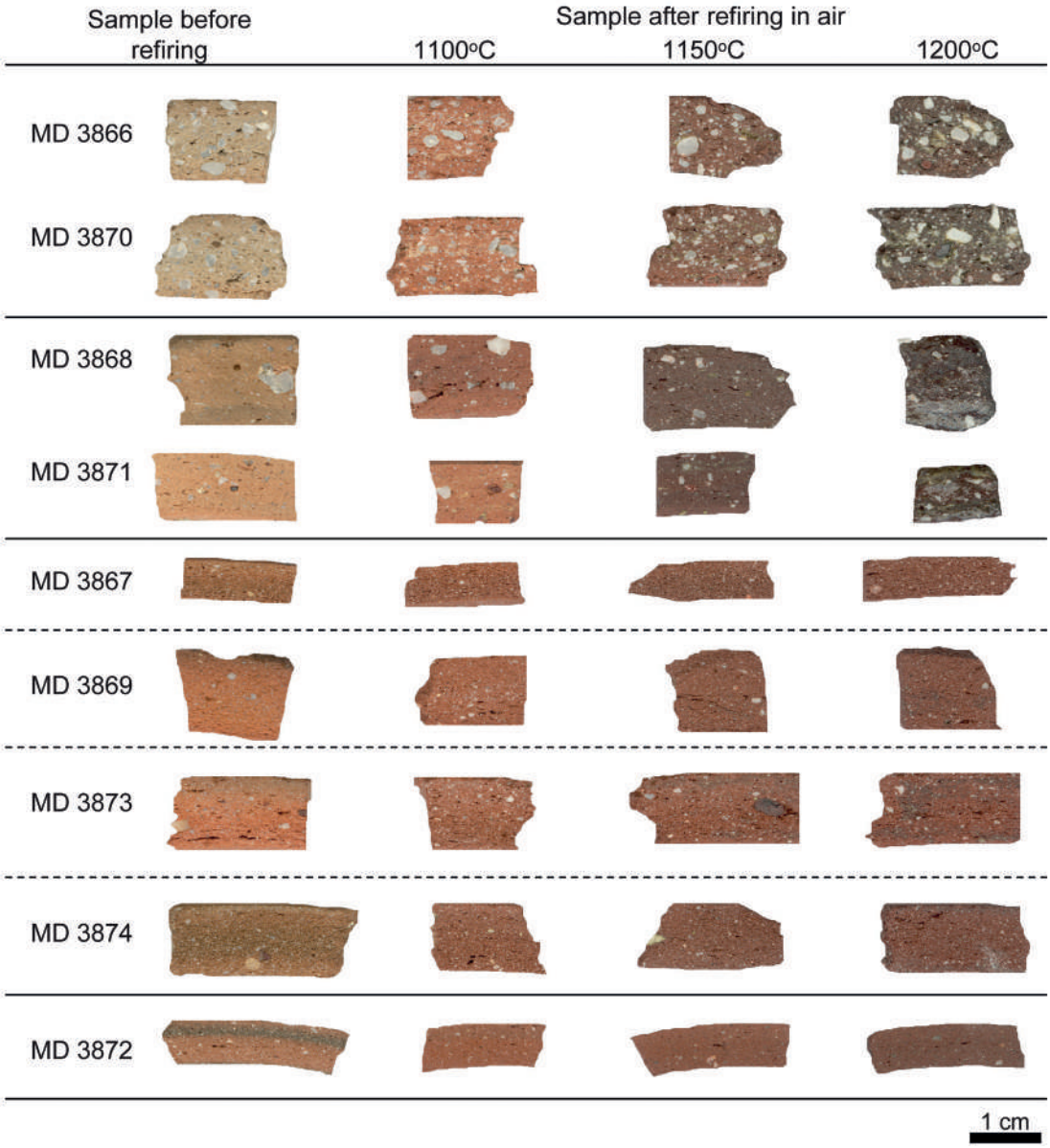
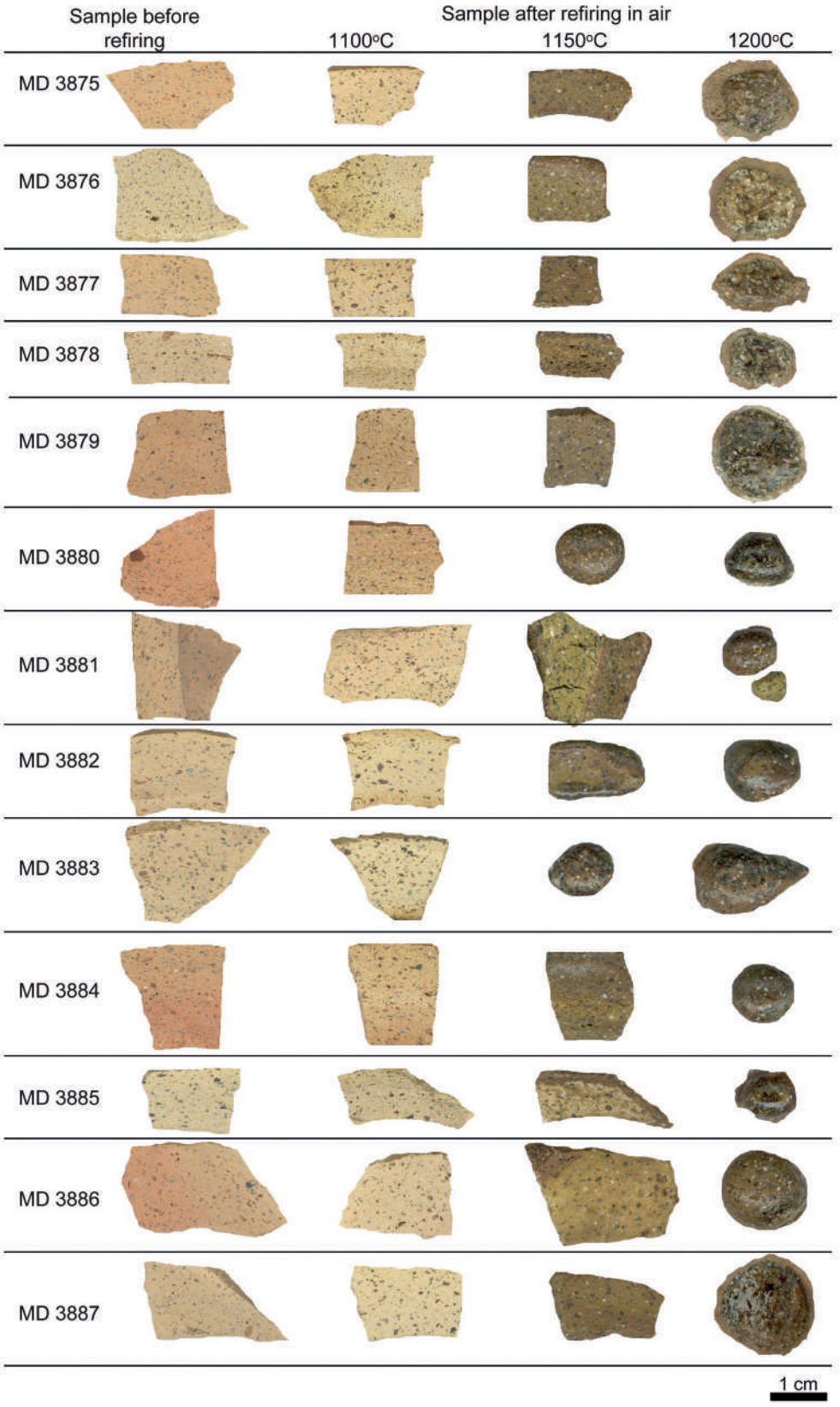
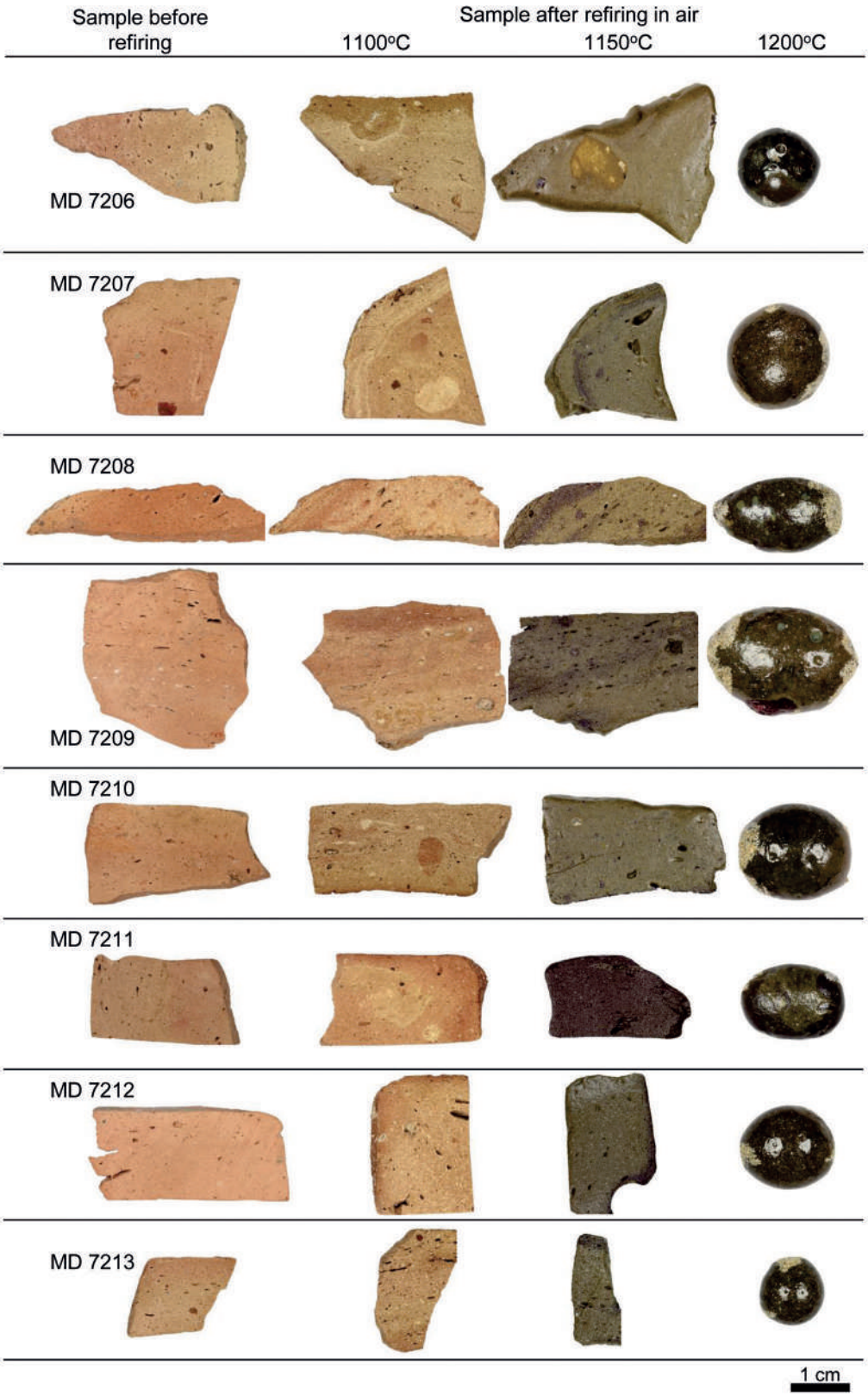


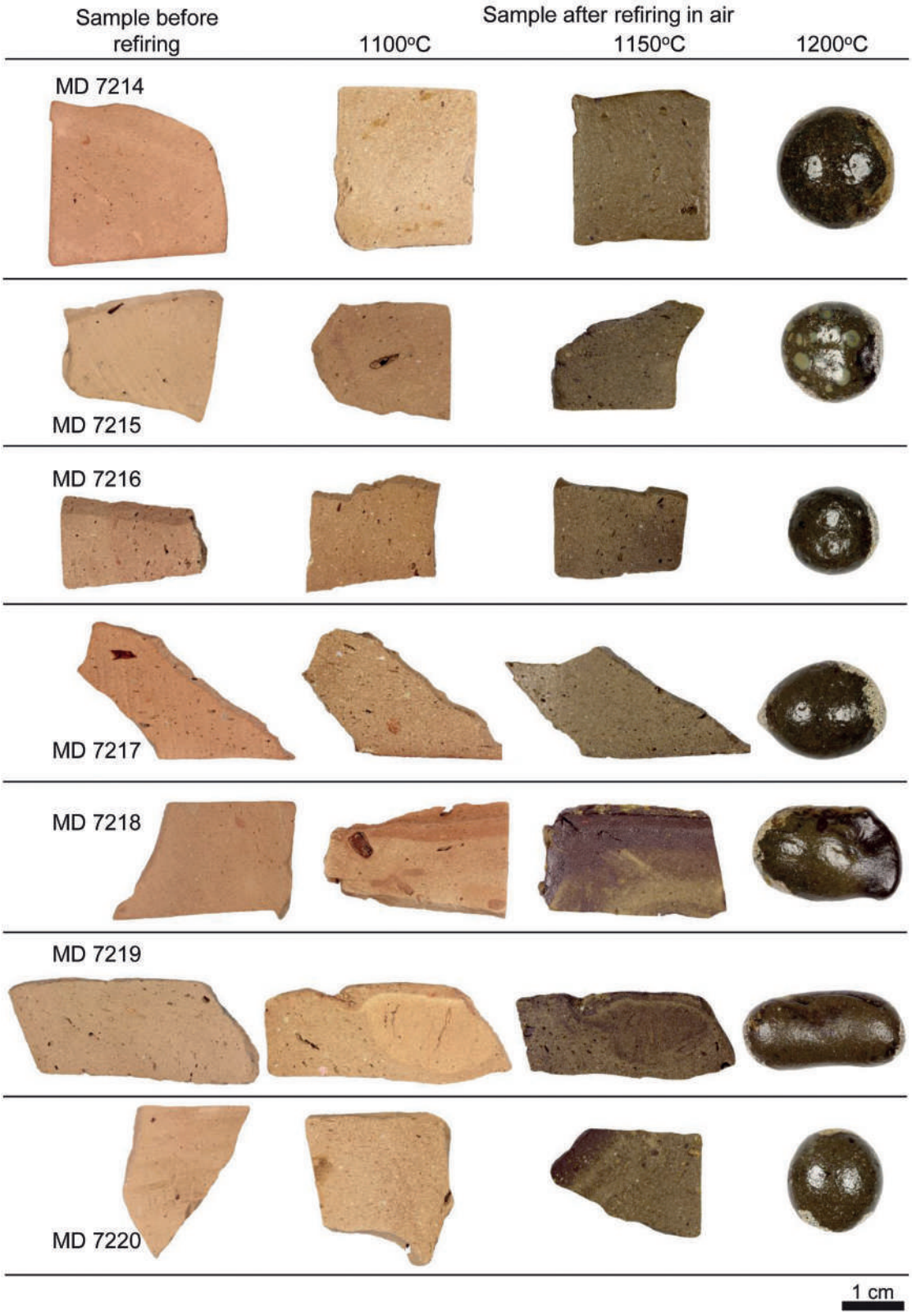
Pl. 1. MGR-analysis, LegP samples MD3866–MD3874, grouped according MGR-groups (compiled by H. Baranowska and M. Daszkiewicz)



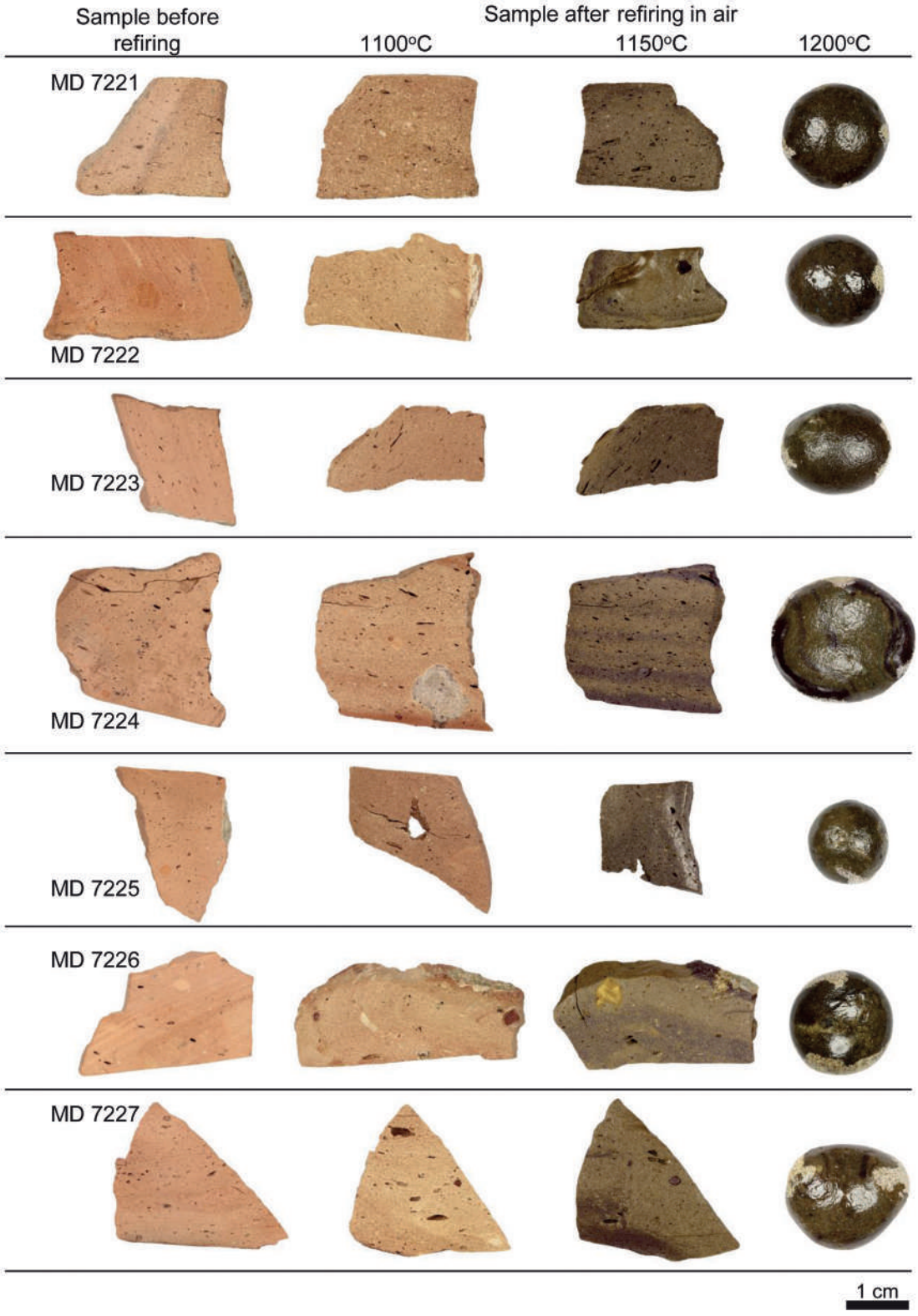
Pl. 2. MGR-analysis, CW samples MD3875–MD3887
(compiled by H. Baranowska and M. Daszkiewicz)



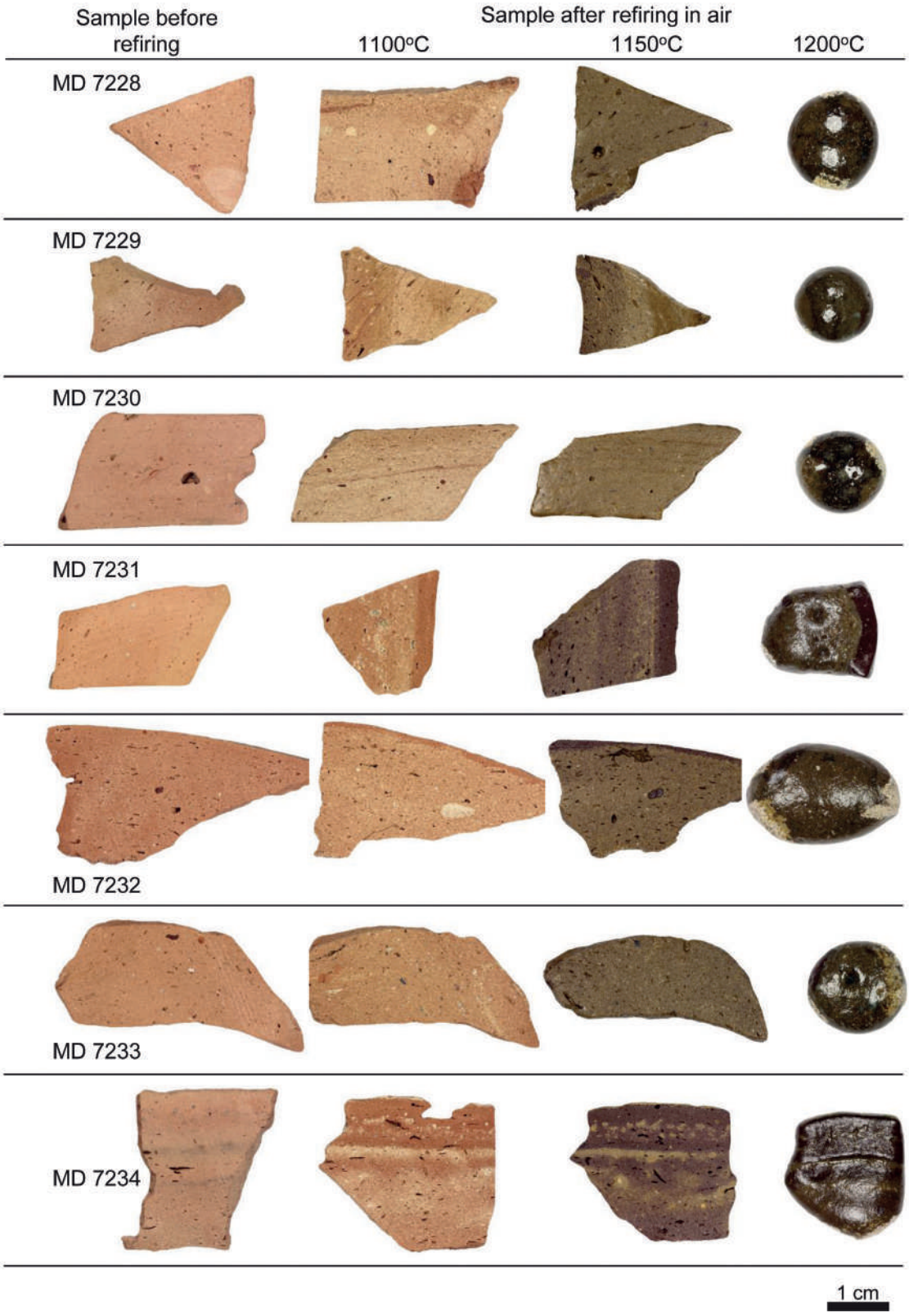
Pl. 3. MGR-analysis, CBM samples MD7206–MD7213
(compiled by H. Baranowska and M. Daszkiewicz)



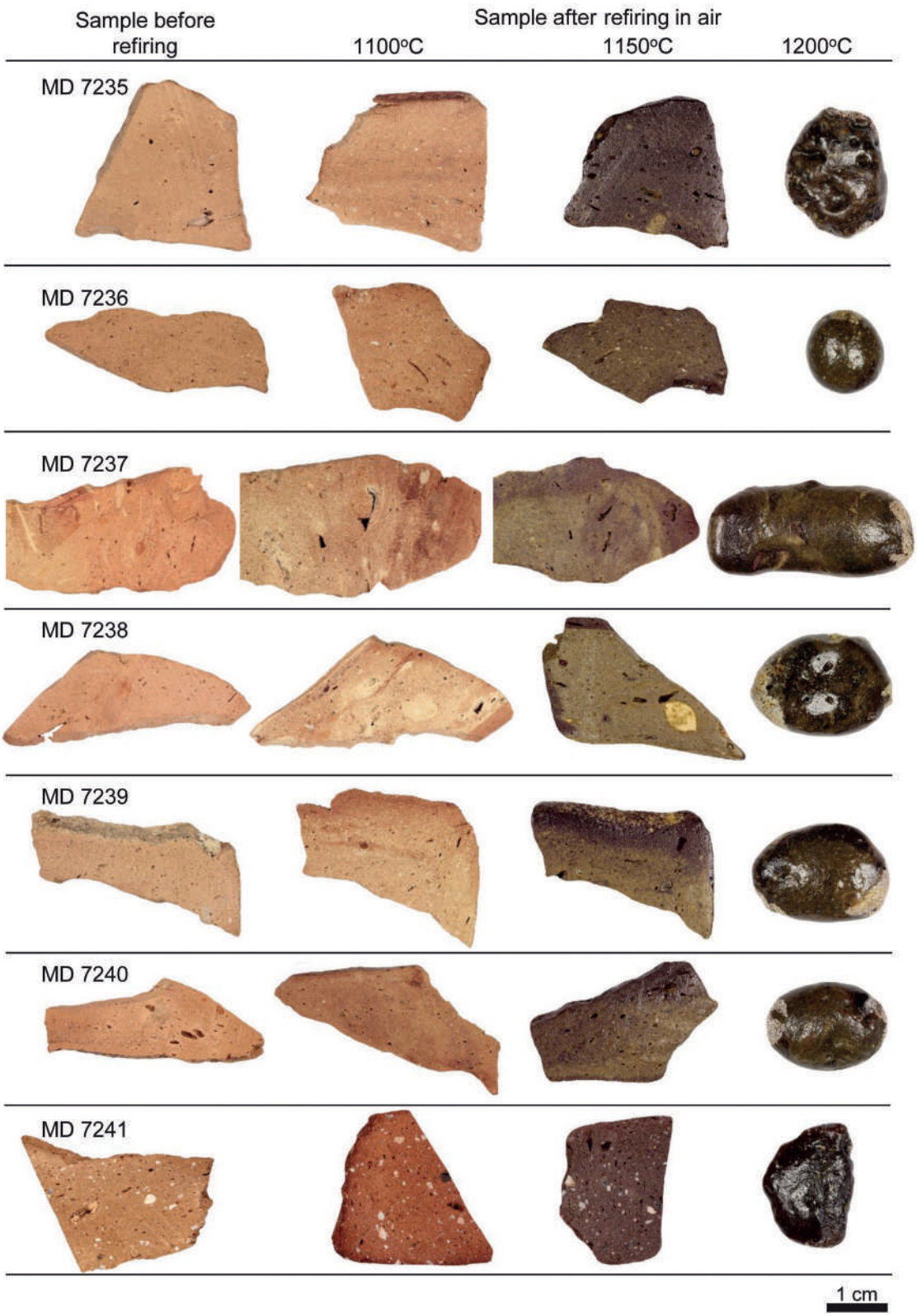
Pl. 4. MGR-analysis, CBM samples MD7214–MD7220
(compiled by H. Baranowska and M. Daszkiewicz)



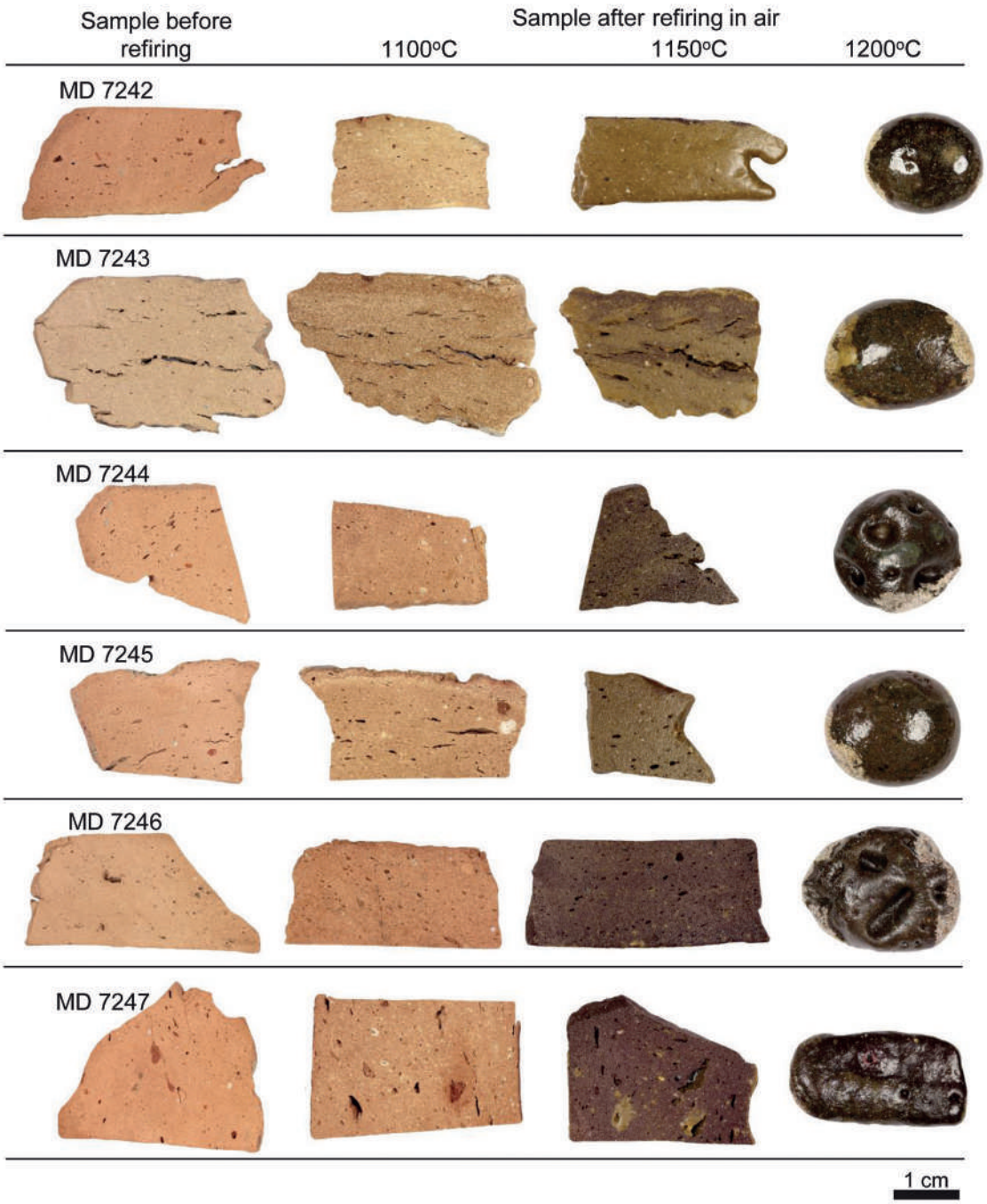
Pl. 5. MGR-analysis, CBM samples MD7221–MD7227
(compiled by H. Baranowska and M. Daszkiewicz)



Pl. 6. MGR-analysis, CBM samples MD7228–MD7234
(compiled by H. Baranowska and M. Daszkiewicz)



Pl. 7. MGR-analysis, CBM samples MD7235–MD7241
(compiled by H. Baranowska and M. Daszkiewicz)



Pl. 8. MGR-analysis, CBM samples MD7242–MD7247
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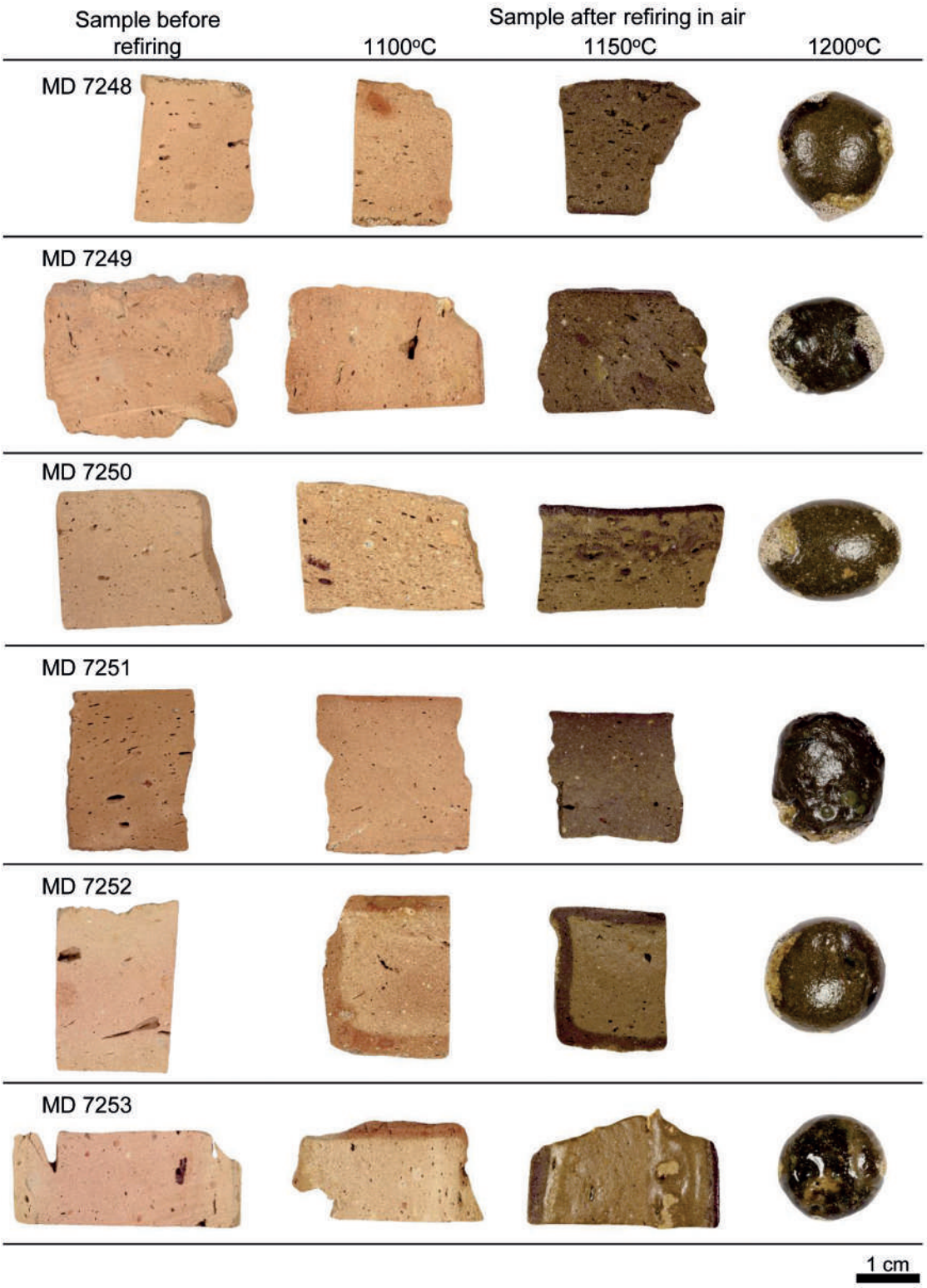
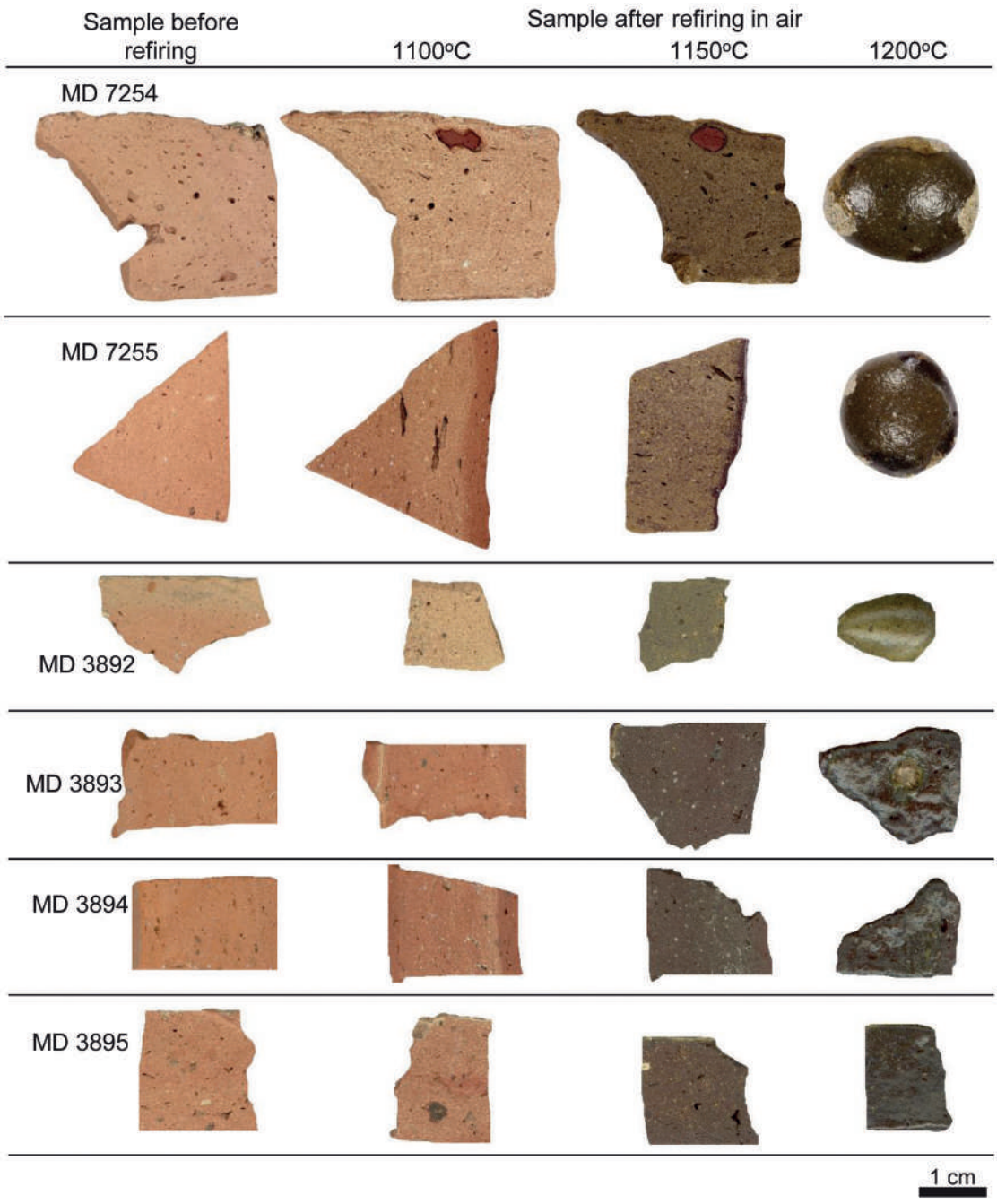


Pl. 9. MGR-analysis, CBM samples MD7248–MD7253
(compiled by H. Baranowska and M. Daszkiewicz)



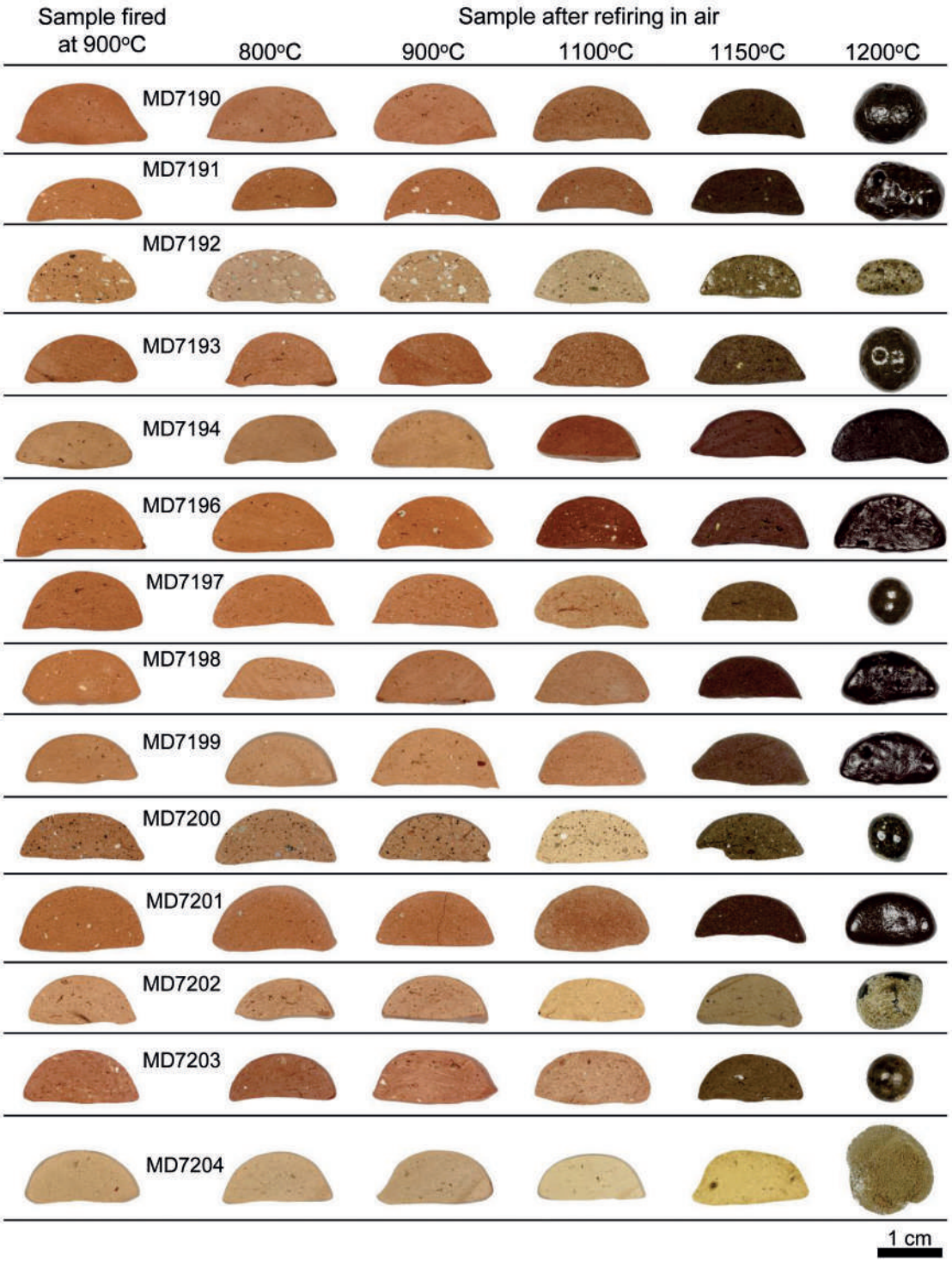
Pl. 10. MGR-analysis, CBM samples MD7254–MD7255 and MD3892–MD3895
(compiled by H. Baranowska and M. Daszkiewicz)

Pl. 11. Firing test, clay samples MD7190–MD7194
(compiled by H. Baranowska and M. Daszkiewicz)

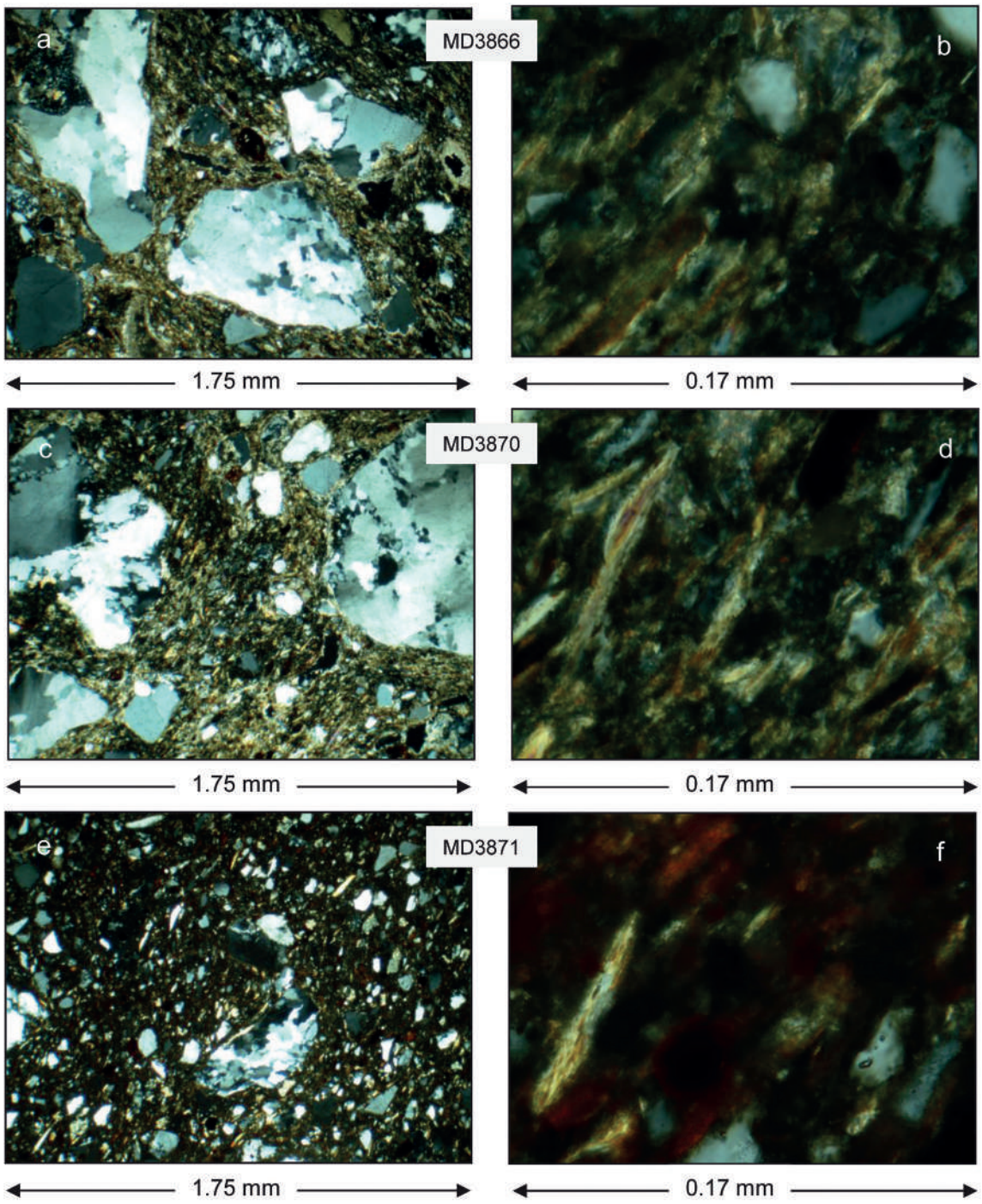
Pl. 12. Firing test, clay samples MD7195–MD7199
(compiled by H. Baranowska and M. Daszkiewicz)

Pl. 13. Firing test, clay samples MD7200–MD7204
(compiled by H. Baranowska and M. Daszkiewicz)

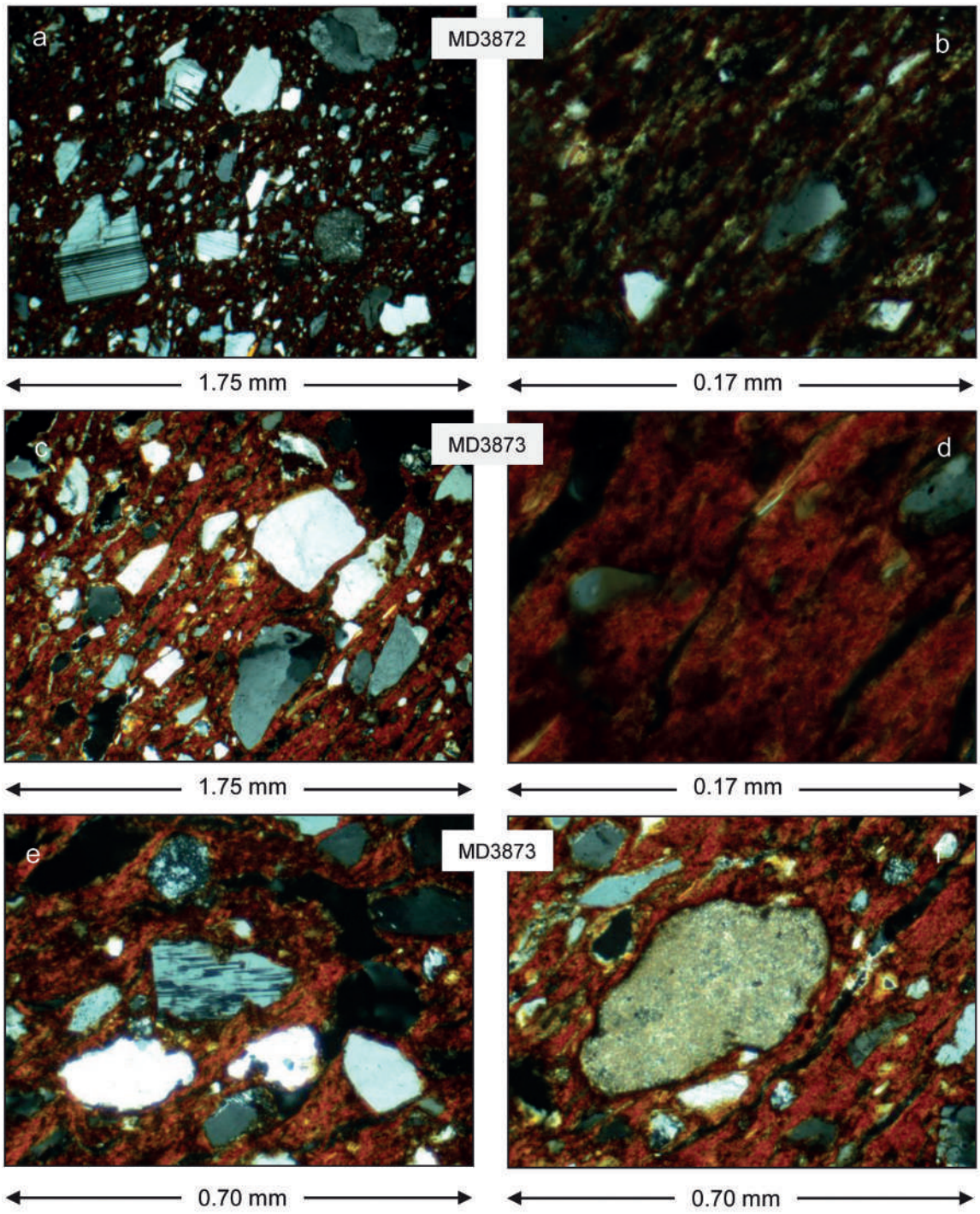
Pl. 14. Test *à la* ceramics of clay samples MD7190–MD7204, briquettes fired at 800°C (compiled by H. Baranowska and M. Daszkiewicz)



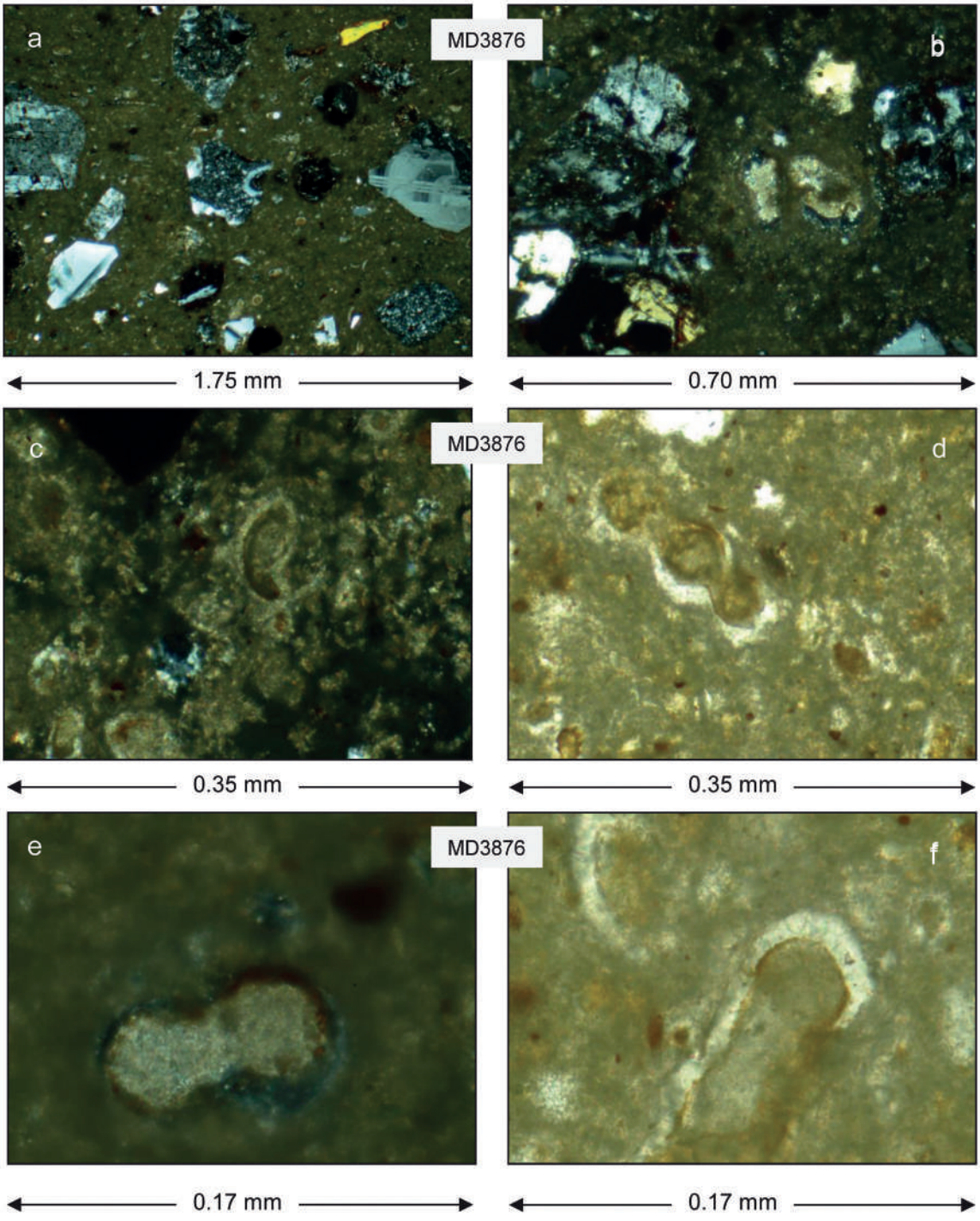
Pl. 15. Test *à la* ceramics of clay samples MD7190–MD7204, briquettes fired at 900°C (compiled by H. Baranowska and M. Daszkiewicz)



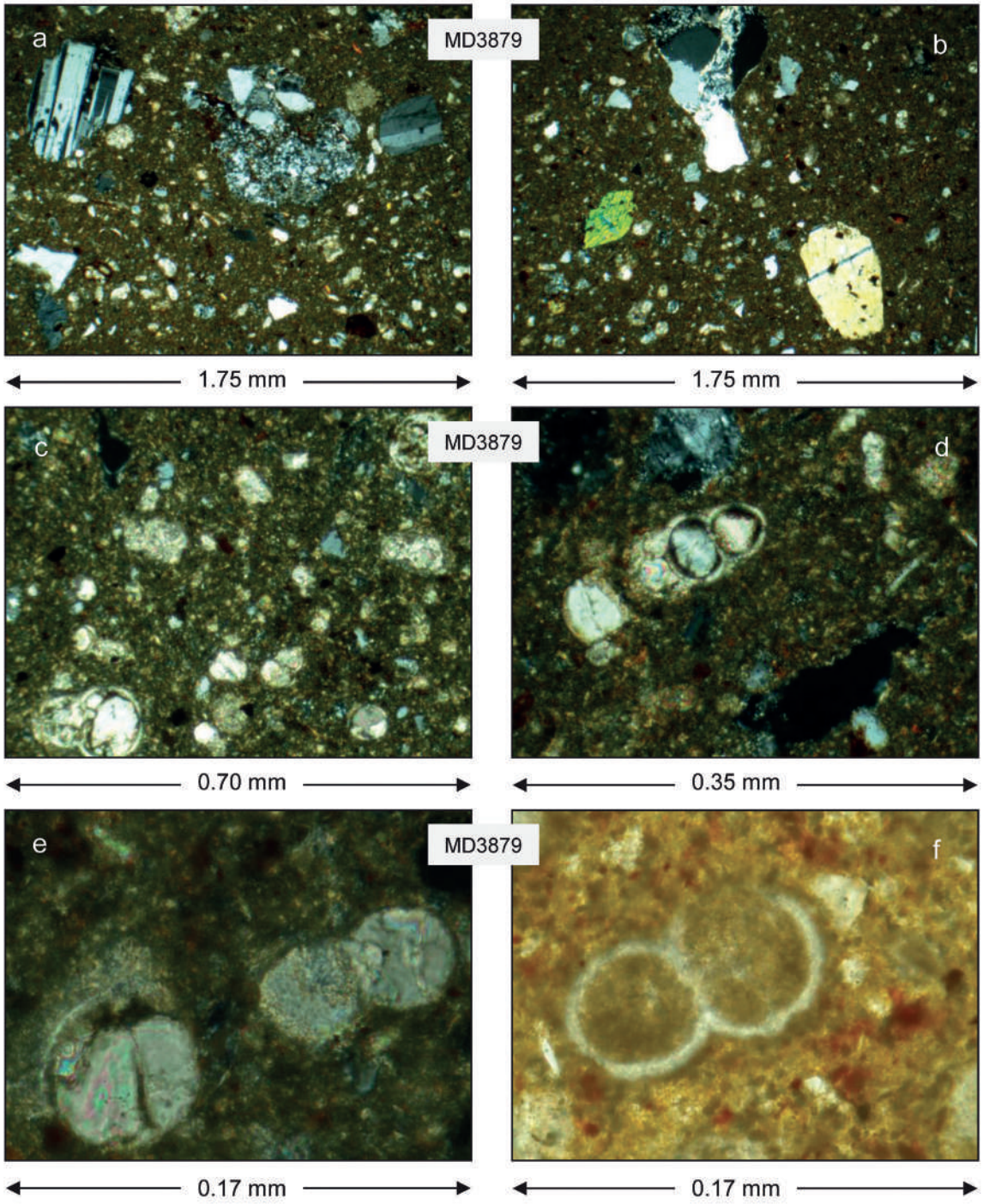
Pl. 16. Micrographs of typical fabric images of LegP samples MD3866, MD3870, MD3871 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



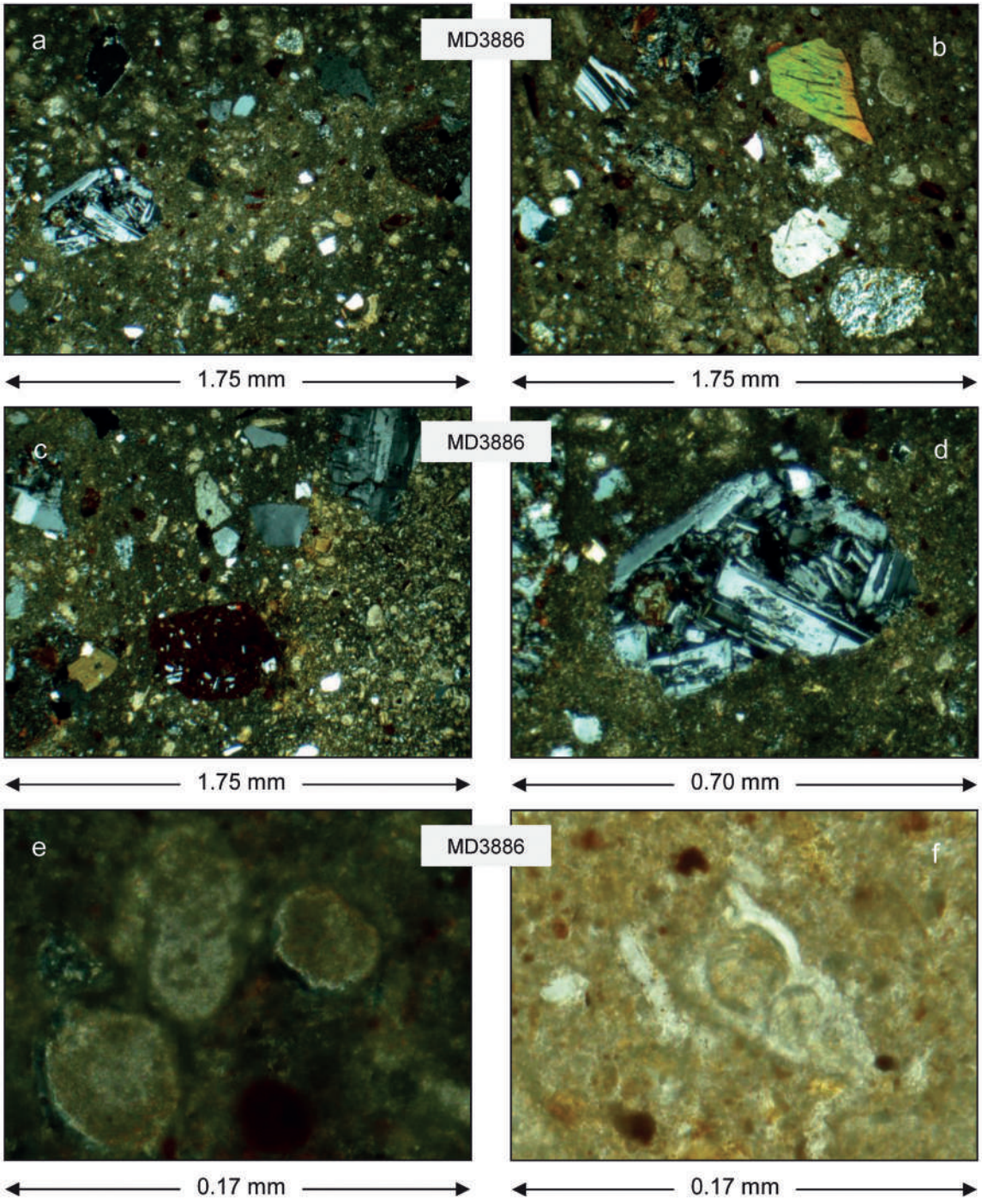
Pl. 17. Micrographs of typical fabric images of LegP samples MD3872, MD3873 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



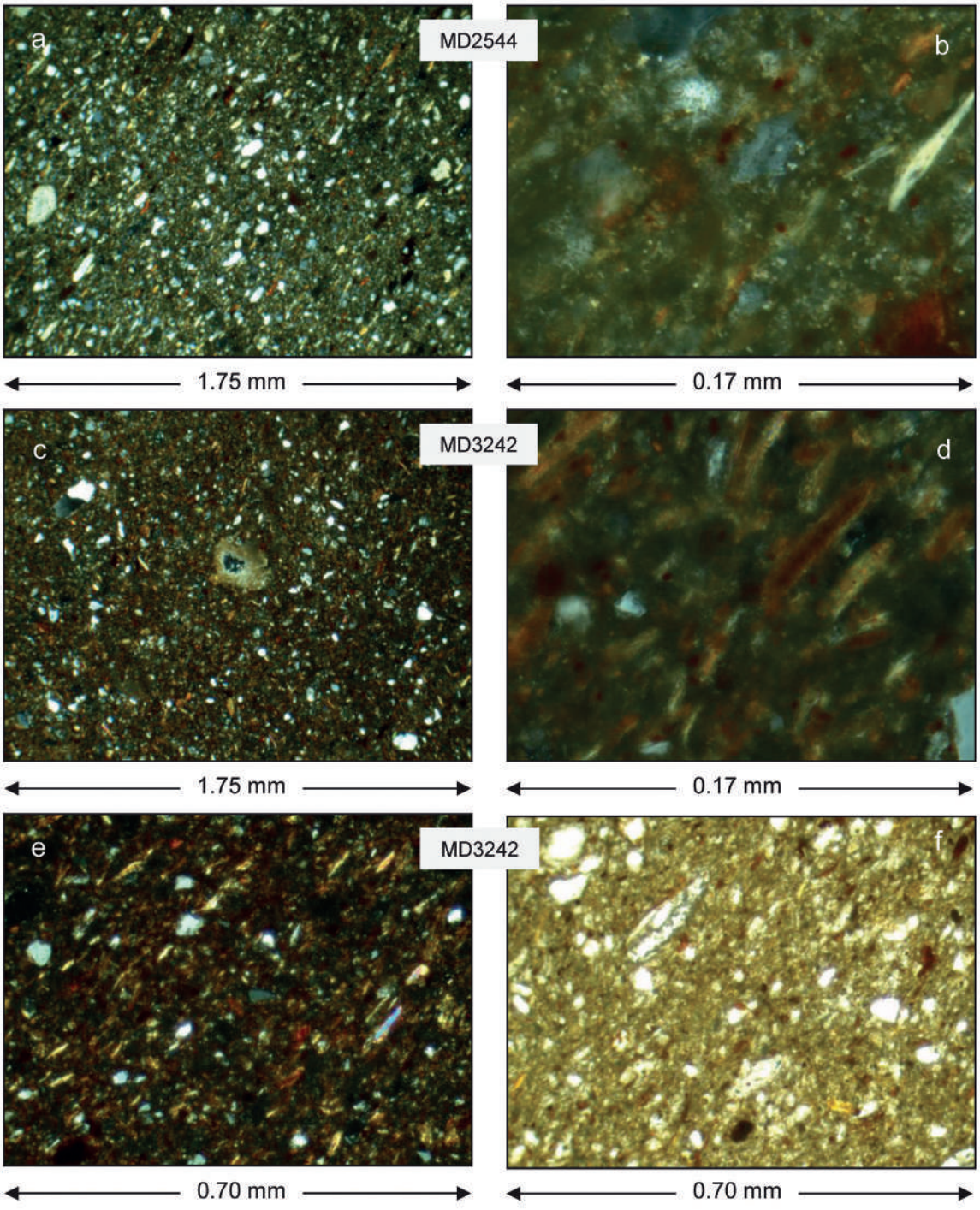
Pl. 18. Micrographs of typical fabric images of CW sample MD3876 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



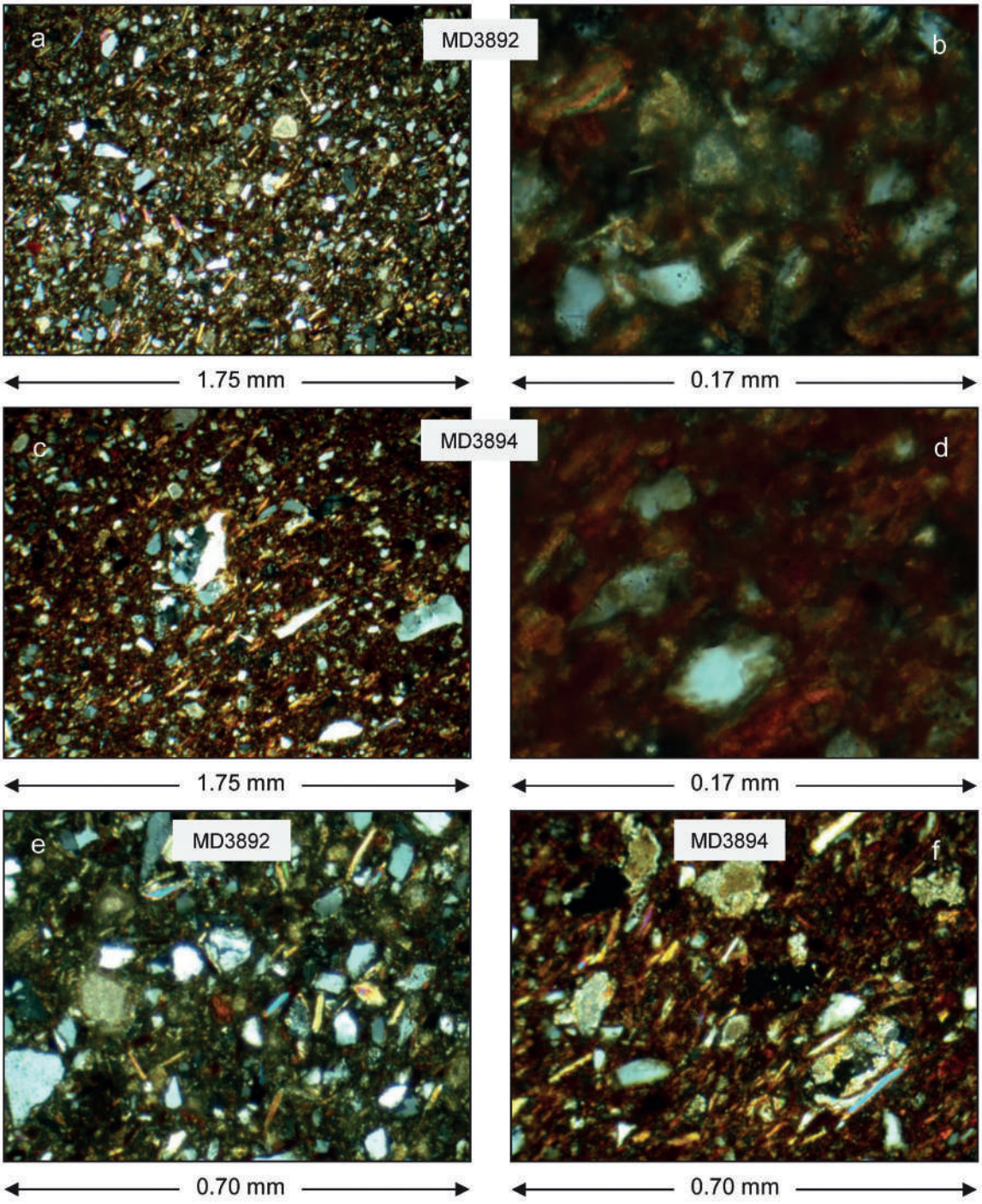
Pl. 19. Micrographs of typical fabric images of CW sample MD3879 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



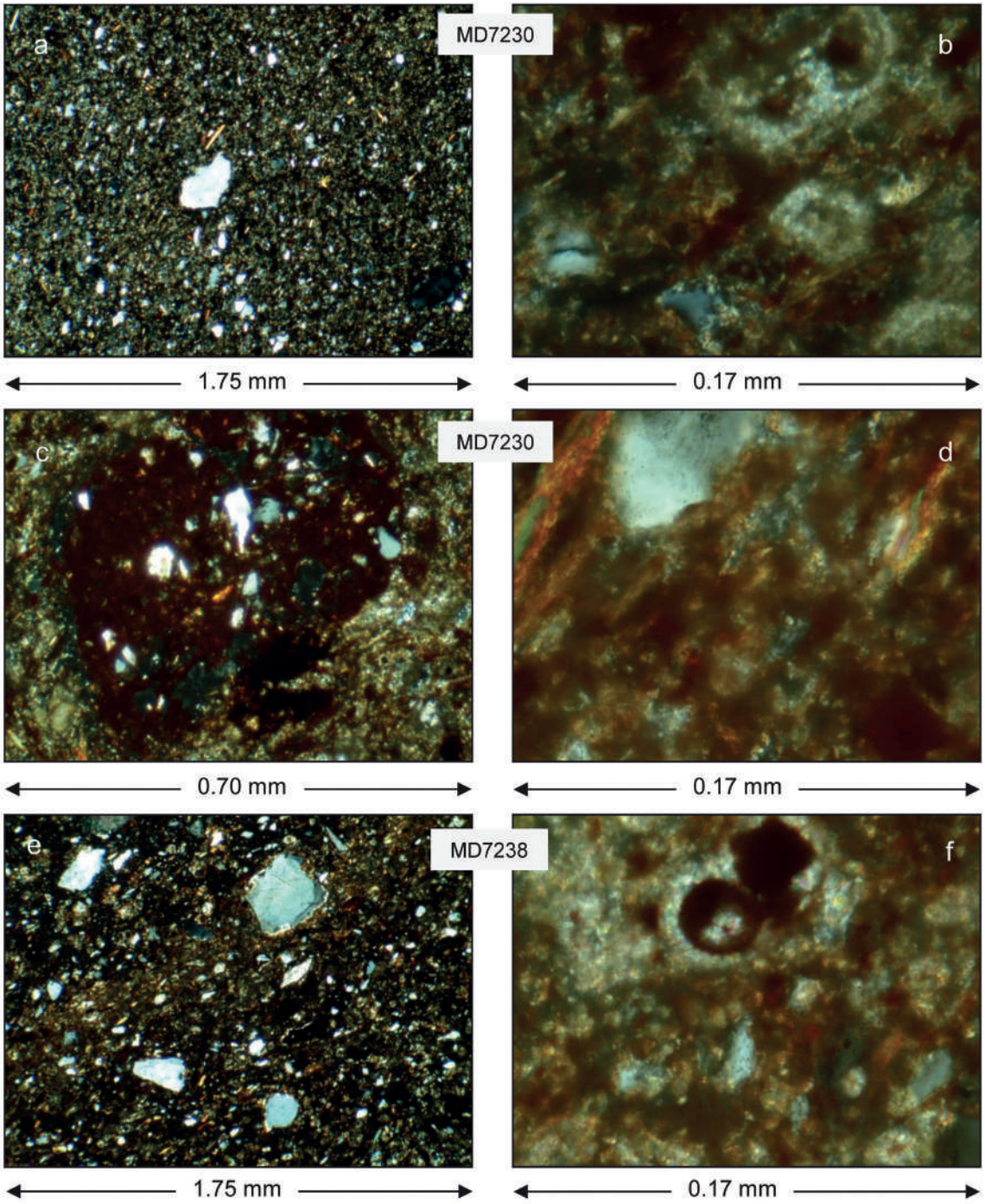
Pl. 20. Micrographs of typical fabric images of CW sample MD3886 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



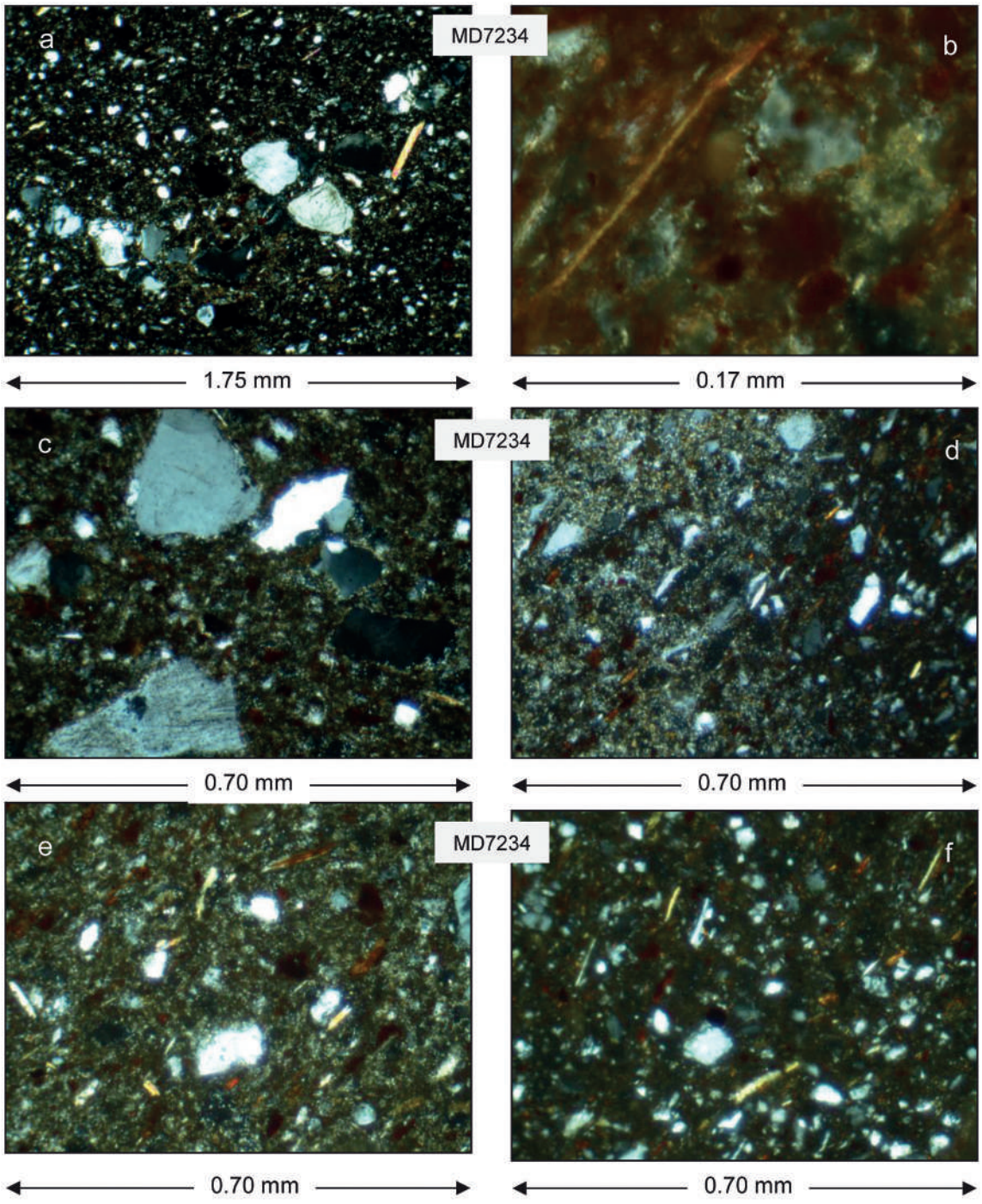
Pl. 21. Micrographs of typical fabric images of TW samples MD2544, MD3242 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



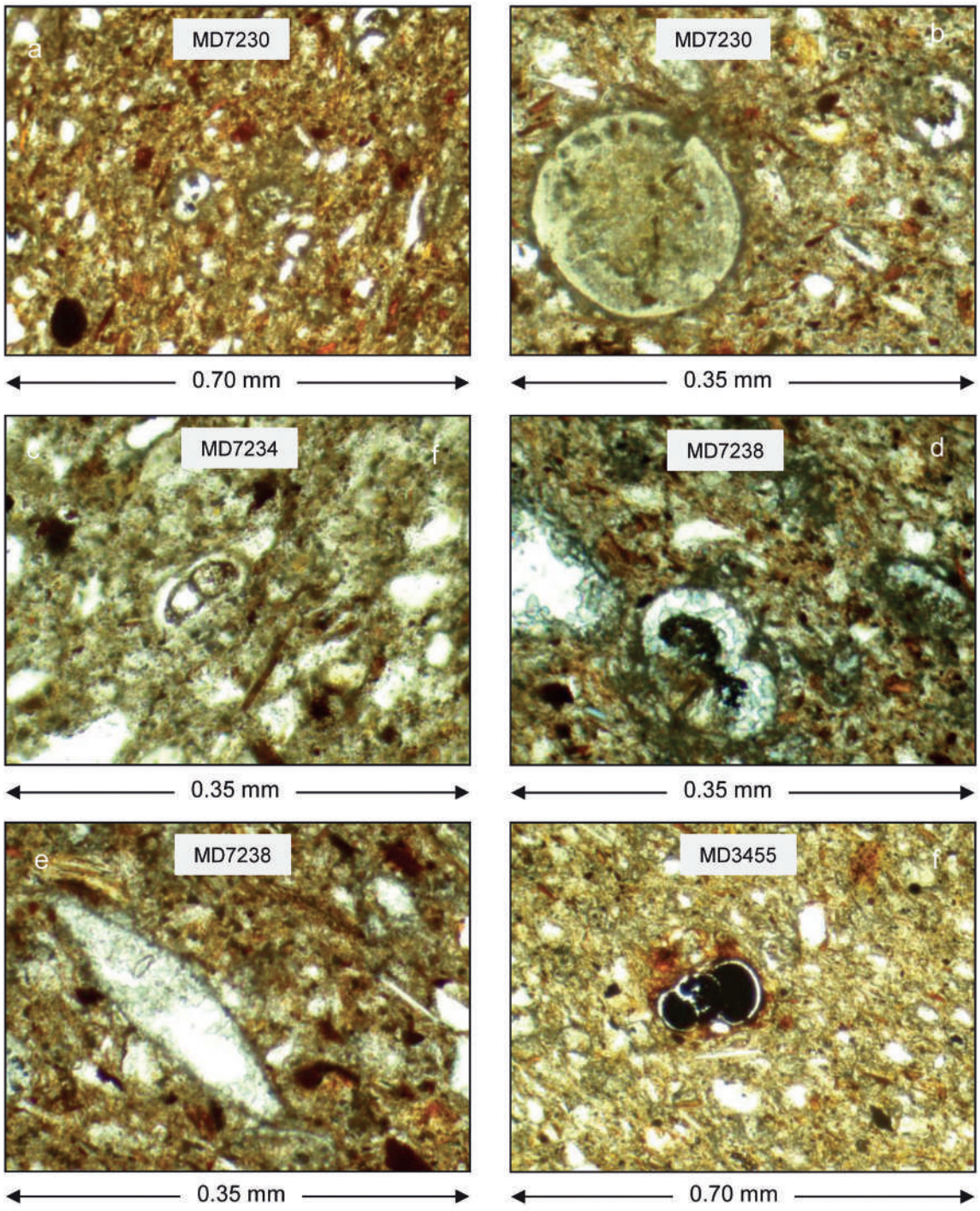
Pl. 22. Micrographs of typical fabric images of CBM samples MD3892, MD3894 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



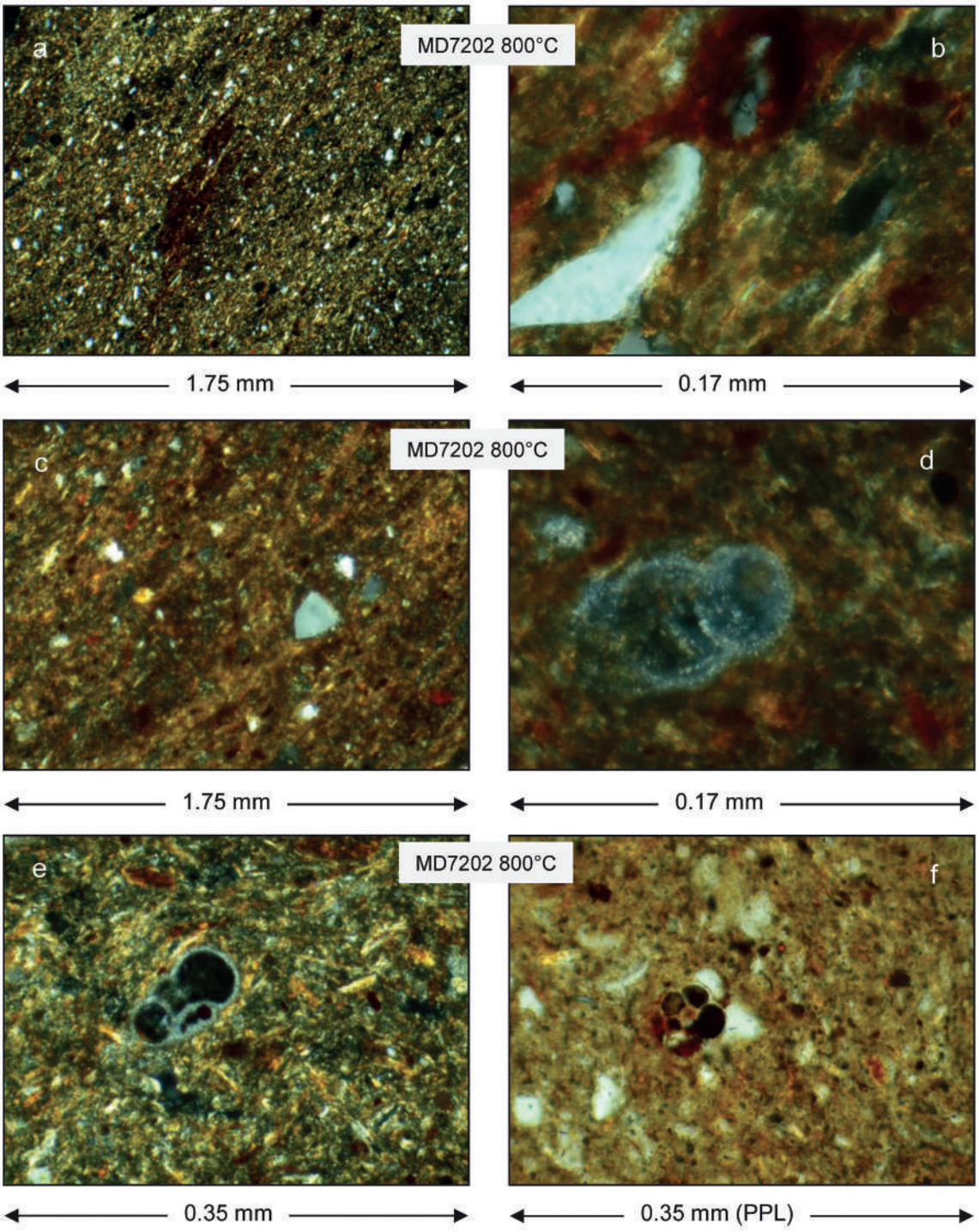
Pl. 23. Micrographs of typical fabric images of CBM samples MD7230, MD7238 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



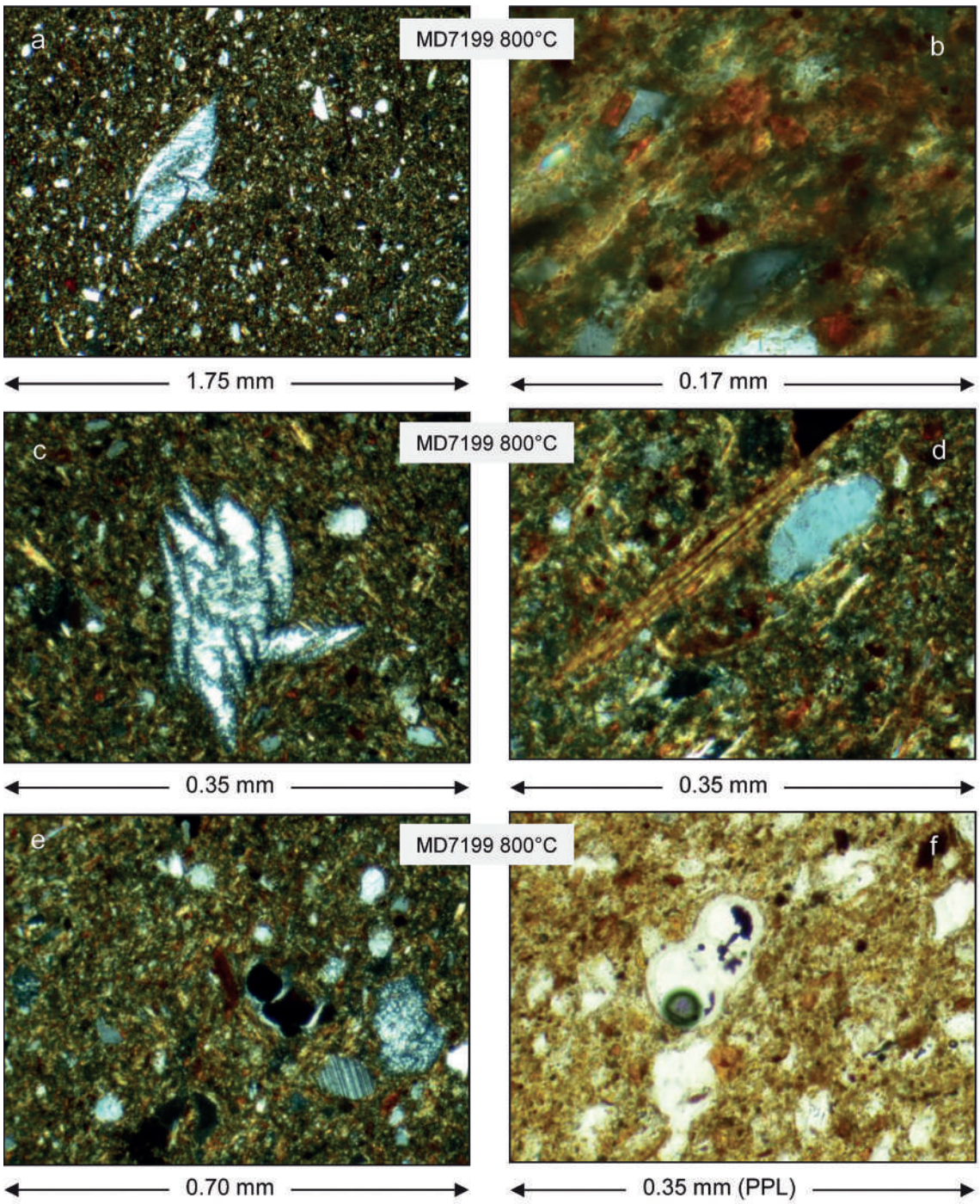
Pl. 24. Micrographs of typical fabric images of CBM sample MD7234 (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)



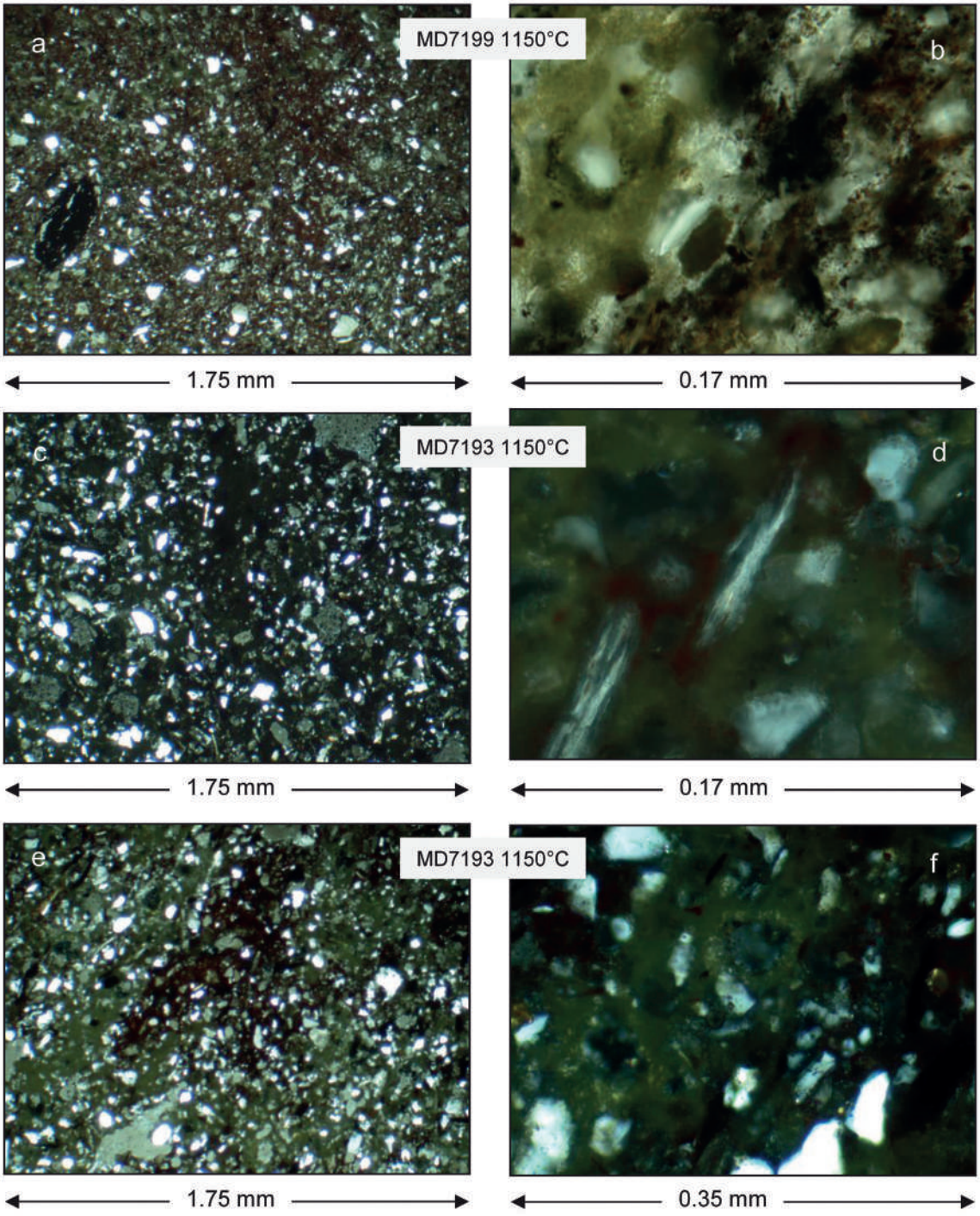
Pl. 25. Micrographs of typical fabric images of CBM samples MD7230, MD7234, MD7238, MD3455 (XPL) (micrographs G. Schneider, compiled by H. Baranowska)



Pl. 26. Micrographs of typical fabric images of clay sample Studena (MD7202) fired at 800°C (XPL) (micrographs G. Schneider, compiled by H. Baranowska)



Pl. 27. Micrographs of typical fabric images of clay sample Ovča Mogila Bis (MD7199) fired at 800°C (XPL) (micrographs G. Schneider, compiled by H. Baranowska)



Pl. 28. Micrographs of typical fabric images of clay sample Ovča Mogila Bis (MD7199) and clay Bâla Voda Bis (MD7193) fired at 1150°C (XPL)
(micrographs G. Schneider, compiled by H. Baranowska)

Adam Jakub Jarych

PUBLIC ACTIVITY OF *BENEFICIARII* IN DACIA POROLISSENSIS[1]

Abstract: The aim of this article is to allow the reader a closer look at the public activity of *beneficiarii* in Dacia Porolissensis. The available source material, which is for the most part epigraphic, makes it possible to specify over twenty military men who carried out various tasks in the second and third centuries AD in the vicinity of Porolissum, Napoca, Samum, and Buciumi. It is particularly noteworthy that the latest *beneficiarii* activity attested to with certainty falls to the reign of Gordian III.

Keywords: Dacia, *beneficiarii*, Roman army

Depending on need and opportunity, the governors of Roman provinces had a larger or smaller administrative apparatus at their disposal. Its members were mostly recruited from the people closest to those governors, that is, legionaries, freedmen, and slaves and facilitated the functioning of a given region of the empire by carrying out various tasks. The main group employed at the office (officium) was that of low-ranking officers, called beneficiarii or "the favoured ones".[2] According to Festus, the word meant legionaries exempt from carrying out their usual tasks through their commander's special authorization[3] or, very rarely, soldiers of auxiliary units (auxilia).[4] Their status was highlighted by characteristic spears which were their ornamenta dignitatis.[5]

Those officers were often active away from the quarters of their unit and the governor's seat, where a few of them tended to be stationed, referred to as *beneficiarii consularis*, since the governors of most provinces with legions in them (formally speaking, *legati Augusti pro praetore*) had previously been consuls. The officers under their command were responsible for gathering intelligence, policing the area, and, indirectly, for certain religious tasks, as attested to by their many votive offerings.[6] In the case of regions famous for their mines, such as Dacia, it is supposed the *beneficiarii* were in some sort of administrative control of those;[7] it is also possible they

[1] Article is the effect of realization of the research project no. 2016/21/B/HS3/02923 financed by National Science Centre, Poland. Translated by M. Jarczyk.

[2] Rankov 1986; Rankov 1999, pp. 17–18.

[3] Festus, *Gloss. Lat*. 30: *beneficiari dicebantur milites qui vacabant muneris beneficio; e contrario munifices vocabantur qui non vacabant, sed munus reipublicae faciebant*. *Beneficiarii* are already attested to in sources from the 1st century BC, such as Julius Caesar's *Bellum civile*, whose author in Book III mentions Pompey's army and remarks: *haec erant milia xlv, evocatorum circiter duo, quae ex beneficiariis superiorum exercituum ad eum convenerant; quae tota acie disperserat*.; see Caes. *BCiv*. 3.88.5.

[4] Dise Jr. 1997, p. 284.

[5] Gaiu 2014, pp. 60–65.

[6] Rankov 1986, p. 11.

[7] Hirt 2010, p. 44.

co-operated with the *frumentarii* on supplying the camps with grain.[8] In summary, the main duties of that part of the *officium* were to maintain public order in the province.[9] Equally importantly, all tasks assigned to those officers were decided on directly by the official governing the province rather than the central administration.[10]

The activity of that class of soldiers intensified under the Antonines, when the number of outposts (*stationes*) administered by *beneficiarii* authorized by the provincial governor was increased. There, they carried out their duties for six, twelve, or even twenty-four months.[11] Four types of outposts can be distinguished in Dacia were such officers were active: towns, the *limes*, major roads, and areas were metal or salt were mined. Most of the *beneficiarii* in Dacia were recruited from two legions, *XIII Gemina* and *V Macedonica*.[12]

The aim of this article is to allow the reader a closer look at the public activity of *beneficiarii* in Dacia Porolissensis. The available source material, which is for the most part epigraphic, makes it possible to specify over twenty military men who carried out various tasks in the second and third centuries AD in the vicinity of Porolissum, Napoca, Samum, and Buciumi.[13] It is particularly noteworthy that the latest *beneficiarii* activity attested to with certainty falls to the reign of Gordian III (AD 238–244). Therefore the question must be asked of what internal or external factors were involved in the activity of that group of officials ceasing suddenly immediately after that emperor's reign.

The rule of Gordian III coincides with dedications left by *beneficiarii* in Samum, a *statio* right on the border of the province and one of the outposts where *beneficiarii* are best confirmed epigraphically in all of Dacia Porolissensis. So far, fourteen inscriptions have been discovered there,[14] and they are extremely interesting for several reasons. First of all, the dedications from AD 239 and 243 mention a region of the province otherwise unknown — a *REGIO ANS*:

Deae [*Ne*]*mesi* | *Reg(inae) M(arcus) Val(erius) Va*|*lentinus b(ene)f(iciarius)* | *co(n)s(ularis)* [*mi*]*l(es) le*[*g(ionis)*] | *XIII G(eminae) Gordi(anae)* | *aed*[*il(is)*] *col(oniae) Nap(ocae)* | ***agens sub sig(nis?)*** | ***Samum cum reg(ione)*** | ***Ans(amensium)*** *v(otum) l(ibens) m(erito)* | *Imp(eratore) d(omino) n(ostro) M(arco) Ant(onio) Gordi(ano) Augus*|*to et Aviola co(n)s(ulibus) X*[---][15]

I(ovi) O(ptimo) M(aximo) | *P(ublius) Ae(lius) Marcellinus* | *b(ene)f(iciarius) co(n)s(ularis) leg(ionis) V M(acedonicae)* | *Gord(ianae) agens Sa*|*mo cum* ***r(e)g(ione) Ans(amensium)*** | ***sub s⟨i⟩g(nis?)*** *pro sa(lute) sua* | *et suorum v(otum) l(ibens) p(osuit)* | [*Ar*]*riano et P*[*apo* (?) *co(n)s(ulibus)*][16]

The terse mention has been analyzed by many researchers, some of whom believe the texts should be read to say *regio Ans(amensium)*.[17] According to that hypothesis, the name refers to the area stretching from Samum all the way to Napoca some 60 kilometres away, since Marcus Valerius Valentinus, the *beneficiarius* of *legio XIII Gemina* stationed in Samum, was also listed in the inscription as *aedilis coloniae Napocensis*.[18] However, no other sources confirm that line of

[8] Roth 1999, p. 274. The range of duties carried out by *frumentarii* was very broad; under the empire, it was not limited to provisioning. The same officers were often assigned policing missions and looked after the security of the province.
[9] Zaninović 2007, p. 181.
[10] Dise Jr. 1997, p. 295.
[11] Dise Jr. 1997, p. 285. However, the starting dates and their length varied greatly across the empire depending on the province.
[12] Cupcea 2012, p. 245.
[13] Ardevan 1991, p. 163.
[14] Cupcea 2010, p. 389; Cupcea 2014. Cupcea has compiled an accurate list of all officers active in Dacia.
[15] *CIL* III 827 = 7633.
[16] *CIL* III 822. There is another inscription discovered at Samum and dated to AD 243, dedicated to Jupiter Dolichenus by one Publius Aelius Proculinus; see *CBI* 525.
[17] Vătavu 2011, pp. 225–234; Deac 2013, p. 266.
[18] *CIL* III 827 = 7633.

thought, so one ought to be cautious drawing any conclusions about Valentinus' prerogatives in Dacia Porolissensis. Another theory would have that region lie across the *limes*, take its name from a people inhabiting it, and be under Roman control.[19] Coriolan H. Opreanu reconstructs *REGIO ANS* differently still, as *regio Ans(ae).* Reading into the data an analogy to Britain, he thinks the term referred to lands which went "all the way to the banks of the river", here specifically the Someş.[20] Unfortunately, lack of further source material forces one to treat those three suggestions in terms of mere research hypotheses.

In the context of those two dedications, made by Valentinus and by Publius Aelius Marcellinus, an officer of *legio V Macedonica*, scholars have pointed out one more significant place, namely the phrase *AGENS SUB SIG*, where the last word can be reconstructed as *signo*, *signis*, or *sigillo*. If the reading *sub signo* is adopted, then it could refer to the spear of the *beneficiarii* which signified their power in the province. On the other hand, *sub signis* could be a purely military expression indicating service under military standards, while the reading *sub sigillo* might be a reference to some statues of the emperor, Nemesis or Jupiter, to whom the two altars and their inscriptions were dedicated.[21]

Still, regardless of the extent of power wielded by the Samum *beneficiarii*, being stationed there was a dangerous task due to the pressure, be it permanent or temporary, from barbarian peoples. That tension is for example expressed in an inscription by Scantius Lucius, who in AD 224 had the words *multis insidiis numinibus liberatus* carved onto an altar to Nemesis.[22] Apparently, the goddess had saved the officer from the many pitfalls awaiting him while he served there.[23] Like Jupiter,[24] Nemesis enjoyed great popularity among the *beneficiarii* stationed in Dacia Porolissensis; suffice it to say there was a shrine to her in Samum itself, which was rebuilt around the end of the second or the beginning of the third century by Cassius Erotianus.[25]

However, neither commissioning votive inscriptions nor funding sanctuaries was the principal task of officers active on Dacia's northern border. For years, researchers wondered what specific duties were assigned to the *beneficiarii* active in the region. According to one theory, they were in charge of the salt mine at Dej, roughly 10 kilometres from Samum. Another suggested they monitored the movement of people crossing the bridge on the Someş,[26] and strictly commercial duties must not be discounted either, since the *beneficiarii* at Samum may have been responsible, as they were in other places, including Porolissum, for exchanging goods (perhaps grain) with the barbarians and may have supervised the local market.[27] Even so, their activity in Samum increased in the last years of the reign of the Severan dynasty and it cannot be ruled out that their main task was to collect intelligence about the movements of barbarians across the *limes*, a possibility indicated by archaeological investigations at the fort, pointing among other things to expanding the *praetorium*.[28]

Unfortunately, the material available does not allow for resolving another question, namely that of the length of service the *beneficiarii* put in at the outpost in Samum. Under the model known from Germania, officers would be stationed at one place for roughly six months,[29] but in the case of the Danubian provinces, determining the length of their "tours" is extremely difficult. Even though we have two inscriptions from Samum dated to the same year (AD 243),[30] they are not enough to definitively establish that the officials in question served exactly six months each.

[19] Daicoviciu 1970, pp. 386–402.
[20] Opreanu 1994, pp. 69–78.
[21] Clément 2000, pp. 29–30.
[22] *CBI* 528.
[23] Clément 2000, p. 39.
[24] *ILD* 771, 772, 773, 778 — inscriptions dedicated by officers stationed at Samum to Jupiter.
[25] *CIL* III 825; Cupcea 2010, p. 390.
[26] Cupcea 2010, pp. 390–391.
[27] Opreanu, Lăzărescu 2015, p. 64.
[28] Găzdac, Isac 2007, p. 22.
[29] Dise Jr. 1997, pp. 284–299.
[30] *ILD* 765, 769.

As Robert L. Dise Jr. already demonstrated, in many provinces mission length varied depending on the tasks involved,[31] so we must not rule out the possibility that in Dacia Porolissensis, two or more officers would often be active in one *statio* at the same time, for a while.

It is not only in Samum that *beneficiarii* were active in northern Dacia. Other equally important locations were the above-mentioned Porolissum, Buciumi, and Potaissa, and two inscriptions are known from the first of those centres, one placed on an altar dedicated by Flavius Valentinus to Pater Liber, while the other was preserved on the tombstone of Cassius Martialis' wife.[32]

There is not much source evidence for the nature of the tasks assigned to those *beneficiarii*, but it is supposed they were to do with trading with the barbarians, and they probably carried them out in co-operation with the customs clerks whose office was discovered there. Moreover, archaeologists found an inscription in the same building mentioning emperor Commodus as a restorer of trade (*restitutor commercii*).[33] In Jocelyne N. Clément's opinion, the tasks of those Porolissum officers revolved around supervising the order of market days, which tended to coincide with religious festivals, usually resulting in increased movement of people.[34]

It is possible the dedication to Commodus should be seen in connection with another inscription, this one found outside Dacia: in Transaquincum (Rákospalota) in present-day Budapest, an inscription was found dedicated by *beneficiarii* to the *Genius Commercii*.[35] The year the altar was erected is uncertain, but the turn of second and third centuries is likely, directly highlighting the restoration of trade with barbarians after the Marcomannic War, which had affected Dacia and the neighbouring provinces directly.[36]

In Buciumi, in turn, one such inscription has been found so far, dedicated by Publius Iulius Firminus. Regrettably, in that case the duties of the officer are not known either, but the inscription on the altar is interesting for a different reason:

I(ovi) o(ptimo) m(aximo) | Doli|cheno | pro sa|lute dd(ominorum) | nn(ostrorum) M(arci) Aur(eli) | Antonini Pii | Aug(usti) n(ostri), P(ublius) Iul(ius) Fir|minus, b(ene)f(iciarius) | co(n)-s(ularis), v(otum) s(olvit) l(ibens) m(erito)[37]

The dedication is for Jupiter Dolichenus, but in addition, it can be read that the monument was originally intended for the good fortune of two emperors, Geta and Caracalla, but after the former's death at the beginning of AD 212, his name was chiselled out of the inscription, which thus provides a classic example for the *damnatio memoriae* of one member of the imperial family in favour of another.[38]

In Potaissa, a collective dedication draws attention, made by several officers during the governorship of Octavius Iulianus (that is, in AD 202–203). The altar was put up for a *genius scholae*;[39] the building presumably served as the office of the *beneficiarii*, allowing them facilities separate from the *praetorium*.

The inscriptions from Samum, Porolissum, Buciumi, and Potaissa presented here are the only examples from Dacia Porolissensis where the activity of individual *beneficiarii* can be dated precisely. In all other cases from the region, we may only hypothesize they were put up in late second or early third century. The dates oscillate between the reigns of the Severan dynasty and emperor Gordian III, begging the question of what could have caused the activity of *beneficiarii* to decrease after AD 244.

[31] Dise Jr. 1997, p. 285.
[32] *ILD* 687, 701.
[33] *AE* 1988, 997; Clément 2000, p. 254; Cupcea 2010, p. 391.
[34] Clément 2000, p. 254.
[35] *CIL* III 3617 = *CBI* 420.
[36] Clément 2000, p. 254.
[37] *CIL* III 7645.
[38] Popa, Braciu 1978, p. 16.
[39] *CIL* III 876.

One reason for there being no more tasks for them to undertake could be that the two legions stationed in Dacia were moved further east. From elsewhere we know Gordian III used soldiers from the legions *XIII Gemina* and *V Macedonica* to fight the Persians. Weakening the potential of the army immediately led to problems staffing the *officium*, since, as noted right at the beginning of this article, *beneficiarii* were for the most part recruited from legionaries. That lowering of the combat capability of the province was already clearly visible in the years 242–244. During that period and due to pressure from the Carpi, Rome abandoned the outpost in the *limes Transalutanus*, where activity of *beneficiarii* was attested to in inscriptions.[40] In other words, constant pressure from barbarians may have constituted another reason why their activity ceased in the several *stationes*. If we also take into account the Romans abandoning in the first half of the 3rd century two mines administered in part by *beneficiarii*,[41] a fairly clear picture will emerge of no tasks left to be assigned to them, and so no administrative duties either–not merely in Dacia Porolissensis, but throughout the province.

To summarize, the material available paints the activity of *beneficiarii* in the northern regions of the province as follows: they were likely used chiefly in trade contacts with representatives of barbarian peoples, and prospered best at the end of the second and beginning of the third century when contacts with those barbarians had been restored, as indicated for instance by the inscription mentioned above honouring emperor Commodus as *restitutor commercii*. Then they continued under the Severi, when perhaps in addition to tasks to do with trade and supervising the customs they may have monitored the flow of the people inhabiting the lands across the *limes* and gathered intelligence. Until inscriptions documenting any activity of *beneficiarii* after AD 244 are discovered or published, we must conclude that the reign of Gordian III saw the end of those officers' work in Dacia Porolissensis.

Abbreviations

AE	*L'Année épigraphique.*
CBI	*Corpus der griechischen und lateinischen Beneficiarier-Inschriften des römischen Reiches*, ed. E. Schallmayer, Stuttgart 1990.
CIL	*Corpus inscriptionum Latinarum*, Berlin.
ILD	*Inscripţii latine din Dacia (Inscriptiones Latinae Dacicae)*, ed. C. C. Petolescu, Bucharest 2005.

Bibliography

Ardevan 1991	R. Ardevan, "Beneficiarii în viaţa civilă a provinciei Dacia", *Ephemeris Napocensis* 1, pp. 163–171.
Ciugudean 2012	H. Ciugudean, "Ancient gold mining in Transylvania: the Rosia Montana-Bucium area", *Arhitectură. Restaurare. Arheologie* 3, pp. 101–178.
Clément 2000	J. N. Clément, *Les « beneficiarii » : militaires et administrateurs au service de l'empire : I^er^ s. a.C. – VI^e^ s. p.C*, Bordeaux.
Cupcea 2010	G. Cupcea, "Professional officers on the Northern Dacian *limes*", [in:] *Identităţi culturale locale şi regionale în context european. Studii de arheologie şi antropologie istorică*, ed. H. Pop *et alii*, Cluj-Napoca – Zalău, pp. 383–394.

[40] *CBI* 539; Clément 2000, p. 165.
[41] Ciugudean 2012, p. 104.

Cupcea 2012 — G. Cupcea, "*Officium consularis*, the evidence of Dacia", *Transylvanian Review* 21, pp. 243–254.

Cupcea 2014 — G. Cupcea, *Professional Ranks in the Roman Army of Dacia*, Oxford.

Daicoviciu 1970 — C. Daicoviciu, "Severus Alexander şi provincia Dacia", [in:] *Dacica*, ed. C. Daicoviciu, Bucharest, pp. 386–402.

Deac 2013 — A. D. Deac, "The toponymy of Dacia Porolissensis. Recent research and new approaches", *Ephemeris Napocensis* 23, pp. 261–270.

Dise Jr. 1997 — R. L. Dise Jr., "Variation in Roman administrative practice: the assignments of *beneficiarii consularis*", *Zeitschrift für Papyrologie und Epigraphik* 116, pp. 284–299.

Gaiu 2014 — C. Gaiu, "The *beneficarius* spearhead from Arcobadara", *Journal of Ancient History and Archeology* 1/3, pp. 60–65.

Găzdac, Isac 2007 — C. Găzdac, D. Isac, *The Auxiliary Forts from Samum (Căşeiu) and Giălu*, Cluj-Napoca.

Hirt 2010 — A. M. Hirt, *Imperial Mines and Quarries in the Roman World*, Oxford.

Opreanu 1994 — C. H. Opreanu, "Misiunile beneficiarilor consulari pe limesul de nord al Daciei în secolul al III-lea", *Acta Musei Napocensis* 31, pp. 69–78.

Opreanu, Lăzărescu 2015 — C. H. Opreanu, V. A. Lăzărescu, *A Roman Frontier Marketplace at Porolissum in the Light of Numismatic Evidence*, Cluj-Napoca.

Popa, Braciu 1978 — A. Popa, I. Braciu, *Le culte de Jupiter Dolichenus dans la Dacie romaine*, Leiden.

Rankov 1986 — B. Rankov, *The Beneficiarii Consularis in the Western Provinces of the Roman Empire*, Oxford (unpublished PhD thesis).

Rankov 1999 — B. Rankov, "The governor's men: the *officium consularis* in provincial administration", [in:] *The Roman Army as a Community: Including Papers of a Conference Held at Birkbeck College, University of London, on 11–12 January 1997*, ed. A. K. Goldsworthy, I. Haynes (= *Journal of Roman Archaeology.* Suppl. 34), Portsmouth, RI, pp. 15–35.

Roth 1999 — J. Roth, *The Logistics of the Roman Army at War (264 B.C. – A.D. 235)*, Leiden – Boston.

Vătavu 2011 — B. V. Vătavu, "Regio şi beneficiarii consulari pe frontiera nordică a provinciei Dacia", *Arheologie şi studii clasice* 1, pp. 225–234.

Zaninović 2007 — M. Zaninović, "*Beneficiarii consularis* in the territory of the Delmatae", *Contributions of Institute of Archaeology in Zagreb* 24, pp. 181–184.

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TROPAEUM TRAIANI IN THE LATE ROMAN TRADE NETWORK AND ROAD SYSTEM. THE EVIDENCE OF THE LONG-DISTANCE IMPORTS OF FINE POTTERY

Abstract: Fragmentarily preserved vessels of Late Roman red slip wares imported from distant production centres: Pontic, Aegean and North African, selected from the pottery materials collected during the excavations carried out recently near Basilica A in Tropaeum Traiani, were analyzed and discussed in order to obtain important chronological indicators for the studies on the identified contexts, and to show the significance of the location of the investigated settlement at the crossroads of the two principal communication lines in Scythia Minor for the inland distribution of commodities imported from overseas. The highest class red slip pottery finds were divided according to the identified wares originating from different production centres, and to their specific forms. They are presented in typo-chronological sequences within the wares, while the wares are discussed according to their presence in Tropaeum Traiani: from the most numerous to the least frequently encountered finds. Altogether 132 fragments of imported Late Roman red slip ware vessels were identified. The most numerous were the imports from the Aegean workshops: Late Roman C / Phocaean Red Slip ware (98 fragments) and Late Roman Light Coloured ware (21 fragments). It is important to note that the products from the most distant workshops in Northern Africa — African Red Slip ware (10 fragments) were found more frequently than those from the north-eastern Anatolia, called Pontic Red Slip ware (5 fragments). It clearly indicates that the most significant part of the analyzed pottery was transported together with the strategically important supplies along the western coast of the Black Sea to Scythia Minor from the central part of the empire. The diachronic overview of the discussed finds shows that the first Late Roman red slip vessels began to be brought from the Aegean to Tropaeum Traiani around the late fourth or early fifth century. The significant increase of these imports took place in the second half of the fifth century and the regular overseas supplies lasted until the early seventh century, with their intensification in the first half of the sixth century. The obtained results reflect the settlement activity in and around the excavated part of Tropaeum Traiani and match the general picture of the distribution of the imported red slip vessels along the principal routes of Scythia Minor to its numerous economic and military centres, in the discussed period.

Keywords: Tropaeum Traiani, Scythia Minor, Late Antiquity, red slip pottery, road system, long-distance trade

Introduction

The paper presents results of the analysis of fine pottery finds from the regular archaeological excavations conducted near Basilica A in the northern part of Tropaeum Traiani, in

2005–2016.[1] The vessels discussed below are the first part of the studied finds of fine pottery. The analysis is focused on the imports from the overseas distant production centres located near the Black Sea, Aegean and western Mediterranean basins, in order to obtain important chronological indicators for the studies on the identified contexts,[2] as well as to expose the importance of the favorable location of the investigated settlement in the network of the inland distribution of imported goods along the principal roads of the province. The analyzed ceramics are characterized by the highest quality among the fine ware vessels, and they were the subject of the regular long-distance maritime trade in the Late Roman period. As the finds of the identified wares are known from other archaeological sites in the Pontic and Mediterranean regions, and the dating of their specific forms was already established, they were used during the reported joint works as the chronological indicators for analyzing the identified contexts and other finds, as the regionally produced fine pottery, which is still the subject of the ongoing studies and will be presented in a separate publication.

Tropaeum Traiani in Moesia Inferior / Scythia Minor is located in the south-eastern part of today Romania, in the central part of the historical region of Dobrudja, between the Lower Danube and the Black Sea coast [Fig. 1]. The ruins of the Late Roman fortified town can be found near the present village Adamclisi, almost 2 km to the west of the Triumphal Monument built during the reign and at the orders of Trajan (98–117), which gave the name to the ancient town.[3]

Fig. 1. Dobrudja, part of the Roman provinces Moesia Inferior and later Scythia Minor, with the main Roman roads (compiled by I. Barnea, A. Panaite)

[1] The reported research was conducted by the authors within the framework of a joint project: *Tropaeum Traiani in Roman trade network and road system — archaeological evidence* (2016–2018) under the agreement on scientific cooperation between the Polish Academy of Sciences and the Romanian Academy.

[2] Cf. other important chronological indicators from the excavations in Tropaeum Traiani, coins and imported trade amphorae, published recently: Panaite, Vîlcu 2019 and Grigoraș, Panaite 2021.

[3] Vulpe, Barnea 1968; Suceveanu, Barnea 1991, pp. 32–33; Sâmpetru 1984. All the dates in the paper are AD.

The settlement took advantage from an outstanding strategic position at the crossroads of the two central roads crossing the province of Scythia Minor: from Noviodunum in the north to Zaldapa and Marcianopolis in the south, as well as from Tomis and Callatis in the east, on the Black Sea coast, to Durostorum on the Danube in the west.[4]

The investigated town was founded as a *municipium* in the place of a previous Getic settlement whose name remains unknown.[5] Like in the case of other fortifications in Dobrudja, its substantial ruins, still visible today, are dated back to the last two or three centuries from the history of the city, namely, to the Late Roman period (fourth – early seventh century). It concerns especially the city walls with four access gates connected with two main streets with porticos (*cardo* and *decumanus*), perpendicular one to another. Other secondary streets and five basilicas were also investigated during the archaeological excavations.[6] One of them is the so-called *basilica forensis* — a monumental civil basilica, while the other four are Christian churches, including an episcopal one with a monumental baptistery. Each Christian basilica has an *atrium* and a martyr crypt or relics under the altar table. Remains of numerous houses, shops, warehouses, etc., were also identified in Tropaeum Traiani. Some of them were excavated and others are known owing to the geo-magnetic investigations.[7]

So-called Basilica A [Fig. 2] was built at the end of the fifth or the beginning of the sixth century during the reign of Anastasius, and repaired during the reign of Justinian around the middle of the sixth century. Five annexes on its south side had been investigated previously.[8] The first excavations in Sector A [Fig. 2], dominated by Basilica A and limited by the *cardo* and

Fig. 2. Aerial view of Sector A (drone photo by R. Constantin, 2020)

[4] Vulpe, Barnea 1968; Suceveanu, Barnea 1991, pp. 252–256; Panaite 2015a, pp. 593–600.
[5] Suceveanu, Barnea 1991, p. 54; Panaite 2016a, pp. 163–172.
[6] Barnea *et alii* 1979; Suceveanu, Barnea 1991, pp. 199–202.
[7] Scurtu, Barnea 2004–2005, pp. 453–474; Ştefan *et alii* 2010a, p. 23; Ştefan *et alii* 2010b, pp. 23–24.
[8] Barnea 1978, pp. 181–187.

decumanus streets, as well as the city wall, were carried out by Alexandru Barnea in 1968–1974. They led to uncovering of a part of the Late Roman city's precinct, represented by five edifices, four of which were investigated completely and the fifth one only partially (A 1–5). They were located along a secondary street (AV1), starting from the *decumanus* and running to the north. The buildings were positioned between the eastern side of the city wall, next to the Eastern Gate, the main gate of the city, and Basilica A. They had various functions — habitation, commercial, and grain storage — and were excavated in order to investigate the latest occupation levels, including repairs and use of the buildings during the Late Roman period,[9] as confirmed by several coins discovered during the excavations.[10]

Fieldworks in the discussed precinct were resumed between 1995 and 1998 by Liana Oța.[11] Later on, two excavation areas were also opened: along the ABV IV street (since 2000), and to the north of Basilica A (since 2005). They verified the results of previous geomagnetic investigations,[12] and extended the research towards the northern side of the city wall. The purpose of the investigations carried out since 2005 in Sector A, north of Basilica A, is to uncover the buildings and the street network in this area of the city, as well as the annexes of Basilica A on its northern side. The general stratigraphy of the area and the urban changes between the fourth and the sixth / early seventh century are in the main scope of the research, leading to the exploration of the whole *insula*, limited by the *decumanus* and *cardo*, and the AV1 and ABV IV secondary streets [Fig. 2].

The recent excavations were carried out by digging parallel trenches of a standard size 5 × 3 m, with the one-meter baulks between them, oriented perpendicular to the northern side of the basilica, starting from the city wall towards the *cardo*. In 2005–2016, 38 trenches were excavated in order to explore the latest, Late Roman, levels. The general stratigraphy of the investigated area is the following: vegetal layer, gravel mixed with grey soil, grey soil, debris with fragments of tiles, bricks and stones, yellow clay with ash, and the occupation layer — clay floor. The archaeological research is still ongoing, and so far it has led to the partial or complete identification of several buildings (A 5 and A 15), as well as two annex rooms attached to the northern wall of the basilica: at its north-eastern and north-western corners [Fig. 3].[13] These buildings are placed in two areas, namely, to the north of the *atrium* and the *narthex*, and next to the north-eastern corner, near the apse. There are no other constructions in this area, indicating that it was probably the space of a courtyard. This empty area was noticed in 2009,[14] when a geo-magnetic survey provided the evidence of its great dimensions. It is situated about the middle of the northern wall of the basilica, between the two aforementioned buildings.

The results of the discussed archaeological research allowed to assume that some additional buildings and a courtyard where the Christians could assemble for various celebrations, were located to the north of Basilica A. The identified structures indicate also the existence of an enclosure on the northern side of the basilica, separating the yard and the annexes from other civil buildings, situated in this part of the Late Roman town [Fig. 3].[15]

[9] Barnea 1979, pp. 79–88.
[10] Barnea 1979, pp. 80–83.
[11] The research reports prepared by L. Oța for the years 1995, 1997 and 1998 are stored in the archives of the "Vasile Pârvan" Institute of Archaeology of the Romanian Academy in Bucharest.
[12] Ionescu, Gămureac, Drăghici 2013; Gămureac, Ionescu, Drăghici 2015–2016. See also: Scurtu, Barnea 2004–2005.
[13] Panaite 2006, p. 33; Panaite 2007, p. 23; Panaite 2009, pp. 66–67; Panaite 2010, pp. 13–14; Panaite 2011, p. 10; Panaite 2012, pp. 15–16; Panaite 2013, p. 15; Panaite 2014, p. 13; Panaite 2015b, p. 17; Panaite 2016b, p. 17; Panaite 2017, p. 12.
[14] Ștefan *et alii* 2010a, p. 23; Ștefan *et alii* 2010b, pp. 23–24.
[15] Panaite 2010, p. 14.

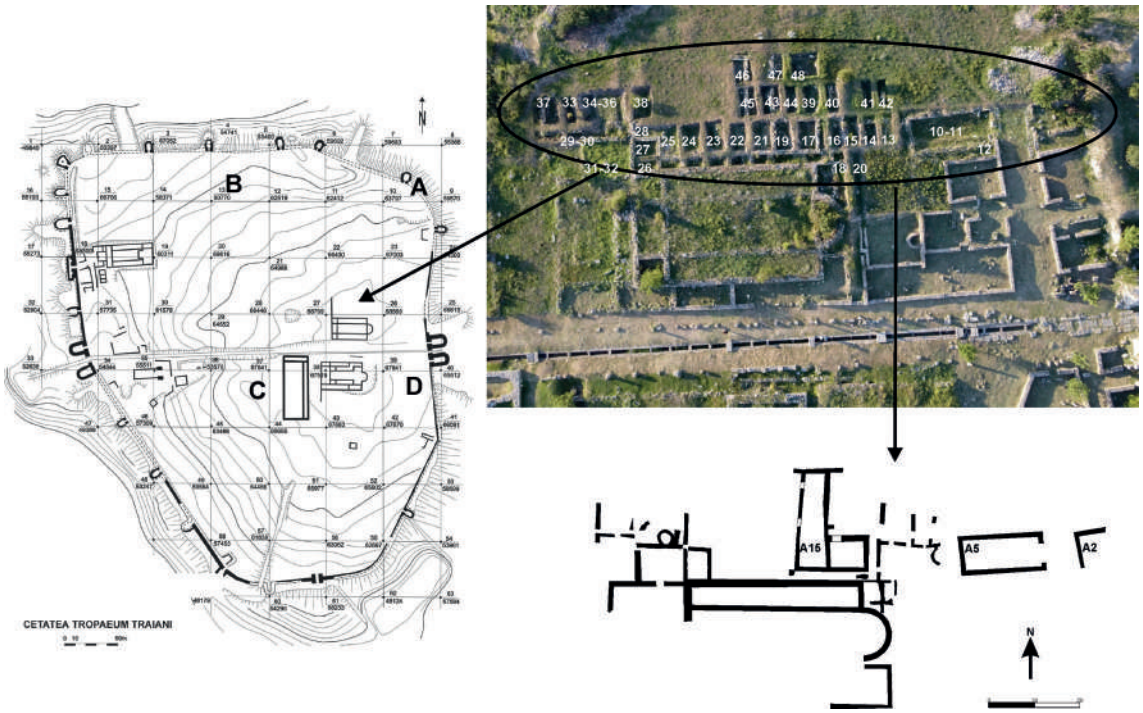

Fig. 3. General plan of the investigated area in Sector A
(drone photo by R. Constantin, 2020, compiled by A. Panaite)

Imported Late Roman red slip wares

Pottery materials collected during the above-mentioned excavations were studied by the authors in 2017 and 2018. During the eleven excavation campaigns carried out between 2005 and 2016, altogether *ca.* 4000 pottery fragments were sorted out for further studies, inventoried and stored. Around 10% of these materials are finds of fine pottery, mostly terra sigillata and red slip wares. Fragments of the imported Late Roman red slip wares selected for the reported analysis constitute *ca.* 30% of all the fine wares. The rest embraced residual sherds of the Early Roman terra sigillata, mostly of Moesian origin, some rare imports of the Eastern Sigillata C / Çandarlı Ware from the Aegean, as well as Late Roman red slip ware fragments of regional origin, and some single finds of other rare groups, such as glazed or engobed wares.

The fragments of the imported Late Roman red slip pottery, found in various contexts connected with the latest building and occupation activities in the investigated part of Tropaeum Traiani represent vessels coming from four production centers: one Pontic, two Aegean and one North African, dated from the late fourth until the early seventh century. Their presence in Tropaeum Traiani has been already noted in several publications of the previous and recent excavations in other parts of the settlement. Some short notes on these vessels, illustrated with selected finds, do not, however, include any discussions or reflections about their production, trade and consumption.[16]

[16] Bogdan Cătăniciu, Barnea 1979, pp. 180, 186–187, 189, figs. 144/2.13, 158/2.1 and 2.5, 160/2.1–2.8, 161/2.3, 2.11 and 2.18–2.19, 167/2.1–2.2 and 2.6–2.7; Gămureac 2009, pp. 265–267, pls. XI/103–104, XII/105–109, XIII/112–113; Ionescu, Gămureac, Drăghici 2013, pp. 180–181, 186, 190–193, 197–198, pls. I/5–6, II/29, III/37, IV/45 and 60; Gămureac, Ionescu, Drăghici 2015–2016, p. 222, pls. III/32–33, IV/34.

Finds of the Late Roman red slip wares of regional origin were excluded from the present study, as their insufficient, in many cases, state of preservation made it difficult to identify forms of the vessels, and to distinguish some of their less diagnostic fragments from the finds of the Early Roman terra sigillata. As the studies on the regional red slip wares from Moesia Inferior / Scythia Minor are much less advanced than those concerning products with supra regional distribution, these finds were selected for a further, detailed analysis.

Altogether 132 diagnostic fragments of imported red slip vessels were identified among the fine pottery finds. They were initially divided by wares according to different macroscopic characteristics of the fabrics (clay and slip), indicating their various origins. For the typological analysis the processed materials were subsequently divided in two groups: entirely diagnostic fragments (usually rims) which allow us to identify precisely the form of the vessel, as well as less diagnostic ones, indicating approximately only a range of forms it could have represented (lower parts of vessels). All the wares recorded in Tropaeum Traiani were also found at several archaeological sites in the Danube delta, in other Black Sea coastal areas, and most of them also in the Mediterranean. The Aegean and North African products: Late Roman C / Phocaean Red Slip ware, Late Roman Light Coloured ware and African Red Slip ware are relatively well known as their basic vessel forms were distinguished and described by J. W. Hayes and other scholars who established their typo-chronological classifications and presented their supra-regional distributions.[17] More recently identified fine ware vessels of the quality and repertoire of shapes similar to the Aegean and Mediterranean imports but of unknown exact origin, called Pontic Red Slip ware, were distributed exclusively along the Black Sea coasts and into the adjoining hinterlands.[18]

The proportions of the imported Late Roman red slip wares are shown in Fig. 4A. The most numerous finds represent the Late Roman C / Phocaean Red Slip (LRC/PhRS) ware from the western coast of Asia Minor, mainly from Phocaea, and on a much smaller scale from some other workshops located to the north, towards Pergamum. As the shapes of these vessels are very distinctive even their small fragments could be identified, and the less diagnostic sherds were recognized as belonging to the early middle or late production phase (cf. below). This allowed us to state that the imports of the Late Roman C / Phocaean Red Slip ware vessels were rather regular and lasted for more than two centuries: from the late fourth until the early seventh century. Other imports were found in smaller numbers and the datings of these finds are more narrow. This concerns mainly the Late Roman Light Coloured (LRLC) ware from the north-eastern Aegean (possibly from Pergamum or its vicinity) with the finds representing exclusively the early phase of their production

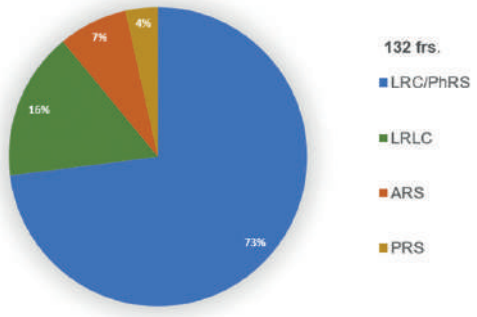

Fig. 4A. Imported Late Roman and Early Byzantine red slip wares found in Tropaeum Traiani (compiled by K. Domżalski)

[17] Hayes 1972, pp. 13–299, 323–370, 408–410; Hayes 1980, pp. 484–523, 525–527; Mackensen, Schneider 2002; Bonifay 2004, pp. 155–209; Mackensen 2009; Ergürer 2014.

[18] Domżalski 2000, pp. 163–166; Arsen'eva, Domżalski 2002, pp. 422–428; Domżalski forthcoming.

from around the middle of the fifth until around the mid-sixth century. Fragments of the African Red Slip (ARS) ware vessels produced in workshops located in the northern part of present Tunisia were found in much smaller quantities. These finds are dated to the sixth and early seventh centuries. The smallest share of the imports belongs to the Pontic Red Slip (PRS) ware with fragments of vessels manufac-tured in the fifth and first half of the sixth century. It is important to note that no earlier finds of the last two mentioned wares: African Red Slip vessels from the fourth and fifth centuries, as well as Pontic Red Slip ones from the fourth century, were identified among the studied materials.

The **Late Roman C / Phocaean Red Slip ware**[19] workshops increased the volume of their production from around the mid-fifth century, during the occupation of North Africa by the Vandals, which resulted in discontinuation of regular supplies from this main source of the highest class red slip pottery in the Mediterranean to the *pars Orientis*. As the Black Sea region was usually the main destination for exporting various valuable goods produced by the Aegean craftsmen, Late Roman C / Phocaean Red Slip vessels were distributed there from the very beginning, becoming in the late fifth and sixth centuries the most commonly delivered products there, especially to such strategically important regions as the Lower Danube *limes* and its hinterland, Chersonesus in the south-western Crimea, Cimmerian Bosporus, and the Caucasian coast. The peak of their popularity was reached during the reign of Justinian, but the deliveries continued later on, at a slightly smaller scale until the early seventh century. This picture is reflected in the numerous materials from Scythia Minor,[20] including some selected finds from Tropaeum Traiani published previously.[21]

Altogether 98 fragments of the Late Roman C / Phocaean Red Slip vessels were identified among the analyzed materials. The earliest vessels were produced in the late fourth / early fifth century and the latest ones in the late sixth / early seventh century. The typo-chronological sequence of the vessel forms and variants, together with their quantitative shares, is presented in Fig. 4B. The chart also includes significant numbers of the so-called less diagnostic fragments, allowing to indicate the production phase only. This analysis shows that the earliest finds, dated

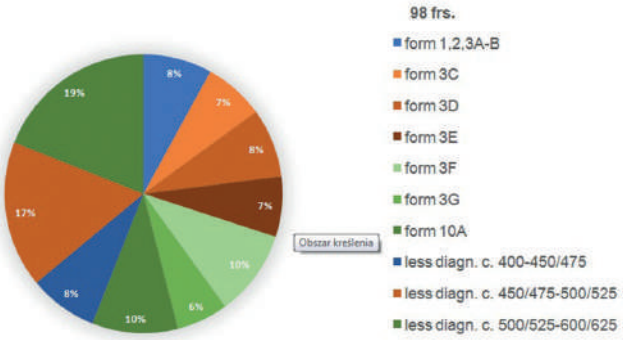

Fig. 4B. Late Roman C / Phocaean Red Slip ware forms and less diagnostic fragments found in Tropaeum Traiani (compiled by K. Domżalski)

[19] Hayes 1972, pp. 323–370; Hayes 1980, pp. 525–527.

[20] Topoleanu 2000, pp. 44–68, 82–87, pls. II, III/23–30, IV–VII/62–63, IX/84–87, X–XI, XII/107 and 110–114, XIII/113–122, XIV–XVI; Opriș 2003, pp. 144, 151–153, pls. LIV/354–363, LV/358–371, LVI/355–379; Opaiț 2004, pp. 75–77, pls. 55–57; Mocanu 2011, pp. 230–240, pls. 2/10–12, 3–7; Mocanu 2014, pp. 154–160, 164–166, pls. 3/12 and 14, 4; Bădescu, Iliescu 2016; Iliescu *et alii* 2017 (several fragments found in Histria, published in the last two works, were identified incorrectly as the early LRC / Phocaean products; cf. also below, note 36); Mocanu, Nuțu 2017, pp. 130–135, figs. 5a/7–14, 5b/1–2, 7/3–7, 8; Mocanu 2018, pp. 238–246, figs. 6–10; Bâjenaru 2018, pp. 501–510, figs. 1/4 and 7–8, 2/10–12 and 19–26, 3/36–45 and 49–54, 4/55–68, 5/79–92, 6/97–101 and 104–109, 7/110; Mocanu 2020, pp. 206–209, 211–212, figs. 3/3–10, 4, with further references.

[21] Bogdan Cătăniciu, Barnea 1979, pp. 180, 186–187, 189, figs. 144/2.13, 158/2.1, 160/2.1 and 2.3–2.6, 161/2.3, 2.11 and 2.18–2.19, 167/2.1 and 2.6; Gămureac 2009, pp. 265–266, pls. XI/103–104, XII/105–109; Ionescu, Gămureac, Drăghici 2013, pp. 180–181, 186, 191–192, pls. I/6, III/37; Gămureac, Ionescu, Drăghici 2015–2016, p. 222, pl. IV/34.

until *ca.* 450–475, were rather uncommon (16%). This group consists of rim fragments of the dishes and bowls, forms 1, 2, 3A and 3B (small fragments, not illustrated), as well as of the equal share of fragments of the lower parts of such vessels. Later variants of the dishes form 3: 3C [Fig. 5: 1], 3D and 3E [Fig. 5: 2], dated to the second half of the fifth and the early sixth century, together with the contemporary less diagnostic fragments, are significantly more numerous (39%). The number of the rims of the standard sixth century vessels, known as dishes, forms 3F [Fig. 5: 3–4], 3G and 10A [Fig. 6], as well as their less diagnostic fragments, is again slightly bigger (45%). Looking closer at this latest phase of imports it is worth noting that the finds from the first half of the sixth century (forms 3F and 3G) are somewhat more common than those from its second half and from the early seventh century (form 10A). It is therefore surprising, that only one stamped fragment was revealed among the Late Roman C / Phocaean finds. Hardly legible Cross or Cross-monogram

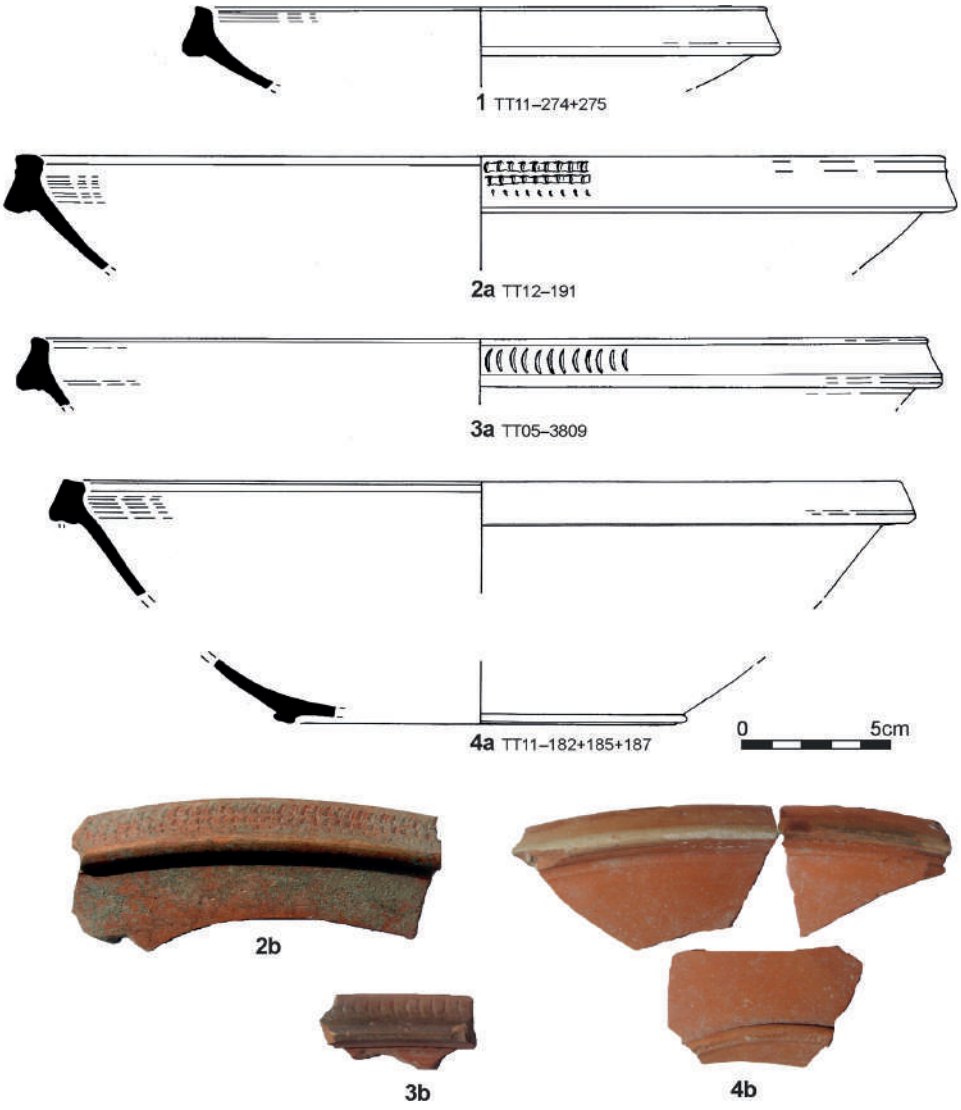

Fig. 5. Late Roman C / Phocaean Red Slip ware:
1 – form 3C, 2 – form 3E, 3–4 – form 3F
(compiled by K. Domżalski, I. Barnea)

with two pendants below arms[22] was identified on one of the latest vessels, form 10A [Fig. 6: 4a–b], which were stamped only occasionally and rather carelessly in comparison with with the products from the mid-fifth–mid-sixth centuries.

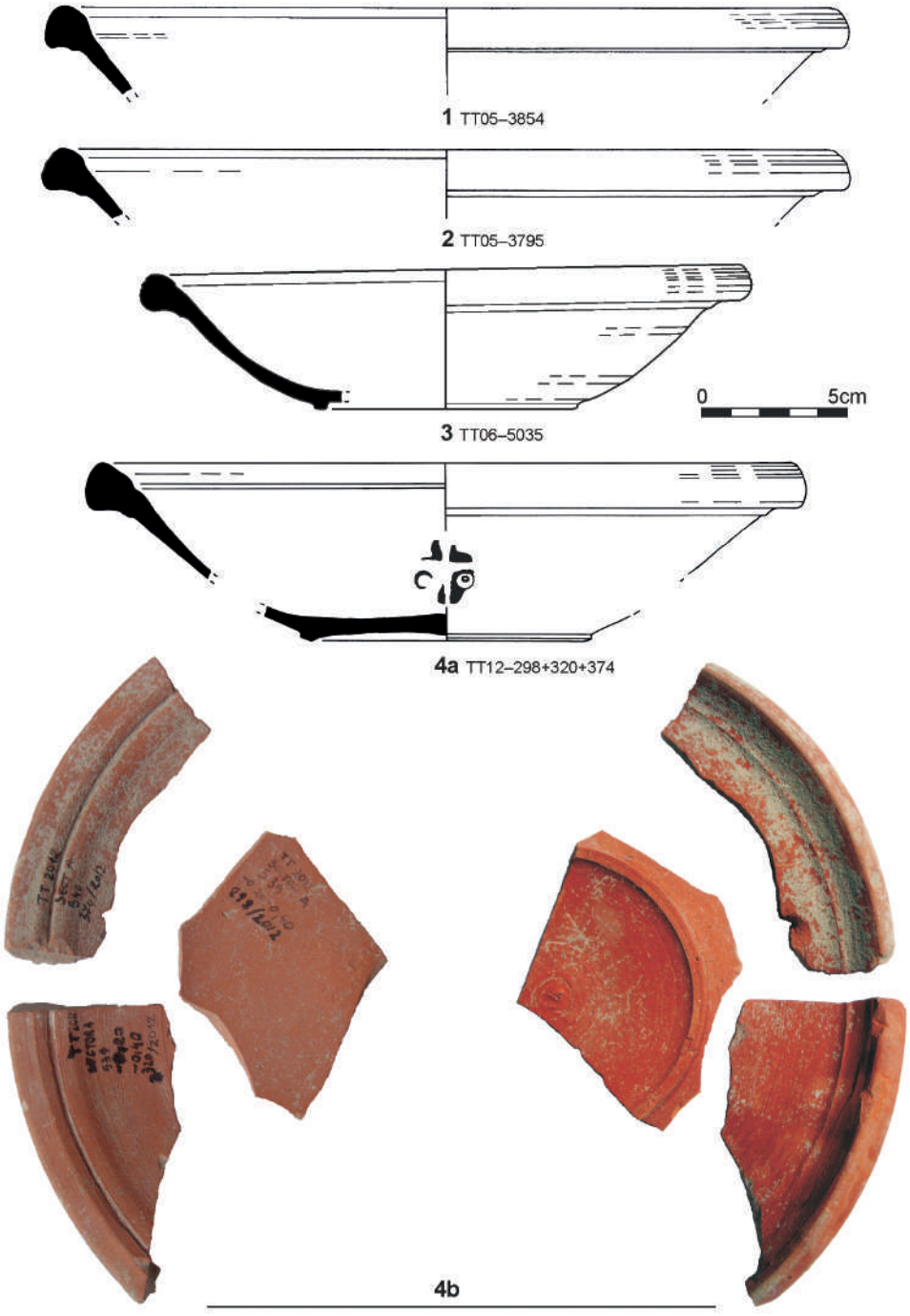

Fig. 6. Late Roman C / Phocaean Red Slip ware: form 10A
(compiled by K. Domżalski, I. Barnea, M. Więch)

[22] Cf. Hayes 1972, pp. 363–368, motifs 67, 80, figs. 78/67, 79/80.

The Aegean vessels are represented also by other very distinctive products of the excellent quality, called **Late Roman Light Coloured ware**, which are less known than the previously discussed Late Roman C / Phocaean ones. These vessels, found at several sites in the Lower Danube area, including Tropaeum Traiani,[23] were misleadingly called Cnidian for a long time,[24] following an initial hypothesis concerning their origin, noted by J. W. Hayes.[25] Recent studies show that the distribution of the Late Roman Light Coloured vessels is especially regular and their finds are numerous in the Northern Aegean and Propontis,[26] possibly indicating the production area, which may be confirmed by the presence of big flakes of golden mica in their fabric, suggesting more precisely the Pergamene region. The broad distribution of the Late Roman Light Coloured vessels began around the mid-fifth century, which is also connected with the above-mentioned occupation of North Africa by the Vandals. They were manufactured until the early or mid-seventh century. The early production, until around the mid-sixth century, is characterized by the presence of multiple rouletting and stamped decorations, while the later vessels were usually not decorated and only some of them were embellished with impressive incised (*champlevé*) figural and other compositions inspired by silverware.

All the 21 fragments of the Late Roman Light Coloured ware found in Tropaeum Traiani represent vessels produced in the early phase, which lasted until around the mid-sixth century. The shapes of some vessels resemble those of the Late Roman C / Phocaean Red Slip ware, bearing also some rouletted and stamped decorative motifs. The most common forms are presented in Fig. 7. They include rim fragments of the dishes similar to the Late Roman C / Phocaean Red Slip ware forms 3C [Fig. 7: 1] and 6 [Fig. 7: 2–4],[27] as well as one specific shape [Fig. 7: 5][28] having no analogy in the above mentioned ware. Less diagnostic fragments of the lower parts of the vessels were decorated with multiple rouletting, and one sherd bears fragmentarily preserved stamp of a Greek cross with dotted decoration inside [Fig. 7: 6–7], which is the most popular motif stamped on the discussed vessels.[29] Late Roman Light Coloured ware fragments from Tropaeum Traiani, as well as the other finds from the Lower Danube area,[30] do not include vessels produced later, in the second half of the sixth and early seventh century, which are characterized with different shapes, influenced by the African Red Slip ware plates, forms 104–105, and by the absence of stamped and rouletted decoration, replaced sometimes with the *champlevé* compositions.[31]

Fragments of the remaining two imported red slip wares, African and Pontic, were found in much smaller quantities. In the case of the **African Red Slip ware**, the number of finds reflects the extremely long distance from the production area (present Tunisia). These workshops were the main supplier of the highest quality red slip tableware in the Mediterranean, establishing a fashion for several vessel forms and styles of their decoration.[32] The vessels in question were usually

[23] Bogdan Cătăniciu, Barnea 1979, p. 186, fig. 158/2.5; Ionescu, Gămureac, Drăghici 2013, pp. 190, 193, 197–198, pls. II/29, IV/45 and 60.
[24] Cf. Opaiț 2004, p. 79, pls. 59–60, with further references.
[25] Hayes 1972, p. 408.
[26] Ergürer 2014, pp. 176–177.
[27] Hayes 1972, pp. 329–330, fig. 67/7, and pp. 340–341, fig. 70/1 (classified incorrectly as form 7); cf. Ergürer 2014, pp. 181–182, form 5, pl. 3, and pp. 183–186, form 11, pl. 5/21–23; for the complete shape of the vessel represented by the fragments in Fig. 7: 2–4, see Bâjenaru 2018, pp. 509–510, fig. 7/111.
[28] Cf. Ergürer 2014, pp. 181–184, form 6, pl. 4/15–16.
[29] Cf. Ergürer 2014, pp. 187–190, pls. 6/33, 8/33.
[30] Cf. above, note 24, as well as: Topoleanu 2000, pp. 54–57, pls. VII/65–69, VIII/70–72, IX/79–83, XII/68; Mocanu, Nuțu 2017, p. 130, figs. 5a/4–6, 7/1–2; Mocanu 2018, pp. 237–238, fig. 5; Bâjenaru 2018, pp. 504, 510, figs. 4/73, 7/110, with further references.
[31] Cf. Ergürer 2014, pp. 185–190, form 15, pls. 6/27–30, 8/29.
[32] Hayes 1972, pp. 13–299; Hayes 1980, pp. 484–523; Mackensen, Schneider 2002; Bonifay 2004, pp. 155–209; Mackensen 2009.

present in the coastal regions around the Black Sea basin, including the lower Danube area,[33] in rather small quantities, from the second until the first half of the seventh century, but the regular influx embraced especially the fourth – early fifth, and the mid-sixth – early seventh century.

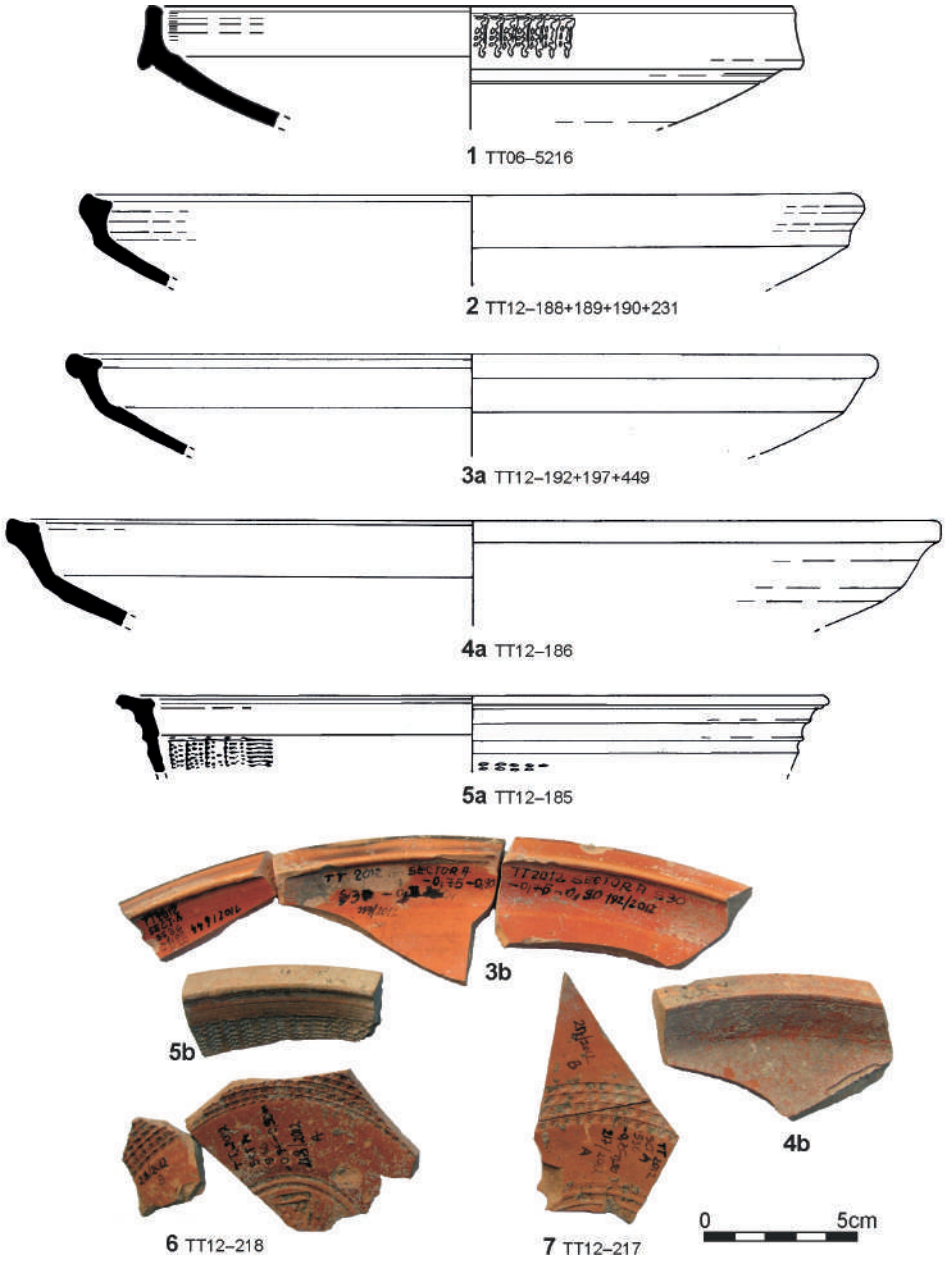

Fig. 7. Late Roman Light Coloured ware: dish fragments and less diagnostic sherds with decorative compositions (compiled by K. Domżalski, I. Barnea, M. Więch)

[33] Topoleanu 2000, pp. 63, 69, 74–78, 85, 87, pls. XII/109, XIII/160, XVIII/152 and 158–159, XIX/161–168; Opriș 2003, pp. 138–150, pls. L–LIV/340–352, LVI/353; Opaiț 2004, pp. 77–79, pl. 58; Mocanu 2011, pp. 227–229, pl. 2/1–5; Mocanu 2012; Mocanu 2014, pp. 151–152, 163, pl. 3/13; Mocanu, Nuțu 2017, pp. 125–129, figs. 5a/1–3, 6; Mocanu 2018, pp. 232–235, fig. 3; Bâjenaru 2018, pp. 501–510, figs. 1/1–3 and 5–6, 2/9 and 17–18, 3/32–35, 6/96 and 102–103; Iliescu, Bottez 2018; Mocanu 2020, pp. 206, 210, fig. 3/1–2, with further references.

All the 10 African Red Slip ware fragments found recently in Tropaeum Traiani represent the late production phase of the ware, dated to the sixth and first half of the seventh century.[34] The best preserved fragments are shown in Fig. 8 and embrace the especially popular bowls, form 99B and C [Fig. 8: 1–3], large bowl or dish, form 103B [Fig. 8: 4], dishes or plates, forms 104A and C (small fragments, not illustrated), as well as the most impressive find — a shallow dish, form 109 [Fig. 8: 5]. The majority of the listed forms (99, 103 and 104), dated from the reign of Justinian

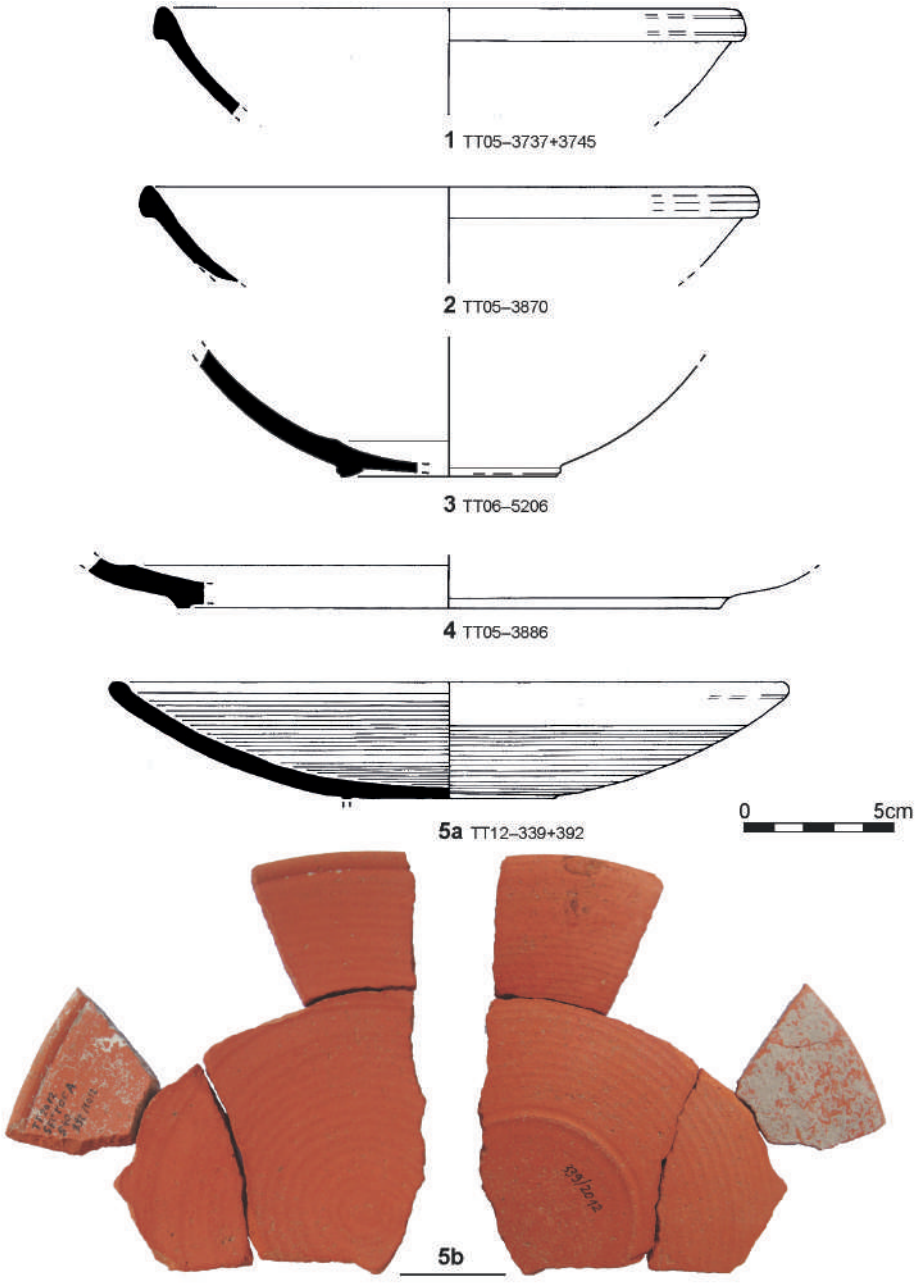

Fig. 8. African Red Slip ware: 1–2 – form 99C, 3 – form 99B, 4 – form 103B, 5 – form 109 (compiled by K. Domżalski, I. Barnea, M. Więch)

[34] Cf. also some previously published African Red Slip ware finds from the investigated settlement, with the prevailing late vessels: Bogdan Cătăniciu, Barnea 1979, pp. 186–187, 189, figs. 160/2.2 and 2.7–2.8, 167/2.2 and 2.7; Ionescu, Gămureac, Drăghici 2013, pp. 180–181, 186, pl. I/5; Gămureac 2009, pp. 266–267, pl. XIII/112–113.

until the early seventh century, became very popular in the supra regional trade and gained broad distribution. The same concerns the latest find, dish form 109, decorated with regular burnishing inside and outside, produced since the end of the sixth and in the first half of the seventh century, which was the last North African vessel distributed supra regionally.

The least represented in Tropaeum Traiani are the **Pontic Red Slip ware** vessels, produced most probably in the north-eastern part of Asia Minor.[35] The distribution of this pottery did not exceed the Pontic basin. The discussed vessels were found at several archaeological sites from the lower Danube area,[36] through the northern and eastern Black Sea littorals, to northern Asia Minor, where Pompeiopolis in Paphlagonia was the westernmost town supplied with these products.[37] Instead, they were identified at some recently investigated sites to the east and south of Pompeiopolis, as Neoclaudiopolis, Comana Pontica and Tavium.[38] In the fourth and fifth centuries Pontic Red Slip ware dominated the long-distance trade within the Black Sea basin, but Scythia Minor was the least important destination in the distribution pattern of these vessels. From the late fifth century they were gradually replaced by the Late Roman C / Phocaean Red Slip ware products imported from the Aegean, and around the mid-sixth century they finally disappeared from the market.

Only 5 Pontic Red Slip ware sherds were identified recently in Tropaeum Traiani, including rim fragments of the large dishes, form 1B [Fig. 9: 1], form 3 (small fragment, not illustrated), and some less diagnostic ones from the lower parts of possibly the same or similar vessels [Fig. 9: 2]. The dishes, form 3 represent the highly developed production of the ware in question, from the first half of the fifth century, while the dish, form 1B is one of the latest products dated to the late fifth and early sixth century.

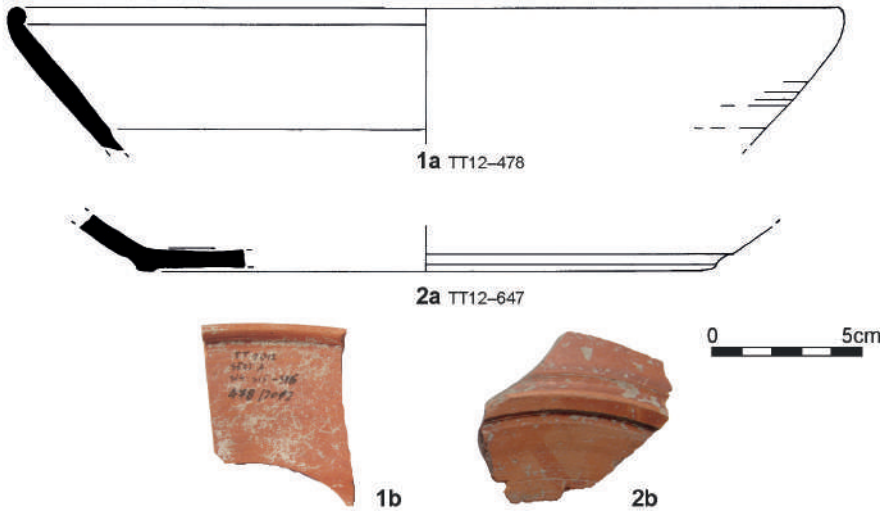

Fig. 9. Pontic Red Slip ware: 1 – form 1B, 2 – less diagnostic fragment of a dish (compiled by K. Domżalski, I. Barnea)

[35] Domżalski 2000, pp. 163–166; Arsen'eva, Domżalski 2002, pp. 422–428; Domżalski forthcoming.
[36] Topoleanu 2000, pp. 42, 46, 56–57, 63, 71–72, pls. I/1–2, III/20, VIII/75–78, XII/108, XVII/142–146 (identified incorrectly); Mocanu 2011, pp. 229–230, pl. 2/6–9; Mocanu 2014, pp. 152, 164, pl. 3/11 and 16; Mocanu, Nuțu 2017, pp. 135–138, figs. 5b/3–5, 9/3–5; Iliescu *et alii* 2017, p. 48, pl. VI/8–9 (identified incorrectly as Late Roman C / Phocaean ware); Mocanu 2018, pp. 235–237, fig. 4 (illustrated finds do not correspond with the vessels described in the paper); Bâjenaru 2018, pp. 503–506, figs. 2/13–15 and 27–31, 3/46–48 (incorrectly identified as Late Roman C / Phocaean ware), 4/69–72. For the previously published finds from Tropaeum Traiani, see Gămureac, Ionescu, Drăghici 2015–2016, p. 222, pl. III/32–33.
[37] Domżalski 2016–2017, pp. 75–77, with further references.
[38] Domżalski forthcoming.

Conclusion

The presented analysis can be perceived as a case study in the process of reconstructing the complete picture of import and consumption of the highest class Late Roman red slip pottery in Scythia Minor. The relatively small number of, however, varied finds collected in a large area explored during eleven excavation seasons in an important part of the investigated settlement is the evidence that the red slip vessels produced in the leading, overseas located production centres were imported regularly but in rather small quantities to Tropaeum Traiani in the last two centuries of its existence as a significant urban center. The majority of the finds (*ca*. 62%) reflect the latest settlement activities in the excavated area, dated to the sixth and early seventh centuries, while the remaining share of fragments (*ca*. 38%) represents vessels produced in the fifth century, evidencing also somewhat earlier occupation there.

The study confirms the importance of the Aegean as the most significant region supplying Scythia Minor with the high quality goods, as shown by the most continuous and numerous imports of the Late Roman C / Phocaean Red Slip ware vessels, accompanied sometimes by the Late Roman Light Coloured ones. The most distant, North African products were surely transshipped in Constantinople, which consumed a substantial share of these deliveries, and therefore the products transported to the Black Sea region must have been especially highly appreciated there. The lowest number of the Pontic Red Slip ware finds clearly shows that Scythia Minor was in the margin of the main sea-borne distribution area of these products, embracing mostly the Crimean Peninsula, Cimmerian Bosporus and Colchis. This picture corresponds with some results of the most recent study of the imported Late Roman trade amphorae found in Sector A in Tropaeum Traiani, especially regarding the relatively low level of imports from the southern Pontic coastal centres as compared with the prevailing ones from the Aegean and the Eastern Mediterranean.[39]

The presented case study confirms also the conclusions of some other investigations on the Late Roman fine wares finds in the region,[40] indicating that during the late fourth – late sixth and/or the early seventh centuries, inhabitants of Tropaeum Traiani, as well as of the other economically and military important settlements in Scythia Minor, had regular access to the fine ware vessels of different overseas provenances, offered on the Black Sea coastal market. Their imports show that the investigated town had a considerable position in the regional economy, being well connected with the central part of the empire by the inland roads towards the ports of Tomis and Callatis, and then by the sea along the western coast of the Black Sea.

Bibliography

Arsen'eva, Domżalski 2002	T. M. Arsen'eva, K. Domżalski, "Late Roman red slip pottery from Tanais", *Eurasia Antiqua* 8, pp. 415–491.
Bădescu, Iliescu 2016	A. Bădescu, I. Iliescu, "Late Roman pottery discovered at Histria in the Acropolis Centre-South Sector (2015). *Vasa escaria* — Late Roman C Wares", *Materiale şi cercetări arheologice* S.N. 12, pp. 141–157.
Băjenaru 2018	C. Băjenaru, "Fine wares from the excavations of the Late Roman fort at *Ulmetum* (province of *Scythia*): Chronology of the late 4th and 5th century main contexts", *Rei Cretariae Romanae Fautorum Acta* 45, pp. 501–510.
Barnea 1978	I. Barnea, "Bazilica „simplă" (A) de la Tropaeum Traiani", *Pontica* 11, pp. 181–187.

[39] Grigoraş, Panaite 2021.
[40] Cf. above, notes: 20–21, 23–24, 30, 33–34, 36.

Barnea 1979 — A. Barnea, "Sectorul A şi via principalis B–C", [in:] Barnea *et alii* 1979, pp. 79–93.

Barnea *et alii* 1979 — I. Barnea, A. Barnea, I. Bogdan Cătăniciu, M. Mărgineanu Cârstoiu, G. Papuc, *Tropaeum Traiani I. Cetatea*, Bucharest.

Bogdan Cătăniciu, Barnea 1979 — I. Bogdan Cătăniciu, A. Barnea, "Ceramica şi descoperiri mărunte", [in:] Barnea *et alii* 1979, pp. 177–226.

Bonifay 2004 — M. Bonifay, *Études sur la céramique romaine tardive d'Afrique*, (= *BAR International Series* 1301), Oxford.

Domżalski 2000 — K. Domżalski, "Notes on Late Roman red slip wares in the Bosporan Kingdom", *Rei Cretariae Romanae Fautorum Acta* 36, pp. 161–168.

Domżalski 2016–2017 — K. Domżalski, "Roman to Early Byzantine fine pottery from Pompeiopolis in Paphlagonia. From the long distance trade to the local market", *Archeologia* (Warsaw) 67, pp. 73–87.

Domżalski forthcoming — K. Domżalski, *Pontic Red Slip Ware: Typology, Chronology and Distribution of a Major Group of Late Roman Fine Pottery in the Black Sea Region* (= *Bibliotheca Antiqua* 25), Warsaw.

Ergürer 2014 — H. E. Ergürer, "Late Roman Light Coloured Ware from Parion", [in:] *Late Hellenistic to Mediaeval Fine Wares of the Aegean Coast of Anatolia. Their Production, Imitation and Use*, ed. H. Meyza, K. Domżalski, Warsaw, pp. 175–191.

Gămureac 2009 — E. Gămureac, "Edificiul B1 din sectorul B al cetăţii Tropaeum Traiani. Consideraţii preliminare privind cercetările din 2005–2008", *Pontica* 42, pp. 243–299.

Gămureac, Ionescu, Drăghici 2015–2016 — Ş. Gămureac, M. S. Ionescu, F. Drăghici, "The A9 Edifice from Tropaeum Traiani (II). A Late Roman house in Scythia Minor (5th–6th century AD)", *Pontica* 48–49, pp. 209–239.

Grigoraş, Panaite 2021 — B. Grigoraş, A. Panaite, "The Late Roman amphorae from Tropaeum Traiani, Sector A (north of the Basilica A), 2005–2016", *Materiale şi cercetări arheologice* S.N. 17, pp. 87–114.

Hayes 1972 — J. W. Hayes, *Late Roman Pottery*, London.

Hayes 1980 — J. W. Hayes, *A Supplement to Late Roman Pottery*, London.

Iliescu, Bottez 2018 — I. Iliescu, V. Bottez, "Late Roman African Red Slip Ware from the Acropolis Centre-South Sector (Histria)", *Materiale şi cercetări arheologice* S.N. 14, pp. 155–167.

Iliescu *et alii* 2017 — I. Iliescu, V. Bottez, A. Ţârlea, A. Liţu, A. Bivolaru, "Late Roman C wares discovered at Histria in the Acropolis Centre-South sector (2013 and 2014)", *Materiale şi cercetări arheologice* S.N. 13, pp. 47–72.

Ionescu, Gămureac, Drăghici 2013 — M. S. Ionescu, Ş.-E. Gămureac, F. Drăghici, "The Edifice A 9 from the Roman-Byzantine town Tropaeum Traiani", *Pontica* 46, pp. 173–215.

Mackensen 2009 — M. Mackensen, "Technology and organisation of ARS ware production-centres in Tunisia", [in:] *Studies on Roman Pottery of the Provinces of Africa Proconsularis and Byzacena (Tunisia). Hommage à Michel Bonifay*, ed. J. H. Humphrey (= *Journal of Roman Archaeology Supplement* 76), Portsmouth, pp. 17–44.

Mackensen, Schneider 2002 — M. Mackensen, G. Schneider, "Production centres of African red slip ware (3rd–7th c.) in northern and central Tunisia: archaeological provenance and reference groups based on chemical analysis", *Journal of Roman Archaeology* 15, pp. 121–158.

Mocanu 2011 — M. Mocanu, "Consideraţii privind ceramica de masă de la (L)ibida. Studiu de caz. Sectorul *extra muros* vest III", *Peuce* S.N. 9, pp. 225–252.

Mocanu 2012 — M. Mocanu, "Notes on the 'African Red Slip Ware' ceramics in Scythia Minor", *Studia Antiqua et Archaeologica* 18, pp. 319–340.

Mocanu 2014 — M. Mocanu, "Consideraţii privind ceramica de masă de la (L)Ibida (II). Sectorul *extra muros* nord I", *Peuce* S.N. 12, pp. 147–168.

Mocanu 2018 — M. Mocanu, "Ceramica de masă romană târzie descoperită la Halmyris", *Peuce* S.N. 16, pp. 227–250.

Mocanu 2020 — M. Mocanu, "Ceramica de masă de la Ibida — Baza 3", *Peuce* S.N. 18, pp. 203–214.

Mocanu, Nuțu 2017 — M. Mocanu, G. Nuțu, "Late Roman red slip ware from Aegyssus", *Novensia* 28, pp. 121–140.

Opaiț 2004 — A. Opaiț, *Local and Imported Ceramics in the Roman Province of Scythia (4th–6th centuries AD)* (= *BAR International Series* 1274), Oxford.

Opriș 2003 — I. I. C. Opriș, *Ceramica romană târzie și paleobizantină de la Capidava în contextul descopeririol de la Dunărea de Jos (sec. IV–VI p.Chr.)*, Bucharest.

Panaite 2006 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2005 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2005*, p. 33.

Panaite 2007 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2006 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2006*, p. 23.

Panaite 2009 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2008 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2008*, pp. 66–67.

Panaite 2010 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2009 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2009*, pp. 13–14.

Panaite 2011 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2010 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2010*, p. 10.

Panaite 2012 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2011 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2011*, pp. 15–16.

Panaite 2013 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2012 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2012*, p. 15.

Panaite 2014 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2013 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2013*, p. 13.

Panaite 2015a — A. Panaite, "Roman roads in Moesia Inferior. Archaeological and epigraphical evidence", [in:] *Limes XXII. Proceedings of the 22nd International Congress of Roman Frontier Studies, Ruse, Bulgaria, September 2012*, ed. L. Vagalinski, N. Sharankov (= *Bulletin of the National Archaeological Institute* 42), Sofia, pp. 593–600.

Panaite 2015b — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2014 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2014*, p. 17.

Panaite 2016a — A. Panaite, "Tropaeum Traiani, from *civitas* to *municipium*, a hypothesis", [in:] *Moesica et Christiana. Studies in Honour of Professor Alexandru Barnea*, ed. A. Panaite, R. Cîrjan, C. Căpiță, Brăila, pp. 163–172.

Panaite 2016b — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2015 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2015*, p. 17.

Panaite 2017 — A. Panaite, "Rezultatele campaniei de cercetări arheologice din anul 2016 din sectorul A al oraşului roman Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2016*, p. 12.

Panaite, Vîlcu 2019 — A. Panaite, A. Vîlcu, "Roman and Byzantine coins discovered at Tropaeum Traiani in Sector A, between the years 2005–2016", *Materiale şi cercetări arheologice* S.N. 15, pp. 157–169.

Sâmpetru 1984 — M. Sâmpetru, *Tropaeum Traiani II. Monumentele romane*, Bucharest.

Scurtu, Barnea 2004–2005 — F. Scurtu, A. Barnea, "Rezultate ale cercetării geofizice (2000–2003) în cetatea Tropaeum Traiani", *Pontica* 37–38, pp. 453–474.

Suceveanu, Barnea 1991 — A. Suceveanu, A. Barnea, *La Dobroudja romaine*, Bucharest.

Ştefan *et alii* 2010a — D. Ştefan, D. Ioane, F. Chitea, M. Mezincescu, "Studii geofizice în perimetrul şi teritoriul oraşului romano-bizantin Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România. Campania 2009*, p. 23.

Ştefan *et alii* 2010b — D. Ştefan, M.-M. Ştefan, C. Constantin, M. Constantin, M. Nicolae, "Documentarea topografică a săpăturilor arheologice, investigaţii geofizice şi studii asupra relaţiei dintre mediul natural şi om în oraşul romano-bizantin Tropaeum Traiani", *Cronica Cercetărilor Arheologice din România*. *Campania 2009*, pp. 23–24.

Topoleanu 2000 — F. Topoleanu, *Ceramica romană şi romano-bizantină de la Halmyris (sec. I–VII d.Ch.)*, Tulcea.

Vulpe, Barnea 1968 — A. Vulpe, I. Barnea, *Din istoria Dobrogei*, vol. II, Bucharest.

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MONETARY CIRCULATION IN ILLYRIA BASED ON CATALOGUED HOARDS OF "ILLYRIAN" COINS[1]

Abstract: The monetary circulation in Illyria is reconstructed based on a distribution of finds of hoards of "Illyrian" coins struck in Greek Illyria from the fourth to the first century BC. A catalog brings together all the hoards discovered in present-day Albania, Bosnia and Herzegovina, Croatia, Montenegro, Kosovo and Serbia. The material has served the author to prepare collective maps, taking into consideration issues in given time periods and issuing centers. Distribution analyses in relation to the topography and settlement networks distinguished areas of concentration of coins from given centers in given periods. The catalogue also revealed certain regularities in the makeup of the hoards: coins from which of the mints were represented together most often or never in combination with others.

Keywords: Illyria, Greek-Illyrian minting, coin hoards, monetary circulation, Balkan Peninsula

The Illyrian tribes inhabited the Balkans from at least the fourth century BC. There are no texts preserved from the region, hence researchers reconstruct the political and economic history of Illyria based on written sources from outside, mainly Roman ones. The boundaries of the territory inhabited by the Illyrians are still debated,[2] especially as they never formed a "state" with strictly defined territory and clearly traced borders.[3]

Coins from the mints of so-called Greek Illyria appear thus as the most reliable source.[4] There is a relatively large number of coin hoards and loose finds available for the study of "Illyrian minting".[5] However, research on Illyrian minting is composed mainly of studies of the issues of particular centers and descriptions of particular coin types.[6] To date there is only one work com-

[1] Research was funded from the Republic of Poland National Science Center grant No. 2016/21/B/HS3/00021 "Monetary circulation in Moesia and Illyria. The case of the finds from Novae (Bulgaria) and Risan (Montenegro)". The authors wish to thank Prof. Piotr Dyczek, Janusz Recław and all the team of the Center for Research on the Antiquity of Southeastern Europe for all their help during the implementation of the grant.

[2] The territorial borders of the Illyrian tribes in particular periods presented in this article are taken from: Pająkowski 1981.

[3] Illyrian statehood was based on a tribal group governed by the strongest of the tribes. The term "Illyrian state" is used in the text for the sake of facilitating the presentation, but always in quotation marks to emphasize the imprecision of the term.

[4] Greek Illyria: eastern Adriatic coast inhabited by the Illyrian tribes and partly colonized by the Greeks, region of merging Greek and Illyrian influence; in the sphere of Greek colonial interest in the fourth century BC.

[5] "Illyrian minting", more properly "Greek-Illyrian minting" was inspired by Greek colonists. It featured the characteristics of Greek coinage, that is, legend in Greek and references to Greek mythology, combined with typically Illyrian symbols, such as an Illyrian galley.

[6] Evans 1880, pp. 269–302; Ceka 1972; Brunšmid 1998.

piling the known "Illyrian" and Roman hoards, but the author took into consideration only hoards from the territory of present-day Albania.[7]

The Illyrian-Greek minting of the two largest mints in the Balkans, Apollonia and Dyrrhachium, is best known today. The other Illyrian centers produced usually briefly and not very intensively, and were replaced completely with Roman denarii from the first century BC. The reason for the limited number of coin finds available today is the accidental discovery of hoards (often when plowing the fields, for example) and, especially in the nineteenth century, a less than professional approach to this category of finds among scholars.

For the purposes of the analysis a catalogue of hoards of Illyrian coins from the Balkans was prepared. Previous attempts in this respect failed to take into consideration all of the finds from the Balkan Peninsula.[8] It proved useful to map all the finds, distributing the findspots by time of issue and the minting centers in order to observe the minting market in a given period, as well as differences between particular phases. On these grounds it was possible to analyze monetary circulation, determining the range of coins from given minting centers and the time of their circulation.

Based on published data, it proved possible to collect 78 Illyrian hoards from the territory of present-day Albania, Bosnia and Herzegovina, Croatia, Montenegro, Kosovo and Serbia, which would correspond to the largest extent of the "Illyrian state" [Fig. 1]. Four categories were discerned, depending on the date of issue. In two instances (Dobra Voda, cat. nos. 23 and 24) hoards were not included in the analysis for lack of a suggested dating. Depending on the volume of the hoards, they are marked with symbols of appropriate size. One should note that the present paper concentrates exclusively on the so-called pre-Roman phase[9] in "Illyrian minting".

Monetary circulation in the fourth/third century BC

The distribution of finds from the fourth/third century BC reveals four clusters [Fig. 2], illustrating the areas with the coins of a given issuer as well as the minting "borders" of Illyrian-occupied territory. These are:

A. present-day Albania;
B. Dalmatian islands and the coast of present-day Croatia;
C. Kotor Bay;
D. present-day Kosovo and the southern part of Serbia.

It is highly probable that at the turn of the fourth century money changed hands on a very local level. Coins from outside, Greek and Macedonian (Corinth, Corcyra, Phillip II, Cassander) constituted an exception, occurring in cluster A. Their presence in "Illyrian" hoards is not difficult to explain, as they appear together with the coins of Apollonia and Dyrrhachium, colonies of Corinth and Corcyra, which still maintained close ties with their metropolises. Coins of Macedonian rulers correspond to Macedonia's conquest of the Illyrians in the second half of the fourth century BC.

Cluster A consists mainly of coins from Apollonia and Dyrrhachium, restricted in this period to the territory of present-day Albania. The only find of coins of Dyrrhachium from this period not in cluster A, is the hoard from Risan (cat. no. 52). Apart from the coins of Dyrrhachium it

[7] Gjongecaj-Vangjeli 2014.

[8] Thompson, Mørkholm, Kraay 1973; Mirnik 1981; Crawford 1985; Brunšmid 1998; Ujes 2001; Gjongecaj-Vangjeli 2014.

[9] The term was first used by Renata Ciołek in reference to the so-called "Illyrian state" in the period prior to 168 BC, that is, the end of the third war of the Romans with the Illyrians.

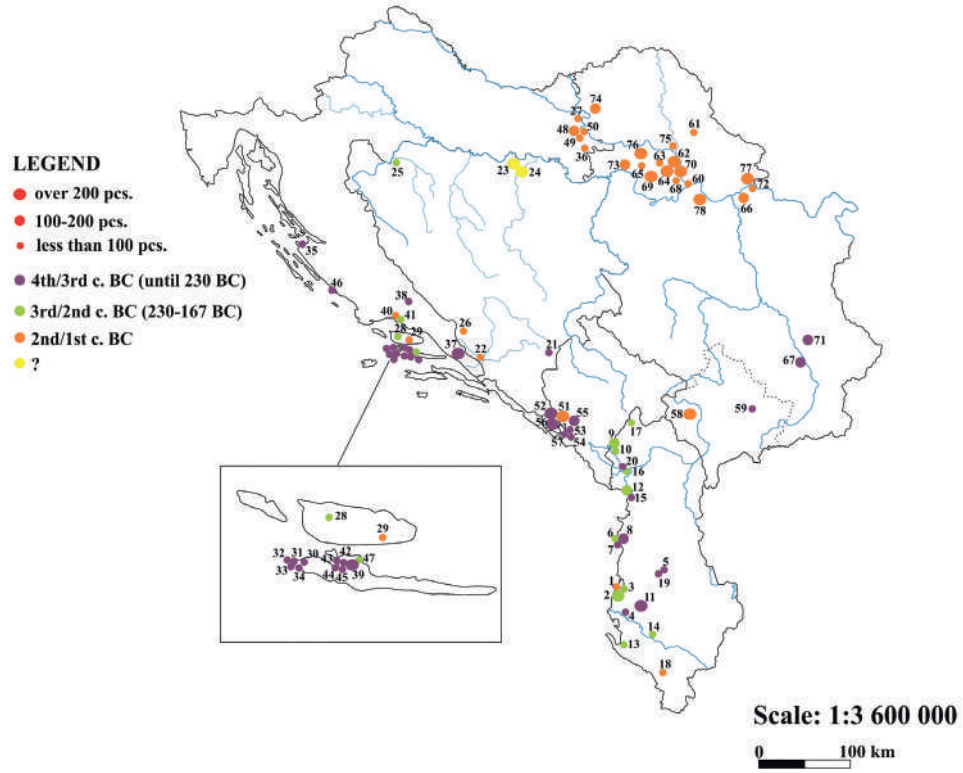

Fig. 1. All the catalogued Illyrian hoards by time of issuing (fourth–first century BC)

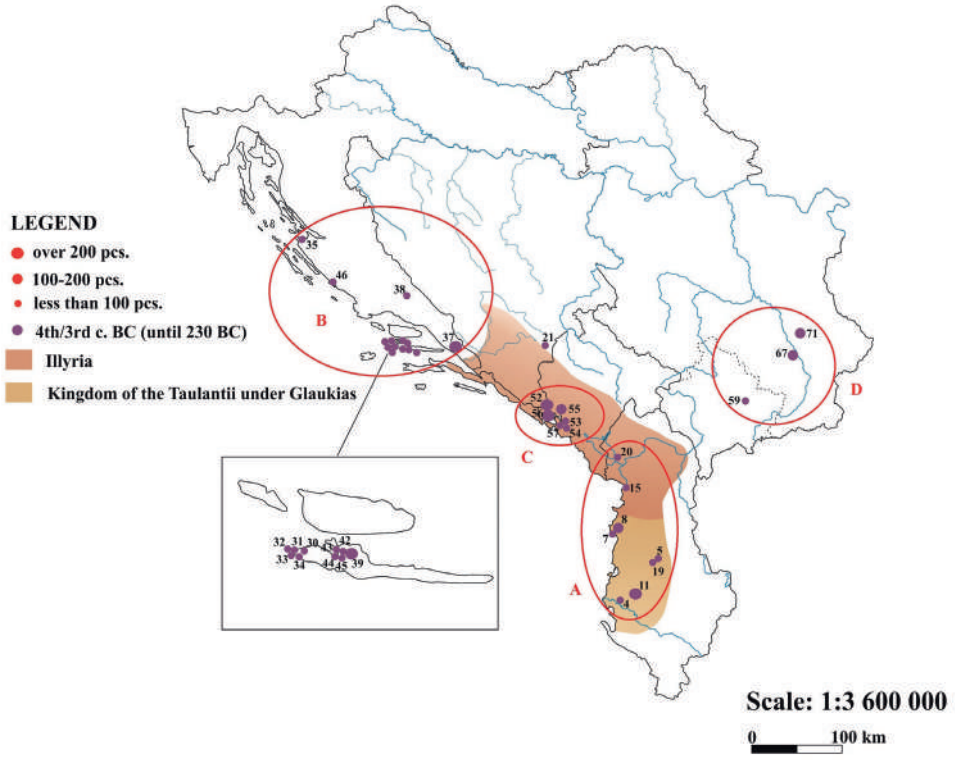

Fig. 2. Illyria at the turn of the fourth/third century BC showing findspots of coin hoards from the fourth/third century BC

contained other foreign issues as well, among others, of Corinth and its colonies, the Epirote cities and a large set of coins of Damastium. The coinage of Apollonia and Dyrrhachium was used probably for local exchange.

The situation on the islands and the eastern Adriatic (cluster B) was similar. The content of the catalogues hoards indicates that the mints operating there, that is, Pharus, Issa, Illyrian Heraclaea, the city of ΔI(M), Corcyra Nigra, maintained mutual relations effecting in a local exchange of coins, but presumably only in the islands. Issues of Illyrian Heraclaea are the only ones to be found in homogeneous hoards on the coast (Nin, cat. no. 35; Tisno, cat. no. 46). The island issues are notably never coexistent with coins from outside the island; not a single island coin has been found in sets of coinage from Illyria proper and the other way round, that is, hoards with coins of Pharus or Issa never include any coins from mainland centers. The exchange evidently did not go beyond the local level. The Greek colonies were presumably not interested in striking up economic relations with centers situated in the other parts of the Balkans.

The minting activity of Ballaeus presents a clearly different picture and not because the identity of this ruler and the time of his reign remain murky. The number of finds is particularly astounding (more than 5500[10]), distributed over a large area, from Pharus in the north to Shkodër Lake in the south, within clusters B and C. Coins of Ballaeus have been found primarily on Pharus (cat. nos. 31, 32 and 39) and in the territory of modern Risan (cat. nos. 53–57). Research by Renata Ciołek has demonstrated that Ballaeus seems to have started out as a local leader in Pharus, where he established the first mint, and subsequently moved to Rhizon.[11] The Pharus and Rhizon types are different in terms of the representations, legends and quality of execution. Singular hoards of Ballaeus have also been found on Shkodër Lake (Shkodër, cat. no. 20), in southeastern Bosnia (Avtovac, cat. no. 21) and at the mouth of the Neretva (Orolik, cat. no. 37). Interestingly, almost all the hoards with coins of Ballaeus are homogeneous, that is, they are never mixed with issues of other cities, as if they were not in wider circulation, merely satisfying the needs of local residents. It appears that the users of coinage produced by Ballaeus had little need of other coin issues.

Issues of Damastium were also in circulation at the turn of the fourth century BC. They have been found distributed over a very large area. The largest numbers come from present-day Kosovo and southern Serbia[12] (cluster D), but they have been recorded in Kotor Bay (Risan, cat. no. 52) and southern Croatia (Sinj, cat. no. 38). Similarly as in the case of Ballaeus, most of the hoards with coins of Damastium are homogeneous, the one exception being the hoard from Risan (cat. no. 52), where they are accompanied by coins of Corinth among others. It is tenable that in the Rhizon region the silver Damastium issues competed with the better known silver coinage of Corinth. John M. F. May has suggested that the set cat. no. 52 reached Rhizon as part of the export of silver from Damastium.[13] Discoveries of Damastium coins on the coast indicate that the city maintained trade connections with this region.

Monetary circulation in the third/second century BC

The growing number of centers issuing coins in this period means a greater variety of coins in circulation. The circulation of "Illyrian" coins covers the area of the Adriatic islands north of the Illyrian-Epirote border to the south [Fig. 3]. At the turn of the third/second century Apollonia and Dyrrhachium produced the largest quantities of coins at the turn of the third century BC, and the situation of Dyrrhachium remained unchanged from the earlier period. It continues to be

[10] Ciołek 2021, pp. 59–66.
[11] Ciołek 2011.
[12] Ujes 2002, pp. 103–129.
[13] May 1939.

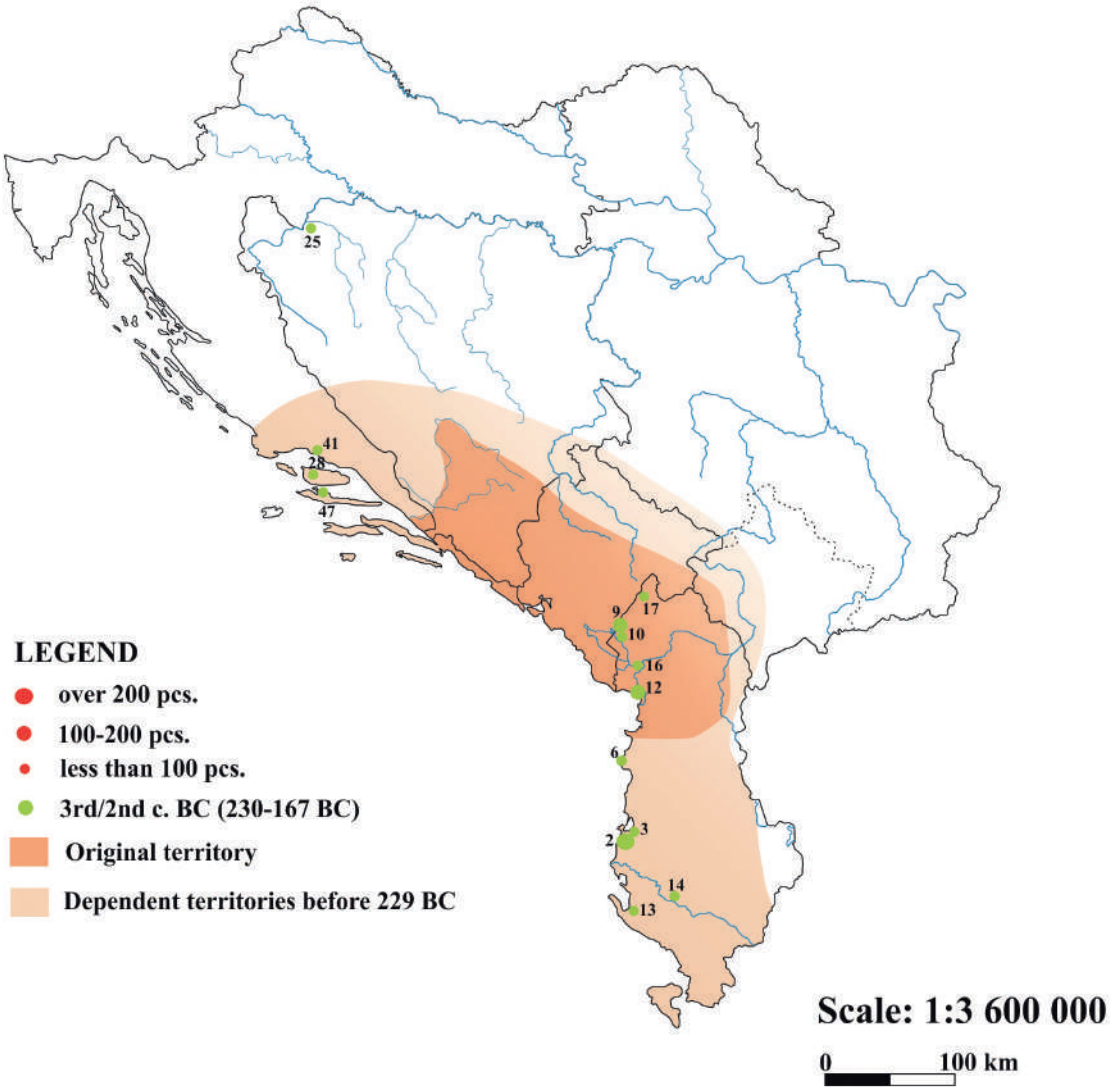

Fig. 3. Illyria during the reign of Agron and Teuta before the first war with the Romans in 229 BC showing findspots of coin hoards from the third/second century BC

represented by a smilax number of coins in the hoards and the territorial extent of these coins corresponds more or less with the territory of present-day Albania. Apollonia witnessed considerable change, considerably intensifying its minting to the point of being comparable with Dyrrhachium. The circulation of Apollonia coins covers the territory of present-day Albania.

At the turn of the third century BC, Apollonia and Dyrrhachium extended their zone of influence beyond the local sphere. The cities established contacts with the Greek *poleis* Thasos and Athens (Bakërr, cat. no. 2) and the Epirote centers of Cassope and Ambracia, as well as the Epirote Union (Bakërr, cat. no. 2; Qesarat, cat. no. 14). According to Shpresa Gjongecaj, the coinage of these two cities reached southern Illyria either by sea (western route) — via this route came coins from mainland Greece — or by land (eastern route) whence came the coins from Macedonia, Epirus, Thessaly and Thrace.[14]

[14] Gjongecaj 1986, p. 148.

The situation on the Adriatic islands continued to be dominated by a local monetary exchange without any evidence for contacts with the mainland cities. However, the number of hoards dropped compared to the earlier period. The catalogue includes four sets of coins, which include pieces from Pharus, Issa and Illyrian Heraclaea.[15] The issues of the city of ΔI(M) and Corcyra Nigra disappear from the record.

New coinage appeared in this period with the Illyrian cities of Scodra, Lissus, Byllis and Oricum, as well as King Genthius striking their own coins.[16] The distribution of these issues points to their use only on a local scale. According to Gjongecaj, intensified local minting is proof of trade relations being introduced between these centers.[17] The coins of Scodra, Lissus and King Genthius were probably used only around Shkodër Lake and in the hinterland of the city of Lissus. The catalogue records only two hoards from Rentzi (cat. no. 16) and Selci (cat. no. 17). The restricted area of distribution may be due to short-time issues and low intensity of production.

The same can be said in the case of Byllis and Oricum. Small quantities of these coins can be found only in southern Albania, in the direct neighborhood of these centers. There is only one hoard from Byllis in the catalogue (Qesarat, cat. no. 14) and two from Oricum (Orikum, cat. no. 13; Senicë, cat. no. 18), the latter of the two already in the next period. This particular coinage must have been in use by the local residents. The cities were situated on the Illyrian–Epirote border, close to Apollonia and Dyrrhachium. They exemplify the mixed influence from the north and the south, issues of Apollonia and Dyrrhachium, as well as Epirote Ambracia and pieces struck by the Epirote Union. Issues of Amantia were also found in this territory; this Illyrian city was producing its own coin with greater intensity than Byllis and Oricum at this time.[18] It is difficult to understand why the hoards discovered to date have not yielded even one coin of this center.

Monetary circulation in the second/first century BC

Political events in Illyria in the second half of the second century BC changed the minting situation entirely. After the defeat of Genthius in the third war with Rome, the Roman Senate occupied a large part of Illyrian territory, subordinating the most important towns and their mints.[19] The fate of these centers differed. For a brief time after 167 BC Scodra continued to issue coins, succumbing to Roman influence, but Lissus, Byllis and Oricum ceased entirely. The most important cities in the region, Apollonia and Dyrrhachium, were already associated with Rome, hence the political changes did not affect them so hard. Their coinage does not differ substantially from the earlier periods except for the names of officials which appeared on the reverse in resemblance of Roman coinage. Moreover, the production of coils from Apollonia and Dyrrhachium continued to develop, going through a period of the greatest intensity of production in the middle of the first century BC.[20]

The coins of Scodra also disappeared from the hoards at the turn of the second/first century BC. Apollonia and Dyrrhachium continued to hold a key share of the market, at least in the catalogued hoards (only one out of 30 failed to have examples of this coinage). Their distribution broadened considerably compared to the earlier period, reaching out beyond present-day Albania's borders [Fig. 4]. The coinage crossed the Dynarian Alps all the way to the lowland Vojvodina. It seems that at the turn of the second century and in the first century the Celts in the north were

[15] Bonačić-Mandinić 1988, p. 69; Nađ 2012, p. 396; Šeparović 2012, pp. 525–536.
[16] More on the minting of Lissus, Scodra and King Genthius: Daniel 2016, pp. 5–24.
[17] Gjongecaj 1986, p. 148.
[18] Ciołek 2011, pp. 176–186.
[19] Wilkes 1969, p. 27; Wilkes 1992, p. 174; Daniel 2016, p. 7.
[20] Gjongecaj, Picard 2000, pp. 137–138; Ujes-Morgan 2012, pp. 369–370.

also using it next to the Greeks and Illyrians. The few finds of hoards from Illyria with coins of Apollonia and Dyrrhachium is surprising. It is possible that after the conquest Rome introduced its own coinage, whereas Greek coins remained in use in the northeastern Balkans, outside the territories of direct Roman expansion.

The inhabitants of independent Illyria and the territory found further to the north and east took advantage of the coins issued by Apollonia and Dyrrhachium, while at the same time making an effort to strike their own coinage. This endeavor is attested by the presence in local hoards of imitations alongside the originals (Orolik, cat. no. 36; Čelopek, cat. no. 58; Stara Pazova, cat. no. 64; Kostolac, cat. no. 66; Titel, cat. no. 75). Access to the coins could have been difficult and their quantity may have not filled the local demand. One can surmise that these territories were enjoying substantial economic growth.

At the same time, in the first century BC, Republican denarii were introduced into the monetary system. Interestingly, they are found exclusively in assemblages from the territory of Vojvodina. They could have reached the area from the south, although it is surprising that they are not found in hoards closer to Illyricum. Loose finds, if taken into account, could explain the situation, but the assumption of the preset article was to treat only the finds of hoards of "Illyrian" coins.

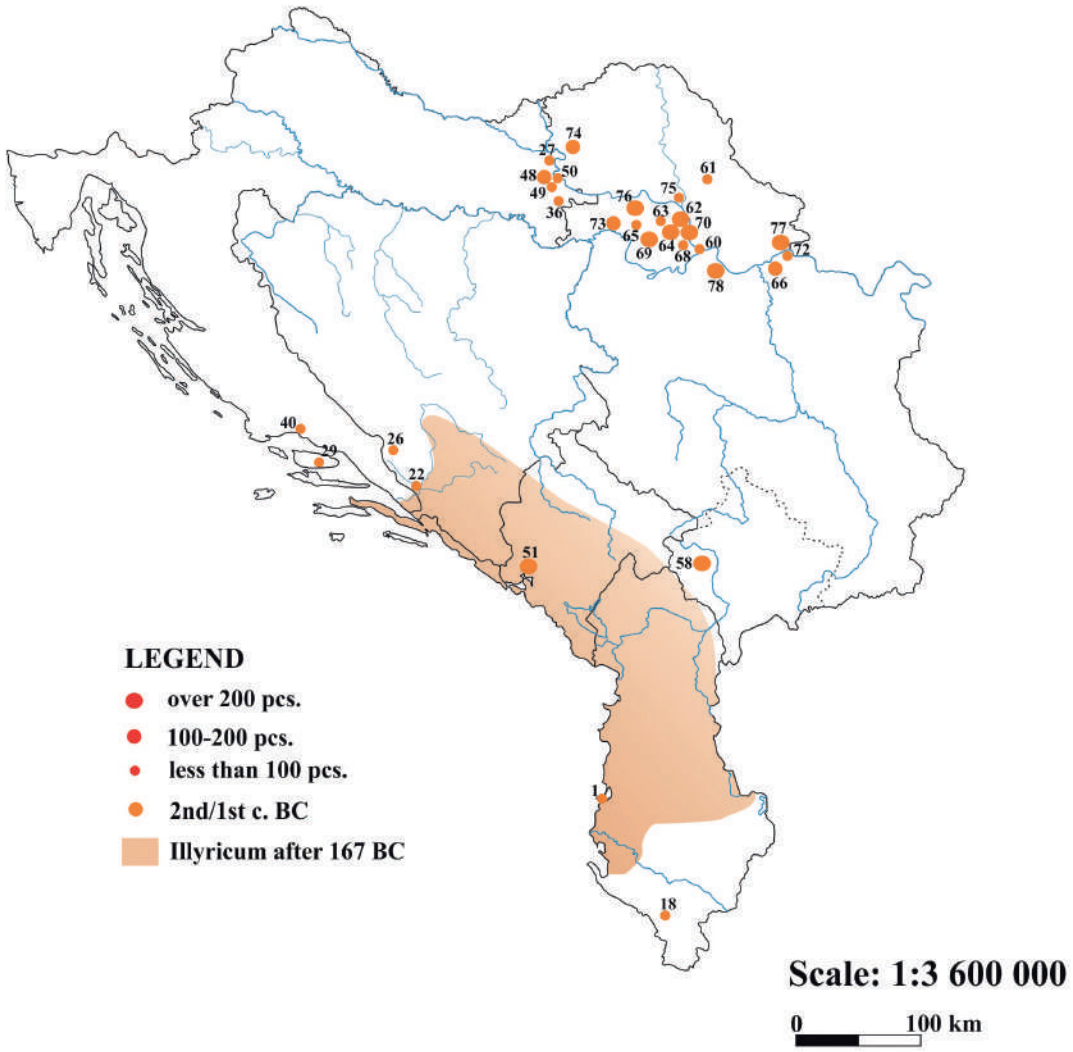

Fig. 4. Illyria in the period post 167 BC showing findspots of coin hoards from the second/first century BC

Recapitulation

The research presented in this study concerns the monetary circulation in the territory of Illyria from the fourth century BC through the first century BC based on an examination of 78 "Illyrian" hoards coming from the territory of selected modern Balkan states and collected in a catalogue appended to this text. Loose finds were intentionally omitted in view of the abundance of the material. The conclusions also benefited from an understanding of the political situation of the "Illyrian".

Two factors were of significance for hoard distribution: marine access and ground topography. Being involved in the sea trade, the Illyrians lived for the most part on the coast. Coin hoards were found mostly in the lowlands and along the coastline, as well as in depressions next to watercourses, that is, in places suitable for settlement. The monetary exchange at the turn of the fourth century was clearly on a local scale. One should list places such as Pharus, Issa, Illyrian Heraclaea, Corcyra Nigra. The cities of Dyrrhachium and Damastium and King Ballaeus issued coins on a larger scale, the latter two reaching a wide area. Dyrrhachium was dependent on its mother city in this period, but its issues are found at a considerable distance from the town, reaching even Kotor Bay.

A century later, in the next period at the turn of the third century BC, Apollonia and Dyrrhachium extended their spheres of influence to cities outside Illyria, even as new local mints emerged to meet the monetary demands of nearby citizens. Foreign issues are recorded from Illyria, but they did not replace the native coinage dominating the local exchange.[21] The variety and quantity of different coins are proof of the dynamic economic development of Illyrian territory.

At the turn of the second and in the first century BC, the catalogued hoards demonstrate mainly issues of Apollonia and Dyrrhachium, sometimes together with local imitations and Republican denarii. The introduction of Roman coinage in the Balkans probably reflected the Romanization of the region. In the first century BC Apollonia and Dyrrhachium coins were still predominant, giving way to the Roman coins as the sole currency in use only in the century that followed.

The present paper is an introduction to the broader subject of monetary circulation in Illyria. Current determination should and will be verified by further research taking into consideration loose finds and covering the entire Balkans. Different paces of the advancement of archeological research in the countries of the Balkans may also have a distorting effect on studies of the economic situation in ancient Illyria. Hence the absolute need for further archaeological research to bring new material under consideration and broaden our knowledge of ancient Illyria.

CATALOGUE

The catalogue is divided into six parts corresponding to particular countries: Albania, Bosnia and Herzegovina, Croatia, Montenegro, Kosovo and Serbia. The hoards are numbered in running order, the name reflecting the findspot. On the left, the number and kind of coins found, the dating in the center, and on the right, the current place of storage. Names of museum follow the list of abbreviations at the end. Each hoard includes information about the date of discovery, date of deposition, remarks and references.

[21] Gjongecaj 1986, pp. 149–150.

ALBANIA

1. APOLLONIA

HOARD

	Imitation of Dyrrhachium	
77 dr.	2nd–1st century BC	Tirana

Date of discovery: 1941
Context: archaeological excavations
Published: Gjongecaj-Vangjeli 2014, pp. 131–134

2. BAKËRR

HOARD

	Thasos	
3 tetradr.	first half 2nd century BC	Tirana
	Apollonia	
133 dr.	229–100 BC (?)	Tirana
4 hemidr.	229–100 BC (?)	Tirana
	Dyrrhachium	
107 dr.	229–100 BC (?)	Tirana
8 hemidr.	229–100 BC (?)	Tirana
	Cassope	
2 dr.	3rd–2nd century BC	Tirana
	Epirote Republic	
5 dr.	?	Tirana
88 dr.	?	Tirana
46 dr.	?	Tirana
41 hemidr.	?	Tirana
	Athens	
4 tetradr.	3rd–2nd century BC	Tirana

Total: 441 AR (321 preserved coins[22])
Date of discovery: 1969
Context: pot hoard
Hoarding date: before 168 BC
Published: Ceka 1972, pp. 49–68; *IGCH* 0559; Boehringer 1989, pp. 189–190, Gjongecaj-Vangjeli 2014, pp. 139–156

[22] Gjongecaj-Vangjeli 2014, p. 139.

3. BAKËRR

HOARD

	Apollonia	
5 AR	250–168 BC	unknown
44 AE	3rd–2nd century BC	unknown

Date of discovery: 1973
Hoarding date: before 229 BC
Published: Gjongecaj-Vangjeli 2014, pp. 135–137

4. CAKRAN

HOARD

	Dyrrhachium	
59 dr.	300 BC[23]	Tirana

Date of discovery: 1962
Hoarding date: 3rd century BC
Context: pot hoard
Published: *IGCH* 0437; Gjongecaj-Vangjeli 2014, pp. 69–72

5. CËRRIK

HOARD

	Cassander	
1 AE	350–297 BC	Elbasan
	Dyrrhachium	
3 dr. (Corinthian types)	4th century BC	Elbasan
57 AE	4th century BC	Elbasan
	Corcyra	
7 AE	4th–3rd century BC	Elbasan
	Uncertain	
2 AE	?	Elbasan

Total: 3 AR, 67 AE
Date of discovery: 1963
Hoarding date: 3rd century BC
Context: pot hoard
Published: *IGCH* 0438; Gjongecaj-Vangjeli 2014, p. 23

[23] Gjongecaj-Vangjeli 2014, p. 69.

6. DURRËS (Dyrrhachium)

HOARD

	Apollonia	
2 dr.	2nd century BC	KH Vienna
	Dyrrhachium	
50 dr.	2nd century BC	KH Vienna

Total: 52 dr.
Date of discovery: 1894
Hoarding date: before 250 BC (Ceka), 2nd century BC (*IGCH*)
Collection: 48 coins at KH Vienna, fate of others unknown
Published: Ceka 1966, pp. 218–219; *IGCH* 0556

7. DURRËS (Dyrrhachium)

HOARD

	Dyrrhachium	
17 dr.	second half 3rd century BC	Vienna
	Apollonia	
2 dr.	second half 3rd century BC	Vienna

Total: 19 dr.
Date of discovery: 1896
Hoarding date: second half 3rd century BC
Notes: Hoard divided; part sold, the rest in the collection of the Numismatic Cabinet in Vienna; possibly same hoard as the collection found in Durrës in 1894
Published: Gjongecaj-Vangjeli 2014, pp. 81–83

8. DURRËS (Dyrrhachium)

HOARD

	Dyrrhachium	
135 AR	330–280 BC	unknown
	Philip II	
2 AE	323/2–315 BC	unknown

Total: 137 coins
Date of discovery: 2006

Hoarding date: 4th–3rd century BC
Notes: hoard found in a house of the Hellenistic period, under a floor, in a wooden box covered with stone tiles 34 cm high
Published: Gjongecaj-Vangjeli 2014, pp. 45–51

9. JUBICË

HOARD

	Apollonia	
91 dr.	second half 3rd century BC	Tirana
	Dyrrhachium	
47 dr.	second half 3rd century BC	Tirana

Total: 138 dr.
Date of discovery: 1965
Hoarding date: *ca.* 229 BC (Ceka), 2nd century BC (*IGCH*), *ca.* 213 BC (Gjongecaj-Vangjeli 2014, p. 125)
Published: Ceka 1971; *IGCH* 0557; Gjongecaj, Picard 2000, p. 139; Gjongecaj-Vangjeli 2014, pp. 119–125

10. KOPLIK

HOARD

	Dyrrhachium	
4 dr.	3rd century BC	unknown
	Apollonia	
12 dr.	3rd century BC	unknown

Date of discovery: before 1967
Hoarding date: *ca.* 213 BC
Notes: entered in a numismatic collection in 1967
Published: Gjongecaj-Vangjeli 2014, pp. 127–129

11. KRESHPAN

HOARD

	Dyrrhachium	
89 st.	330–290 BC	unknown
	Apollonia	
1 st.	4th–3rd century BC	unknown

	Corcyra	
18 st.	4th–3rd century BC	unknown
8 hemist.	300–229 BC	unknown
	Monunius	
45 st.	280–270 BC	unknown

Date of discovery: 1982
Hoarding date: first half 3rd century BC
Published: Gjongecaj 1998; Civici *et alii* 2007; Gjongecaj-Vangjeli 2014, pp. 53–67

12. LEZHA (Lissus)

HOARD

	Apollonia	
30 dr.	before 168 BC	Tirana
	Dyrrhachium	
70 dr.	before 168 BC	Tirana

Total: 100 dr.
Date of discovery: 1919
Hoarding date: *ca.* 168 BC (Ceka), 250–168 BC (Gjongecaj-Vangjeli)
Published: Ceka 1966, p. 218; *IGCH* 0558; Gjongecaj-Vangjeli 2014, p. 24

13. ORIKUM (Oricum)

HOARD

	Syracuse (?)	
1 AE	?	Tirana
	Oricum	
13 AE	3rd–2nd century BC	Tirana
	Epirote Republic	
4 AE	?	Tirana

Total: 18 AE
Date of discovery: 1958
Hoarding date: *ca.* 200 BC (Ceka)
Notes: H. Ceka, personal communication
Published: *IGCH* 0211; Gjongecaj-Vangjeli 2014, p. 25

14. QESARAT

HOARD

	Apollonia	
1[24] dr.	250–168 BC	Tirana
2 AE	250–168 BC	Tirana
	Byllis	
23 AE	234–168 BC[25]	Tirana
	Dyrrhachium	
1 dr.	230/229–168 BC	Tirana
	Epirote Republic	
2 dr.	234–168 BC	Tirana
30 AE	234–168 BC	Tirana
	Ambracia	
1 AE	238–168 BC	Tirana

Total: 60 coins (4 AR, 56 AE)
Date of discovery: 1963
Hoarding date: *ca.* 200 BC (Ceka), before 168 BC (Gjongecaj-Vangjeli)
Notes: H. Ceka, personal communication
Published: *IGCH* 0212; Gjongecaj-Vangjeli 2014, pp. 157–160

15. PLLANË (Bassania)

HOARD

	Dyrrhachium	
21 AR, dr.	4th–3rd century BC	Lezha

Date of discovery: 1960
Hoarding date: *ca.* 300 BC (Ceka), 290–280 BC (Gjongecaj-Vangjeli)
Published: *IGCH* 0436; Gjongecaj-Vangjeli 2014, p. 23

16. RENC

HOARD

	Scodra	
1 AE	213–181 BC	ING UVienna

[24] After Gjongecaj-Vangjeli 2014, pp. 157–159.

[25] Ciołek 2011, p. 189.

1 AE	after 168 BC	missing
1 AE	after 168 BC	missing
1 AE	after 168 BC	missing
1 AE	after 168 BC	missing
	Genthius	
1 AE	197–168 BC	ING UVienna
1 AE	197–168 BC	ING UVienna
	Uncertain	
1 AE (no. 8)	?	ING UVienna

Total: 8 AE
Date of discovery: 1900
Hoarding date: 2nd century BC
Notes: coins believed to be lost. No. 8 identified by J. Scholz as a coin minted by Ballaeus; determination not to be upheld upon examination of the coin.
Published: Scholz 1901; Islami 1966; *IGCH* 0562; Gorini 1988, pp. 20–21; Ujes 1993a, p. 23

17. SELCE

HOARD

	Apollonia	
1 dr.	229–100 BC	Oxford
	Dyrrhachium	
3 dr.	229–100 BC[26]	Oxford
13 AE	229–100 BC	Oxford
	Lissus	
1 AE	3rd century BC[27]	Oxford
	Scodra	
13 AE	213–181 BC[28]	Oxford
	Genthius	
6 AE	181–168 BC[29]	Oxford
	Uncertain	
1 AE	?	Oxford

Date of discovery: before 1870 (?)
Hoarding date: 2nd century BC

[26] Gardner 1883, p. 67.
[27] Ciołek 2011.
[28] Ciołek 2011.
[29] Ciołek 2011.

Context: pot hoard
Published: Evans 1880, pp. 269–288; Ceka 1966; *IGCH* 0560

18. SENICË

HOARD

	Epirote Republic	
16 AE	234–168 BC	unknown
	Chaonia	
2 AE	168–148 BC	unknown
	Apollonia	
1 AE	3rd–2nd century BC	unknown
	Oricum	
2 AE	second half 3rd century BC[30]	unknown
	Corcyra	
1 AE	229–48 BC	unknown
	Ambracia	
2 AE	230–168 BC	unknown

Total: 24 AE
Date of discovery: 1958
Hoarding date: second half 2nd century BC
Published: Gjongecaj-Vangjeli 2014, pp. 179–182

19. SHALËS

HOARD

	Dyrrhachium	
46 AE	330–270 BC	unknown
	Corinth	
1 (?)	350–243 BC	unknown
	Corcyra	
2 (?)	300–229 BC	unknown

[30] Ciołek 2011.

	Cassander	
1 AE	316–297 BC	unknown

Date of discovery: 1963
Hoarding date: 3rd century BC
Published: Gjongecaj-Vangjeli 2014, pp. 77–79

20. SHKODËR (Scodra)

HOARD

	Ballaeus	
14 AE	second half 3rd century BC	missing

Date of discovery: before 1782
Notes: Most of the coins represent the Pharus type; a few pieces were of the Rhizon type.
Published: Brunšmid 1998, p. 76; *IGCH* 0563; Gorini 1984, p. 43 (incorrectly marked as found in Risan)

BOSNIA AND HERZEGOVINA

21. AVTOVAC

HOARD

	Ballaeus	
9 AE	second half 3rd century BC	ZM Sarajevo

Date of discovery: before World War II
Notes: also known as the Berušica hoard
Published: Ujes 2001, p. 341

BERUŠICA, see: AVTOVAC

22. ČAPLJINA

SMALL FINDS (HOARD?)

	Apollonia	
3 (2) dr.	3rd–1st century BC	ZM Sarajevo

	Dyrrhachium	
9 (7) dr./hemidr.	3rd–1st century BC	ZM Sarajevo

Date of discovery: before 1896 (purchased from residents of the area in 1896–1912)
Hoarding date: 20s BC
Notes: According to Kraljević, one coin of Dyrrhachium (no. 7) was found in Neum. In addition, Kraljević reports that the collection of the Museum in Sarajevo contains 12 coins from Čapljina, while Marić describes only nine. Finally, Dragićević distinguishes three pieces of Apollonia and six pieces of Dyrrhachium (five dr. and one hemidr.). He does not take into account one unidentified coin (probably Dyrrhachium).
Published: Mirnik 1981, p. 42, no. 51; Kraljević 1978, pp. 133–136; Marić 2010; Dragićević 2014, p. 100

23. DOBRA VODA

SMALL FINDS

	Apollonia and Dyrrhachium	
15 kg AR	?	(25 pcs in AM Zagreb)

Date of discovery: 1877
Notes: The pot contained probably 15 kg of coins, but only 25 pieces were stored in AM Zagreb; the rest is lost.
Published: Patsch 1902, p. 420; Mirnik 1981, p. 42, no. 55

24. DOBRA VODA

HOARD

	Apollonia and Dyrrhachium	
ca. 200 dr.	?	(one coin in AM Sarajevo)

Date of discovery: 1886
Notes: Two hoards come from the same archaeological site and from the same year. The first consisted of about 200 pieces and was buried in a pot. At present, it is hard to say whether it is an independent find or perhaps related to the earlier hoard found in 1877. The hoard has dispersed, there is only one coin of Dyrrhachium in AM Sarajevo. The hoard was found in Nova Krčevina near the site of Dobra Voda. Most of this hoard is in the collection of V. Kopač.
Published: Patsch 1902, p. 420

25. JAPRA

HOARD

	Illyrian coins	
18 AE	3rd–2nd century BC	ZM Sarajevo

Date of discovery: 1961
Context: pot hoard
Published: Basler 1973; Mirnik 1981, p. 36, no. 19

26. LJUBUŠKI

SMALL FINDS

	Apollonia	
9 dr.	2nd–1st century BC	ZM Sarajevo
	Dyrrhachium	
24 dr.	2nd–1st century BC	ZM Sarajevo

Date of discovery: before 1902
Notes: Most of the Dyrrhachium coins are stored in ZM Sarajevo. The rest are scattered in other museum and private collections. According to Kraljević, two coins of Dyrrhachium were found in the village of Studenci, and one in Vitina. K. Patsch also describes the coin hoard from Ljubuški, indicating the presence of 13 coins of Dyrrhachium. Mirnik found only six coins of Apollonia and 14 coins of Dyrrhachium. The assemblage from the area of Ljubuški currently consists of nine dr. of Apollonia and 24 dr. of Dyrrhachium.
Published: Patsch 1896, pp. 193–195; Kraljević 1979, pp. 133–136; Mirnik 1981, p. 45, no. 74; Dragićević 2014, pp. 100–102

CROATIA

27. DALJ

HOARD

	Apollonia	
11 AR	1st century BC	ZM Sarajevo (?)
	Dyrrhachium	
1 AR	1st century BC	ZM Sarajevo (?)

Date of discovery: *ca.* 1910
Notes: 12 pieces survive, while the original quantity of coins in the hoard is unknown.
Published: Mirnik 1981, p. 42, no. 54; Ujes-Morgan 2012, p. 376

28. DONJI HUMAC

HOARD

	Issa	
11 AE	2nd century BC	unknown
	Heraclaea (Illyria)	
1 AE	3rd century BC	AM Split

Date of discovery: 1891 or before
Published: Bonačić-Mandinić 1988, p. 69; Nađ 2012, p. 436

29. GORNJI HUMAC

HOARD

	Apollonia	
4 AE	1st century BC	AM Split
	Dyrrhachium	
? AR / AE	1st century BC	AM Split

Date of discovery: 1872
Notes: Original hoard contained 70 coins of Apollonia and Dyrrhachium as well as Roman republican coins (see Popović 1987, p. 102).
Published: Mirnik 1981, p. 43, no. 62; Popović 1987, p. 102

30. HVAR

HOARD (?)

	Acragas	
1 AV	4th century BC	unknown
	Pharus	
	type IONIO	
? AR	4th century BC	unknown[31]

[31] Steinbüchel 1837, p. 168: "A very particular circumstance are the known brass coins of Pharos with the letters …IONIO…, all of which are re-struck; but it has been impossible hitherto to discover, satisfactorily, what was the original type. So many similar re-struck coins of other ancient cities have been found connected with

Date of discovery: 1836
Notes: not clear whether found together and constituting a single hoard
Published: Steinbüchel 1837; *IGCH* 0417

31. HVAR

HOARD

	Ballaeus	
65 AE	second half 3rd century BC	AM Zagreb

Date of discovery: before 1942
Published: Mirnik 1981, p. 38, no. 26

HVAR
See also: STARIGRAD (coin hoard, found in 1836–1837)

32. HVAR

HOARD / SMALL FINDS (?)

	Ballaeus	
25 AE	second half 3rd century BC	private

Notes: private collection in Bol (Brač); said to come from the island of Hvar (Pharus)
Published: Dukat, Mirnik 1976, pp. 186

33. HVAR

HOARD

	Heraclaea (Illyria)	
31 AE	4th–3rd century BC	AM Split
	Corcyra	
1 AE	3rd century BC	AM Split

Date of discovery: unknown
Notes: The private Machiedo collection purchased by the Archaeological Museum in Split in 1934. Originally 27 pieces, to which number four were attached due to mixing of coins in the

some interesting historical fact (which would furnish materials for a separate dissertation) that it seemed worthwhile to note that circumstance occurring on the coins of the little island of Pharos".

museum (which ones unidentifiable today). According to Brunšmid, the collection contained 300 pieces of Pharus coins, 14 of Issa, 26 pieces of Heraclaea, 14 pieces of ΔI(M), 1 piece of Genthius, 150 pieces of Ballaeus.
Published: Brunšmid 1998; Bonačić-Mandinić 1988; Bonačić-Mandinić 1993

34. HVAR

HOARD

	Heraclaea (Illyria)	
6 AE	4th–3rd century BC	AM Split

Date of discovery: unknown
Notes: purchased by AM Split from Bučić
Published: Bonačić-Mandinić 1988, pp. 65–80

35. NIN

HOARD

	Heraclaea (Illyria)	
24 AE	4th–3rd century BC	AM Zadar

Date of discovery: 1913
Published: Bonačić-Mandinić 1988, pp. 65–80; Šeparović 2012; Nađ 2012, p. 396

36. "OROLIŠKA GRADINA", OROLIK

HOARD

	Apollonia and Dyrrhachium	
23 dr.	80/70–40 BC	unknown
	Barbaric imitation	
19 Scordiscan	?	unknown
4 dr. (type Srem B)	?	unknown

Date of discovery: 1987
Context: pot hoard
Published: Ujes 2001, p. 344; Ujes-Morgan 2012, p. 376

37. PASIČINA

HOARD

	Ballaeus	
328 AE	second half 3rd century BC	AM Split
141 AE	second half 3rd century BC	unknown

Date of discovery: before 1908
Notes: archival data on the purchase of a part of this hoard in 1908 by the Archaeological Museum in Split, notably 328 coins; the rest, 141 coins, in the possession of Girolamo Moscovit, current location unknown.
Published: Marović 1988, p. 82; Ujes 2001, p. 341

38. SINJ

HOARD

	Damastium	
30 tetradr.	4th century BC	dispersed

Date of discovery: before 1939
Published: May 1939, p. 8, n. 4; *IGCH* 0416; Mirnik 1981, p. 35, no. 10; Ujes 2002, p. 114

39. ŠKUDLJIVAC

HOARD

	Pharus	
58 AE	330–320 BC	private
	ΔI and IONIO	
55 AE	330–320 BC	private
	Heraclaea (Illyria)	
49 AE	330–320 BC	private

Date of discovery: 1835
Notes: In 1837–1840, Petar Nisiteo sold or donated about 20 coins. Three coins (type IONIO) are currently in the Kunsthistorisches Museum in Vienna and five pieces are probably in the Archaeological Museum in Zagreb. The rest of the collection (about 50%) was sold to Teodor Unger and is now in MS Osijek.

	Pharus[32]	
89 AE	4th century BC	MS Osijek
88 hemilitre, 1 trias	4th century BC	MS Osijek
	ΔI	
4 AE	4th century BC	MS Osijek
	Heraclaea (Illyria)	
32 AE	4th century BC	MS Osijek
	Issa	
3 AE	4th century BC	MS Osijek
	Ballaeus	
20 AE	second half 3rd century BC	MS Osijek

Notes: The Unger collection was bought by MS Osijek at the Egger auction in Vienna in 1898.
Published: Kubitschek 1897; *IGCH* 0420; Rendić-Miočević 1970, pp. 354–356; Mirnik 1981, p. 35, no. 12; Gorini 1982, p. 143; Visona 1987; Kirigin 2003, p. 145; Göricke-Lukić 2004; Visona 2005; Göricke-Lukić 2012

40. SOLIN

HOARD

	Apollonia	
? dr.	1st century BC	AM Split
	Dyrrhachium	
? dr.	1st century BC	AM Split

Total: 4 pieces
Date of discovery: about 1877
Published: Mirnik 1981, p. 47, no. 86

41. SPLIT

HOARD

	Pharus	
1 AE	first half 4th century BC	NM Budapest
11 AE	3rd–2nd century BC	NM Budapest

Date of discovery: 1826

[32] Göricke-Lukić 2012.

Notes: Bonačić-Mandinić describes 12 coins, while Nađ mentions only 10 pieces.
Published: Bonačić-Mandinić 2000, pp. 255–263; Nađ 2012, p. 397

42. STARI GRAD

HOARD

	Heraclaea (Illyria)	
49 AR/AE	4th century BC	AM Zagreb
	IONIO	
55 AR/AE	4th century BC	AM Zagreb
	Pharus	
58 AR/AE	4th century BC	AM Zagreb

Date of discovery: 1836 or 1837
Hoarding date: 4th century BC
Notes: three hoards (1835, 1836 and 1837) found in a small area over a short period of time, considered as one collection
Published: Brunšmid 1998, p. 35; *IGCH* 0418–0419 (as Cittavecchia, Dalmatia); Mirnik 1981, p. 34, no. 4 (as Hvar); Mirnik 1981, p. 35, no. 11 (as Stari Grad)

43. STARI GRAD

HOARD

	Paros	
1 AE	4th century BC	AM Zagreb
	Pharus	
11 AE	second half 4th century BC	AM Zagreb

Date of discovery: before 1901
Published: Visona 1993

44. STARI GRAD

HOARD

	Pharus	
18 AE	4th century BC	unknown

Date of discovery: 1994–2004

Notes: Archaeological excavations at the Remetin vrt in Stari Grad. They come from different layers.
Published: Dukat, Jeličić-Radonić 2012

45. STARI GRAD

HOARD

	Heraclaea (Illyria)	
14 AE	4th–3rd century BC	AM Split

Date of discovery: unknown
Notes: Purchased from A. Ilijić
Published: Bonačić-Mandinić 1988

46. TISNO

HOARD

	Heraclaea (Illyria)	
15 AE	4th–3rd century BC	AM Zadar

Date of discovery: before 1919
Published: Stockert 1919, p. 127, no. 52; Mirnik 1981, p. 34, no. 7; Bonačić-Mandinić 1988; Šeparović 2012

47. VRBANJ

HOARD

	Pharus	
45 AE	(after 219 BC)	AM Split
	Uncertain	
6 (?)	?	unknown

Date of discovery: 1900
Notes: There are 45 coins in AM Split, the rest are missing. Almost all coins were minted at the same time in one place. Fresh emission, rather unused or used for a very short time.
Published: Marović 1976, pp. 234–243; Mirnik 1981, p. 40, no. 43a

48. VUKOVAR

HOARD

	Apollonia	
88 dr.	60–40 BC	unknown
	Dyrrhachium	
48 dr.	60–40 BC	unknown
	Roman republican	
4 den.	1st century BC	unknown

Date of discovery: before 1912
Notes: The hoard probably consisted of about 1000 pieces (?). 59 of the 140 pieces that were determined went to the National Museum in Zagreb (?) and 81 coins remained in a private collection.
Published: Brunšmid 1912; Popović 1978, p. 20; Mirnik 1981, p. 49, no. 95; Ujes-Morgan 2012, p. 376

49. VUKOVAR

HOARD

	Apollonia	
52 dr.	1st century BC	AM Zagreb
	Dyrrhachium	
20 dr.	1st century BC	AM Zagreb

Date of discovery: before 1917
Notes: 72 coins were determined of the total of about 80 coins that the hoard contained.
Published: Mirnik 1981, p. 49, no. 96; Ujes-Morgan 2012, p. 376

50. VUKOVAR

HOARD

	Apollonia	
6 dr.	1st century BC	unknown
	Dyrrhachium	
4 dr.	1st century BC	unknown

Total: 14 dr.
Date of discovery: 1961
Published: Mirnik 1981, p. 49, no. 97; Ujes-Morgan 2012, p. 376

MONTENEGRO

51. RISAN

HOARD (uncertain)

Sinus Rhizonicus

437 AR	2nd century BC	KH Vienna (?)
1 AE	2nd century BC	KH Vienna (?)

Date of discovery: about 1888
Notes: 28 coins in KH Vienna, the rest missing; probably a secondary find
Published: Pink 1940; Mirnik 1981, pp. 39–40, no. 39; Ujes-Morgan 2011, pp. 121–122

52. RISAN

HOARD

Corinth

1 st.	5th century BC	unknown
1 tetradr.	457–415 BC	NM Belgrade
1 tetradr.	415–387 BC	NM Belgrade
1 tetradr.	386–307 BC	NM Belgrade
1 tetradr.	386–307 BC	NM Belgrade
1 tetradr.	386–307 BC	NM Belgrade
1 tetradr.	386–307 BC	NM Belgrade
1 tetradr.	386–307 BC	unknown[33]
1 tetradr.	386–307 BC	unknown[34]
1 tetradr.	386–307 BC	unknown[35]
1 tetradr.	386–307 BC	unknown[36]

Dyrrhachium

1 tetradr.	*BMC* 12, Dyrrhachium, nos. 10–11 var.	NM Belgrade
1 tetradr.	4th century BC	unknown[37]

Corinth or Dyrrhachium

1 tetradr.	386–307 BC	unknown[38]
1 tetradr.	386–307 BC	unknown[39]

Corcyra

1 tetradr.	*BMC* 12, Corcyra, nos. 1–2 var.	NM Belgrade

[33] Horvat 1934–1936, p. 12, fig. T. II/3.
[34] Horvat 1934–1936, p. 13.
[35] Horvat 1934–1936, p. 5.
[36] Horvat 1934–1936, p. 6.
[37] Horvat 1934–1936; BMC 12, Dyrrhachium, nos. 10–11 var.
[38] Horvat 1934–1936, p. 2.
[39] Horvat 1934–1936, p. 3.

	Anactorium	
1 tetradr.	?	NM Belgrade
1 tetradr.	*BMC* 12, Anactorium, no. 13	NM Belgrade
1 tetradr.	?	unknown[40]
	Leucas	
1 tetradr.	?	NM Belgrade
1 tetradr.	?	NM Belgrade
1 tetradr.	?	unknown[41]
1 tetradr.	?	unknown[42]
1 tetradr.	?	unknown[43]
	Ambracia	
1 tetradr.	?	unknown[44]
	Corinth and colonies (Dyrrhachium, Leucas, Anactorium, Paeonia)	
ca. 100 tetradr.	4th century BC	NM Belgrade
	Damastium	
ca. 200 tetradr.	350–320 BC	NM Belgrade
	Daparria	
3 M	4th century BC	NM Belgrade
	Pelagia	
1 M	4th century BC	NM Belgrade
	Tenestini (?)	
1 M	4th century BC	NM Belgrade

Date of discovery: 1927
Place of finding: Carine, found at a depth of 1 m
Hoarding date: about 330 BC (Horvat) or after 330 BC (May)
Notes: Coins scattered in several collections: 50 in NM Belgrade and in the private collection of dr. J. Barić in Belgrade there are 50, another 50 coins from this hoard in another private collection in Belgrade; 20 coins in the private collection of S. Hrčić and five pieces in the collection of B. Horvat in Zagreb. Some coins were missing. According to D. Ujes, the hoard can be dated back to 350–325 BC. The place of hiding the hoard, defensive walls, are dated to the fourth century BC.
Published: Horvat 1934–1936; May 1939, pp. 8, 11, 37, 126, 199–202; *IGCH* 0391; Mirnik 1981, pp. 34–35, no. 9; Popović 1987, p. 27; Ujes 1994; Ujes 1999; Ujes-Morgan 2011

[40] Horvat 1934–1936.
[41] Horvat 1934–1936; Imhoof-Blumer 1884.
[42] Horvat 1934–1936.
[43] Horvat 1934–1936.
[44] Horvat 1934–1936.

53. RISAN

HOARD

	Ballaeus	
ca. 100 AE	260–230 BC	unknown

Date of discovery: about 1927
Notes: 10 coins in a private collection in Zagreb, the fate of the rest unknown
Published: Klemenc 1934–1936, p. 128, no. 16; *IGCH* 0564; Mirnik 1981, p. 40, no. 40; Ujes-Morgan 2011, p. 121

54. RISAN region (or BUDVA)

HOARD

	Ballaeus (type Rhizon)	
9 AE	260–230 BC[45]	NM Belgrade

Date of discovery: before 1958
Notes: purchased by the National Museum in Belgrade in 1958
Published: Gaj-Popović 1964; Garašanin 1964; *IGCH* 0565; Mirnik 1981, p. 37, no. 21

55. RISAN, Carine

HOARD

	Ballaeus	
135 AE	260–230 BC[46]	unknown

Total: 135 AE (94.25% type Rhizon; 5.75% type Pharus; 27.60% imitations of type Rhizon)
Date of discovery: 1988
Notes: found at the Risan-Carine site, in the wall of a house
Published: Ujes 1993b

56. RISAN

HOARD

	Ballaeus	
4653 AE	260–230 BC	Kotor/Cetinje[47]
3 AR	260–230 BC	Kotor/Cetinje

[45] Ciołek 2011.
[46] Ciołek 2011.
[47] Centar za Konzervaciju i Arheologiju Crne Gore, Cetinje.

Date of discovery: 2010
Notes: Pot found excavating under the floor of a building, so-called "great hoard of Risan". Only coins minted in Rhizon except for one coin with the head of Heracles on the obverse and a Pegasus on the reverse. Coins of the Rhizon type (86%) feature a portrait head of King Ballaeus to left on the obverse and Artemis walking left on the reverse. The hoard also contains three silver coins. According to Renata Ciołek, the room in which it was discovered was part of the mint, hence the dating of the coins to one period.
Published: Ciołek 2010; Ciołek typescript, p. 8

57. RISAN

HOARD

	Ballaeus	
37 AE	260–230 BC	Kotor/Cetinje[48]

Date of discovery: 2012
Notes: "Small hoard of Risan" discovered during archaeological excavations. It contained 83 coins and 19 fragments. 37 pieces were identified as coins of Ballaeus of the Rhizon type. 13 of them have the king's head on the obverse. Almost half of the hoard too corroded to be analyzed more thoroughly.
Published: Ciołek typescript, p. 5

KOSOVO

58. ČELOPEK

HOARD

	Apollonia	
475 dr.	1st century BC	NM Belgrade
	Barbaric imitation	
2 dr.	1st century BC	NM Belgrade

Date of discovery: before 1961
Published: Popović 1976; Mirnik 1981, p. 42, no. 52

[48] Centar za Konzervaciju i Arheologiju Crne Gore, Cetinje.

59. JANJEVO

HOARD

	Damastium	
52 st.	4th century BC	unknown
8 dr.	4th century BC	unknown

Date of discovery: July 20, 1961
Published: Pegan 1962; Mirnik 1981, p. 34, no. 5

SERBIA

60. BELGRADE

HOARD

	Apollonia and Dyrrhachium	
54 dr.	80/70–40 BC	unknown

Date of discovery: 1996
Published: Ujes 2001, p. 343; Ujes-Morgan 2012, p. 376

61. BOTOŠ

	Dyrrhachium	
5 dr.	1st century BC	unknown

Date of discovery: 1895
Published: Mitrea 1945, p. 86, no. 17; Ujes-Morgan 2012, p. 376

62. "FARM PETROVIĆ", STARA PAZOVA

HOARD

	Apollonia and Dyrrhachium	
about 300 dr.	1st century BC	unknown

Date of discovery: 1996
Published: Ujes 2001, p. 343; Ujes-Morgan 2012, p. 376

63. INĐIJA

HOARD

	Apollonia	
10 dr.	80/70–40 BC	unknown
	Roman Republican	
1 den.	117–116 BC	unknown

Date of discovery: 1996
Published: Ujes 2001, p. 343; Ujes-Morgan 2012, p. 376

64. "JANKO ČMELNIK FARM", STARA PAZOVA

HOARD

	Apollonia and Dyrrhachium	
330 dr.	80/70–40 BC	unknown
	Roman Republican	
78 den.	1st century BC	unknown
	Barbaric imitation	
30 Scordiscan	?	unknown
4 dr. (type Srem B)	?	unknown

Date of discovery: 1989
Published: Ujes 2001, p. 343; Ujes-Morgan 2012, p. 376

65. "JEZERO", RUMA

HOARD

	Apollonia and Dyrrhachium	
48 dr.	80/70–40 BC	unknown

Date of discovery: 1976
Notes: found in a La Tène cemetery
Published: Ujes 2001, p. 343; Ujes-Morgan 2012, p. 376

66. KOSTOLAC

HOARD

	Apollonia	
36 dr.	1st century BC	unknown
	Dyrrhachium	
70 dr.	1st century BC	unknown
1 hemidr.	1st century BC	unknown
	Barbaric imitation	
2 (?)	?	unknown

Date of discovery: 1982
Notes: pot hoard; found digging the foundations for a house near a primary school
Published: Ujes-Morgan 2012, p. 376

67. KUTINA

HOARD

	Damastium	
about 100 tetradr.	395–355 BC	dispersed

Date of discovery: 1923
Notes: dispersed: two coins at the NM Belgrade, 12 coins in Vienna, 19 coins in private collections, 70 coins illegally sold.
Published: Klemenc 1934–1936, p. 126; Saria 1925; Popović 1987, p. 27

68. NOVA PAZOVA

HOARD

	Apollonia	
7 dr.	1st century BC	NM Belgrade
	Dyrrhachium	
7 dr.	1st century BC	NM Belgrade

Date of discovery: 1948
Notes: 11 coins in the collection found in a grave
Published: Mirnik 1981, p. 46; Ujes-Morgan 2012, p. 376

69. PEĆINCI

HOARD

	Apollonia	
18 dr.	1st century BC	private
	Dyrrhachium	
202 dr.	1st century BC	private

Total: *ca.* 220 dr.
Date of discovery: 1960s
Published: Popović 1976,1978,1987; Mirnik 1981, p. 47; Ujes-Morgan 2012, p. 376

70. "PETROVIĆ FARM", STARA PAZOVA

HOARD

	Apollonia and Dyrrhachium	
300 dr.	90/80–50/40 BC	unknown

Date of discovery: 1996
Published: Ujes 2001, p. 343

71. PRVA KUTINA

HOARD

	Damastium	
100 tetradr.	4th century BC	NM Belgrade / KH Vienna

Date of discovery: 1923
Hoarding date: after 355 BC (May)
Notes: dispersed: 12 coins in Vienna, two coins in Belgrade, one coin in a private collection
Published: May 1939, pp. 7–8, 11, 189, 200; *IGCH* 0369; Mirnik 1981, p. 34, no. 8

72. RAM

HOARD

	Apollonia	
23 dr.	1st century BC	unknown

	Dyrrhachium	
24 dr.	1st century BC	unknown

Date of discovery: 1981
Published: Ujes-Morgan 2012, p. 376

73. SREMSKA MITROVICA

HOARD

	Apollonia and Dyrrhachium	
about 200 dr.	80/70–40 BC	unknown

Date of discovery: 1997
Published: Ujes 2001, p. 344; Ujes-Morgan 2012, p. 376

74. SRPSKI MILETIĆ

HOARD

	Apollonia	
94 dr.	80/70–40 BC	Sombor/unknown
	Dyrrhachium	
79 dr.	80/70–40 BC	Sombor/unknown

Total: about 300 dr.
Date of discovery: 1960
Notes: 94 coins are stored in Gradski Muzej in Sombor.
Published: Ujes 2001, p. 344; Ujes-Morgan 2012, p. 376

75. TITEL

HOARD

	Apollonia	
1 dr.	1st century BC	NM Budapest
	Dyrrhachium	
15 (14)[49] dr.	1st century BC	NM Budapest

[49] In brackets, the number of coins given by Torbagyi 2008, p. 224.

	Barbaric imitation	
7 tetradr. Scordiscan	?	NM Budapest
4 (1) dr. (type Srem A)	?	NM Budapest

Total: 23 coins
Date of discovery: before 1910
Published: Mirnik 1981, p. 48, no. 89; Torbagyi 2008, p. 224; Ujes-Morgan 2012, p. 376

76. VRDNIK

HOARD

	Apollonia and Dyrrhachium	
about 300 dr.	80/70–40 BC	Museum Vojvodina Novi Sad

Date of discovery: 1970s
Notes: 38 coins preserved
Published: Ujes 2001; Ujes-Morgan 2012, p. 376

77. VRAČEVGAJ

HOARD

	Apollonia and Dyrrhachium	
about 300 dr.	1st century BC	unknown
	Roman republican	
about 100 dr.	1st century BC	unknown

Date of discovery: 1890s
Published: Mirnik 1981, p. 48, no. 92; Ujes-Morgan 2012, p. 376

78. ZAKLOPAČA

HOARD

	Apollonia	
450 dr.	80/70–40 BC	NM Belgrade
	Dyrrhachium	
1120 dr.	80/70–40 BC	NM Belgrade

Date of discovery: 1928
Published: Petrović 1932; *IGCH* 0579; Mirnik 1981, p. 49; Ujes-Morgan 2012, p. 376

Abbreviations

Denominations

AE	"bronze" coin
AR	silver coin
den.	denarius
dr.	drachma
hemidr.	hemidrachma
hemist.	hemistater
tetradr.	tetradrachm
st.	stater
M	coin made of undetermined metal

Museums

Austria

KH Vienna	Kunsthistorisches Museum, Vienna
ING UVienna	Institut für Numismatik und Geldgeschichte, University of Vienna

Bosnia and Herzegovina

AM Sarajevo	Arheološki Muzej, Sarajevo
ZM Sarajevo	Zemaljski Muzej Bosne i Hercegovine, Sarajevo

Croatia

AM Split	Arheološki Muzej, Split
AM Zadar	Arheološki Muzej, Zadar
AM Zagreb	Arheološki Muzej, Zagreb
MS Osijek	Muzej Slavonije, Osijek

Hungary

NM Budapest	Nemzeti Muzeum, Budapest

Serbia

NM Belgrade	Narodni Muzej, Belgrade

Bibliographical abbreviations

BMC 12	*A Catalogue of the Greek Coins in the British Museum*, vol. XII: *Corinth, Colonies of Corinth, etc.*, ed. B. V. Head, London 1889.
IGCH	*An Inventory of Greek Coin Hoards*, ed. M. Thompson, O. Mørkholm, C. M. Kraay, New York 1973.

Bibliography

Basler 1973 — Đ. Basler, "Nalaz novaca iz predrimskog doba u Japri" [Finds of coins of the pre-Roman period at Japra], *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu. Arheologija* NS 27–28, pp. 261–269.

Boehringer 1989 — Ch. Boehringer, "Fragen zum Münzumlauf in Illyrien in hellenistischer Zeit", *Iliria* 19/2, pp. 185–195.

Bonačić-Mandinić 1988 — M. Bonačić-Mandinić, "Novac Herakleje u Arheološkom muzeju u Splitu" [Coins of Heraclaea in the Archaeological Museum in Split], *Vjesnik za arheologiju i historiju dalmatinsku* 81, pp. 65–80.

Bonačić-Mandinić 1993 — M. Bonačić-Mandinić, "Novac Korkire Melaine u Arheološkom muzeju u Splitu" [Coins of Corcyra Nigra in the Archaeological Museum in Split], *Vjesnik za arheologiju i historiju dalmatinsku* 86, pp. 261–266.

Bonačić-Mandinić 2000 — M. Bonačić-Mandinić, "Novac Isse i Farosa u zbirci Magyar Nemzeti Muzeum u Budimpešti" [Coins of Issa and Pharus in the collection of the Hungarian National Museum in Budapest], *Vjesnik za arheologiju i historiju dalmatinsku* 92, pp. 255–267.

Brunšmid 1912 — J. Brunšmid, "Nekoliko našašća novaca na skupu u Hrvatskoj i Slavoniji. Nahođaj srebrnih ilirskih i rimskih republikanskih novaca II. i I. stoljeća prije Kr. u Vukovaru" [Some finds of hoards from Croatia and Slavonia. Discovery of silver Illyrian and Roman Republican coins from the 2nd and 1st millennium BC in Vukovar], *Vjesnik Hrvatskoga arheološkoga društva* NS 12, pp. 260–271.

Brunšmid 1998 — J. Brunšmid, *Natpisi i novac grčkih gradova u Dalmaciji* [Inscriptions and coins of the Greek cities in Dalmatia], Split [first edition: *Die Inschriften und Münzen der griechischen Städte Dalmatiens*, Vienna 1898].

Ceka 1966 — H. Ceka, "La datation des drachmes de Dyrrachion et d'Apôllonie et l'époque de leur pénétration massive vers les côtes de la mer Noire", *Studia Albanica* 3/1, pp. 213-223.

Ceka 1971 — H. Ceka, "Thesari i Jubicës, hallkë tjetër me rëndësi për rënditjen kronologjike të drahmeve Ilire" [The Jubica hoard, another important chronological link in the order of Illyrian drachmas], *Iliria* 1, pp. 83–101.

Ceka 1972 — H. Ceka, *Questions de numismatique illyrienne. Avec un catalogue des monnaies d'Apollonie et de Dyrrhachium*, Tirana.

Ciołek 2010 — R. Ciołek, "'Great hoard' of 4656 coins of King Ballaios from Risan", *Novensia* 21, pp. 7–12.

Ciołek 2011 — R. Ciołek, *Emisje króla Ballaiosa. Początki mennictwa w Ilirii* [The issues of King Ballaeus. Beginnings of minting in Illyria], Warsaw.

Ciołek 2021 — R. Ciołek, *The Monetary System in the Kingdom of Ballaeus* (= *Rhizon/Risinum. Illyrian Fortress, Greek and Roman Town* 2), Warsaw.

Ciołek typescript — R. Ciołek, *Sensacyjny skarb monet z Risan (Czarnogóra). Badania „lat ciemnych" w Ilirii* [The imposing coin trove from Risan (Montenegro); research on the "dark ages" in Illyria], Warsaw (typescript).

Civici *et alii* 2007 — N. Civici, Sh. Gjongecaj, F. Stamati, T. Dilo, E. Pavlidou, E. K. Polychroniadis, Z. Smit, "Compositional study of 3rd-century-BC silver coins from Kreshpan hoard (Albania) using EDXRF spectrometry", *Nuclear Instruments and Methods in Physics Research, Section B, Beam Interactions with Materials and Atoms* 258/2, pp. 414–420.

Crawford 1985 — M. C. Crawford, *Coinage and Money under the Roman Republic: Italy and the Mediterranean Economy*, London.

Daniel 2016 — M. Daniel, "Scodra i Lissos. Rola dwóch miast w polityce Gentiosa" [Scodra and Lissus. The role of the two cities in the policies of Genthius], *Studia i Materiały Archeologiczne* 15, pp. 5–24.

Dragićević 2014 — I. Dragićević, "Grčko-ilirski novac Apolonije i Dirahija iz zbirke Franjevačkoga muzeja na Humcu kod Ljubuškoga" [Greek-Illyrian minting in Apollonia and Dyrrhachium from the collections of the Humac museum near Ljubuški], *Časopis Franjevačkoga muzeja i galerije Gorica-Livno* 1, pp. 96–109.

Dragićević 2016 — I. Dragićević, "Daorski novac. Prilog poznavanju najstarijeg optjecaja novca na daorskom području" [The minting of the Daorsi. Introduction to the study of the oldest monetary circulation in the territory of the Daorsi], *Vjesnik za arheologiju i historiju dalmatinsku* 109, pp. 107–128.

Dukat, Jeličić-Radonić 2012 — Z. Dukat, J. Jeličić-Radonić, "Rane emisije farske kovnice iz Remetinog vrta u Starom Gradu na Hvaru" [Early mint issues of Pharus from Remetin vrt in Stari Grad on the island of Hvar], *Vjesnik Arheološkog muzeja u Zagrebu* (series 3) 45, pp. 239–259.

Dukat, Mirnik 1976 — Z. Dukat, I. Mirnik, "Pre-Roman coinage on the territory of modern Yugoslavia", *Bulletin of the Institute of Archaeology. University of London* 13, pp. 175–210.

Evans 1880 — A. Evans, "On some recent discoveries of Illyrian coins", *The Numismatic Chronicle* NS 13, pp. 269–302.

Gaj-Popović 1964 — D. Gaj-Popović, "Ilirijski novac. Novac Balajosa risanskog tipa" [Illyrian minting. The mint of Ballaeus Rhizon type], *Zbornik Narodnog muzeja* 4, pp. 75–78.

Garašanin 1964 — D. Garašanin, "Miscellanea Illyrica", *Zbornik Narodnog muzeja* 4, pp. 65–73.

Gardner 1883 — P. Gardner, *A Catalogue of the Greek Coins in the British Museum. Thessaly to Aetolia*, London.

Gjongecaj 1986 — Sh. Gjongecaj, "Qarkullimi i monedhave të huaja në Ilirinë e jugut në shek. VI–I p.e.sonë" [Circulation of foreign coinage in southern Illyria, 6th–1st century BC], *Iliria* 16/1, pp. 145–154.

Gjongecaj 1998 — Sh. Gjongecaj, "Le trésor de Kreshpan", *Revue numismatique* 153, p. 81.

Gjongecaj-Vangjeli 2014 — Sh. Gjongecaj-Vangjeli, *Thesare me monedha antike të gjetura në Shqipëri (shek. V–I p.kr.)* [Hoards of ancient coins found in Albania (5th–1st century BC)], Tirana.

Gjongecaj, Picard 2000 — Sh. Gjongecaj, O. Picard, "Le monnayage d'Apollonia à la vache allaitant", *Revue numismatique* 155, pp. 137–160.

Gorini 1982 — G. Gorini, "Monete greche riconiate in Illiria", [in:] *Actes du IX^e Congrès international de numismatique*, Louvain, vol. I, pp. 141–146.

Gorini 1984 — G. Gorini, "Re Ballaios: una proposta cronologica", [in:] *Il crinale d'Europa. L'area illirico-danubiana nei suoi rapporti con il mondo classico* (= *Biblioteca Internazionale di Cultura* 13), Rome, pp. 43–49.

Gorini 1988 — G. Gorini, "Bilješke o novcu kralja Baleja (Ilirija)" [Notes on the minting of King Ballaeus (Illyria)], *Numizmatika* 7, pp. 16–21.

Göricke-Lukić 2004 — H. Göricke-Lukić, *Grčki, grčko-kolonijalni i keltski novac iz Muzeja Slavonije Osijek* [Greek, Greek-colonial and Celtic minting from the Museum of Slavonia in Osijek], Osijek.

Göricke-Lukić 2012 — H. Göricke-Lukić, "Ostava grčkog novca iz Škudljivca na otoku Hvaru" [Remains of Greek minting from Škudljivac on the island of Hvar], *Vjesnik Arheološkog muzeja u Zagrebu* (series 3) 45, pp. 299–349.

Horvat 1934–1936 — B. Horvat, "Tetradrachme 'grada' Damastiona iz nalaza u Risnu (Rhizon)" [Tetradrachmas of the city of Damastium discovered in Risan (Rhizon)], *Numismatika. Vjesnik Numismatičkog društva u Zagrebu* 2–4, pp. 26–64.

Imhoof-Blumer 1884 — F. Imhoof-Blumer, "Griechische Münzen aus dem Museum in Klagenfurt und anderen Sammlungen", *Numismatische Zeitschrift* 16, pp. 227–300.

Islami 1966 — S. Islami, "Le monnayage de Skodra, Lissos et Genthios (Essai d'une révision du problème)", *Studia Albanica* 3/1, pp. 225–252.

Kirigin 2003 — B. Kirigin, "Faros, Parska naseobina. Prilog proučavanju Grčke civilizacije u Dalmaciji" [Pharus, a colony of Paros. Introduction to studies of Greek civilization in Dalmatia], *Vjesnik za arheologiju i historiju dalmatinsku* 96, pp. 9–301.

Klemenc 1934–1936 — J. Klemenc, "Nalazi novaca Jugoslaviji 1910–1936" [Finds of coins from Yugoslavia 1910–1936], *Numismatika. Vjesnik Numismatičkog društva u Zagrebu* 2–4, pp. 124–133.

Kraljević 1978 — G. Kraljević, "Antički novci sa područja Ljubuškog" [Ancient coins from the territory of the town of Ljubuški], *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu. Arheologija* NS 33, pp. 133–136.

Kraljević 1979 — G. Kraljević, "Antički novci iz okolice Čapljine" [Ancient coins from the vicinity of Čapljina], *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu. Arheologija* NS 34, pp. 127–133.

Kubitschek 1897 — G. Kubitschek, "Ripostiglio di monete illiriche da Škudljivac", *Bulletin d'archeologie et d'historie dalmate* 20/1–2, pp. 159–171.

Marić 2010 — A. Marić, "Ostava antičkog novca iz Čapljine" [Finds of ancient coins from Čapljina], [in:] *Acta Numismatica INCC 2010*, Rijeka, pp. 205–222.

Marović 1976 — I. Marović, "Iz numizmatičke zbirke Arheološkog muzeja u Splitu" [From the numismatic collection of the Archaeological Museum in Split], *Godišnjak. Centar za balkanološka ispitivanja, Akademija nauka i umjetnosti Bosne i Hercegovine, Sarajevo* 11, pp. 221–244.

Marović 1988 — I. Marović, "Novac ilirskog dinasta Baleja (ΒΑΛΛΑΙΟΣ) u Arheološkom muzeju u Splitu" [The coinage of the Illyrian ruler Ballaeus (ΒΑΛΛΑΙΟΣ) in the Archaeological Museum in Split], *Vjesnik za arheologiju i historiju dalmatinsku* 81, pp. 81–145.

May 1939 — J. M. F. May, *The Coinage of Damastion and the Lesser Coinages of the Illyro-Paeonian Region*, London.

Mirnik 1981 — I. Mirnik, *Coin Hoards in Yugoslavia*, Oxford.

Mitrea 1945 — B. Mitrea, "Penetrazione commerciale e circolazione monetaria nella Dacia prima della conquista", *Ephemeris Dacoromana* 10, pp. 1–154.

Nađ 2012 — M. Nađ, "Coin hoards in Croatia — an update on the CHY", *Vjesnik Arheološkog muzeja u Zagrebu* 45, pp. 395–466.

Nisiteo 1838 — P. Nisiteo, "Monete di Eraclea in Dalmazia", *Bullettino dell'Instituto Archeologico* 86, pp. 90–94.

Nisiteo 1842 — P. Nisiteo, "Medaglie del re Ballaeus", *Annali dell'Instituto di Corrispondeza Archeologica* 14, pp. 122–128.

Pająkowski 1981 — W. Pająkowski, *Ilirowie* [The Illyrians], Poznań.

Patsch 1896 — C. Patsch, "Novci iz Apolonije i Dyrrhachija" [Coins from Apollonia and Dyrrhachium], *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu* 8, pp. 193–195.

Patsch 1902 — C. Patsch, "Nahogjaji novaca" [Coin finds], *Glasnik Zemaljskog muzeja Bosne i Hercegovine u Sarajevu* 14, pp. 391–438.

Pegan 1962 — E. Pegan, "Najdba Damastionskih staterjev" [Find of staters from Damastium], *Argo* 1, pp. 25–26.

Petrović 1932 — J. Petrović, "Грчко благо из села Заклопаче код Београда" / "Grčko blago iz sela Zaklopače kod Beograda" [Greek hoard from the village of Zaklopače near Beograd], *Starinar* (series 3) 7, pp. 40–65.

Pink 1940 — K. Pink, "Lokale Prägungen aus dem sinus Rhizonicus", [in:] *Serta Hoffilleriana*, Zagreb, pp. 527–535.

Popović 1976 — P. Popović, "Остава драхми Аполоније из Челопека код Пећи" / "Ostava drahmi Apolonije iz Čelopeka kod Peći" [Hoard of drachmas of Apollonia from Čelopek near Peć], *Starinar* 27, pp. 175–179.

Popović 1978 — P. Popović, “Ostava drahmi Apolonije i Dirahiona iz Pećinaca” [Hoard of drachmas of Apollonia and Dyrrhachium from Pećinac], *Numizmatičar* 1, pp. 9–22.

Popović 1987 — P. Popović, *Новац Скордиска* / *Novac Skordiska* [The minting of the Skordisci], Belgrade – Novi Sad.

Rendić-Miočević 1970 — D. Rendić-Miočević, “ΙΟΝΙΟΣ ‘ΤΟ ΓΕΝΟΣ ΙΛΛΥΡΙΟΣ’ i novci grčko-ilirskih kovnica na Jadranu” [ΙΟΝΙΟΣ ‘ΤΟ ΓΕΝΟΣ ΙΛΛΥΡΙΟΣ’ and coins of the Greek-Illyrian mints on the Adriatic], [in:] *Adriatica Praehistorica et Antiqua. Miscellanea Gregorio Novak dicata*, Zagreb, pp. 347–372.

Saria 1925 — B. Saria, “Iz numizmatičke zbirke Narodnog muzeja u Beogradu. VI: Damastionske tetradrahme iz Kutine” [From the numismatic collection of the National Museum in Beograd. VI: Damastium tetradrachmas from the town of Kutina], *Starinar* (series 3), pp. 97–99.

Scholz 1901 — J. Scholz, “Beitrag zur Münzkunde von Scodra-Illyricum. (Heute Scutari in Albanien)”, *Monatsblatt der Numismatischen Gesellschaft* 5/210, pp. 123–127.

Steinbüchel 1837 — M. Steinbüchel, “On certain coins hitherto attributed to Heracleum in the Chersonesus Taurica”, *The Numismatic Journal* 1, pp. 167–169.

Stockert 1919 — K. Stockert, “Zur Münzkunde der dalmatinisch-griechischen Kolonien”, *Numismatische Zeitschrift* NF 12 (52), pp. 125–127.

Šeparović 2012 — T. Šeparović, “Pregled nalaza grčko-ilirskog novca u sjevernoj Dalmaciji” [Review of Greek-Illyrian coinage from northern Dalmatia], *Vjesnik Arheološkog muzeja u Zagrebu* (series 3) 45, pp. 525–536.

Thompson, Mørkholm, Kraay 1973 — M. Thompson, O. Mørkholm, C. M. Kraay, *An Inventory of Greek Coin Hoards (IGCH)*, New York.

Torbagyi 2008 — M. Torbagyi, “Hoard fragments of Illyrian drachms in the coin cabinet of the Hungarian National Museum”, [in:] *Miscellanea numismatica Antiquitatis*. *In honorem septagenarii magistri Virgilii Mihailescu-Bîrliba oblata*, ed. V. Spinei, L. Munteanu, Bucharest, pp. 221–228.

Ujes 1993a — D. Ujes, “Новац ‘краља’ Балајоса и рисанске ковнице из Народног музеја у Београду” / “Novac ‘kralja’ Balajosa i risanske kovnice iz Narodnog muzeja u Beogradu” [The minting of King Ballaeus and the mint of Risan in the National Museum in Beograd], *Numizmatičar* 16, pp. 5–36.

Ujes 1993b — D. Ujes, “Nuovi ritrovamenti numismatici di Risan (Bocche di Cattaro, Montenegro, Jugoslavia)”, [in:] *Actes du XI^e Congrès international de numismatique*, ed. T. Hackens, G. Moucharte, vol. I, Louvain-la-Neuve, pp. 139–145.

Ujes 1994 — D. Ujes, “Део оставе тетрадрахми Дамастиона и Дапарије и статера коринтског типа из Рисна (IGCH 391) у Народном музеју у Београду” / “Deo ostave tetradrahmi Damastiona i Daparije i statera korintskog tipa iz Risna (IGCH 391) u Narodnom muzeju u Beogradu” [Part of a hoard of tetradrachmas of Damastium and Daparria and staters of the Corinthian type from Risan], *Numizmatičar* 17, pp. 7–16.

Ujes 1999 — D. Ujes, “Le trésor monétaire de Risan (*IGCH* 391) — une contribution à l’étude de l’histoire économique de l’Illyrie du sud”, [in:] *L’Illyrie méridionale et l’Épire dans l’Antiquité. III. Actes du III^e Colloque international de Chantilly (16–19 octobre 1996)*, ed. P. Cabanes, Paris, pp. 107–114.

Ujes 2001 — D. Ujes, “Greek hoards from the Western Balkans”, *The Numismatic Chronicle* 161, pp. 341–347.

Ujes 2002 — D. Ujes, “Recherche sur localisation de Damastion et ses mines”, *Revue numismatique* 158, pp. 103–128.

Ujes-Morgan 2011 — D. Ujes-Morgan, “Ancient greek coin finds from Risan”, [in:] *L’Illyrie méridionale et l’Épire dans l’Antiquité. VI*, ed. J. L. Lamboley, M. P. Castiglioni, Paris, pp. 115–132.

Ujes-Morgan 2012 — D. Ujes-Morgan, "1st century BC drachms of Apollonia and Dyrrhachium in the territory of the Scordisci. A prologue to the Roman conquest of the Balkans", [in:] *ΗΡΑΚΛΕΟΥΣ ΣΩΤΗΡΟΣ ΘΑΣΙΩΝ. Studia in honorem Iliae Prokopov sexagenario ab amicis et discipulis dedicata*, ed. E. Paunov, S. Filipova, Veliko Tărnovo, pp. 367–387.

Visona 1987 — P. Visona, "The Škudljivac hoard: further remarks", *Arheološki radovi i rasprave* 10, pp. 125–131.

Visona 1993 — P. Visona, "Bronze coins of Paros from the island of Hvar", *Vjesnik za arheologiju i historiju dalmatinsku* 86, pp. 253–260.

Visona 2005 — P. Visona, "The Škudljivac hoard reconsidered", [in:] *Illyrica antiqua. Ob honorem D. Rendić-Miočević. Radovi s međunarodnoga skupa o problemima antičke arheologije, Zagreb, 6–8. XI. 2003*, Zagreb, pp. 451–454.

Wilkes 1969 — J. J. Wilkes, *Dalmatia. History of the Provinces of the Roman Empire*, London.

Wilkes 1992 — J. J. Wilkes, *The Illyrians*, Oxford – Cambridge.

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HELLENISTIC THRESHING FLOOR IDENTIFIED AT THE ILLYRIAN SITE NEAR BUSHATI

Abstract: The article deals with a Hellenistic structure situated *extra muros* of the Illyrian town at Bushati. The building was discovered in the early 1990s and interpreted as a fountain. Recent Albanian-Polish fieldwork at the site led to its reconsideration as a threshing floor. This fact provides new insights on the agricultural processes during the Hellenistic Period and leads to a better understanding of the peri-urban area of the Hellenistic Illyrian town at Bushati.

Keywords: Bushati, Scodra, Labeates, Illyria, ancient agriculture, threshing floor, wheat and barley, harvesting, winnowing

The ongoing Albanian-Polish project in Shkodra and its vicinity has contributed greatly to the understanding of the general layout and chronology of the Illyrian town identified within the contemporary village of Bushati [Fig. 1].[1] The site, spanning 15 to 20 hectares, is situated on one of a few hills surrounded by the plain of Zadrima, irrigated by the rivers of Drini, Gjadri, and Buna [Fig. 2]. Fieldwork has revealed some of the main components of the fortification wall and focused on investigating the inner space of this previously unknown Illyrian town of the Hellenistic Period. Our research has also focused on an *extra muros* structure identified in the early 1990s and interpreted as a fountain dated to the Hellenistic Period [Fig. 3].[2] This structure, situated at the foothills of Bushati, in its eastern side, will be the focus of this article. The building was discovered accidentally during agricultural works. Consequently, the Institute of Archaeology in Tirana organised two fieldwork campaigns directed by Bashkim Lahi. In 1995, the results of the excavations were published in the periodical *Iliria*.[3] Lahi's arguments in favour of its interpretation as a fountain were the architectural shape of the monument and the presence of a water source situated some 30 metres to the west.[4] The present author similarly points out that the structure has to be considered in relation to the ancient town situated on the hills of Bushati. In 2018, a general cleaning as well as some small-scale trenches were undertaken to investigate this structure. The main purpose of these operations was to integrate it into the emerging overall topography of the

[1] The project, under the direction of Piotr Dyczek and the author of this paper, is a collaboration between the University of Warsaw and the Institute of Archaeology in Tirana. It is financed by the Polish National Science Centre 2014/14/M/HS3/00741. For the early results of these excavations, see Shpuza, Dyczek 2018, pp. 251–282.

[2] Lahi 1995, pp. 231–240.

[3] Lahi 1995, p. 231.

[4] Lahi 1995, p. 236.

site. These operations allowed us to make some further observations on the monument as well as to reconsider its function.

Fig. 1. Geographical position of the Illyrian site at Bushati (compiled by S. Shpuza)

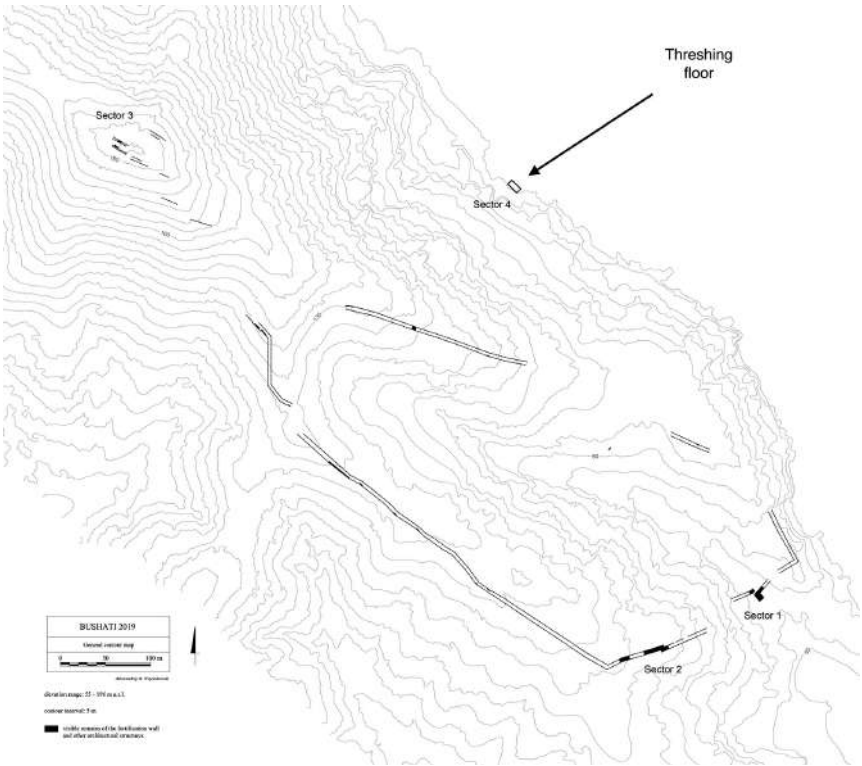

Fig. 2. Topographical plan of Bushati (compiled by P. Dyczek, S. Shpuza)

Fig. 3. Photogrammetry of the *extra muros* structure
(photo by M. Lemke, compiled by B. Wojciechowski)

Description of the structure and its interpretation

The structure has a rectangular shape, 6.30 × 13.35 metres. Four walls of different altitude, constructed with Hellenistic blocks, enclose a floor paved with stone slabs. The western and southern walls are the highest, with a maximal height of 1.70 metre at the south-western corner of the structure [Fig. 4].[5] The height of the walls decreases gradually towards their southern and eastern corners. Two trenches were performed by us outside these two walls. None of them yielded any material, as we very quickly reached the geological layer which consists of tuff rocks. This suggests that natural tuff was excavated and levelled in order to create a construction platform for this structure. As a result, the western and southern walls have acted as a terrace, which explains their higher altitude compared to the two other walls. The northern wall is preserved only as a row of blocks, while the eastern wall survived mostly as a line of stones without any particular arrangement [Fig. 5]. It seems that some care was taken to align the four blocks vertically in the south-eastern corner of the structure. On this wall, Bashkim Lahi identifies two entries. Although the way in which the blocks are arranged, simply confining the paved space, makes it difficult to speak of proper entrances, it is safe to assume that the structure was accessible from the eastern side.

Fig. 4. *Extra muros* structure. View from the north
(photo by M. Lemke)

Fig. 5. *Extra muros* structure. View from the south
(photo by M. Lemke)

[5] The altitude of this wall is given after the Bashkim Lahi's report. In 2018, during our fieldwork, a part of it collapsed.

Except for the northern wall, the other walls stand directly on the paved floor, implying their later construction. On the western wall, the Hellenistic blocks were placed horizontally, whereas on the other three walls they lie vertically, simply to limit the floor. The width of the walls varies according to the way in which the blocks were arranged – vertically or horizontally.[6] The current preserved height of the walls surrounding the floor suggests that they were not too high. Moreover, the monument must have had no roof, since no tiles have been found during excavations. Two niches are visible in the western wall of the monument [Fig. 6]. The northern niche is 56 cm wide, 60 cm high, and 70 cm deep. The slab covering it measures, respectively, 76 × 84 × 5 cm. The total depth is 83 cm. The width of the niche is greater than the width of the wall itself. Also, the southern niche has a maximum depth of 83 cm. Its width is 62 cm and the height 55 cm [Fig. 7a–b]. The floor of the southern niche is 8 cm below the floor of the structure.

As it concerns the floor, it does not show a definite rule of placement nor a standard size of slabs. No special inclination has been applied, as the aim seems to have been just to create a more or less flat paved surface [Fig. 8].

We were unable to provide an exact date for its construction, since our trenches immediately reached the natural substrate. However, excavations of Bashkim Lahi, which were focused on the deposits covering the pavement, testify that the structure was abandoned during the first century BC.[7] We can, thus, be sure that the structure was in use during the Hellenistic Period. This date corresponds with the most recent data from the excavations *intra muros*, where material from the Roman Period is generally missing and most of the structures seem to have been in use from the end of the fourth to the first century BC.[8]

Fig. 6. Photogrammetry of the western wall where the niches are situated
(compiled by B. Wojciechowski)

Fig. 7a. View of the southern niche
(photo by M. Lemke)

Fig. 7b. View of the northern niche
(photo by M. Lemke)

[6] The western wall varies in width: from 35 cm in the northern part up to 55 cm in the southern part. The width of the southern wall ranges from 30 to 35 cm. The eastern wall measures between 22 and 60 cm. Only the northern wall has a regular width of 33 cm.

[7] Lahi 1995, pp. 232–236, pls. I–II.

[8] Shpuza, Dyczek 2018, pp. 272–274.

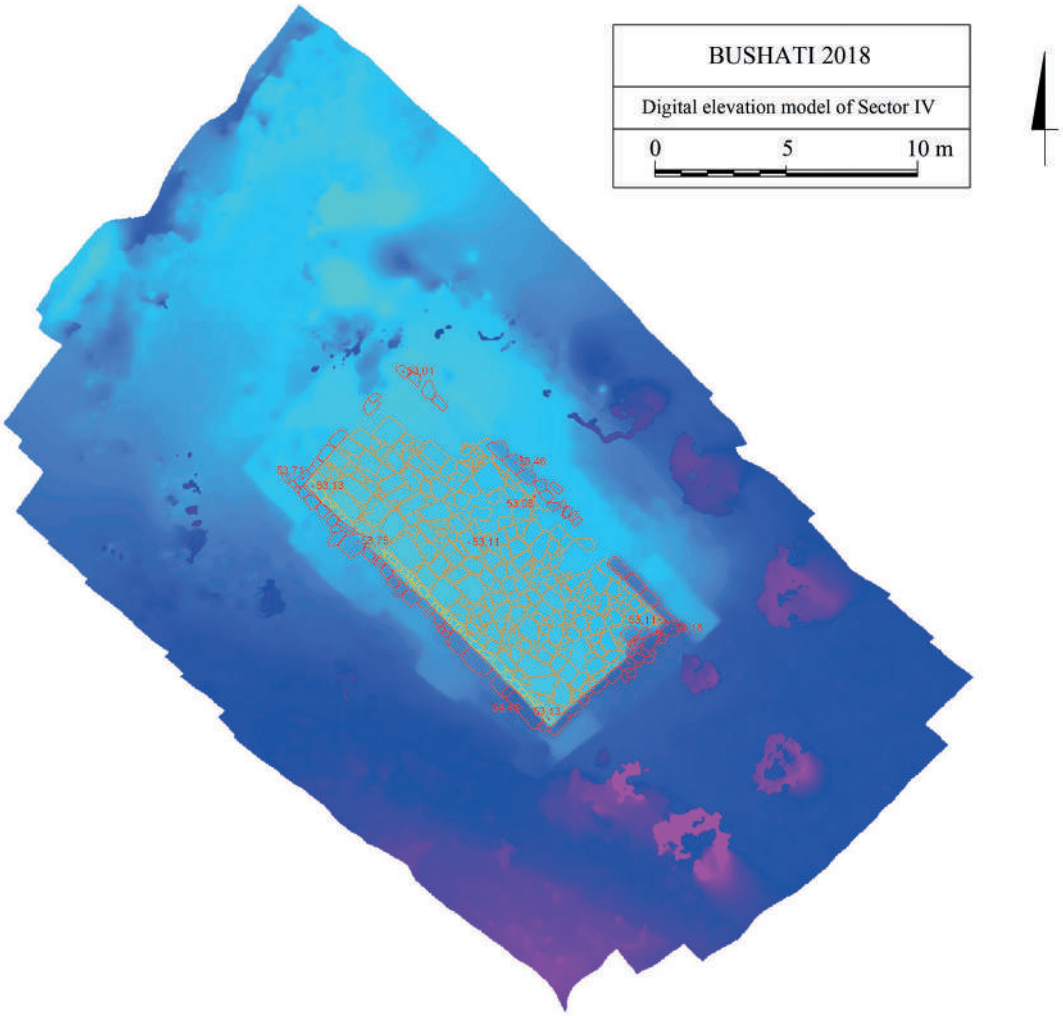

Fig. 8. Digital elevation model and plan of the threshing floor (compiled by B. Wojciechowski)

Identification of such a structure can be problematic. We find it unconvincing to identify it as a fountain. Despite its proximity to a source of water, water-supply installations (channels, cistern, and basin) are completely missing. Such a structure, consisting only of a flat pavement surrounded by low walls, bears greatest resemblance to threshing floors used for threshing and winnowing of wheat and barley. Most of the ancient threshing floors known to date are circular or roughly circular in shape, however some rectangular examples have been uncovered as well.[9] Because of the difficulties in their identification, several ethnographic and archaeological studies have been undertaken in order to classify and identify threshing floors. These studies have argued that such structures are found in open areas outside of a settlement, with a single hard surface, signs of trampling, and no artefacts, since the floor would have been cleared after each threshing.[10] The structure under analysis here seems to meet these criteria. Basically, as we saw in the descriptive

[9] For an example of the Byzantine Period identified at Or ʻAqiva in Israel, see Nagorsky 2017; for a Roman example found at the Roman Villa near Boscoreale, Italy, see White 1970, pp. 422–423; Whittaker 2003, p. 383, discusses examples from Cyprus.

[10] Whittaker 2000; Shahack-Gross, Gafri, Finkelstein 2009, p. 173.

section, the structure consists of a paved surface, easily cleanable, and limited by terrace walls. Probably, the eastern wall was intentionally left as a mere line of stones in order to avoid accumulation of water. It is situated in an open area and profiting mostly from the north-eastern winds coming from the area of the Scodra Lake and the Drini valley.

The trenches performed by us made it possible to understand that the threshing floor itself was installed on a non-fertile area but at the same time very close to the fields. Its constructors decided to build it at the feet of a tuff rock, so that this fixed structure would not cover any fertile land. This remark is not without importance, since in some areas where fertile land was scarce, threshing floors would be dismantled and remade every year because of the shortage of land, so as to re-use former threshing floors as cultivable plots.[11] Our small trench in the inner part of the structure, conducted below the level of the floor slabs, provided interesting data. A layer of white clay (potentially kaolin, sources of which are present in the region) was visible below the pavement [Fig. 9]. We are not sure if this is present everywhere below the pavement, but its thickness and its compactness suggest application on a large area [Fig. 10]. Its presence can be explained in two possible ways. One would be that it may have been applied to serve as a preparation level for the stone slabs. Alternatively, it represents the remains of an earlier threshing floor whose flat surface consisted of this beaten white clay and which, at a later time, was paved with flagstones and surrounded by terrace walls. Unfortunately, the trenches failed to provide material for dating particular phases of the structure. However, the site itself contains material going back to the Late Bronze Age.[12]

According to these data, as well as many examples of other similar features, we may be sure that this structure can be considered a threshing floor of good quality. Its surface is flat and made of flagstones, which was best for threshing, and it has terrace walls to prevent loose earth and small stones from mixing with the grain. The permanent role of the structure, as well as its area of *ca.* 84 square metres attests to the importance of agriculture in the town's economy. Admittedly, rectangular was not the most common shape for threshing floors in Antiquity, as suggested by Varro's preference for circular ones,[13] but it is worth noting that Columella's description of bean threshing floor refers mostly to rectangular or oblong shapes.[14]

Fig. 9. The layer of white clay visible on the small trench below the pavement (photo by M. Lemke)

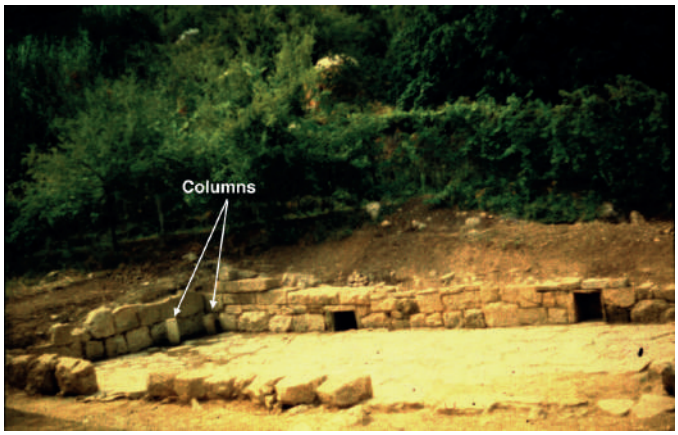

Fig. 10. Photo of the excavations of the year 1990 showing the two fragments of columns now lost (photo by B. Lahi)

[11] Tsartsidou *et alii* 2008, p. 610. This study suggested that after the crops were grown and harvested the place was turned into a threshing floor again.

[12] Shpuza, Dyczek 2018, p. 110.

[13] Varro, *Rust.* 1.51.1.

[14] Columella, *Rust.* 2.10.13; Spurr 1986, pp. 73–78.

Assuming the discussed structure is to be seen as a threshing floor, the two niches situated in the western wall are not so problematic to interpret. Recent ethnographic and ethnoarchaeological research has shown that niches are a common feature in the majority of contemporary threshing floors or drystone walls in general. They are very practical for storing pots of water and sheltering them from sun exposure.[15] In this case, even the proximity of the threshing floor to the water source is not casual, since it could have been a deliberate move by the builders. Considering that threshing was a task carried out during the hottest period of summer (July–August), water was without a doubt essential to appease thirst of those working.

In the excavations of the 1990s, Bashkim Lahi similarly found two fragments of columns whose role in the structure is difficult to determine, as this type of buildings were never meant to be monumental [Fig. 11]. It is probable that the columns were a part of other possible monuments neighbouring the threshing floor or that they slipped in with the earth deposits that covered the structure after the first century BC. However, their practical role in the process of threshing should, perhaps, not be neglected, since ethnographic studies in Albania showed that, in some cases, cylindrical stones, similar to fragments of columns, were used for threshing. Cords were attached to two opposing sides and the stones were then pulled by animals or people.[16] Unfortunately, as these fragments of columns remain lost, a detailed analysis which would have given important information in this direction is impossible.

Fig. 11. Some of the working tools found at Melgusha now exhibited in the Archaeological Museums of Tirana and Shkodra (photos by A. Hyka and N. Mlika)[17]

[15] Cagin, Nicolas 2011, p. 144.
[16] Shkurti 2002, pp. 276–277, fig. 48.
[17] All the objects found at Melgusha were published in Dibra 1981, p. 238, pl. 1.

The practice of harvesting and threshing has not changed since Antiquity, and in some areas of the world ancient techniques are still in use.[18] A specific calendar concerning the agricultural activity that existed in Antiquity has remained largely unchanged also today. Corn and barley are sown in winter (November or December) and harvested in spring (barley) or summer (corn). Varro and Columella, when speaking of the Italian climate, suggest that harvest was completed starting from mid-July and throughout August.[19] This should be the case in north Albania, too, as the climate there is very similar to that of Italy. However, regional modifications were also possible. Following the harvest, crops were brought to the threshing floor, spread flat, and threshed by crushing in order to separate the grain from the stalks. Several different ways for threshing the crops existed.[20] This work may be done manually with a stick or a flail, or by animals.[21] After threshing was completed and the refuse removed, the stalks would be winnowed.[22] After the grains were released, they were gathered together and put through a sieve to remove any remaining debris. The straw gained from this process was used either for animals or for preparing mattresses.

Living in the town, working in the fields

The proposed interpretation of this structure as a threshing floor permits us to examine an important agricultural space where crops were threshed and winnowed to release the grain. Moreover, it also brings multiple new insights on the Illyrian agriculture in general. Firstly, studies on such monuments are almost missing, especially for the Hellenistic Period, probably because threshing floors are not easily detected in the archaeological record.[23] Similarly, relevant historical sources are fewer for the Hellenistic Period than for the time of the Roman Empire.[24] Secondly, the threshing floor at Bushati is a direct testimony to the processing of crops among the Illyrians and to the organisation of agriculture in general. The existence of this structure is a part of an agricultural chain of operation: harvesting, threshing, winnowing, and storing.

However, due to incompleteness of data from excavations on the area, it remains unclear if the threshing floor belonged to the nearby Illyrian town or a rural farm that would be situated in its vicinity. The data gathered to date allows for nothing but suppositions. Judging from the topographic point of view, it seems more likely that the threshing floor functioned in a close relation with the town, the fortification walls located only 200 metres from it. Moreover, hypothesising the existence of a farm outside the town walls would necessitate presence of some protective structures meant for storing of the produce. For example, in many cases threshing floors are found close to towers where production is stored and protected.[25] In our case, the vicinity of the town is more of a structure serving the town itself. As a matter of fact, it is unsurprising that such activities as threshing and winnowing took place outside the town walls, because they had to be carried out near the fields and in an open space to profit from the winds. After the task was done, it was possible to store and protect the resultant produce inside the town walls. However, in the case of the threshing floor's relation to the town, we should probably expect to find similar structures in the vicinity in the future years, as only one would not be enough considering the size of the town

[18] Varro, *Rust.* 1.50 describes different techniques of harvesting used especially in Italy; Anderson *et alii* 2003.
[19] Varro, *Rust.* 1.27.3; Columella, *Rust.* 11.2.54.
[20] Columella, *Rust.* 2.20.4, specifies that the wheat was cut with a sickle and that the initial storage could be in the form of sheaves which would be beaten with sticks or trodden by cattle.
[21] Cheetham 1982, pp. 127–130.
[22] Thurmond 2006, p. 23.
[23] Most of the Hellenistic examples comes from Attica and Delos in Greece. See Lohmann 1992; Brunet, Poupet 1997, p. 776.
[24] For a collection of the ancient sources, see Amouretti 1986, pp. 263–281.
[25] Lohmann 1992.

as well as the fertility of the Zadrima Plain. Ethnoarchaeological studies have pointed out similar cases where threshing floors were situated close to each other. This was because crop processing there was performed at the same time and people helped each other and socialised.[26] This kind of activity seems to have been very hard and required a lot of manpower, which probably included freemen as well as slaves.[27] Anyway, most of the threshing floors were not paved and made only of beaten earth. Consequently, they are difficult to identify during archaeological excavations.

Considering all this, it is very likely that the *extra muros* space where the threshing floor is situated corresponds to an economic area dedicated to processing of crops. Important data on this hypothesis was provided by a deposit of working tools found at Melgusha,[28] situated on a hill just 400 metres away from the acropolis of Bushati. The deposit included: two sickles, two spades, two hoes, and two axes. Thus, this assemblage constitutes an almost complete inventory of an Illyrian farmer. The context of these finds is also limited, because it was a casual find made during agricultural works in the area. Their first publisher mentions the presence of a column capital as well as human bones found 10 metres away from the deposit. We can, thus, suppose that the deposit was a part of a grave inventory. However, considering the importance of such tools, as well as their non-negligible price in Antiquity,[29] it seems difficult to believe that people would bury them. We can suggest that constructions related to the storage of working tools were probably situated in this area, outside the city walls. Most of the tools are directly related to agricultural activities. The spades are particularly interesting, since they represent models with two wooden handles.[30] These were used to dig or loosen ground, to break up roots in the soil, or simply to open holes for plantation. The two sickles represent the common tool for harvesting[31] which Hesiod calls *drepanon*.[32] On the other hand, the double-edged axe offers an example of such tools' use in agriculture, to cut trees and roots, apart from their function as weapons.

There are many examples of threshing floors fulfilling religious and ritual roles. Such was the case in Israel as well as in many towns and sanctuaries of Greece.[33] However, this concerns mostly the threshing floors of circular shape, used for ceremonial dancing or as spaces for social gatherings. Equally, there is a close relationship between the agricultural production and gods.[34] Nevertheless, since our research in Bushati is at its early stage, we cannot make any meaningful supposition of this kind.

The existence of the threshing floor, as well as the presence of a wide range of agricultural working tools at Bushati, suggest that agriculture was the most important economic domain for the town. The rich and fertile plain of Zadrima, about 4000 hectares of arable land, constituted the main asset of this urban centre. The plain is mostly alluvial, as it was historically flooded by the rivers of Drini and Gjadri. Similarly, in the north-western part of the plain, the Buna River swamped many cultivable fields on what corresponds to the contemporary plains of Trushi and Velipoja. Very few hills are present, all of which are of a very low altitude, varying between 20 and 100 metres a.s.l. The only exception is the sites of Bushati, situated at 195 metres a.s.l., and Zefjana, situated 2 kilometres to the west of Bushati, at *ca.* 300 metres a.s.l.

[26] Whittaker 2000, p. 64.
[27] Bresson 2019, p. 122.
[28] Dibra 1981.
[29] Amouretti 1993.
[30] Similar examples of spades were found at Antigonea (Budina 1972, pp. 295–296, fig. 38), as well as in Lohe e Poshtme, probably a rural site in the territory of Scodra, not far from Bushati (Jubani 1984, p. 130, fig. 5). It is also worth noting that a casual find of an ancient plough was discovered in the village of Anamali, on the right bank of the River Buna. The object is exhibited at the Shkodra Archaeological and Ethnographical Museum. I would like to use this opportunity to thank Helidon Sokoli and Ndriçim Mlika for their kind help and providing me with photographs of the agricultural tools found in the territory of Scodra.
[31] Isager, Skydsgaard 1992, pp. 52–73.
[32] Hes. *Op.* 1.473.
[33] Wescoat 2012, pp. 83–87.
[34] Isager, Skydsgaard 1992, pp. 157–199.

In this geographical context, it seems obvious that the power of the local elite resided in the land and in the agricultural production. Wheat, barley, and legumes were the main products processed in the threshing floor, but the land and climate are equally appropriate for other crops, such as olives or grapes. In addition, the eastern part of the area is occupied by hilltops appropriate for pasture.[35] However, the territory of Bushati during the Hellenistic Period should be considered rather small, as it stretched between Lissus in the south and Scodra in the north – both of these important ancient towns would have access to the plain of Zadrima.[36] These circumstances, as well as the relatively small size of the *chôra*, suggest that it was possible to live in the town and commute to the fields to accomplish agricultural tasks.[37] Thus, there was probably no necessity to construct farmsteads in the countryside. Archaeological research in other Illyrian and Epirote towns has discovered the presence of agricultural tools in urban contexts, such as Irmaj,[38] Dimale,[39] Gradishta e Symizes,[40] and Antigonea.[41] This phenomenon can, thus, be generalised onto several medium or small towns composing a small *chora*. This information reveals a very close relation between the town and its agricultural production. At the same time, it indicates that most of the energy of the people living at such sites was probably engaged in agricultural work and the basic livelihood of the people depended on farming. Such towns were, thus, at the centre of the regional agricultural activity and likely served as places where grain (and maybe cattle, too) was stored. However, at the same time they provided its inhabitants with facilities not available in scattered rural settlements. Therefore, it will be very interesting in the future to learn more about the layout of the Illyrian site at Bushati. Was it a proper town with well-built houses and monumental buildings? Or maybe behind the fortification wall developed a settlement more resembling of a large village, that is, an urban organism which played its political role without luxury, without an agora, and without theatre and temples?

The importance of agricultural production is equally reflected by the coinage circulating in this geographical area. We lack any direct testimonies from coins of the Labeates, Scodra, or Lissus, but in the larger context it seems clear that the symbol of the *ear of corn* became quite common on coins, for example in Chaonia (Epirus)[42] and in the drachms of Dyrrhachium.[43] The representation of agricultural symbols on coinage during the Hellenistic Period seems to have enjoyed similar currency to the mythological symbolism or representations of arms and galleys.[44]

Finally, the identification of the threshing floor in Bushati, a modest discovery as it may appear, seems very important. Given that no ancient text describes the Illyrian countryside, such archaeological finds become the only key to its understanding. This structure reveals the significance of such constructions dedicated to agriculture for the Illyrians while simultaneously highlighting the bearing of agricultural history for understanding of the Illyrian way of life.

[35] Shpuza 2009–2010.
[36] Shpuza 2017; Shpuza 2020. We have expressed the opinion that the area of the Labeates corresponds mostly to communal occupation, because the same watch towers, for example, were used by the three townships. In this case, the agricultural land was, perhaps, also used in a communal manner, like in a *koine*. However, without epigraphic data it is hard to discuss the status of the land on the basis of archaeological finds alone.
[37] McHugh 2017, pp. 28–29.
[38] Prendi, Budina 1972, pp. 37–39.
[39] Dautaj 1972, p. 148.
[40] Lera 1974, p. 463.
[41] Budina 1972, pp. 293–298.
[42] Gjongecaj, Picard 2005, p. 56.
[43] Meta 2015, p. 238.
[44] Shpuza 2016, p. 198.

Bibliography

Amouretti 1986 — M. Cl. Amouretti, *Le pain et l'huile dans la Grèce antique. De l'araire au moulin*, Paris.

Amouretti 1993 — M. Cl. Amouretti, "De l'ethnologie à l'économie. Le coût de l'outillage agricole dans la Grèce classique", [in:] *Mélanges Pierre Lévèque*, vol. VII: *Anthropologie et société* (= *Annales littéraires de l'Université de Besançon. Collection de l'Institut des sciences et techniques de l'Antiquité* 491), pp. 1–13.

Anderson *et alii* 2003 — *Le traitement des récoltes: un regard sur la diversité du Néolithique au présent. XXIII Rencontres internationales d'archéologie et d'histoire d'Antibes*, ed. P. C. Anderson, L. S. Cummings, T. K. Schippers, B. Simonel, Antibes.

Bresson 2019 — A. Bresson, *The Making of the Ancient Greek Economy: Institutions, Markets, and Growth in the City-States*, Princeton.

Brunet, Poupet 1997 — M. Brunet, P. Poupet, "Le territoire délien", [in:] M. Brunet, Ph. Fraisse, J.-Ch. Moretti, F. Prost, P. Poupet, "Delos", *Bulletin de correspondance hellénique* 121/2, pp. 776–789.

Budina 1972 — Dh. Budina, "Antigonea (Rezultatet e gërmimeve 1966–1970)" [Antigonea. Results of the excavation campaigns 1966–1970], *Iliria* 2, pp. 245–349.

Cagin, Nicolas 2011 — L. Cagin, L. Nicolas, *Construire en pierre sèche*, Paris.

Cheetham 1982 — L. Cheetham, "Threshing and winnowing — an ethnographic study", *Antiquity* 56, pp. 127–130.

Dautaj 1972 — B. Dautaj, "Zbulimi i qytetit ilir Dimal" [The discovery of the Illyrian city of Dimal], *Iliria* 2, pp. 135–150.

Dibra 1981 — M. Dibra, "Një depo me vegla bujqësore ilire nga fshati Melgush i rrethit të Shkodrës" [A deposit of Illyrian agricultural tools from the village of Melgush in the district of Shkodra], *Iliria* 11/1, pp. 235–238.

Gjongecaj, Picard 2005 — Sh. Gjongecaj, O. Picard, "Le trésor de Senitsa et le monnayage des Chaônes en Épire", *Revue numismatique* 161, pp. 51–58.

Isager, Skydsgaard 1992 — S. Isager, J. E. Skydsgaard, *Ancient Greek Agriculture. An Introduction*, London – New York.

Jubani 1984 — B. Jubani, "Monumente arkeologjike në Mbishkodër" [Archaeological monuments in Upper Shkodra], *Monumentet* 28, pp. 127–141.

Lahi 1995 — B. Lahi, "Fontana e Bushatit" [The fountain of Bushati], *Iliria* 25, pp. 231–240.

Lera 1974 — P. Lera, "Rezultatet e gërmimit të zhvilluar në Gradishtën e Symizës gjatë vitit 1973" [Results of the archaeological excavation effectuated at Gradishta of Symiza during the year 1973], *Iliria* 3, pp. 461–467.

Lohmann 1992 — "Agriculture and country life in classical Attica", [in:] *Agriculture in Ancient Greece. Proceedings of the Seventh International Symposium at the Swedish Institute at Athens, 16–17 May, 1990*, ed. B. Wells, Stockholm, pp. 29–57.

McHugh 2017 — M. McHugh, *The Ancient Greek Farmstead*, Oxford – Philadelphia.

Meta 2015 — A. Meta, *Le monnayage en argent de Dyrrachion 375–60/55 av. J.C.* (= *Recherches archéologiques franco-albanaises* 1), Athens.

Nagorsky 2017 — A. Nagorsky, "Or 'Aqiva: A Mausoleum and a threshing floor from the Roman-Byzantine periods", *Hadashot Arkheologiyot – Excavations and Surveys in Israel* 129, pp. 1–16.

Prendi, Budina 1972 — F. Prendi, Dh. Budina, "Kalaja e Irmajt (Gërmime të vitit 1960)" [The fortress of Irmaj (Excavation campaign 1960)], *Iliria* 2, pp. 21–60.

Shahack-Gross, Gafri, Finkelstein 2009 — R. Shahack-Gross, M. Gafri, I. Finkelstein, "Identifying threshing floors in the archaeological record: a test case at Iron Age Tel Megiddo, Israel", *Journal of Field Archaeology* 34, pp. 171–184.

Shkurti 2002 — S. Shkurti, *Tradita bujqësore të shqiptarëve* [Albanian agricultural traditions], Tirana.

Shpuza 2009–2010 — S. Shpuza, "Aspekte të ekonomisë antike ilire dhe epirote" [Aspects of ancient Illyrian and Epirotic economy], *Iliria* 34, pp. 91–110.

Shpuza 2016 — S. Shpuza, *La romanisation de l'Illyrie méridionale et de la Chaônie* (= *Collection de l'École française de Rome* 513), Rome.

Shpuza 2017 — S. Shpuza, "Scodra and the Labeates. Cities, rural fortifications and territorial defense in the Hellenistic Period", *Novensia* 28, pp. 41–64.

Shpuza 2020 — S. Shpuza, "From tribal territory to the *chôra* of a city. Urban and rural fortifications in the region of the Labeates (Illyria)", [in:] *Fortifications and Societies in the Western Mediterranean*, ed. L. M. Calio, M. Kopsacheili, Catania, pp. 117–136.

Shpuza, Dyczek 2018 — S. Shpuza, P. Dyczek, "Qyteti ilir në Bushat. Fortifikimi, kronologjia dhe probleme të identifikimit të tij" [The Illyrian city at Bushati. Fortifications, chronology and problems of identification], *Iliria* 42, pp. 99–130.

Spurr 1986 — M. S. Spurr, *Arable Cultivation in Roman Italy c. 200 B.C. – c. A.D. 100*, London.

Thurmond 2006 — D. L. Thurmond, *A Handbook of Food Processing in Classical Rome*, Leiden – Boston.

Tsartsidou *et alii* 2008 — G. Tsartsidou, S. Lev-Yadun, N. Efstratiou, S. Weiner, "Ethno-archaeological study of phytolith assemblages from an agro-pastoral village in Northern Greece (Sarakini): development and application of a Phytolith difference index", *Journal of Archaeological Science* 35, pp. 600–613.

Wescoat 2012 — B. D. Wescoat, "Coming and going in Sanctuary of the Great Gods, Samothrace", [in:] *Architecture of the Sacred. Space, Ritual, and Experience from Classical Greece to Byzantium*, ed. B. D. Wescoat, R. G. Ousterhout, Cambridge, pp. 66–113.

White 1970 — K. D. White, *Roman Farming*, New York.

Whittaker 2000 — J. C. Whittaker, "*Alonia* and *Dhoukanes*. The ethnoarchaeology of threshing in Cyprus", *Near Eastern Archaeology* 63/2, pp. 62–69.

Whittaker 2003 — J. C. Whittaker, "Threshing sledges and threshing floors in Cyprus", [in:] *Le traitement des récoltes: un regard sur la diversité du Néolithique au présent. XXIII Rencontres internationales d'archéologie et d'histoire d'Antibes*, ed. P. C. Anderson, L. S. Cummings, T. K. Schippers, B. Simonel, Antibes, pp. 375–387.

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LEFT HAND, RIGHT HAND, NEAR HAND, FAR HAND: ON HANDEDNESS IN AEGEAN ART[1]

Abstract: Right-handedness dominates among all human populations but the question is if and how the Aegean artists depicted it in their art, or whether they compromised between reality and artistic concepts. In order to find answers to those questions, this paper examines wall and vase paintings, stone and metal vases, ivories, bronzes and terracottas, larnakes, stelae, daggers (seals and sealings are excluded because of the seal/sealing problem). These are examined according to the categorisation of skilled and unskilled, bi- and unimanual activities. The results suggest a domination of right-handedness in the Aegean iconography with some exceptions resulting mainly from the symmetry of specific compositions. It is also notable that the Aegean artists tended to represent right hands as the near ones and they preferred to show shoulders supporting long objects like spears as the near ones regardless of the orientation of depicted subjects.

Keywords: Aegaean archaeology, Aegaean art, handedness, near and far hand

Manual laterality is observable among primates but handedness understood as a species-level one hand preference appears solely among humans.[2] Research carried out over a number of decades has shown that the right handedness prevails over left- and bi-handedness (ambidexterity) by about 90%.[3] As far as it is possible to study the handedness among the earliest humans this already applied to the Neanderthals and is more or less stable throughout the whole prehistory and history.[4] Thus there is no question of the handedness of the Minoans or Mycenaeans — the great majority of them would have been right handed. We can be sure of that. Maybe among the Minoans, the percentage of left-handers was a little higher than average because there are opinions that people with preference of the left hand have more artistic abilities and are more creative,[5] and the Minoan

[1] Because of the pandemics and closed libraries it was impossible to consult all the necessary publications. I decided to send this paper to the Editor "as is" because reopening of libraries is difficult to predict and the observations which I present here are based on evidence solid enough to make them reliable, at least in my opinion. I'd like also to thank the following colleagues for their invaluable help: Barbara Arciszewska, Angela Catania, Elżbieta Jaskulska, Pietro Militello, Arkadiusz Sołtysiak. I am greatly indebted to Dorota Stabrowska for helping me to prepare the illustration, to Lucy Goodison for sending the scan of her original drawing and permission to print it here, to École française d'Athènes and Pascale Darque for granting permission to reprint two illustrations, and to Paul Barford for correcting my English.

[2] McManus 2002, p. 210; Uomini, Ruck 2018, pp. 296–299.

[3] Coren, Porac 1977; Cashmore, Uomini, Chapelain 2008, p. 8; Uomini 2009, p. 411.

[4] Cashmore, Uomini, Chapelain 2008; Uomini 2009, p. 412; Uomini, Ruck 2018, p. 304.

[5] Singg, Martin 2016, pp. 2–3; contra McManus 2002, p. 298.

civilization is known for its creativity, numerous works of art and sublime aesthetics. Similarly, we can speculate on the percentage of left-handers among Mycenaeans because left hand offers some advantage in fighting against right-handers[6] and war was especially important for the Late Helladic civilization. Such conjectures, however, do not have good scientific foundations and handedness seems to be mostly conditioned by genes and not culture.[7]

The problems I want to discuss in this paper concern handedness in Aegean art: did the artists take care about showing the handedness of their subjects; if that was the case, did they do this deliberately or just from habit; did they manipulate the representation of handedness for artistic or symbolic effects? Did they consistently show actions in which there is a specialization of the use of certain hands, even if not related to handedness, such as gestures?

In order to find answers to those questions, we have to evaluate the Bronze Age Aegean in respect of representations of handedness and manual actions in which it manifests itself (if it does). I propose a catalogue of manual actions usually performed unimanually or bimanually with preference for one hand and which are to be found in Aegean art. Among them there are skilled and unskilled actions.[8] Fighting with a sword would be an example of the first, but carrying an object or gesturing would be an example of the second. For unskilled actions, hand preference is of importance, both in uni- or bimanual actions. Sometimes we use one particular hand, not because it is more skilled than the other, but out of preference:

- Fighting/hunting with a sword/dagger — skilled unimanual
- Fighting/hunting with a spear — skilled bimanual with hand preference
- Carrying weapons — unskilled unimanual
- Bow shooting — skilled bimanual with hand preference
- Slinging — skilled bimanual with hand preference
- Using whip or goad when driving a chariot — skilled unimanual
- Playing an instrument — skilled bimanual with hand preference or unimanual
- Gesturing — unskilled bi-/unimanual
- Carrying large vessels — unskilled bimanual with hand preference
- Carrying small vessels — unskilled unimanual
- Carrying a baby (*kourotrophoi*) — unskilled unimanual
- Saffron gathering — unskilled? bimanual with hand preference

We will see how those actions were depicted in different media. Among them are wall and vase paintings, stone and metal vases, ivories, bronzes and terracottas, larnakes, stelae, the Lion Hunt niello dagger, and the Lasithi Dagger. The depictions in those media are more or less clear about showing the handedness. Seals and sealings will be left aside for a separate paper because of a problem with judging whether the seal or its impression was to show the "correct" orientation of the composition. For the purposes of this article, I have attempted to collect archaeological evidence providing a sufficiently broad overview of Aegean art to obtain highly probable results. The most complete research concerns frescoes, while for Mycenaean vase paintings,[9] Minoan bronze figurines,[10] or Mycenaean ivories,[11] I relied primarily, although not exclusively, on works containing corpora of finds belonging to these categories. We are interested here in representations of humans, monkeys, as well as hybrids like Minoan Genii equipped with hands. Many of them

[6] McManus 2002, pp. 254–258; Steele, Uomini 2005, pp. 218–220; Llaurens, Raymond, Faurie 2009, p. 882; Singg, Martin 2016, p. 2.

[7] McManus 2002, pp. 205–209, 361–361; Llaurens, Raymond, Faurie 2009, pp. 883–884; Singg, Martin 2016, p. 2.

[8] Dennis 1958; Spenneman 1984.

[9] Vermeule, Karageorghis 1982; Sakellarakis 1992.

[10] Verlinden 1984; Sapouna-Sakellarakis 1995.

[11] Poursat 1977a; 1977b.

do not perform any action in which handedness could manifest itself, many are preserved in a state not allowing for any analysis (esp. in frescoes), some others (esp. in vase paintings and on larnakes) are too schematic or represented as silhouettes. Without complete statistics, it is impossible to estimate the proportion of figures performing actions involving handedness to the total of all represented figures. This had been done for Egypt by Dennis who analysed 14892 figures and ended up with just 1085 performing unimanual skilled actions.[12] In our case, the proportion is most probably different because I am also taking into account unskilled actions, such as gesturing or carrying objects. In anticipation of our reasoning, let us point out that we will also pay attention to the issue of far and near hands/arms, as it seems important for the analysis of Aegean art.[13]

Let us begin with unimanual skilled actions. In the realm of Aegean iconography, these are usually scenes of fighting/hunting with weapons. The most emblematic (but not unproblematic) is fighting with a sword or dagger, strongly connected with handedness. Our problem is that we have very few preserved representations of fighting/hunting swordsmen that are not on seals. Generally such warriors/huntsmen were depicted using their right hands to use their weapons. We see that in LH IIIB[14] Battle Fresco from Pylos (22 H 64),[15] where both duelists hold swords in their right hands,[16] in one case the far one and in the other the near one [Fig. 1]. Swordsmen using weapons with their right hand are visible in the griffin/lion fighting scenes on LH III ivory mirror handles

Fig. 1. Fragment of the reconstruction of the Battle Fresco from Pylos
(drawing by K. Lewartowski after Lang 1969, pl. M)

[12] Dennis 1958.

[13] I've been inspired to turn my attention to this feature by M. Lang's publication of the Pylos frescos (Lang 1969). The concept of near and far shoulder, foot, hand, etc. is widely used in works on Egyptian art, e.g. Smith 1949, from page 140 onwards; Eaton-Krauss 1984; Fazzini 2010.

[14] Relative chronology abbreviations: EC = Early Cycladic, EM = Early Minoan, LC= Late Cycladic, LH = Late Helladic, LM = Late Minoan, MC = Middle Cycladic, MM = Middle Minoan. For absolute chronology, see Manning 2010, p. 23, tab. 2.2, with corrections suggested by Pierson *et alii* 2018.

[15] Numbers of Pylos frescoes according to Lang 1969.

[16] By "right" or "left" hands, shoulders, sides we always mean "proper right" and "proper left": the sides seen from the point of view of represented subjects.

from Enkomi Tomb 24, Kouklia Tomb 8 and an ivory pyxis from Enkomi Tomb 24.[17] Another scene of sword fighting is in the lower register of side A of larnax CM 40[18] from Tanagra tomb 22 [Fig. 2]. This is a duel of two swordsmen poorly rendered in silhouette. Assuming that they are represented in the usual way, i.e. with their upper bodies frontally, one of them is handling his sword in his right (far) hand and the other in the left (far) one.[19] In the upper register of side B, we have a huntsman sticking his sword held in the right hand in an antelope's neck. Thus right-handers prevail and we can hypothesize that in the duel scene the artist sacrificed realism for the sake of composition — the scene is symmetrical. We cannot, however, exclude the possibility that the artist really intended to show a fight of warriors using different hands.

Some fresco pieces from Pylos 25 H 64, 28 H 64 are very fragmentarily preserved parts of a Battle Scene. One right (near) hand gripping a dagger is preserved; according to Lang's reconstruction, in one of them there were also warriors using daggers in their left hands, but this is purely conjectural and can't be used as evidence. We read in the description of the other one that there were warriors with daggers but they are not visible on published fragments.

We have some instances of figures handling swords but not in the context of fighting. The LC IA monkey from Akrotiri Xeste 3[20] seems to hold the sword in its right hand, the youth from LM I Chieftain Cup[21] rests his sword against his right shoulder holding its hilt in the right hand, the near one. The charioteer from Stele I from the Grave Circle A (further on as GCA) at Mycenae holds the reins in his left (far) hand and a sword in his right (near) one,[22] exactly opposite to his fellow

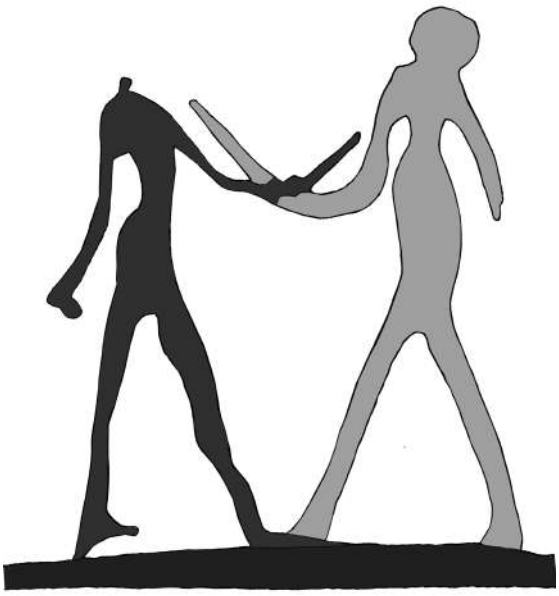

Fig. 2. Duelists from Tanagra larnax CM 40
(drawing by K. Lewartowski after Cavanagh, Mee 1995, fig. 3)

[17] Poursat 1977a, pl. XVI.3, 4, 6. The pyxis is fragmentarily preserved, thus it is not sure what weapon is used by the warrior, but it closely resembles the Enkomi handle: Murray, Smith, Walters 1900, no. 883, p. 32.

[18] For abbreviations of catalogues frequently used in this article, see the list below the text.

[19] Papadopoulos 2009, p. 69, thinks this is religious representation not a duel. For the new catalogue of the Tanagra larnakes, see Kramer-Hajos 2015.

[20] Doumas 1992, p. 128, figs. 95–96.

[21] Koehl 1986 with further bibliography.

[22] Heurtley 1921–1922, p. 128. The finds from the Grave Circle A at Mycenae belong basically to the LH I period: French 2002, p. 37; Crowley 2008, p. 259; cf. papers by R. Laffineur, Th. Papadopoulos, A. Xenaki-Sakellariou in: Laffineur (ed.) 1989.

from Stele V[23] who holds the reins in his right (near) hand and rests the left (far) one on the hilt of the sword shown against the background of his body, tilted to the left, suggesting that the warrior is left-handed. We must note that the man walking in front of the chariot is holding something in his raised left (far) hand. In this case it is possible that we are dealing with a representation of two left-handers although because of style and composition it is not conclusive. Warriors represented on two fragmentary LH IIIC vases from Tiryns (VK XI.49, XI.54) are using their swords in their right (near) hands, but another one on a LH IIIC fragmentary krater from Ugarit (VK XIII.29) is holding a large fish in his right hand and a sword in the left (near) one. The warrior from the reused stele from the Shaft Grave Γ in the Grave Circle B at Mycenae seems to hold his sword with both hands.[24]

An indirect hint of the handedness of swordsmen is supplied by representations of figures with their weapons kept in scabbards, especially those three-dimensional ones which are terracottas. Figurines from Phylakopi (SF 2340),[25] Midea,[26] Petsofas [Fig. 3],[27] and Ashmolean Museum (AN1896-1908.AE.990)[28] all have their weapons (daggers or swords) attached to their belts in a position typical for right-handers — at their left sides or centrally, with hilts directed upwards to the right. But another figurine from Petsofas, a poorly rendered one,[29] has its weapon attached in a position convenient to a left-hander [Fig. 4]. A similar situation is seen on a horse rider from Mycenae if the object on his breast is a dagger and not a quiver or a bow.[30] The Chieftain from the Chieftain Cup has a knife at his left (near) hip as the right-handers do. A hunter on a larnax from

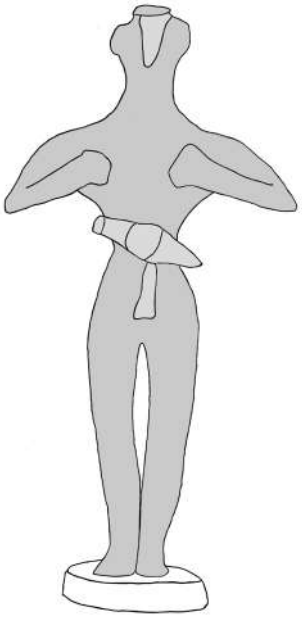

Fig. 3. Terracotta figurine from Petsofas (drawing by K. Lewartowski after Rutkowski 1991, pl. VIII.2)

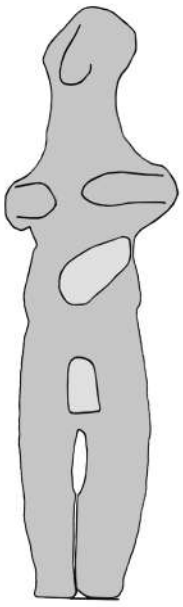

Fig. 4. Terracotta figurine from Petsofas (drawing by K. Lewartowski after Rutkowski 1991, pl. III.3)

[23] Heurtley 1921–1922, p. 132.
[24] Mylonas 1973, pp. 50–51, pl. 40.
[25] French 1985, p. 223.
[26] Demakopoulou, Divari-Valakou 2001, p. 187.
[27] Rutkowski 1991, nos. 1.1.8, 1.1.13, 1.1.15.
[28] http://collections.ashmolean.org/object/476084 (access 16.02.2020).
[29] Rutkowski 1991, no. 1.1.1.
[30] Hood 1953; Crouwel 1981, pp. 47 (whip in the right hand possible) and 161, cat. no. T 18; Papadopoulos 2009, p. 70.

tomb 24 in Armenoi (LM IIIB-C)[31] has his dagger attached in a position typical for right-handers (he is keeping a spear in the left, far hand). Less clear is the image built by vase paintings. Among the vases collected by Vermeule and Karageorghis there are at least eight showing warriors with swords attached to their belts. In three cases it is impossible to say on which hip, but on four kraters we see weapons attached to the right hips, e.g. on Enkomi LH IIIA1 krater (VK III.21) where a long-robed individual has his sword hanging from the baldric on his right (near) hip with the grip to the left. Before we conclude that Mycenaean vase painters tended to paint the left-handed warriors, let us have a look at a fragmentary LH III B1 krater from Enkomi (VK V.38) [Fig. 5]. Five long-robed figures with swords at their sides are preserved there: three of them have swords on their left (near) and two on the right (near) sides. The krater illustrates clearly the near side (or hand or arm) rule practiced by Mycenaean vase and wall painters, although the motivations of artists working in those media could be different. The vase painters were probably interested in showing whole swords and not the handedness thus the way to do this was to show figures facing right with swords at their right sides and those facing left at their left sides, the sides with which they are turned to the viewers, the near sides.[32]

We have seen that among representations of figures holding their swords/daggers in their hands, right-handers prevail and two sure exceptions are made by the symmetric scene of a duel from Tanagra and by the krater from Ugarit. The situation is less clear when we analyse the positions of scabbards. They are sometimes attached to the left and sometimes the right sides of their owners, and the vase paintings are useless at this point because of the near side rule.

The spear was the weapon most frequently shown in art, used for the hunt and war. We have two main groups of spear representations. The first one shows warriors/hunters in a war/hunt context or aiming their weapons at enemies or game not shown or not preserved on fragments of compositions. The second group shows warriors/hunters walking or horse-riding and carrying their spears in their hands or leaning them against their shoulders. Both groups are fairly consistent in application of the near hand/arm rule.

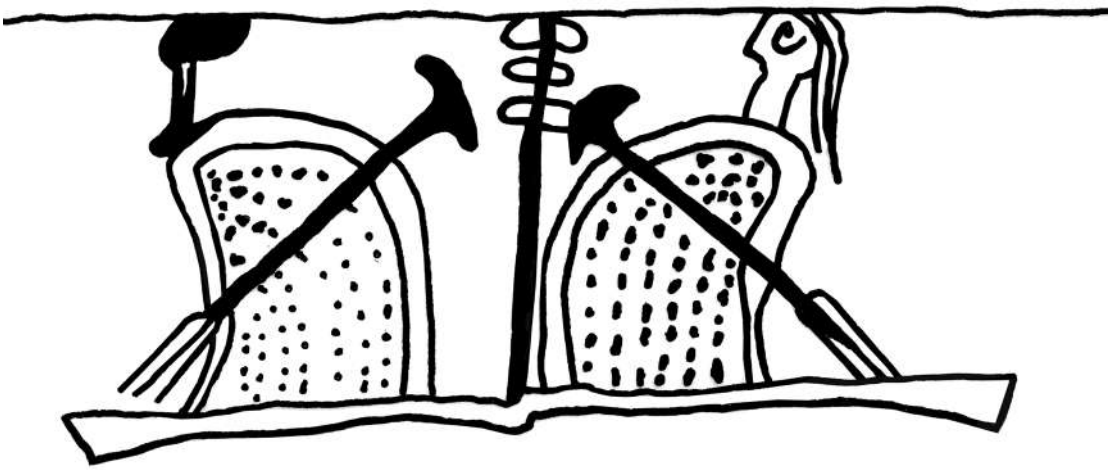

Fig. 5. Fragment of the naval scene on Enkomi krater
(drawing by K. Lewartowski after Vermeule, Karageorghis 1982, no. V.38)

[31] Tzedakis 1971, pp. 219–220, fig. 5, pl. III.1; Catania 2012, cat. no. ARM 2.

[32] It's a pity that the line of warriors marching right on fresco from The West House at Akrotiri, all with swords at their sides have their bodies hidden by tower shields letting only the ends of scabbards to be visible; on the other hand they are carrying their long spears in their right (near) hands suggesting they are right-handed: Doumas 1992, pp. 47–49, figs. 26–48.

The scenes of spearmen from GCA at Mycenae: the silver Battle Krater[33] and the Lion Hunt Dagger[34] show a similar technique of using long spears [Fig. 6]: the right hand is gripping the lower part of the spear and gives impetus to the stroke and the left hand grips the upper part of the spear near the spearhead helping to direct it at the target. Five warriors attacking right display this technique which is consistent with right-handedness. Their shields are visible behind them hanging on baldrics, leaving both hands free. On the Krater, there are also spearmen attacking left but they are very fragmentarily preserved. Although Sakellariou recognized the right shoulder of one of them to the right of his head,[35] it is impossible to assess with certainty the way they are using their weapons but their shields are at their left sides typical for right-handers. But one of the warriors attacking right protects his body with a figure-of-eight shield at his right side which covers him from our view except his feet, head and arms, but both hands gripping the spear are not preserved. Again we cannot tell if he is a right- or left-hander, but the position of the shield would suggest the second possibility. Similarly, one of the warriors depicted on the Dagger (all attacking right) has his figure-of-eight shield in an atypical position: in front of him, and also covering him almost completely. In this case, one hand is not shown, we see only the hand behind his head and it disappears behind the head of another warrior following him. This suggests that the "rear" hand is the left one and the warrior is left-handed, but it is more probable that the artist didn't want to obscure the view of the other's head leaving us with the question of the warrior's handedness unanswered. Another candidate for a left-handed spearmen is a partly preserved figure on the Siege Rhyton from the GCA at Mycenae[36] below the archers, if the object he is carrying is a spear. He is not shown in a clash with an enemy but his pose looks like a reversed version of the other spearmen. The right-handed use of a spear was illustrated on LH IIIB frescos: from Pylos (23 H 64), most probably on the Boar Hunt fresco from Tiryns (Rod. Tir. no. 172),[37] and reconstructed frescos from Pylos (16 H 46) and Tiryns (Rod. Tir. no. 153). A warrior or hunter using his spear in the same way is also represented on a LH IIIB1 rhyton from Ugarit (VK V.36).[38] Similarly,

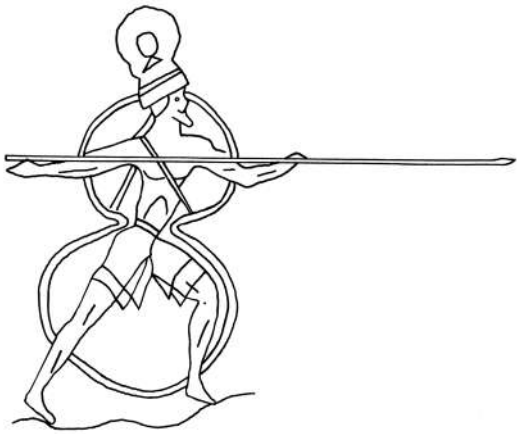

Fig. 6. One of the spearmen from the Silver Battle Krater from Mycenae
(drawing by K. Lewartowski after Blakolmer 2009, pl. LVII)

[33] Karo 1930, pp. 119–120, nos. 605–607, pls. CXXIX–CXXXI; Sakellariou 1974 (the complete reconstruction and detailed study); Blakolmer 2009, pp. 218–223.
[34] Karo 1930, pp. 95–97, cat. no. 394.
[35] Sakellariou 1974, pp. 6–7.
[36] Karo 1930, pp. 106–108, no. 48, pl. CXXXII; Koehl 2006, pp. 138–140, no. 425. For new reconstruction, see Papadopoulos 2019, esp. pp. 407–408, pl. CLIV.
[37] The reconstructions in Rodenwaldt 1912, fig. 55, pl. 13, show fragment no. 172 in reversed position for the sake of completeness of the composition, but pl. XI.8 shows it in the right position.
[38] On the other hand, a warrior from a LH IIIB krater from Ugarit with only right (far) hand preserved seems to be using his spear in the left-handed way: Vonhoff 2008, no. 197.

the hunter from the LM IB-IIIA Lasithi Dagger turned right uses both hands with his long spear probably in the same way as the others, but this image is a simple schematic incision where the spear and the hands form one shape.[39] In all those cases the spearmen were right-handers and their right hands were the near hands. This technique of manipulating spears with both hands was used for long weapons.[40]

The lighter spears or javelins could be easily used with one hand. A reconstructed hunter from the Deer Hunt fresco from Pylos (16 H 46) is probably prepared to throw his spear with his raised right (near) hand [Fig. 7]. The running hunter on a LM IB ivory pyxis from Katsamba[41] aims his quite large spear with his raised right hand at a bull. He is running left, but looking and aiming backwards, which means that he is showing us his back and his right hand is the far one. The artist wanted to show the right-handedness of this figure even in such atypical pose. But on a LM II collared jug from Knossos a warrior or hunter is clearly depicted holding the spear in his left, near hand.[42] On LH IIIB/C kraters from Tiryns and Phylakopi (VK X.37 and X.38 = Sak. 24A) there are warriors throwing their weapons and they are right-handers again and their right hands are the near hands. Hunters aiming their weapons at animals were shown on larnakes from Armenoi (tomb 24)[43] and Episkopi,[44] on LM IIIC Mouliana krater.[45] The hunters hold the spears in their raised right (far) hands, with the spearheads directed downwards. On the chest and the lid of the famous Episkopi larnax we see two hunters moving left, gripping their spears in their midsections with their right (far) hands while the hunter from Mouliana is shown with his right hand as the near one. On one of the panels of the Armenoi specimen, the hunter is using his left (far) hand. His left-handedness is slightly obscured by the fact that in his right hand he is gripping

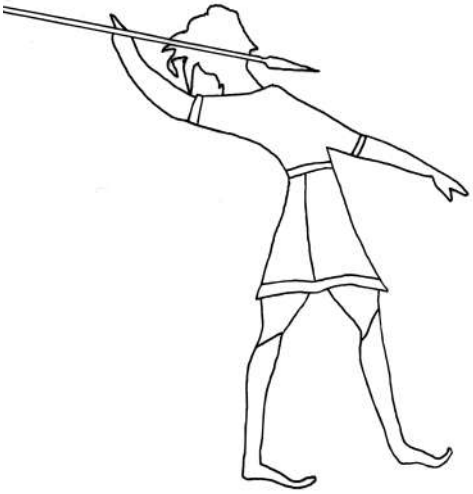

Fig. 7. Fragment of the reconstruction of the deer hunt fresco from Pylos
(drawing by K. Lewartowski after Lang 1969, pl. B)

[39] Long 1978.

[40] A doubtful case is made by Stele IV from the Grave Circle A at Mycenae — a figure fronting the chariot is handling an extremely long spear aimed at the charioteer or is being stabbed by the charioteer. If the first is the case this warrior is in the reversed position in which the left (near) hand is the dominating one.

[41] Alexiou 1967, pp. 55–56, pls. 30–33.

[42] Crouwel, Morris 1995, no. 36, pl. 3e.

[43] Tzedakis 1971, pp. 219–220, fig. 5, pl. III.1; Catania 2012, cat. no. ARM 2.

[44] Platon 1947, p. 638; Platonos 2008 *n.v.*; Catania 2012, cat. no. EPI 4.

[45] Xanthoudides 1904, pp. 32–36, pl. 3; Papadopoulos 2009, p. 74, fig. 9.9.

the leash of his hunting dog, but still the spear manipulation is a skilled action in contrary to leash handling, so the figure is most probably a left-hander (on a larnax from tomb 11 of the same cemetery painted in a very peculiar style, there are two figures, both using their right, near hands to carry a double axe (?) and an unidentified object).[46] A similar male figure is on one of the side panels of the Episkopi larnax but he is holding the leash in his left hand when his right (near) one is raised up but empty. In this case, it is possible that the painter forgot about the spear or the figure is performing a gesture with his right (near) hand which is consistent with other representations of gestures (see below). It seems that the Episkopi painter was very careful about showing the handedness of his subjects.

A similar pose can be seen on the LH IIIC Warrior Stele (VK XI.43 = Sak. no. 21) and side B of the Warrior Vase (VK XI.42 = Sak. no. 32) [Fig. 8], from Mycenae where the enemy or game is not represented and on fragments of LH IIIC kraters from Mycenae (VK XI.1) and Iolkos (VK XI.57) where the potential enemy is not preserved. In all those cases, the warriors are holding their spears with their right (near) hands. The same can be seen on fragments of a LH IIIB/C-early LH III C krater from Bademgediği Tepe where we see warriors on ships steering towards a battle. Those moving right raise their javelins with right (near) hands, those moving left are preserved on small fragments, one of them is probably raising his javelin with his left (near) hand, but three others look like having shields on their left (near) sides and carrying their weapons in front of them in right (far) hands.[47] A LH IIIC krater from Kynos in east Lokris with similar scene [Fig. 9] doesn't leave any doubt: the warriors are shown as using for javelins their near hands only, what means that some of them are shown as right-handers and the others as left-handers.[48] A small fragment with one warrior left shows again the same "near hand rule".[49] Other warriors are shown moving to the right, thus their right hands are the near ones.[50]

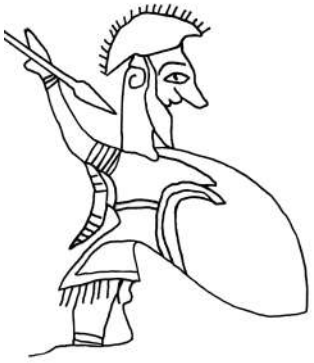

Fig. 8. One of the warriors from side B of the Warrior Vase from Mycenae (drawing by K. Lewartowski after Vermeule, Karageorghis 1982, no. XI.42)

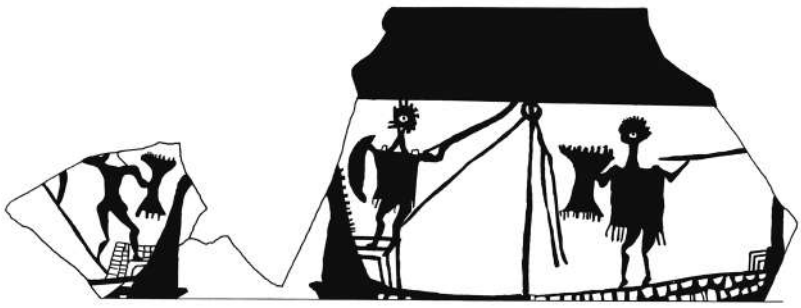

Fig. 9. Fragments of the naval battle scene on krater from Kynos (drawing by K. Lewartowski after Mountjoy 2011, fig. 2)

[46] Tzedakis 1971, p. 220, fig. 4, pl. III.3; Catania 2012, cat. no. ARM 1.
[47] Mountjoy 2011, pp. 485–487, fig. 3.
[48] Dakoronia 2006a, pp. 24–26, fig. 1.
[49] Dakoronia 2006a, p. 27, fig. 6.
[50] Dakoronia 2006a, pp. 28–29, fig. 8; 2006b, p. 173, fig. 5 (a footed warrior). For war on sea, cf. Wedde 1999b.

Spears can help with interpretation of the iconography in another way. We have a number of representations of warriors/hunters carrying their spears resting against their shoulders (carrying weapons is not a skilled action, but this theme has a special importance for our subject). They are shown in LM II/IIIA frescos from Knossos (Im. Kn. no. 27), LH IIIA2-B fresco from Mycenae (Rod. Myk. no. 5, 7), Orchomenos (Im. Or. no. 3),[51] Pylos (26 H 64, 32 H 64) [Fig. 10], Thebes (?),[52] Tiryns (Rod. Tir. nos. 1, 151) [Fig. 11], and on LH IIIB vases from Aradippo (VK III.29), LH IIIC from Mycenae (VK XI.42, 44), and LM IIIC from Mouliana.[53] The striking feature of this group is that almost all represented figures carrying their spears leaning against their near shoulders regardless the orientation of their movement, and the number of spears (one or two) The possible exception is on a fresco fragment from Orchomenos[54] and a LH IIIC Tiryns krater fragment (VK XI.51), but the state of preservation makes this identification not certain in both cases. Other objects are also hold on near shoulders. We can mention here a LH IIIB1 fresco from the West House at Mycenae[55] where a participant of hunt is carrying a pole with something hanging from it on his near (left) shoulder and Minoan Genii from a miniature fresco fragment from Mycenae (Im. My. no. 8) supporting a rope with their near (right) shoulders. We see that the same practice was shared by painters from Crete, and the Mycenaean ones (fresco and vase painters) through the Late Bronze Age. Interesting case is made in this context by the LM I Harvesters Vase from Agia Triada.[56] The composition on this rhyton has nothing to do with war or hunt, it shows rows of men carrying some agricultural long tools on their left (far) shoulders with exception of the "Priest", probably the most important participant of the rite or procession — who is carrying something

Fig. 10. Warrior from the chariot scene fresco from Pylos (drawing by K. Lewartowski after Lang 1969, pl. 18)

Fig. 11. Hunter from the hunt fresco from Tiryns (drawing by K. Lewartowski after Rodenwaldt 1912, fig. 49)

[51] Spyropoulos 2015, figs. 15, 16.
[52] Kountouri 2018, pp. 451–463.
[53] Xanthoudides 1904, pp. 32–35, pl. 3.
[54] Spyropoulos 2015, fig. 16.
[55] Tournavitou 2015, p. 152, fig. 12. But a man preserved on fragments of LH IIIA2 fresco from the House of the Oil Merchant at Mycenae is holding a horizontal pole with a load attached to it on his right, far shoulder: Wace 1953, p. 14, pl. 9a; Cameron, Mayer 1995, p. 282.
[56] Koehl 2006, no. 110, pp. 90–91.

looking like a solid cane on his right (near) shoulder. The tools carried by the participants of the procession are very long and they widen considerably just behind the heads of the carriers. Showing them in such a way that they do not cover the faces of the people in the next row would be more difficult if they were resting on near shoulders and the effect could look rather unnatural. The leader's cane, on the other hand, is narrow and much shorter. It can, therefore, be assumed that Aegean artists generally preferred to show the carrying of objects on near shoulders, if it did not pose any problems.

Shields do not add much to handedness. They accompany spears or swords and usually are shown held in left hands or on the left sides of their owners. Sometimes as is the case of Kynos, where some warriors are shown as keeping javelins in left hands, they are hold in right hands [Fig. 8]. Consequently they are usually on the far sides of the warriors. The cases of warriors protected with large shields on the right (near) side or at the front of a warrior known from the Battle Krater and the Lion Hunt Dagger from Mycenae has been analysed in the section on spears. Both are potential candidates for left-handers. The case of marching warriors from the West House at Akrotiri is different, because their shields look like kept on the right sides of their owners however the warriors are holding spears in their right hands in a way excluding such a possibility. Most probably the painter wanted to show the front sides of the shields for some reason and did it in such a way that they can be seen as shields and as simplified cuirasses at the same time (see note 32).

Shooting with a bow and arrow is certainly a skilled action. Modern right-handed archers hold their bows in their left hands and they use the right ones to draw bowstrings and lefthanders do this the other way round.[57] Few Aegean representations of archers showing them when shooting and preserved to the extent allowing recognition of their handedness suggest that this was the case in the Bronze Age as well.[58] Finds from the GCA (the Silver Siege Rhyton, the Battle Krater and the Lion Hunt Dagger [Fig. 12]), a fragment of a LM I steatite rhyton from Knossos,[59] LH IIIB fresco fragments from Pylos,[60] side B of a LH III B1 krater from Enkomi (VK V.28) [Fig. 13] all show archers holding bows in their left hands which, depending on the subjects' orientation, can be far or near (a small fragment from Iolkos, VK XI.58, is difficult to interpret). The artists were very careful about depicting right-handed archers.

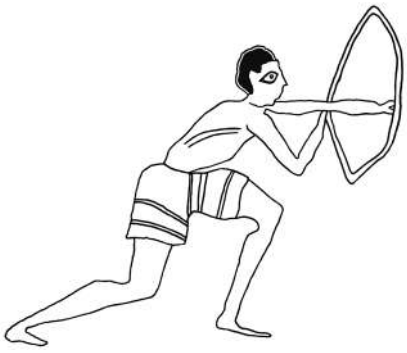

Fig. 12. Archer from the Lions Hunt Dagger from Mycenae (drawing by K. Lewartowski after https://historyofwesternartblog.wordpress.com/2015/10/09/inlaid-dagger-blade-with-lion-hunt/; access 16.12.2020)

Fig. 13. Archers from side B of Enkomi krater (drawing by K. Lewartowski after Vermeule, Karageorghis 1982, no. V.28)

[57] I am grateful to Mr. Henryk Jurzak, the Vice President of the Polish Archery Federation for his advice.
[58] Cf. Brecoulaki *et alii* 2008, p. 372.
[59] Koehl 2006, p. 181, no. 769.
[60] Brecoulaki *et alii* 2008.

The last activity directly connected with fighting or hunting is slinging. Here we have only one certain depiction of slingers in action (the Silver Siege Rhyton from Mycenae) and one doubtful example (the Stele VIII from Mycenae[61]). In all cases, the warriors hold the slings in their right hands (far on the Rhyton and near on the Stele) and use their left ones to stretch them as can be expected from right-handers.

Driving a chariot in war, hunting or parade is a skilled action, however only one its aspect is directly connected with handedness: manipulation of a whip or a goad.[62] It is difficult to state if this was a skilled action in Mycenaean times. Modern drivers of horse vehicles can use whips in a very subtle manner and are trained in this skill; right-handers do it with their right hands and left-handers with their left ones. Reins, if handled with one hand, are usually kept in the left one regardless the driver's handedness although in sports in which driver is sitting in the centre of the vehicle's front (like in ancient chariots) they use their preferred hand for this.[63] Clear representations of charioteers with whips/goads are not very abundant. On the LM II/IIIA1 "Palanquin" fresco from Knossos (Im. Kn. no. 25), the charioteer holds both the reins and the whip in the right (near) one [Fig. 14]. Also side C of the LM IIIA Agia Triada Sarcophagus (Im. A.T. no. 2) seems to show the driver of the goat chariot holding half of the reins in her left (near) hand and the whip and the other half of the reins in her right (far) hand.[64] The charioteer on the left panel of the side A of the Episkopi larnax is depicted holding the whip in his right (near hand) and the reins in the other one. A small fragment of a fresco from Mycenae[65] shows probably the right (far) hand of a charioteer holding the whip/goad and half reins. A better preserved LH III A/B charioteer from Tiryns (Rod. Tir. no. 4) is holding the goad and reins in his right (far) hand while retaining a spear (?) horizontally in his left [Fig. 15]. In this case we do not know which action is more skilled thus

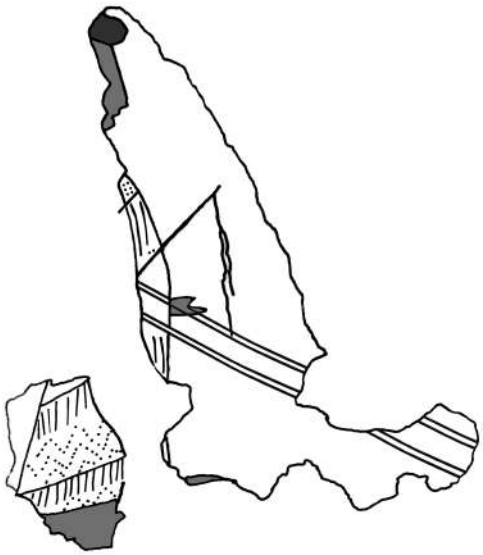

Fig. 14. Charioteer from the "Palanquin" fresco from Knossos (drawing by K. Lewartowski after Crouwel 1981, pls. 104–105)

Fig. 15. Charioteer from Tiryns fresco (drawing by K. Lewartowski after Crouwel 1981, pl. 91)

[61] According to Heurtley 1921–1922, p. 135.
[62] Crouwel 1981, p. 111.
[63] I am deeply grateful to Mr. Marek Zalewski from the Polish Equestrian Federation for his patience in answering my questions and for the information he provided.
[64] Long 1974, esp. p. 55.
[65] Rodenwaldt 1921, p. 169, n. 154, no. A4; Crouwel 1981, cat. no. W 22.

it is equally possible that the charioteer was right- as left-handed. A small fragment of a LH IIIB fresco from Tiryns (Rod. Tir. no. 120) shows the right (near) hand of a female driver holding a goad and half of the reins. According to Rodenwaldt's reconstruction the goad is visible on another LH IIIB fresco fragment from Mycenae (Rod. Myk. no. 15) and although the hand is not preserved it would be the right (near) one.

The Stele I from CGA at Mycenae was mentioned in the context of swords — the charioteer holds the reins in his left (far) hand and a sword in the right (near) one. A fresco fragment from Argos shows the left hand of a charioteer holding reins, but we do not know what is occupied his right one with.[66] Similarly the Agia Triada Sarcophagus (Im. A.T. no. 2) side D shows a charioteer of the griffin chariot holding reins in her left (near) hand, but the state of preservation of the paint does not allow for any observation on the right hand's action. Despite the very small size of the preserved fragment, preventing a reliable reconstruction, it is possible that a LH IIIC vase from Lefkandi may have shown a right-handed charioteer with his goad (VK XI.37).

We have two possible LH IIIC examples of a whip from a bowl from Tiryns (VK XI.19 = Sak. 36) in left (far) hand and a double-pronged goad from a krater from Lefkandi, in this case it would be the right (near) hand. The fragmentary state of those vessels does not allow for reliable reconstruction.

The interpretation of Stele V from CGA at Mycenae is not clear: the charioteer is holding reins in his right hand and his left one rests on his sword's grip (see above). Is he left-handed or on the contrary — is he using his preferred hand for driving while the left one is just resting?

The representations of charioteers seem to show the tendency of artists to depict right-handed chariot drivers.

The last skilled action we can discuss here is the play of instruments, mostly lyres, kitharas, phorminxes or harps. Musicians use both hands for playing but their role is different. All representations preserved well enough to allow the reconstruction of the playing technique show that the musicians were right-handed: they held instruments with their left hands used also to suppress the strings (depending on the type of instrument), and they stroked strings with their right hands. We can see this on Cycladic harpists from EC II (the soundbox on the right hip), on the LC I fresco of monkeys from Xeste 3 at Akrotiri, LM III terracotta group from Palaikastro as well as on the LM II-III La Grande Processione fresco and the Sarcophagus from Agia Triada. Interestingly enough the player from the fresco is oriented right and the one from the Sarcophagus left but both are shown playing in the same way. It means that they were portrayed realistically at least from this aspect. Because both works could have been by the same author it is even more important for our subject showing the artists took care to show real technique and consequently the right-handedness of those musicians. It is a pity that the hands of the Lyre Player from Pylos (PY 43 H 6) are not preserved. It is also impossible to determine the technique of the player from a fragmentary LH IIIB krater found at Nauplion (VK IX.14.1) because of the painter's highly stylised manner.[67]

The sistrum player from the Harvesters Vase is using his right (near) hand for playing the instrument.

Representations of gestures constitute a class of actions which are not skilled but important for our topic.[68] Among gestures classified by Wedde,[69] there are some executed symmetrically with both hands and others in which the roles of hands are different and usually one seems to be active and the other one passive. The second group of gestures (or postures)[70] and in which we are

[66] Tournavitou, Brecoulaki 2015, pp. 220–223.

[67] For types of instruments, playing techniques, the catalogue of representations, see Younger 1998.

[68] See Corballis 2003 on connection between speech, gesture and right-handedness.

[69] Wedde 1999a. Cf. Hitchcock 1997, esp. pp. 113–116.

[70] See Morris, Peatfield 2002, p. 109.

interested comprise Wedde's gestures nos. 2–8 (in other sections of this paper we will address also gestures 18–21 which are connected to carrying objects). In contrary to all other actions discussed here, whether skilled or not, the hand preference more probably results not from biological reasons but is connected with beliefs, habits, traditional opposing dualities such as left-right, dark-light etc. It is not clear to what extent the artists were aware of this but surely they knew very well how the ritual gestures should be executed. For our purpose the classification is not essential, we will treat all asymmetrical gestures together. Three groups of Minoan gestures show such a laterality. The first one is usually called the "adoration gesture"[71] in which the right fist touches the forehead of male or female figurine. The second one consists of a group of gestures collected here in one set in which the right hand is upraised in front of the chest or the head of a figurine. The third one is much rarer than the two former ones — in this gesture the right palm rests on the left shoulder, the left hand is below the right one; in one case the palm of the left hand rests on the wrist of the right one.

Those gestures are represented richly by terracottas and bronzes from MM III to LM III.[72] The right hand is almost exclusively the one which is higher, or active or seems to be more active than the left one. A female terracotta figurine in "Klage oder Ausichtsgestus" from Chamaizi[73] seems exceptional in raising her left hand higher than the right one in front of her face. Similar gestures, resembling G2, G4, G5, are known from the Mycenaean vase paintings in LH IIIA2 – LH IIIC. They are usually performed by individuals accompanying chariots on foot (e.g. VK IV.13, IV.14, IV.18, V.170) but also by the woman on the Warrior Vase (VK XI.48) and a child on the krater from Agia Triada in Elis.[74] In all listed cases the acting hand is the left, far one.

Because gestures have ritual character we include into this group also representations of figures holding rods, lances or staffs vertically in front of them, probably presenting them (Wedde's G8; the so called commanding gesture[75]). We know it from the famous LM I Chieftain Cup[76] and an ivory plaque from the Delian Artemision.[77] The Minoan chieftain is turned to the left, the Mycenaean warrior to the right [Fig. 16] but they both present their staffs or lances with their right hands, in the first case the far one and in the second the near one. A man from a LH IIIB2 krater from Mycenae (VK IX.2 = Sak. no. 11) turned left is holding vertically a short stick in his left (near hand) but this gesture does not seem to be a presentation of the object and from the point of a viewer of the vase the holder has it behind him instead of in front of him.

With the exception of the Mycenaean vase painters the artists almost unanimously represented unsymmetrical gestures as executed with right hands or in which right hands are more active, more important, more exposed. In the two-dimensional art, this is emphasized by showing right hands sometimes as far ones sometimes as near ones.

Carrying a vessel is another unskilled action but with importance for our discussion. The vessels can be of large dimensions or heavy (bimanual action) or of small dimensions (unimanual one). In the case of large handled vases we can expect that right-handers would hold the handles in their right hands and support the bottoms with their left hands. And this is the case of a LH IIIB Minoan Genius from the ivory plaque from Pylos[78] and of another from the LM I chlorite

[71] E.g. Morris 2001, p. 246.
[72] As collected in Verlinden 1984; Sapouna-Sakellarakis 1995; Rethemiotakis 2001.
[73] Sapouna-Sakellarakis 1995, p. 109, pl. 39.2.
[74] Schoinas 1999, p. 258, fig. 1.
[75] E.g. Niemeier 1988, esp. pp. 238–242; Blakolmer 2019, p. 54.
[76] Koehl 1986.
[77] Gallet de Santerre, Tréheux 1947–1948, pp. 156–162, pl. XXV; Poursat 1977b, p. 157, pl. XIV.1; Tournavitou 1995, pp. 491–492. Poursat 1977b, p. 152, and Tournavitou 1995, p. 527, date the deposit to LH IIIA2–B2.
[78] Blegen, Rawson 1966, p. 202, fig. 284; Gill 1964, no. 1; Poursat 1977a, no. 393/7840.

triton from Malia [Fig. 17].[79] Both are turned to the right what means their right hands are the far ones (Minoan Genii carrying jugs were represented mostly on seals[80]). We see exactly the same on a MC III bridge-spouted jug from Akrotiri ("Ganimedes Jug") where a man is pouring a liquid from his large jug to the small cup of another man [Fig. 18].[81] On the Cupbearer and Corridor of the Procession LM II-IIIA frescos from Knossos (Im. Kn. no. 22) there are fragments of at least two men carrying large vessels whose pose could be safely restored. Interestingly enough the Cupbearer[82] is walking left and the member of the Group C from the West Porch[83] is walking right although both are carrying their vases in the way described above, which means that the painter really wanted to show the right-handed individuals since the right hand of one of them is the near one and of the other — the far one. A boy from Xeste 3 at Akrotiri is holding a shallow metal vase exactly in the same way, and the hand holding the handle is the far one. But the mature man from the same wall is shown differently: he is pouring a liquid from a large metal hydria while securing the base with his right (near) hand and with the wrist of his left hand he is supporting the handle.[84]

Fig. 16. Ivory plaque from the Delian Artemision (courtesy École française d'Athènes; source: Gallet de Santerre, Tréheux 1947–1948, frontispiece)

Fig. 14. — La représentation, interprétation graphique (éch. 1:1 ; dessin I. Athanassiadi)*.

Fig. 17. Chlorite triton from Mallia (courtesy Pasquale Darcque and École française d'Athènes; source: Baurain, Darcque 1983, fig. 14)

[79] Baurain 1985, p. 95, fig. 1; Baurain, Darcque 1983.
[80] E.g. Gill 1964; Weingarten 1991; Rehak 1995; Blakolmer 2015.
[81] Nikolakopoulou 2010; Vlachopoulos 2015, p. 42, fig. 3, with further bibliography.
[82] Evans 1928, p. 705, pl. XII.
[83] Evans 1928, p. 725, fig. 450; Evans reconstructed there three men in the same pose, but only one is preserved to an extent not leaving any doubt about his carrying of a vessel.
[84] Doumas 1992, p. 130, figs. 109–115; Vlachopoulos 2008, p. 452.

We have two scenes showing individuals carrying small vessels in a way similar to the one described above and both from Akrotiri. On the "Ganimedes Jug" mentioned above [Fig. 18] the man on the right side is holding his small cup on the palm of his left (near) hand and securing the rim with the right one. The priestess from the West House is carrying the small vase on the palm of her left (near) hand and using the right one to keep the fire that was kept in the vessel[85] — typical for right-handers. Such representations are rare — normally small drinking vessels, usually kylikes, can be carried with one hand gripping the stem and the left one prevails. This is the case of two women from a LH IIIB2 fresco from Thebes (near hands),[86] a man from a LH IIIA1 krater from Enkomi (VK III.17) (a cup?, phiale?, far hand), a man from Agia Triada in Elis LH IIIC krater with *prothesis scene* (far hand) [Fig. 19],[87] a woman on a Tanagra LH IIIB larnax from tomb 36 (CM 48, far hand) [Fig. 20], and preserved left hand of a LH IIIC terracotta figurine from Amyklai in Lakonia.[88] On side A of a LM IIIB larnax from Episkopi, the first figure in the left panel, has a kylix in his raised left (far) hand and the man in the right panel is holding a kylix in his right (far) raised hand [Fig. 21][89] as is a woman on a throne from a LH IIIC krater from Tiryns (VK XI.19.1). There are preserved two fragments of the Campstool Fresco from Knossos (Im. Kn. no. 26) with hands gripping stems of two different type vessels: fragment A shows a man's right near hand with a kylix, and fragment G a man's left near hand with a golden chalice.[90] The fresco is very poorly preserved so we can only conjecture that in this case the artist preferred the symmetry of his composition over reality. The depiction of the LH IIIB fresco from Tiryns (Rod. Tir. no. 101) is unclear, only a woman's left far hand on a rim of a bottle or stirrup jar is preserved — probably the right one carried the vessel.

Fig. 18. Scene from the bridge-spouted jug from Akrotiri (drawing by K. Lewartowski after Vlachopoulos 2015, fig. 3)

Fig. 19. Fragment of the prothesis scene from a fragmentary krater from Agia Trada in Elis (drawing by K. Lewartowski after Schoinas 1999, fig. 1)

[85] Doumas 1992, p. 47, figs. 24–25.
[86] Kountouri 2018, p. 453, fig. on p. 450, fig. 1.
[87] Schoinas 1999, p. 258; Gallou 2005, p. 100 — an axe or hammer.
[88] Demakopoulou 1982, pp. 54–56, pls. 25–26.
[89] Marinatos 1993, p. 237.
[90] Evans 1935, pp. 323–325, pl. XXXI.

As we've seen, the far hand dominates. This can mean that the artists were generally showing real scenes which have usually a funerary context. According to the believes known from many cultures, death belongs to the left side while life to the right one,[91] and many of the kylikes were kept in the left hands.

Nursing a baby is not a skilled manual action (it needs other skills of course) but belongs to important lateralities. Mycenaean art offers figures of *kourotrophoi* — mortal women or goddesses, carrying small children and sometimes breast-feeding them. The majority of this class is made by Mycenaean idols of all types except Late Psi [Fig. 22].[92] They are usually standing, but there is also a sitting one from Louvre[93] and one from Voula.[94] The only bronze *kourotrophos*, a pendant from the Cyclades in the George Ortiz Collection is of problematic chronology. Most probably Sub-Mycenaean/Protogeometric, it was dated by Eckstein to MM III.[95] With a few exceptions[96] the babies are shown as leaning against the left breasts of their mothers.

Fig. 20. Woman with a kylix from Tanagra larnax CM 48 (drawing by K. Lewartowski after Cavanagh, Mee 1995, fig. 9)

Fig. 21. An individual with a kylix from the Episkopi larnax (drawing by K. Lewartowski after Meroussis 2018, fig. 14)

Fig. 22. Example of Mycenaean kourotrophos, Zurich 3956 (drawing by K. Lewartowski after Pilafidis-Williams 2009, fig. 8)

[91] On dualisms from anthropological perspective, see, e.g., Hertz 1960, esp. pp. 99–109; Needham 1973; Mallory 1989, pp. 140–141; McManus 2002, pp. 22–23.

[92] Budin 2011, pp. 303–309; 2016, pp. 604–605; Olsen 1998, pp. 384–388; Pilafidis-Williams 2009.

[93] Inv. no. CA 1872: Mollard-Besques 1954, pl. I; Pilafidis-Williams 2009, p. 120.

[94] Olsen 1998, p. 387.

[95] https://www.georgeortiz.com/objects/greek-world/064-mother-and-child-mycenaean/ (access 03.03.2020); Eck-stein 1959, p. 644; 1961, p. 404.

[96] Cf. fragment of a Tau idol from the British Museum: Pilafidis-Williams 2009, fig. 10 and p. 116.

Crete is lacking kourotrophic representations.[97] Instead we have a series of anthropomorphic vases, sometimes called "Vase-Goddesses", dated to EM II-EM/MM and usually having feminine features like breasts.[98] Seven of them are embracing jugs with one hand (visible in five cases) in the way similar to baby-nursing.[99] Some of the jugs are shown in more realistic manner, like on the famous Goddess of Myrtos, the Snake Goddess from Koumasa HM 4137 or Koumasa HM 4993 [Fig. 23], in three other cases the jugs are the figurines' shoulders at the same time but the vessels are still recognizable (Koumasa HM 4138, Agios Myron, Trapeza Cave, Yiophyrakia). Except the Trapeza figurine, all others have the jugs at their left shoulders. The formal similarity to Mycenaean *kourotrophoi* is quite clear despite of difference in style and chronology. It makes probable that the intention of Minoan makers of those figurines was to show babies symbolically as jugs. It is not our aim here to discuss the meaning and use of those "Vase-Goddesses". From our point of view it is important that both Early Minoan and much later Mycenaean makers had the same scheme of baby nursing in mind — a baby should be shown on the left side of its mother. This is a widely shared conviction in different areas and epochs. Already Uhrbrock had shown that there is a great prevalence in art of women with children on the left arm[100] although McManus pointed out that in Renaissance paintings of the Madonna with Child in the 13th century the Child is on the left, but in 15th–16th-century scenes the child is usually on the right, which change can be explained by developments in theology.[101] It seems that in our case the artists were guided by the observation of real mothers who tend to carry their children on the left sides regardless their handedness whatever the reason for that is.[102]

Before coming to the conclusions we can briefly mention some other representations which can be of some use in this discussion.

The Saffron Gatherers from LC I Akrotiri[103] use their right (far) hands for picking the crocuses (the older one uses her left one for holding a basket). The great majority of pictures representing modern saffron gatherers from Morocco, Iran etc. show them using their hands exactly in the same way. To make the picture less clear, we have to note that the monkey from the MM III/LM I Saffron

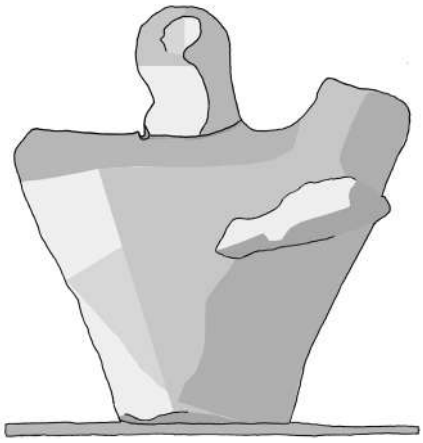

Fig. 23. "Vase-Goddess" from Koumasa, HM 4993
(drawing by L. Goodison after Xanthoudides 1924, pl. 19:4993)

[97] Budin 2016, pp. 596–598; Olsen 1998, pp. 388–390.
[98] See esp. Budin 2010, pp. 23–24; Cadogan 2010; Fowden 1990; Goodison 2009, pp. 235–236; Nikolaïdou 2012, pp. 44–46; Peatfield 1995, p. 223.
[99] Fowden 1990, pp. 17–18; Olsen 1998, p. 388.
[100] Uhrbrock 1973, pp. 32–34.
[101] McManus 2002, p. 330.
[102] McManus 2002, p. 330; Pilafidis-Williams 2009, p. 113; Uhrbrock 1973, p. 34.
[103] Doumas 1992, pp. 130–131, figs. 122–130; on saffron and crocuses in the Aegean Bronze Age, see Day 2011.

Gatherer fresco from Knossos (Im. Kn. no. 1) uses its left (near) hand for picking saffron.[104] Because this is only a small fragment we do not know what the right hand was doing. It is also possible that the painter hadn't been concerned with handedness because his subject was an animal or had other reasons to show it this way. On the other hand the Gatherers from Akrotiri are moving left,[105] thus they compose very nicely with their right hands stretching out horizontally in front of them.

Some of the LM IIIB1 idols from the House of the Idols at Mycenae were carrying objects, now lost, in their raised right hands but never in left ones.[106] Probably those objects were hammers/axes[107] or weapons.[108] Nevertheless, those idols were right-handed.

Less instructive is the case of LH IIIB frescos depicting women carrying idols/little girls in their right (near) hands. We know two such cases from Tiryns (Rod. Tir. no. 103) and Mycenae.[109] Related to those frescos is a female procession from a Tanagra LH IIIB larnax CM 50, where the leading figure seems to carry a small figurine on her left (far) hand. In this case the range of interpretations is wider,[110] thus it is very difficult to tell if the far hand had been chosen because for some reason it was important to engage the left one for this ritual action (funerary context) or maybe it was just the matter of composition.

On larnakes from Tanagra tombs 6 (CM 31) and 51 (CM 45, 46) there are figures touching columns or chequered objects with their far hands (right or left). In all these cases, we have symmetrical compositions, which probably explains the use of different hands. Taking into account also the duel scene mentioned above, we can suppose that the Tanagra artists were not especially concerned with handedness, and the composition was more important to them.

Two women shown carrying necklaces on frescos from Akrotiri[111] and Mycenae[112] (LC IA and LH IIIB) are turned in opposite direction and handle their objects in the far hands which are respectively the left and the right one. This difference can have many explanations such as various traditions, the meanings of this gesture, the character of the depicted women (e.g., a mortal one as opposed to a goddess).

In the light of the evidence presented above, it is clear that figures using their right hands are shown much more frequently than the others. It is absolutely clear as concerns three-dimensional representations, which are very rarely occupied with skilled activities: mostly *kourotrophoi* and performers of ritual gestures. In the first case we are not dealing with handedness and in the second one the role of the hands was defined on religious or cultural grounds but both prove convincingly that the artists depicted such lateralities in line with reality. In the two-dimensional representations, the unimanual skilled actions are almost always performed with right hands and bimanual in ways typical for right-handers. The number of warriors, hunters, or charioteers shown as left-handers is very low and the musicians are all right-handers. The same applies, somewhat surprisingly, to the unskilled action of the carrying of large or heavy vessels where the right hands hold vessels handles and the left ones support bottoms. It was shown that way, regardless the orientation of the subjects. About half of all exceptions to right-handedness are to be found in vase painting or on larnakes which both present schematic and simplified styles. In one case at least, the artist from Tanagra, realism was sacrificed for the symmetry of the duel scene. We can conclude

[104] Evans 1921, pp. 265–266, pl. IV.
[105] Vlachopoulos 2008, p. 453.
[106] Moore, Taylour 2000, cat. nos. 69-63, 68-1572, 68-1589.
[107] Moore, Taylour 2000, pp. 93–101.
[108] Whittaker 2009, pp. 102–103.
[109] Kritseli-Providi 1982, cat. no. B-2. For the reconstruction and discussion, see also, e.g., Boulotis 1979; Immerwahr 1990, My. no. 4, Ti. no. 4, pp. 119–120; Budin 2007–2008, pp. 102–103; Jones 2009.
[110] Spyropoulos 1974, pp. 12–13 (palladion); Cavanagh, Mee 1995, pp. 46–47 (soul or small goddess); Immerwahr 1995, p. 117 (figurine); Gallou 2005, pp. 57–58 (*theophoreia*).
[111] Doumas 1992, pp. 121–130, figs. 100–108; Vlachopoulos 2008, p. 453.
[112] Kritseli-Providi 1982, cat. no. B-1 ("Mykenaia"); Jones 2009.

that the majority of artists depicting those skilled and unskilled activities were correct as regards the handedness of their subjects. It is also clear that the right hand was usually the near hand which means that the figures were usually turned to the right. This is especially true as regards swords, daggers and spears (the last ones when operated both bi- and unimanually). The charioteers using whips or goads, archers and musicians but also the holders of large vessels although represented as right-handed could be oriented right as well as left. For some reason in this case, it was not so important to depict their right hands as the near ones. We can hypothesize that such activities, involving both hands, made them more equal and their actions less characteristic.

Although the right-handedness of warriors and hunters was so important for artists, the real position of scabbards, connected with handedness, usually correctly shown in terracottas, was much less important for vase painters who were concerned with depicting them on the near sides of their owners, irrespective of whether they were left or right ones. A similar situation is seen in the case of carrying spears and other long objects on shoulders (this time shown mostly on frescos) which should be the near ones. Raising up small drinking vessels, usually kylikes, known from paintings on walls, vases and larnakes can be performed with the right as well as the left hand which can be near or far as well. In this case there is no difference between frescos and other media. Gestures of raised hands known from LH vase paintings are performed with left, always far hands. Perhaps Mycenaean gestures have different meaning than those known from Minoan terracottas and bronzes.

Even though the Aegean art is not "realistic",[113] the artists when creating their world(s) used elements well known to them and right-handedness was so common that they even didn't have to think about it to show most of their subjects as right-handers. The same applies to activities with hand preference, whatever were the grounds of such literalities: biological, instinctive, cultural, ritual etc. which were commonly performed as gestures. But I think that artists did it at least in some cases deliberately, e.g. the Silver Battle Krater from Mycenae where it would be much easier for the artist to show warriors oriented left as left-handed instead of right-handed. On the other hand, the list of possible candidates for left-handers shown as such deliberately is very short. The most probable, although not completely sure, are depictions on the Stele V, the Silver Battle Krater and Lion Hunt Dagger from Mycenae, the collared jug from Knossos, and the larnax from Armenoi. Many cases of "left handedness" resulted probably from the fact that the composition was more important for some artists than the depiction of handedness like on the Kynos krater.

It seems also that this tendency to represent right-handed subjects or the real arrangement of hands in unskilled actions was common among the Aegean artists regardless of chronology, culture or sex of represented figures.

Abbreviations

CM	Cavanagh, Mee 1995: catalogue of Tanagra larnakes
HM	Heraklion Museum inv. number
Im.	Immerwahr 1990: catalogue of the Aegean frescos
Rod. Myk.	Rodenwaldt 1921: the publication of frescos from Mycenae
Rod. Tir.	Rodenwaldt 1912: publication of frescos from Tiryns
Sak.	Sakellarakis 1992: the catalogue of Mycenaean pictorial vases from the National Archaeological Museum at Athens
VK	Vermeule, Karageorghis 1982: the catalogue of Mycenaean pictorial vase painting

[113] Estrin 2015, esp. p. 120.

Bibliography

Alexiou 1967 — S. Alexiou, *Υστερομινωικοί τάφοι λιμένος Κνωσού (Κατσαμπά) / Ysterominōikoi taphoi limenos Knōsou (Katsampa)* [Late Minoan tombs of the Knossos harbour (Katsamba)] (= *Βιβλιοθήκη της εν Αθήναις Αρχαιολογικής Εταιρείας* 56), Athens.

Baurain 1985 — C. Baurain, "Pour une autre interprétation des génies minoens", [in:] *L'iconographie minoenne. Actes de la Table Ronde d'Athènes (21–22 avril 1983)*, ed. P. Darcque, J.-Cl. Poursat (= *Suppléments au Bulletin de correspondance hellénique* 11), Paris, pp. 95–118.

Baurain, Darcque 1983 — C. Baurain, P. Darcque, "Un triton en pierre à Malia", *Bulletin de correspondance hellénique* 107, pp. 3–73.

Blakolmer 2009 — F. Blakolmer, "The silver Battle Krater form Shaft Grave IV at Mycenae: evidence of fighting 'heroes' on Minoan palace walls at Knossos?", [in:] *Epos: Reconsidering Greek Epic and Aegean Bronze Age Archaeology. Proceedings of the 11th International Aegean Conference, Los Angeles, UCLA – The J. Paul Getty Villa, 20–23 April 2006*, ed. S. P. Morris, R. Laffineur (= *Aegaeum* 28), Liège, pp. 213–224.

Blakolmer 2015 — F. Blakolmer, "The many-faced 'Minoan Genius' and his iconographical prototype Taweret. On the character of Near Eastern religious motifs in Neopalatial Crete", [in:] *There and Back Again – The Crossroads II. Proceedings of an International Conference Held in Prague, September 15–18, 2014*, ed. J. Mynářová, P. Onderka, P. Pavúk, Prague, pp. 197–219.

Blakolmer 2019 — F. Blakolmer, "No kings, no inscriptions, no historical events? Some thoughts on the iconography of rulership in Mycenaean Greece", [in:] *From 'LUGAL.GAL' to 'Wanax'. Kingship and Political Organisation in the Late Bronze Age Aegean*, ed. J. M. Kelder, W. J. I. Waal, Leiden, pp. 49–94.

Blegen, Rawson 1966 — C. W. Blegen, M. Rawson, *The Palace of Nestor at Pylos in Western Messenia*, vol. I: *The Buildings and Their Contents*, Princeton.

Boulotis 1979 — Ch. Boulotis, "Zur Deutung des Freskofragmentes Nr 103 aus der tirynther Frauenprozession", *Archäologisches Korrespondenzblatt* 9, pp. 59–67.

Brecoulaki *et alii* 2008 — H. Brecoulaki, C. Zaitoun, S. R. Stocker, J. L. Davis, "An archer from the Palace of Nestor: a new wall-painting fragment in the Chora Museum", *Hesperia* 77, pp. 363–397.

Budin 2007–2008 — S. L. Budin, "A new look at the Mavrospelio 'Kourotrophos'", *Aegean Archaeology* 9, pp. 91–103.

Budin 2010 — S. L. Budin, "Maternity, children and 'Mother Goddesses' in Minoan iconography", *Journal of Prehistoric Religion* 22, pp. 6–38.

Budin 2011 — S. L. Budin, *Images of Woman and Child from the Bronze Age: Reconsidering Fertility, Maternity, and Gender in the Ancient World*, Cambridge.

Budin 2016 — S. L. Budin, "Maternity in the Bronze Age Aegean", [in:] *Women in Antiquity: Real Women across the Ancient World*, ed. S. L. Budin, J. M. Turfa, Abingdon – New York, pp. 595–607.

Cadogan 2010 — G. Cadogan, "Goddess, nymph or housewife; and water worries at Myrtos?", [in:] *Cretan Offerings: Studies in Honour of Peter Warren*, ed. O. Krzyszkowska (= *British School at Athens Studies* 18), London, pp. 41–47.

Cameron, Mayer 1995 — M. Cameron, A. Mayer, "Frescoes", [in:] I. Tournavitou, *The 'Ivory Houses' at Mycenae* (= *British School at Athens Supplementary Volume* 24), London, pp. 280–283.

Cashmore, Uomini, Chapelain 2008 L. Cashmore, N. Uomini, A. Chapelain, "The evolution of handedness in humans and great apes: a review and current issues", *Journal of Anthropological Sciences* 86, pp. 7–35.

Catania 2012 A. M. Catania, *Le larnakes dipinte nel TM III: analisi iconografica e stilistica*, Catania, unpublished MA thesis.

Cavanagh, Mee 1995 M. Cavanagh, Ch. Mee, "Mourning before and after the Dark Age", [in:] *Klados. Essays in Honour of J. N. Coldstream*, ed. Ch. Morris, C. E. Morris (= *Bulletin of the Institute of Classical Studies. Supplement* 65), London, pp. 45–61.

Corballis 2003 M. C. Corballis, "From mouth to hand: gesture, speech, and the evolution of right-handedness", *Behavioral and Brain Sciences* 26, pp. 199–260.

Coren, Porac 1977 S. Coren, C. Porac, "Fifty centuries of right-handedness: the historical perspective", *Science* 187 (4317), pp. 631–632.

Crouwel 1981 J. H. Crouwel, *Chariots and Other Means of Land Transport in Bronze Age Greece* (= *Allard Pierson Series* 3), Amsterdam.

Crouwel, Morris 1995 J. H. Crouwel, C. E. Morris, "Pictorial pottery of Late Minoan II-III A2 Early from Knossos", *Annual of the British School at Athens* 90, pp. 157–182.

Crowley 2008 J. L. Crowley, "Mycenaean art and architecture", [in:] *The Cambridge Companion to the Aegean Bronze Age*, ed. C. W. Shelmerdine, Cambridge, pp. 258–288.

Dakoronia 2006a F. Dakoronia, "Mycenaean Pictorial Style at Kynos, East Locris", [in:] *Pictorial Pursuits: Figurative Painting on Mycenaean and Geometric Pottery. Papers from Two Seminars at the Swedish Institute at Athens in 1999 and 2001*, ed. E. Rystedt, B. Wells, Stockholm, pp. 23–29.

Dakoronia 2006b F. Dakoronia, "Bronze Age pictorial tradition on Geometric pottery", [in:] *Pictorial Pursuits: Figurative Painting on Mycenaean and Geometric Pottery. Papers from Two Seminars at the Swedish Institute at Athens in 1999 and 2001*, ed. E. Rystedt, B. Wells, Stockholm, pp. 171–176.

Day 2011 J. Day, "Crocuses in context: a diachronic survey of the crocus motif in the Aegean Bronze Age", *Hesperia* 80, pp. 337–379.

Demakopoulou 1982 K. Demakopoulou, *Το μυκηναϊκο ιερο στο Αμυκλαίο και η ΥΕ ΙΙΙ Γ περίοδος στη Λακωνία* / *To mykēnaïko iero sto Amyklaio kai ē YE III Γ periodos stē Lakōnia* [The Mycenaean temple at Amyklaion and the LH IIIC Period in Laconia], Athens.

Demakopoulou, Divari-Valakou 2001 K Demakopoulou, N. Divari-Valakou, "Evidence of cult practice at Midea", [in:] *Potnia, Deities and Religion in the Aegean Bronze Age. Proceedings of the 8th International Aegean Conference. Göteborg, Göteborg University, 12–15 April 2000*, ed. R. Laffineur, R. Hägg (= *Aegaeum* 22), Liège – Austin, pp. 181–191.

Dennis 1958 W. Dennis, "Early graphic evidence of dextrality in man", *Perceptual and Motor Skills* 8, pp. 147–149.

Doumas 1992 Ch. Doumas, *The Wall-Paintings of Thera*, Athens.

Eaton-Krauss 1984 M. Eaton-Krauss, *The Representations of Statuary in Private Tombs of the Old Kingdom*, Wiesbaden.

Eckstein 1959 F. Eckstein, Review of: *Greek, Etruscan and Roman Antiquities. An Exhibition from the Collection of Walter Cummings Baker Esq. Held at the Century Association, New York 17.5.1950–25.9.1950* by René D'Harnoncourt, Dietrich v. Bothmer; *Ancient Art in American Private Collections. A Loan Exhibition at the Fogg Art Museum of Harvard University 28.12.1954–15.2.1955*, *Gnomon* 31, pp. 639–646.

Eckstein 1961 F. Eckstein, Review of: *Meisterwerke griechischer Kunst* by Karl Schefold, *Gnomon* 33, pp. 400–406.

Estrin 2015 — S. Estrin, "Living surfaces: the materiality of Minoan wall paintings", [in:] *Beyond Iconography: Materials, Methods and Meaning in Ancient Surface Decoration*, ed. S. Lepinski, S. McFadden, Boston, pp. 109–125.

Evans 1921 — A. Evans, *The Palace of Minos at Knossos*, vol. I, London.

Evans 1928 — A. Evans, *The Palace of Minos at Knossos*, vol. II.2, London.

Evans 1935 — A. Evans, *The Palace of Minos at Knossos*, vol. IV.2, London.

Fazzini 2010 — R. Fazzini, "Aspects of the Mut's Temple's contra-temple at south Karnak Part II", [in:] *Offerings to the Discerning Eye: An Egyptological Medley in Honor of Jack A. Josephson*, ed. S. D'Auria, Leiden, pp. 83–103.

Fowden 1990 — E. Fowden. "The Early Minoan goddess: images of provision", *Journal of Prehistoric Religion* 3–4, pp. 15–18.

French 1985 — E. French, "The figures and figurines", [in:] *The Archaeology of Cult: The Sanctuary at Phylakopi*, ed. C. Renfrew (= *British School at Athens Supplementary Volume* 18), London, pp. 209–280.

French 2002 — E. French, *Mycenae: Agamemnon's Capital. The Site and Its Setting*, Stroud, Gloucestershire.

Gallet de Santerre, Tréheux 1947–1948 — H. Gallet de Santerre, J. Tréheux, "Rapport sur le dépôt égéen et géométrique de l'Artémision à Délos", *Bulletin de correspondance hellénique* 71–72, pp. 148–254.

Gallou 2005 — Ch. Gallou, *The Mycenaean Cult of the Dead* (= *BAR International Series* 1373), Oxford.

Gill 1964 — M. A. V. Gill, "The Minoan 'Genius'", *Athenische Mitteilungen* 79, pp. 1–21.

Goodison 2009 — L. Goodison, "Gender, body and the Minoans: contemporary and prehistoric perceptions", [in:] *FYLO. Engendering Prehistoric 'Stratigraphies' in the Aegean and the Mediterranean. Proceedings of an International Conference, University of Crete, Rethymno, 2–5 June 2005*, ed. K. Kopaka (= *Aegaeum* 30), Liège – Austin, pp. 234–241.

Hertz 1960 — R. Hertz, *Death and the Right Hand*, Glencoe, IL [English translation of the French original texts from 1907 and 1909].

Heurtley 1921–1922 — W. A. Heurtley, "The grave stelai", *Annual of the British School at Athens* 25, pp. 126–146.

Hitchcock 1997 — L. A. Hitchcock, "Engendering domination: a structural and contextual analysis of Minoan Neopalatial bronze figurines", [in:] *Invisible People and Processes. Writing Gender and Childhood into European Archaeology*, ed. J. Moore, E. Scott, London – New York.

Hood 1953 — M. S. F. Hood, "A Mycenaean cavalryman", *Annual of the British School at Athens* 48**,** pp. 84–93.

Immerwahr 1990 — S. A. Immerwahr, *Aegean Painting in the Bronze Age*, London.

Immerwahr 1995 — S. A. Immerwahr, "Death and the Tanagra larnakes", [in:] *The Ages of Homer: A Tribute to Emily Townsend Vermeule*, ed. J. B. Carter, S. P. Morris, Austin, pp. 109–122.

Jones 2009 — B. R. Jones, "New reconstructions of the 'Mykenaia' and a Seated Woman from Mycenae", *American Journal of Archaeology* 113, pp. 309–337.

Karo 1930 — G. Karo, *Die Schachtgräber von Mykenai*, Munich.

Koehl 1986 — R. B. Koehl, "The Chieftain Cup and a Minoan rite of passage", *Journal of Hellenic Studies* 106, pp. 99–110.

Koehl 2006 — R. B. Koehl, *Aegean Bronze Age Rhyta* (= *Prehistory Monographs* 19), Philadelphia, PA.

Kountouri 2018 — E. Kountouri "Part of iconographic 'koine'? Discussing new wall paintings from Thebes", [in:] *ΧΡΩΣΤΗΡΕΣ* / *PAINTBRUSHES. Wall--painting and Vase-painting of the Second Millennium BC in Dialogue:*

Proceedings of the International Conference on Aegean Iconography Held at Akrotiri, Thera, 24–26 May 2013, ed. A. G. Vlachopoulos, Athens, pp. 451–463.

Kramer-Hajos 2015 — M. Kramer-Hajos, "Mourning on the larnakes at Tanagra: gender and agency in Late Bronze Age Greece", *Hesperia* 84, pp. 627–667.

Kritseli-Providi 1982 — I. Kritseli-Providi, *Τοιχογραφίες τοῦ θρησκευτικοῦ κέντρου τῶν Μυκηνῶν* / *Toichographies tou thrēskeutikou kentrou tōn Mykēnōn* [Wall-paintings from the cult centre at Mycenae], Athens.

Laffineur (ed.) 1989 — *Transition: le monde égéen du Bronze Moyen au Bronze Récent: Actes de la deuxième Rencontre égéenne internationale de l'Université de Liège, 19–20 avril 1988*, ed. R. Laffineur (= *Aegaeum* 3), Liège.

Lang 1969 — M. L. Lang, *The Palace of Nestor at Pylos in Western Messenia*, vol. II: *The Frescoes*, Princeton.

Llaurens, Raymond, Faurie 2009 — V. Llaurens, M. Raymond, C. Faurie, "Why are some people left-handed? An evolutionary perspective", *Philosophical Transactions of* the *Royal Society of London* B 364, pp. 881–894.

Long 1974 — Ch. R. Long, *The Ayia Triadha Sarcophagus: A Study of Late Minoan and Mycenaean Funerary Practices and Beliefs* (= *Studies in Mediterranean Archaeology* 41), Göteborg.

Long 1978 — Ch. R. Long, "The Lasithi Dagger", *American Journal of Archaeology* 82/1, pp. 35–46.

Mallory 1989 — J. P. Mallory, *In Search of the Indo-Europeans: Language, Archaeology, and Myth*, London.

Manning 2010 — S. W. Manning, "Chronology and terminology", [in:] *The Oxford Handbook of the Bronze Age Aegean (ca. 3000–1000 BC)*, ed. E. H. Cline, Oxford, pp. 11–28.

Marinatos 1993 — N. Marinatos, *Minoan Religion: Ritual, Image, and Symbol*, Columbia.

McManus 2002 — Ch. McManus, *Right Hand, Left Hand: the Origins of Asymmetry in Brains, Bodies, Atoms and Cultures*, London.

Meroussis 2018 — N. Meroussis, "Larnax-painters and vase-painters: *vitae parallelae* in Late Minoan III Crete", [in:] *ΧΡΩΣΤΗΡΕΣ* / *PAINTBRUSHES. Wall-painting and Vase-painting of the Second Millennium BC in Dialogue: Proceedings of the International Conference on Aegean Iconography held at Akrotiri, Thera, 24–26 May 2013*, ed. A. G. Vlachopoulos, Athens, pp. 339–357.

Mollard-Besques 1954 — S. Mollard-Besques, *Musée National du Louvre. Catalogue raisonné des figurines et reliefs de terre cuite grecs, étrusques et romains*, vol. I: *Époques préhellénique, géométrique, archaïque, et classique*, Paris.

Moore, Taylour 2000 — A. D. Moore, W. D. Taylour, *Well Built Mycenae*, fasc. 10: *The Temple*, Cambridge.

Morris 2001 — C. Morris, "The language of gesture in Minoan religion", [in:] *Potnia, Deities and Religion in the Aegean Bronze Age. Proceedings of the 8th International Aegean Conference. Göteborg, Göteborg University, 12–15 April 2000*, ed. R. Laffineur, R. Hägg (= *Aegaeum* 22), Liège – Austin, pp. 245–251.

Morris, Peatfield 2002 — C. Morris, A. Peatfield, "Feeling through the body. Gesture in Cretan Bronze Age religion", [in:] *Thinking through the Body. Archaeologies of Corporeality*, ed. Y. Hamilakis, M. Pluciennik, S. Tarlow, New York, pp. 105–120.

Mountjoy 2011 — P. A. Mountjoy, "A Bronze Age ship from Ashkelon with particular reference to the Bronze Age ship from Bademgediği Tepe", *American Journal of Archaeology* 115/3, pp. 483–488.

Murray, Smith, Walters 1900 — A. S Murray, A. H. Smith, H. B. Walters, *Excavations in Cyprus: Bequest of Miss E. T. Turner to the British Museum*, London.

Mylonas 1973 — G. E. Mylonas, *O Ταφικός Κύκλος Β των Μυκηνών* / *O Taphikos Kyklos B tōn Mykēnōn* [The Grave Circle B at Mycenae], Athens.

Needham 1973 — R. Needham, "Right and Left in Nyoro symbolic classification", [in:] *Right and Left. Essays on Dual Symbolic Classification*, ed. R. Needham, Chicago – London 1973, pp. 299–341 (= "Right and Left in Nyoro symbolic classification", *Africa* 34/4, 1967, pp. 425–452).

Nicolaïdou 2012 — M. Nicolaïdou, "Looking for Minoan and Mycenaean women: paths of feminist scholarship towards the Aegean Bronze Age", [in:] *A Companion to Women in the Ancient World* (*Blackwell Companions to the Ancient World. Ancient History*), ed. S. L. James, S. Dillon, Oxford – Chichester, pp. 38–53.

Niemeier 1988 — W.-D. Niemeier, "The 'Priest King' fresco from Knossos. A new reconstruction and interpretation", [in:] *Problems in Greek Prehistory: Papers Presented at the Centenary Conference of the British School of Archaeology at Athens. Manchester, April 1986*, ed. E. B. French, K. A. Wardle, Bedminster – Bristol, pp. 235–244.

Nikolakopoulou 2010 — I. Nikolakopoulou, "Middle Cycladic iconography: a social context for 'A new chapter in Aegean Art'", [in:] *Cretan Offerings: Studies in Honour of Peter Warren*, ed. O. Krzyszkowska (= *British School at Athens Studies* 18), London, pp. 213–222.

Olsen 1998 — B. Olsen, "Women, children and the family in the Late Aegean Bronze Age: differences in Minoan and Mycenaean constructions of gender", *World Archaeology* 29, pp. 380–392.

Papadopoulos 2009 — A. Papadopoulos, "Warriors, hunters and ships in the Late Helladic IIIC Aegean: changes in the iconography of warfare?", [in:] *Forces of Transformation: The End of the Bronze Age in the Mediterranean. Proceedings of an International Symposium Held at St John's College, University of Oxford, 25–26 March 2006*, ed. Ch. Bachhuber, R. R. Gareth (= *BANEA Publication Series* 1), Oxford, pp. 69–77.

Papadopoulos 2019 — A. Papadopoulos, "*Mneme* and propaganda in the Early Late Bronze Age Aegean: the case of the 'Siege Rhyton'", [in:] *MNHMH/MNEME. Past and Memory in the Aegean Bronze Age. Proceedings of the 17th International Aegean Conference, University of Udine, Department of Humanities and Cultural Heritage, Ca' Foscari University of Venice, Department of Humanities, 17–21 April 2018*, ed. E. Borgna *et alii* (= *Aegaeum* 43), Leuven – Liège, pp. 405–412.

Peatfield 1995 — A. A. D. Peatfield, "Water, fertility, and purification in Minoan religion", [in:] *Klados. Essays in Honour of J. N. Coldstream*, ed. Ch. Morris, C. E. Morris (= *Bulletin of the Institute of Classical Studies. Supplement* 63), London, pp. 217–227.

Pierson *et alii* 2018 — Ch. L. Pierson, P. W. brewer, D. Brown, T. J. Heaton, G. W. L. Hodgins, A. J. T. Jull, T. Lange, M. W. Salzer, "Annual radiocarbon record indicates 16th century BCE date for the Thera eruption", *Science Advances* 4/8 (15 August 2018): eaar8241. DOI: 10.1126/sciadv.aar8241.

Pilafidis-Williams 2009 — K. Pilafidis-Williams, "The Mycenaean kourotrophos figurine at the Sanctuary of Aphaia on Aigina", [in:] *Encounters with Mycenaean Figures and Figurines. Papers Presented at the Seminar at the Swedish Institute at Athens, 27–29 April 2001*, ed. A.-L. Schallin (= *Acti Instituti Atheniensis Regni Sueciae, Series in 8* 20), Stockholm, pp. 113–124.

Platon 1947 — N. Platon, "Η αρχαιολογική κίνησης εν Κρήτη κατά τα έτη 1941–1947 / Ē archaiologikē kinēsēs en Krētē kata ta etē 1941–1947" [Archaeological activities in Crete in years 1941–1947], *Κρητικά Χρονικά: Κείμενα και μελέται της κρητικής ιστορίας* 1, pp. 631–640.

Platonos 2008 — M. Platonos, "Εικονιστική σαρκοφάγος από την Επισκοπή Ιεράπετρας / Eikonistikē sarkophagos apo tēn Episkopē Ierapetras" [Painted sarcophagus from Episope Hierapetras], [in:] *Amicitiae Gratia. Τόμος στη μνήμη Αλκμήνης Σταυρίδη*, ed. D. Zafiropoulou, Athens, pp. 17–34 (*n.v.*).

Poursat 1977a — J.-C. Poursat, *Catalogue des ivoires mycéniens du Musée National d'Athènes* (= *Bibliothèque des Écoles françaises d'Athènes et de Rome* 230bis), Paris.

Poursat 1977b — J.-C. Poursat, *Les ivoires mycéniens: essai sur la formation d'un art mycénien* (= *Bibliothèque des Écoles françaises d'Athènes et de Rome* 230), Paris.

Rehak 1995 — P. Rehak, "The 'Genius' in Late Bronze Age glyptic: the later evolution of an Aegean cult figure", [in:] *Sceaux Minoens et Mycéniens, IV symposium international, 10–12 septembre 1992, Clermont-Ferrand*, ed. W. Müller (= *Corpus der minoischen und mykenischen Siegel. Beiheft* 5), Berlin, pp. 215–231.

Rethemiotakis 2001 — G. Rethemiotakis**,** *Μινωικά πήλινα ειδώλια από την νεοανακτορική έως την υπομινωική περίοδο / Minōika pēlina eidōlia apo tēn neoanaktorikē eōs tēn ypominōikē periodo* [Minoan clay idols from the New Palatial and Sub-Minoan periods] (= *Βιβλιοθήκη της εν Αθηναις Αρχαιολογικής Εταιρείας* 218), Athens.

Rodenwaldt 1912 — G. Rodenwaldt, *Tiryns II. Die Fresken des Palastes*, Athens.

Rodenwaldt 1921 — G. Rodenwaldt, *Die Fries des Megarons von Mykenai*, Halle.

Rutkowski 1991 — B. Rutkowski, *Petsophas. A Cretan Peak Sanctuary* (= *Studies and Monographs in Mediterranean Archaeology and Civilization*, series I, 1), Warsaw.

Sakellarakis 1992 — J. A. Sakellarakis, *The Mycenaean Pictorial Style in the National Archaeological Museum of Athens*, Athens.

Sakellariou 1974 — A. Sakellariou, "Un cratère d'argent avec scène de bataille provenant de la IV[e] tombe de l'acropole de Mycènes", *Antike Kunst* 17, pp. 3–20.

Sapouna-Sakellarakis 1995 — E. Sapouna-Sakellarakis, *Die bronzenen Menschenfiguren auf Kreta und in der Ägäis* (= *Prähistorische Bronzefunde* I.5), Stuttgart.

Schoinas 1999 — Ch. Schoinas, "Εικονιστική παράσταση σε όστρακα κρατήρα από την Αγ. Τριάδα Ηλείας / Eikonistikē parastasē se ostraka kratēra apo tēn Ag. Triada Ēleias" [Krater sherds with pictorial representations from Aghia Triadha Elias], [in:] *Η περιφέρεια του μυκηναϊκού κόσμου, Πρακτικά Α΄ Διεθνούς Διεπιστημονικού Συμποσίου, Λαμία 25–29 Σεπτεμβρίου 1994*, ed. E. Phroussou, Lamia, pp. 257–262.

Singg, Martin 2016 — S. Singg, Z. Martin, "Left-handedness and artistic abilities: a first look", *Biology and Medicine* 8/2 (no page numbers).

Smith 1949 — W. S. Smith, *A History of Egyptian Sculpture and Painting in the Old Kingdom* (2nd. ed.), London.

Spenneman 1984 — D. H. R. Spenneman, "Right- and left-handedness in Early Southeast Asia: the graphic evidence of the Borobudur", *Bijadragen lot de Tall--Land en Volkenkunde* 140/1, pp. 163–166.

Spyropoulos 1974 — Th. Spyropoulos, "Ανασκαφή Μυκηναϊκής Τανάγρας / Anaskaphē Mykēnaïkēs Tanagras" [Excavations of Mycenaean Tanagra], *Πρακτικά της εν Αθήναις Αρχαιολογικής Εταιρείας*, pp. 9–33.

Spyropoulos 2015 — Th. Spyropoulos, "Wall paintings from the Mycenaean palace of Boiotian Orchomenos", [in:] *Mycenaean Wall Paintings in Context: New Discoveries, Old Finds Reconsidered*, ed. H. Brecoulaki, J. L. Davis, S. R. Stoker, Athens, pp. 355–370.

Steele, Uomini 2005 — J. Steele, N. Uomini, "Humans, tools, and handedness", [in:] *Stone Knapping: The Necessary Conditions for a Uniquely Hominin Behaviour*, ed. V. Roux, B. Bril, Cambridge, pp. 217–239.

Tournavitou 1995 — I. Tournavitou, 'The Mycenaean ivories from the Artemision at Delos', *Bulletin de correspondance hellénique* 119, pp. 479–527.

Tournavitou 2015 — I. Tournavitou, "Sport, prestige, and ritual outside the palaces: pictorial frescoes from the West House at Mycenae", [in:] *Mycenaean Wall Paintings in Context: New Discoveries, Old Finds Reconsidered*, ed. H. Brecoulaki, J. L. Davis, S. R. Stoker, Athens, pp. 145–169.

Tournavitou, Brecoulaki 2015 — I. Tournavitou, H. Brecoulaki, "The Mycenaean wall paintings from Argos: a preliminary presentation", [in:] *Mycenaean Wall Paintings in Context: New Discoveries, Old Finds Reconsidered*, ed. H. Brecoulaki, J. L. Davis, S. R. Stoker, Athens, pp. 212–245.

Tzedakis 1971 — Y. Tzedakis, "Λάρνακες Υστερομινωικού νεκροταφείου Αρμένων Ρεθύμνης / Larnakes Ysteromin̄oikou nekrotapheiou Armen̄on Rethymn̄es" [Larnakes from the Late Minoan cemetery at Armenoi Rethymni], *Athens Annals of Archaeology* 4/2, pp. 216–222.

Uhrbrock 1973 — R. S. Uhrbrock, "Laterality in art", *The Journal of Aesthetics and Art Criticism* 32/1, pp. 27–35.

Uomini 2009 — N. T. Uomini, "The prehistory of handedness: Archaeological data and comparative ethology", *Journal of Human Evolution* 57, pp. 411–419.

Uomini, Ruck 2018 — N. Uomini, L. Ruck, "Chapter 11. Manual laterality and cognition through evolution: An archeological perspective", [in:] *Cerebral Lateralization and Cognition: Evolutionary and Developmental Investigations of Behavioral Biases*, ed. G. S. Forrester *et alii* (= *Progress in Brain Research* 238), London, pp. 295–323.

Verlinden 1984 — C. Verlinden, *Les statuettes antropomorphiques crétoises en bronze et en plomb du III^e^ millénaire au VII^e^ siècle av. J.-C.* (= *Archaeologia transatlantica* 4), Providence – Louvain-la-Neuve.

Vermeule, Karageorghis 1982 — E. Vermeule, V. Karageorghis, *Mycenaean Pictorial Vase Painting*, Cambridge, MA – London.

Vlachopoulos 2008 — A. G. Vlachopoulos, "The wall paintings from the Xeste 3 building at Akrotiri: towards an interpretation of the iconographic programme", [in:] *Horizon: A Colloquium on the Prehistory of the Cyclades*, ed. N. Brodie, Cambridge, pp. 451–465.

Vlachopoulos 2015 — A. G. Vlachopoulos, "Detecting 'Mycenaean' elements in the 'Minoan' wall paintings of a 'Cycladic' settlement: the wall paintings at Akrotiri, Thera, within their iconographic *koine*", [in:] *Mycenaean Wall Paintings in Context: New Discoveries, Old Finds Reconsidered*, ed. H. Brecoulaki, J. L. Davis, S. R. Stoker, Athens, pp. 37–65.

Vonhoff 2008 — Ch. Vonhoff**,** *Darstellungen von Kampf und Krieg in der minoischen und mykenischen Kultur* (= *Internationale Archäologie* 109), Rahden/Westf.

Wace 1953 — A. J. B. Wace, "Mycenae, 1939–1952. Part I: Preliminary report on the excavations of 1952", *Annual of the British School at Athens* 48, pp. 1–18.

Wedde 1999a — M. Wedde, "Talking hands. A study of Minoan and Mycenaean ritual gesture. Some preliminary notes", [in:] *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters His 65th Year*, ed. Ph. Betancourt *et alii* (= *Aegaeum* 20), Liège, pp. 911–920.

Wedde 1999b — M. Wedde, "War at sea: The Mycenaean and Early Iron Age oared galley", [in:] *Polemos: Le contexte guerier en Égée à l'âge du Bronze. Actes de la 7^e^ Rencontre égéene internationale, Université de Liège, 14–17 avril 1998*, ed. R. Laffineur (= *Aegaeum* 19), Liège – Austin, pp. 465–476.

Weingarten 1991 — J. Weingarten, *The Transformation of Egyptian Taweret into the Minoan Genius: A Study in Cultural Transmission in the Middle Bronze Age* (= *Studies in Mediterranean Archaeology* 88), Partille.

Whittaker 2009 — H. Whittaker, "The cultic function of Mycenaean anthropomorphic terracotta figurines", [in:] *Encounters with Mycenaean Figures and Figurines. Papers Presented at a Seminar at the Swedish Institute at Athens, 27–29 April 2001*, ed. A.-L. Schallin, P Pakkanen (= *Acta Instituti Regni Sueciae, Series in 8* 20), Stockholm, pp. 99–111.

Xanthoudides 1904 — S. A. Xanthoudides, "Εκ Κρήτης / Ek Krētēs" [From Crete], *Αρχαιολογική Εφημερίς*, pp. 1–56.

Xanthoudides 1924 — S. A. Xanthoudides, *The Vaulted Tombs of Mesará: An Account of Some Early Cemeteries of Southern Crete*, London.

Younger 1998 — J. G. Younger, *Music in the Aegean Bronze Age* (= *Studies in Mediterranean Archaeology and Literature. Pocket-book* 114), Jonsered.

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FROM THE HISTORY OF WARSAW ARCHAEOLOGY, OR HOW THIS ACADEMIC DISCIPLINE WAS INAUGURATED IN THE POLISH CAPITAL DESPITE THE ADVERSITIES OF FATE

Abstract: History is a truly important tool for understanding the realities of the present. This is especially true of academic disciplines, which cannot function without understanding the origins of the research questions, the methods of their development, or the limitations of a given era. The case is no different for archaeology, whose history, though equally "ancient", is still underestimated by many. A case in point may be the fate of Warsaw archaeology, which for over 100 years, at the turn of the nineteenth and twentieth centuries, developed in the Russian Partition of Poland. Although the origins of this area of study can be traced back to the mid-eighteenth century in Warsaw, the turbulent political history of the country led to its long-standing stagnation, which was overcome by the efforts of eminent individuals. However, the understanding of archaeology as a private interest of the wealthy did not change until the internal crises in the Russian Empire in 1905. These allowed for an institutional revival in Warsaw. Nevertheless, none of these changes equals the regaining of independence, which became an inspiration to rebuild the country, also in the academic domain. One of the pillars of this reconstruction became the University of Warsaw. Despite adversities, the first chair of prehistoric archaeology in Warsaw was established within the structures of the then newly-founded university, and an outstanding self-taught archaeologist, Erazm Majewski, became its head.

Keywords: history of archaeology, Warsaw archaeology, Erazm Majewski

"Earth gives birth to pots", or the beginnings of interest in antiquities in Poland

Polish activity in the field of research on the past has an extremely old tradition. Jan Długosz (1415–1480) was one of the first to mention the presence of archaeological records as early as in the fifteenth century.[1] For the next three centuries Długosz's "Earth gives birth to pots" was almost a paradigm, reproduced by other Polish and European chroniclers.[2] The idea of "pots being born from the earth" referred to Aristotle's doctrine of matter and form, which were to be created, in a very simplified way, straight from the ground. Such a visualisation was, in a way, made by a Franciscan, Barthélemy de Glanville (identified in sources between 1230 and 1250), who included in his encyclopaedia of philosophy and nature a woodcut illustrating a mountain over water at the foot of which and between two trees animals — a wild boar and a roe deer — emerged from

[1] Abramowicz 1983, p. 30.
[2] Abramowicz 1983, pp. 30–52.

the ground together with pots [Fig. 1]. It was not until the Age of Enlightenment that a breakthrough in thinking occurred, especially in the scholarly societies founded at that time, including the Society for Advancement of Arts and Sciences with branches in Warsaw, Poznań, Cracow, and Lviv. Nevertheless, it was in the Middle Ages that the first "excavations" were carried out in Poland. They were commissioned in 1390 by Louis I of Brzeg (1321–1398) "in search of bishops" (so far it has remained unknown what this term meant), and by Władysław Jagiełło (1362–1434) in 1416 at Nochów, in order to redress the doubts of an Austrian prince, Ernest, about the spontaneously growing vessels in Poland.[3] The real development of interest in antiquities, however, came with the Early Modern Period and the Renaissance. In 1544, the first functional research began — craftsmen and goldsmiths tried to explain the functions of objects from the furnishings found in graves.[4] In 1633, for beatification purposes, the grave of Wincenty Kadłubek was searched for and consequently opened.[5] And in 1656, a real box grave was discovered near Gdańsk, which was also the subject of the first archaeological documentation in the history of Poland.[6] The second half of the seventeenth century brought two important works which not only treated urns as a historical source, but also characterised the customs of the communities in question, in this case the Prussians. The authors, Christoph Hartknoch (1644–1687) and Jacob von Melle (1659–1743), are also associated with a breakthrough in the development of studies in antiquities — they were the first to make references to ancient finds and use literature.[7] In the Age of Enlightenment, a Jesuit priest, Gabriel Rzączyński (1664–1737), came to the forefront of thinkers dealing with antiquity. He gave vent to his knowledge of wide-ranging finds from the Polish lands and was among the first to outline the historical polemics on the subject of "pots born of the earth", unfortunately not insisting consistently on any option (although he does not rule out the enormous power of nature).[8]

Fig. 1. Earth gives birth to pots — pottery presented as a natural resource
(B. de Glanville, *Livre des propriétés des choses*, 1247)
(after Abramowicz 1983, p. 23; modified by the author)

[3] Abramowicz 1983, p. 30.
[4] Abramowicz 1983, p. 93.
[5] Abramowicz 1983, pp. 101–102.
[6] Kostrzewski 1949, p. 6; Kostrzewski 1970.
[7] Abramowicz 1983, pp. 116–137.
[8] Abramowicz 1983, p. 47.

As in other parts of Europe, the main determinant of the chronology of this period became the Holy Bible, according to which ancient history was conducted. Calculations of the Renaissance Period reached for various periodisation solutions, linking the beginnings of the world even to such concrete dates as 4004 BC. This date was defended in particular by an English bishop, James Ussher (1581–1656).[9] Another important object of interest for antiquarians were the frequently discovered Roman coins, which were correctly identified as early as the time of Matthias de Miechów (1457–1523). Apart from time concerns, the affiliation of the collections to specific peoples became another issue. Due to the prestige of Roman culture, as well as the numismatic objects found on Polish lands, people started to interpret Polish history as follows: the case of Krak was similar to that of Romulus, while pagan burial rites started to be traced back to the ancient Romans.[10] This process of *antiquarianisation*, apart from the barbarisation (*ethnologisation*) of finds and *actualism*, i.e. viewing Antiquity from the perspective of one's own historical period, were the main standards of investigating the past. Apart from attitudes aiming at understanding monuments, it was also common to avoid them, among other things, under the pretext of ensuring the peace of the dead. Nevertheless, the research initiated in the Middle Ages, accompanied by the development of natural sciences and philosophical thought in the Renaissance Period, was successful in later times. Classicism, widespread in literature and art, began to play an important role. One of its inspirations was the discovery and exploration of the towns destroyed by the eruption of Vesuvius, which began in the mid-eighteenth century.

The beginnings of interest in antiquities in Poland can therefore be considered above all in the context of the process of recognising different categories of archaeological records. Among the Poles, this interest was sparked by landmarks in the form of graves and burial mounds, pottery, church antiquities, treasures and individual Roman coins. For the longest time, until as late as 1717, stone tools, mainly flint, were often misidentified as the so-called lightning arrows.[11]

"When Poland ceased to exist, it occurred to me for the first time to collect Polish memorabilia, which I entrust to posterity" (Izabela Czartoryska, Polish aristocrat of the Enlightenment)

The aforementioned classicism, which was a continuation of the renaissance cult of Antiquity, became a marker of taste and a cultural model in the age of the Enlightenment. For the Polish territory, however, it was still distant. Fortunately, this state of affairs was overturned by numerous foreign journeys in the eighteenth and the first quarter of the nineteenth century, which were a real breakthrough for the history of archaeology in Poland. These expeditions were attended by members of King Stanisław August Poniatowski's (1732–1798) [Fig. 2] court, as well as other high-born noblemen, including Jan Potocki (1761–1815), Aleksander Sapieha (1733–1812), Zorian Dołęga Chodakowski (1784–1825), Wacław Rzewuski (1784–1831), Józef Sękowski (1800–1858), and Edward Raczyński (1786–1845).[12] They all undertook research journeys to satisfy their historical curiosity. Their activity was later appreciated by one of the greatest Polish poets, Adam Mickiewicz, who wrote about their experimental investigation of history, which was something of a novelty for the era. The impressions came from numerous corners of the world, from the Middle East to Siberia, from North Africa to the shores of Karelia. However, from the beginning, the interest was focused predominantly on the ancient world of Italy, most abundant in ancient records. From

[9] Abramowicz 1983, pp. 193–194.
[10] Abramowicz 1983, pp. 55–64.
[11] Abramowicz 1983, pp. 148–151.
[12] Abramowicz 1987, pp. 15–32; Abramowicz 1991, pp. 11–46.

Fig. 2. King Stanisław August Poniatowski
(source: Polona)

there, for considerable sums of money, the statues and other antiquities were transported by the great gentlemen-enthusiasts to richly-decorated sculpture galleries. These trips, which constitute today's tourist destinations in Rome, Pompeii, Herculaneum, and Sicily, were accompanied by the first insights into the principles of stratigraphy. The most important figure of this period was King Stanisław August himself, who not only personally collected various items (with intention of putting them to public use), but also organised scholarships for every outstanding traveller, artist, and thinker. His interest in Antiquity led to the popularisation of the Classicist style, even known as the Stanislaus style. As a result, many investments referring to the traditions of ancient civilisations were made, especially in the Royal Łazienki residence in Warsaw. Among other things, a stylised amphitheatre was erected there, and the alleys of the residence were decorated with numerous figures representing mythological characters. During the reign of King Stanisław August, thanks to the reform of the Commission for National Education, the knowledge of antiquities was also introduced to schools. Thanks to the activity of Hugo Kołłątaj (1750–1812), a Chair of Antiquities was established at the Crown High School in Cracow in 1782.[13] The King's cadets, including Tadeusz Kościuszko, a world-famous military engineer, statesman, and military leader, as well as the author of numerous drawings of antiquities now kept in the National Museum in Cracow, were also well acquainted with Antiquity. The King's interests were so wide and widely-known that on many occasions people from all over the Republic came to him with collections of antiquities. However, the shock of the first partition in 1772 and the awareness of the threat to the statehood turned Poles' interest in antiquities towards their own past, which was strengthened by the total collapse of the state. This led not only to the expansion of private collections with domestic antiquities, but also to the storage and compilation of monuments by scholarly societies emerging at that time. Their primary purpose was to serve the preservation of the Polish identity. The thriving activities of these societies soon revealed serious problems for Polish academicians, especially those attending to the need to register all the historical finds. The collapse of the state did not stop the development of interest in antiquity, as evidenced by numerous research journeys abroad, the pioneer of which was the already-mentioned Jan Potocki, author of the renowned rogue novel, *Rękopis znaleziony w Saragossie* ("The Saragossa Manuscript"). He visited the countries of the Mediterranean basin, and at the end of his life he also reached the ends of Eurasia. He meticulously noted down all his

[13] Abramowicz 1987, pp. 229–239.

observations in a diary titled *Podróże* ("Journeys"). The second protagonist, Aleksander Sapieha, chose the Balkans as his destination, where he wanted to get to know the Slavic peoples. Instead, he came upon rich Illyrian tombs. The next one, Zorian Dołęga Chodakowski,[14] focused on the Slavic culture and related beliefs, while yet another one, Józef Sękowski, travelled through Troy to Egypt, which captured his interest for a long time. The last of them, Edward Raczyński, apart from travelling, also conducted his own excavations, e.g. in Gniezno.

As already mentioned, apart from continuing the interest in the ancient world, the Partitions became a veritable seedbed of Polish Slavophilia and the idea of searching for the roots of the Poles among ancient peoples. Such investigations were supposed to encourage people's hearts by proving the native origin and ancient roots of the Polish-Lithuanian state.[15] These sentiments, strengthened by the processes undertaken by the partitioning powers, as well as by the Romanticism prevailing in Europe, were also reinforced by a return to folk tales and traditions, which was the main characteristic of this period. Apart from interests growing in the area of prehistoric cultures, scholarly passions still revolved around Antiquity. Nevertheless, the first major scholarly publications appearing in the Polish lands reflected the interest in local communities. One of them was a book published in 1818 by Zorian Dołęga Chodakowski (actually Adam Czarnocki): *O Słowiańszczyźnie przed chrześcijaństwem* ("On Slavia before Christianity").[16]

A Polish statesman, thinker, and historian, Joachim Lelewel (1786–1861) [Fig. 3], was also important for the development of archaeology at the time of the partitions. He was one of the first to make a methodological distinction between material heritage in his work *Historyka* (manuscript), defining it as "unwritten monuments, or mute statues, in all manners used, carried and shaped by human hands, such as buildings, statues, graves, tombstones, and medals",[17] and archaeology itself (in 1826). Unfortunately, the November Uprising (1830–1831), directed against the tsarist regime, and its subsequent collapse put an end to the development of scholarly thought in the field of research into the past. Lelewel was forced to emigrate to France, and the scholarly associations established by that time were dissolved. However, not everywhere did the "night of Paskevič"[18]

Fig. 3. Joachim Lelewel
(source: Polona)

[14] Dołęga-Chodakowski 1818 (1967).
[15] See Abramowicz 1991, pp. 11–46; Matlęgiewicz 2012.
[16] Dołęga-Chodakowski 1818.
[17] *Historyka rękopiśmienna*, manuscript, 1815, [in:] J. Lelewel, *Dzieła*, vol. II (1), Warsaw 1964, p. 107.
[18] Ivan Paskevič (1782–1856) — infamous Imperial Russian military leader who repressed the Poles economically and culturally after the November Uprising.

interfere with the development of interest in antiquity. In the Prussian and Austrian partitions, they could develop freely.[19] This allowed those passionate about the study of the past to consider and adopt the system of three epochs — a true revolution in Antiquity studies ultimately attributed to the Danish Christian Jürgensen Thomsen (1788–1865), who argued for a succession of Stone, Bronze, and Iron ages, thus creating the framework for a relative chronology of prehistoric times.

Despite the threat of repression, antiquarian activities were not completely stifled and continued as part of private interests. As far as Lelewel is concerned, emigration allowed him to make new acquaintances with the *crème de la crème* of Antiquity scholars in Europe, as well as to introduce this community to archaeological research in Poland.[20] The 1850s can be regarded as a period of particular development for Polish archaeology — in Cracow a "Proclamation of the Scientific Society with the Jagiellonian University united for the purpose of archaeological prospecting together with a dossier which could serve as a guide for such prospecting" was issued then. Among other things, it envisioned establishment of a museum for collecting and studying antiquities. It was also at this time that the lack of a journalistic forum began to be keenly felt, a fact which moved another man of state, Wincenty Pol (1807–1872). To cater for this need, he tried to establish a journal, which was to be entitled *Skarbiec Archeologiczny* ("The Archaeological Treasury").[21] Eventually, the Archaeological Committee of the Cracow Scientific Society created its own series of the so-called *Roczniki* ("Annals"). In the first issue, the article "News about a Slavic idol found in Zbrucz in 1848" took pride of place. It probably contributed to the great commotion caused by the arrival of the famous Świątowit statue [Fig. 4] in Cracow in 1851.

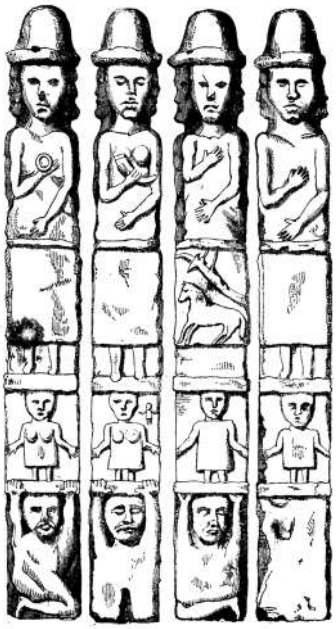

Fig. 4. Świątowid from Zbrucz
as seen from different sides
(J. Lelewel, *Narody na ziemiach słowiańskich przed powstaniem Polski*, 1853)
(source: Wikimedia Commons)

[19] Abramowicz 1991, pp. 11–46.
[20] Abramowicz 1991, pp. 29–30.
[21] Abramowicz 1991, pp. 31–32.

On the other hand, in Warsaw, studies coming from the first excavations carried out in 1851 by Franciszek Maksymilian Sobieszczański (1814–1878) were published. Despite repressions, the capital city received news and articles from various quarters. They were published in the *Biblioteka Warszawska* ("Warsaw Library"), *Gazeta Warszawska* ("Warsaw Newspaper"), and *Dziennik Warszawski* ("Warsaw Journal"). The growing collections and increased interest in archaeology also led to their publication — e.g., in Vilnius a museum and an archaeological commission were established, under the supervision of Eustachy Count Tyszkiewicz, who acted as a correspondent for the Imperial Russian Archaeological Society from 1849. The 1850s also brought an organisational revival, which also benefited the Society for the Advancement of Arts and Sciences in Poznań. The prestige of Polish archaeology at that time was also reflected in the membership of the famous Danish *La Societé royale des antiquaires du Nord*, to which many Polish antiquarians belonged, including Wacław Aleksander Maciejowski (1792–1883).[22]

One of the most important figures in Polish archaeology of the Romantic Period was Józef Łepkowski (1823–1896), who was the first Pole to receive habilitation (postdoctoral degree) in medieval archaeology at the Jagiellonian University in 1862.[23] This earned him the right to lecture on the past. This event is considered to be the beginning of career of archaeology as an academic discipline in Poland. In 1875, after becoming a full professor, he established the first chair of archaeology in the history of Poland at the same university.

However, there is another side to this story, as Józef Łepkowski was to establish his first chair at the Royal University of Warsaw. Unfortunately, its foundation, as well as the entire development of archaeology in the Russian Partition, were undone by subsequent political events — the January Uprising (1863–1864) had a devastating impact on Polish society and science. Nevertheless, individual activity and news from Europe about new discoveries led to a phenomenon called "the positivist breakthrough" in Polish archaeology. It consisted to a large extent of priming historical perspectives on the methodology of natural sciences, especially geology and biology. Scientists who did so were called positivist-evolutionaries. One such person was Gotfryd Ossowski (1835–1897), a geologist and archaeologist, active within the Academy of Arts and Sciences.[24] His work was connected, among other things, to documentation and inventorying of caves in the regions of Cracow, Ojców, and the Tatra Mountains, but his numerous achievements in research, also in other fields, were somewhat overshadowed by questioning the authenticity of the finds from Mników, which, initially treated as a stunning discovery, turned out to be a forgery by a local craftsman.

Another large group of archaeologists were traditionalists who dealt with the interface between history of art and "antiquarianism", as exemplified by the activity of the Archaeological Commission of the Academy of Arts and Sciences, headed by Adam Honory Kirkor (1818–1886).[25] A similar approach to that taken at the Cracow Academy was also adopted in Lviv, where the goal was to "search for, study and preserve, as well as describe, draw or photograph all portable and non-portable monuments of the past". The journal *Przegląd Archeologiczny* ("Archaeological Review") with the Światowit statue on the cover was to serve this purpose.[26] In the territory of Poznań, archaeology remained under the aegis of the Poznań Society for the Advancement of Arts and Sciences, where scholars would continue to pursue the Romantic and Slavophile interests. To this end, members of the society participated in many conventions, including an archaeological exhibition in Berlin in 1880 on the occasion of the 11th Congress of the German Anthropological

[22] This is confirmed by the letter addressed to Maciejowski in 1843 and signed by the founders of the Nordic scientific association, preserved in the Archives of the Polish Academy of Sciences, Warsaw, see Bardach 1971, pp. 232–233 (reproduction).

[23] Chochorowski 2015.

[24] Abramowicz 1991, pp. 66–68.

[25] Abramowicz 1991, pp. 65–66.

[26] The periodical of the State Archaeological Society of Lviv. Not to be confounded with the *Przegląd Archeologiczny* published since 1919 by Józef Kostrzewski (1885–1969).

Society, which came as a real shock to the Polish delegation — objects treated by researchers from Poznań as Slavic were considered Germanic by German scholars.[27] This was probably one of the first manifestations of a long German-Polish polemics, which would continue until the early twentieth century.

The archaeology of the Partition Period often had to deal with the academic life of the divided country. In the Russian Partition, the common interest in Slavic studies was somewhat beneficial — the Poles were often members of Russian societies, while in the Prussian Partition Polish archaeology was oppositional towards the Germans, which, barring disputes, was productive and motivated healthy scholarly competition. In the Austrian Partition, which enjoyed considerable autonomy, cooperation proceeded without major obstacles, although Józef Łepkowski's chair or the institutions of the Academy of Arts and Sciences could complain of severe underfunding. Despite the separation, archaeologists from different partitions tried to maintain friendly relations, which was helped by historical conventions, the first of which was organised in 1880 in Cracow.[28] In spite of the unity of Polish archaeology at the time, archaeology itself underwent a process of disintegration, resulting from the growing source base and widening range of interests. However, classical archaeology, now known as Mediterranean archaeology, was a different matter, which in the discussed period remained under the influence of great collectors, such as Izabela Czartoryska (1746–1835), who in the Temple of the Sybil in Puławy gathered family collections and mementoes of great Poles, which strengthened hearts and commemorated pre-partition Poland.

In a kind of brief summary of the Partition Period in the practice of archaeology, a strong interest in antiquities, numismatics, but also in indigenous heritage and folklore was palpable at the time. In the middle of the nineteenth century, there was a certain evolution of views, related to works challenging in the first place the traditional understanding of the history of the Earth, related to spirituality and Christian religion. This stage, known as the Positivist Period, not only extended the timeline, but also gave the history more detailed and anthropological themes. This process was accompanied by new discoveries of the oldest traces of human activity in Europe.[29] The end of the nineteenth century also marked the dawn of a certain epoch of romantic and vigorous research into the past, which was probably due to a generational change — Włodzimierz Demetrykiewicz (1859–1937) for almost twenty years headed the Cracow archaeological centre and concentrated in his hands all the contemporary archaeology of the Polish lands;[30] Karol Hadaczek (1873–1914) headed the chair of classical archaeology in Lviv and orchestrated development of trends in "historicising" and "anthropologising" the past.[31] Only at the end of the nineteenth century was there a certain revival of archaeology. Older scholars, whose interests and skills were still rooted in Romanticism, were replaced by a younger generation, developing in the positivist school of thought, especially oriented towards history, anthropology, and conservation. In the Prussian Partition, an archaeological renaissance began thanks to the activity of a young explorer, Józef Kostrzewski (1885–1969), a student of the famous scholar, Gustaf Kossinna (1858–1931). In 1914, immediately after his studies in Berlin, Kostrzewski was appointed head of the German Provincial Museum in Poznań.[32] He organised the museum's numerous collections and carried out field research. At the same time, Warsaw archaeology gained much from the activities of a prominent chemist, entrepreneur, researcher, and self-taught archaeologist, Erazm Majewski (1858–1922).[33]

[27] Abramowicz 1991, pp. 70–71.
[28] Abramowicz 1991, pp. 11–78.
[29] Abramowicz 1991, pp. 46–104.
[30] Woźny 2018.
[31] Bulyk, Lech 2011.
[32] Abramowicz 1991, pp. 90–91.
[33] Krajewska 2010.

Warsaw under the Russian Partition

The most prominent centre of studies in antiquities in Warsaw was the Society for Advancement of Arts and Sciences, founded in 1800, which since its inception had shown interest in the past of the Polish lands. It grouped eminent figures of the time, such as count Stanisław Kostka Potocki (1755–1821) [Fig. 5], the linguist Samuel Linde (1771–1847), the historian Joachim Lelewel, the playwright Julian Ursyn Niemcewicz (1758–1841), the politician Hugo Kołłątaj (1750–1812), and the educationalist Tadeusz Czacki (1765–1813). It dealt not only with collecting sources, but also with their characteristics, elaboration, and interpretation. The activity of this association in the field of research into the past led in the early nineteenth century to an increase in the number of monuments, which were treated without scepticism as historical premises for assessing the degree of civilisational development of a given society.[34] An innovation brought by the Enlightenment became practising geology, which reflected positively on ancient interests, especially in the study of stratigraphy. It was right there, on the threshold of geoarchaeology, that the questions about the beginnings of mankind arose. Thanks to this, these problems began to be approached not from a local but rather global perspective.[35] At the same time, the research equipment available to scholars improved, too. Except for the already-mentioned research journeys, the personal activity of scholars increased, especially in regard to studies focused on particular artefacts. The genuine change in the antiquarian and archaeological practice had to wait until the reign of Tsar Alexander I (1777–1825), who restored not only the Polish statehood, but also the academic structures of the city. In 1815, the Royal University of Warsaw was established, which marked the beginning of a structured archaeological activity in Warsaw.[36] Quickly, already in 1816, the Numismatic

Fig. 5. Stanisław Kostka Potocki
(source: Polona)

[34] The so-called "ethnologising" trend, which began in the eighteenth century.

[35] Abramowicz 1991, pp. 79–104.

[36] Mikocki 1993.

Cabinet was created, where interest was focused on a group of antiquities with the longest history of discovery in the Polish lands — coins.[37] Later on, this increasing interest in antiquities led to the establishment of another centre in 1826, which came to be known as the Cabinet of Ancient Curiosities.[38] Unfortunately, the November Uprising and its collapse put an end to the institutions responsible for preservation of the testimonies of the past, which resulted in a long-term stagnation of institutional activity in the Russian Partition. This event, however, encouraged those interested in antiquities to engage in individual endeavours, especially related to the discovery of pre-Christian Slavic history. As a result, patriotic feelings and a desire to proclaim the glory of the ancient past increased. At this time in Warsaw, which had lost most of its research collections, the remaining sources were made available — at the Zoological Cabinet, there was the "Division of Various Curiosities", an exposition visited by *ca*. 15,000 people during 1847 alone. Another success was the Exhibition of Antiquities and Objects of Art in the Augustów-Potocki Palace, opened in 1856. According to the statistics compiled by Andrzej Abramowicz, the catalogue of the exhibition included 1053 items, which included domestic antiquities under the numbers 57–173 and 1011–1027. The exhibition was even documented by Bolesław Podczaszyński (1822–1876), and Karol Beyer (1818–1877), the latter of whom was a pioneer in the use of photography for archaeological documentation.[39] The existence of individual initiatives, as well as of collections in general, in Warsaw, as well as in the whole Russian Empire, depended on the actions of the Tsarist Archaeological Commission, a conservation institution established in 1859 by Tsar Alexander II (1855–1881). Its task was, among others, to acquire relics from the entire area under Russian rule.[40] In this way, the more interesting specimens were sent to St Petersburg, while the less spectacular ones became local property. In addition to collecting, the Commission's tasks included the study of antiquities and their scholarly evaluation. Many Poles belonged to the Tsar's Archaeological Commission, as it was one of the opportunities for exchanging expertise and conducting one's own research or foreign queries. The institutional situation improved only with the establishment of the Warsaw Main School in 1862, which led to the revival of the Numismatic Cabinet and the Cabinet of Ancient Curiosities. The most prominent figure of that period was undoubtedly Józef Przyborowski (1823–1896), a historian, numismatist, antiquarian, and university lecturer, who carried out numerous archaeological undertakings.[41] The development of his interest in antiquities was somewhat halted by the January Uprising, which prevented the establishment of the Chair of Archaeology in Warsaw. Józef Łepkowski, who was to be its head, moved to his native Cracow, where he soon received habilitation. Had it not been for the political events of 1863–1864, he would have been able to start regular classes and mark the beginning of archaeology as an academic discipline in Warsaw.

The political situation in Warsaw, which temporarily eased once or twice after the January Uprising, allowed for the inauguration of another university initiative. In 1869, the Tsarist University of Warsaw was established, and with it the Museum of Antiquities.[42] A few years later, in 1871, it was transformed into the Cabinet of Antiquities, later known as the Cabinet of Archaeology, which from 1877 was supervised by Antoni Julian Mierzyński (1829–1907). At that time, the collection consisted of approximately 2,000 artefacts. Although in the 1860s and 1870s archaeology was not included in the list of courses, it appeared in academic life, e.g. thanks to Adolf Pawiński, who used the inauguration of the academic year 1875/1876 to give an inaugural lecture entitled: "On the history and prehistory of the Polish Kingdom and on the history of primitive civilisations".[43] In 1877, Numismatic and Archaeological Cabinets were merged into one centre of antiquities studies.

[37] Kolendo 1993b.
[38] Kolendo 1993b.
[39] Abramowicz 1991, pp. 36–38.
[40] Szczerba 2010.
[41] Kozłowski 2016.
[42] Mikocki 1993.
[43] Kolendo 1993a.

Problems of Warsaw archaeological research during the Partitions

Although the post-Uprising repressions led to a certain stagnation in the development of interest in Antiquity, this did not apply to issues from the Slavic borderland. It became a common field for Polish and Russian scholars. Their research results and discussions were concentrated in *Tygodnik Petersburski* ("St. Petersburg Weekly"), a periodical where Eustachy Count Tyszkiewicz (1814–1873), the most prominent archaeologist of Lithuania and Belarus, published among others.[44] Also, the well-known Józef Ignacy Kraszewski (1812–1887) was keenly interested in archaeology, although the beginnings of his activity left much to be desired in terms of how he typologised prehistoric relics.[45] However, numerous Polish trips to Scandinavia or Odessa broadened his and other researchers' scholarly horizons and analytical workshop. Constant involvement in the study of the past was also shown by editors of the *Biblioteka Warszawska*, established after the November Uprising, where Kazimierz Stronczyński (1809–1896) was very active, among others.[46] A well-known numismatist, he strove to improve the inventory of archaeological artefacts, which was only made possible by a decree issued by Prince Viceroy Paskevič in 1844. Another figure was the aforementioned Franciszek Maksymilian Sobieszczański, who became famous for his work "Archaeological research on the state of art and industry in Slavic lands before Christianity".[47] In this work, he managed to note that digging up graves scattered on the lands of Slavic communities provided a lot of important information. In 1851, the same researcher published the results of his excavations, in which he made reference to the natural sciences and pointed out the problem of "indulging" the imagination in research on the past.

The 1850s were a time of relative development for Polish archaeology. It was also a time of the first serious methodological concerns, as exemplified by the attitude of Antoni Białecki (1836–1912), Professor at the Warsaw Main School, and later at the Imperial University of Warsaw. Białecki, being a lawyer, took a keen interest in antiquities and his activity was not limited to collecting, but extended to research and documentation.[48] In his texts, he often expressed concerns about the ethnic interpretation of archaeological sources. He was an advocate of research cosmopolitanism, doubting the validity of national feelings and prejudices in research on the past. This approach was all the more important, because at the same time when studies on the Slavic past were being conducted in Poland "antediluvian" human bones were discovered in France, near Abbeville. Although these discoveries changed worldviews, they also greatly troubled people's consciences. The Paris correspondent, Zofia Węgierska (1822–1869) [Fig. 6], was the first to report on the new discoveries, referring in 1863 on the pages of *Biblioteka Warszawska* to the disputes connected with them, fuelled by Charles Darwin's 1859 dissertation *On the Origin of Species*.[49] The personal involvement of antiquarians and archaeologists-enthusiasts is also evidenced by their frequent attendance at international congresses initiated in 1866 in Italy and continued in Paris, Antwerp, Norwich, Copenhagen, Bologna, Brussels, or Stockholm. In roughly the same years, a Lithuanian aristocrat, Count Jan Zawisza (1822–1887), who was keenly interested in prehistoric research, also attended these meetings. He conducted his own research in the Mammoth Cave that he owned.[50] Apart from using stratigraphic methods and proving the relative chronology of his finds, he published his research on the pages of *Wiadomości Archeologiczne* ("The Archaeological News"), a journal he established and whose first volume was published in 1873 [Fig. 7]. The editor of the first volumes and the author of the articles was the above-mentioned Józef Przyborowski.

[44] Abramowicz 1991, pp. 24–27.
[45] Abramowicz 1991, pp. 26–27.
[46] Abramowicz 1991, pp. 27–29.
[47] Sobieszczański 1845.
[48] Abramowicz 1991, pp. 44–45.
[49] Abramowicz 1991, p. 51.
[50] Kozłowski 2016, p. 20.

Fig. 6. Zofia Węgierska
(source: Polona)

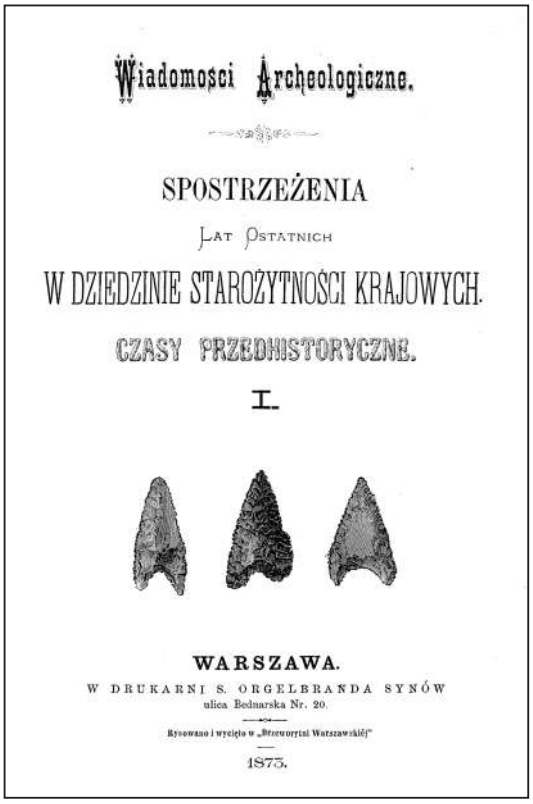

Fig. 7. Cover of the first volume
of *Wiadomości Archeologiczne*
(photo by M. Dąbski)

Despite increased scholarly activity, archaeology maintained in the spirit of "biologising" positivism did not stand the test of time. The same can also be said about the attitude of the then enthusiasts of this paradigm. At the end of the nineteenth century, the interest in archaeology in the Russian Partition, and throughout the Polish lands in general, declined, partly due to actions taken by Russian scholarly commissions. *Wiadomości Archeologiczne* collapsed. However, their place was taken by *Światowit* established in 1899 and published by Erazm Majewski, one of the last truly versatile archaeologists.[51] His research priority became to avoid harmful ethnic interpretations, as he believed that, for the sake of research integrity, prehistory should remain "nameless".[52]

Despite the activity of several Warsaw researchers, the lack of independent institutions hindered the academic development of the capital. The situation changed with the Russian revolution of 1905, which allowed for a certain renaissance in archaeology. New societies began to emerge, such as the Anthropological Laboratory, the first of its kind in Poland, operating at the Museum of Industry and Agriculture in Warsaw, headed by Kazimierz Stołyhwo (1880–1966) [Fig. 8], and the Department of Prehistoric Excavations, led from 1906 by a painter, Marian Wawrzeniecki (1863–1943).[53] In 1907, the Warsaw Scientific Society was also founded,[54] taking up the tradition of its predecessor functioning until the outbreak of the November Uprising. A year later, in the building of the Society for the Encouragement of Fine Arts, the Erazm Majewski Archaeological

[51] Abramowicz 1991, pp. 93–95.
[52] Abramowicz 1991, p. 94.
[53] Wrońska 1986.
[54] Mikulski 2007.

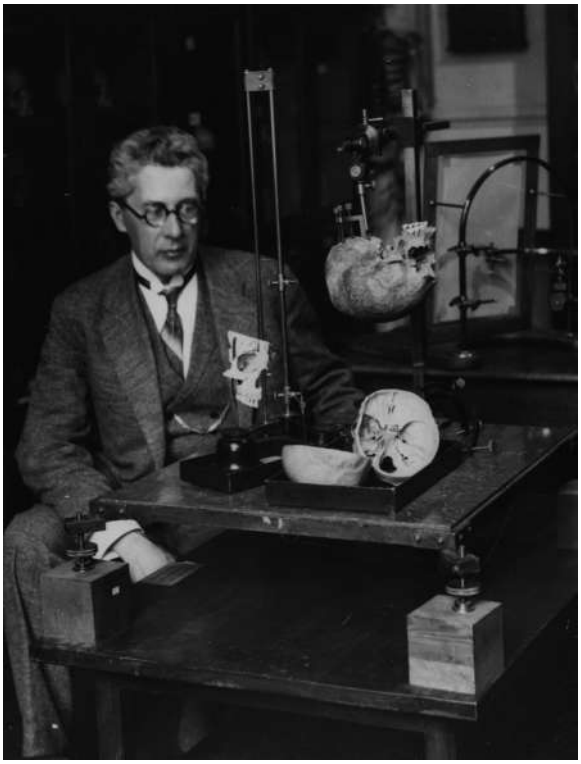

Fig. 8. Kazimierz Stołyhwo
(source: National Digital Agency)

Museum was opened.[55] The accomplishments of the founder of this institution, which went beyond scholarly writing about archaeological relics, but included also their collection, studying, and conservation, quickly attracted other interested parties. In this way, the future "giants" of Polish archaeology came under Majewski's tutelage, so to speak: Leon Kozłowski (1892–1944), Marian Himner (1888–1916), Stefan Krukowski (1890–1982), and Ludwik Sawicki (1893–1972). Their remuneration took the form of research stipends, which made their employment resembling more of an informal archaeological school rather than actual work.[56] Perhaps, Majewski's substantive leadership in this case served as an additional argument compelling the university authorities to establish the chair, which happened several years after the opening of the museum facility. The period of activity of the researchers mentioned in this section is also associated with increasingly ambitious scholarly plans in the field of research on the past. Young archaeologists grouped around Majewski would conduct extensive archaeological investigations, take up studies in foreign institutions, and publish.[57] All this coincided with a crisis caused by the First World War. In 1914, the university authorities decided to transport the most valuable exhibits of the Tsarist Warsaw University to St Petersburg and Moscow. In August 1915, the Russian army left Warsaw and was replaced by the German forces. The German authorities gave permission for creation of the University of Warsaw with Polish as the language of instruction. The ceremonial inauguration of the thus reborn University took place on 15 November 1915 in the presence of the German governor, General Hans von Beseler.

[55] Modrzewska 1983; Krajewska 2013.
[56] Kozłowski, Lech 1996; Kozłowski 2016.
[57] Kozłowski 2012, pp. 35–39.

Inauguration of the first chair of archaeology in Warsaw

When Poland regained its own statehood, archaeology faced the problem of securing a place for itself in the emerging academic structures of the country.[58] The issue of educated human resources was to be solved by the old and new universities.[59] From 1915, efforts were made to establish the Chair of Archaeology in Warsaw. Erazm Majewski, who was also offered the chairs of Sociology at the University of Vilnius and Ethnology at the University of Lviv, was a natural candidate for its head.[60] Finally, he chose the Warsaw proposal. Unfortunately, due to his lack of formal education in this field, establishing and taking up the chair went not without some problems. The arduous path leading to granting full professorship began. A committee was set up at the University of Warsaw to establish the Chair of Archaeology and to nominate Majewski as Professor [Fig. 9]. It asked for an opinion on the qualifications and scholarly achievements of the candidate from the most important professors of archaeology in Poland: Józef Kostrzewski from Poznań and Włodzimierz Demetrykiewicz from Cracow.[61] Both gave very favourable and supportive opinions. After obtaining the support of the Faculty of Philosophy and positive opinions about his academic qualifications and achievements, the nomination remained a mere formality. Majewski then began to plan the organisation of the chair and teaching of archaeology. However, before he proceeded with the implementation, he suffered a stroke on 23 April 1919. Quickly undertaken intensive therapy, rehabilitation, and excellent medical care caused his condition to improve, but hemiparesis and blindness remained. However, Majewski's candidature did not fail and on 7 October 1919 he was unanimously appointed Full Professor of prehistoric archaeology at the University of Warsaw, while on 18 December 1919 his nomination was signed by the Head of State. However, the progressing illness prevented the newly-promoted professor from devoting himself to research

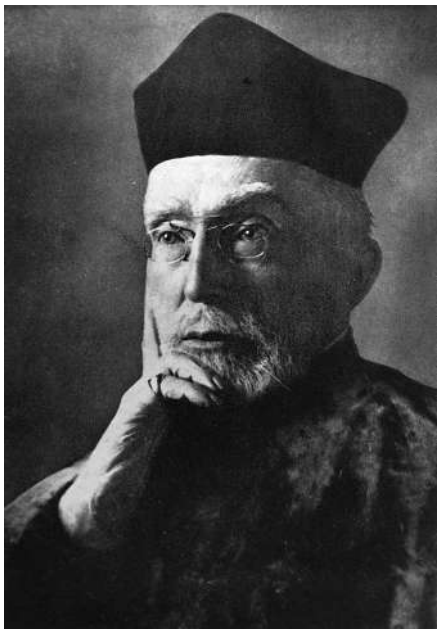

Fig. 9. Erazm Majewski
(source: National Digital Agency)

[58] Lech 1997–1998.
[59] Abramowicz 1991, pp. 105–138.
[60] Krajewska 2010.
[61] For the review by W. Demetrykiewicz, see Kozłowski 2016, pp. 34–37.

and teaching. This led him to look for a docent who could relieve him of some of his duties. A pretender to this role was Leon Kozłowski, the future Prime Minister.[62] Treated by Majewski as his adoptive son, he alienated himself from his protector by reason of his arrogance, political activities, and opinions. At that time, Włodzimierz Antoniewicz (1983–1973) [Fig. 10] was also put forward as a candidate.[63] A graduate of the Jan Kazimierz University in Lviv, a doctoral student at the Jagiellonian University, a postdoctoral student at the Piast University (now the Adam Mickiewicz University), a lecturer at the universities in Vienna and Prague, and, most importantly, a protégé of Józef Kostrzewski, he quickly gained Majewski's recognition. The decision was made in the second half of 1920, with Antoniewicz becoming the first assistant professor in archaeology at the University of Warsaw. Moreover, from 13 November 1920 was the head of the seminar which efficiently made him the head of the department. Despite Prof. Majewski's urging, Antoniewicz did not start teaching until January 1921, when he finally inaugurated the first strictly archaeological lectures at the University of Warsaw, attended by but a single student, Zofia Podkowińska (1894–1975). As it turned out, Majewski liked neither the classes nor Antoniewicz's attitude and aspirations. Relations between the two researchers cooled down, and there was even an attempt to remove Antoniewicz from his chair. However, the plan failed, due to the deteriorating health of Prof. Majewski and his eventual passing.[64] He died on 14 November 1922, in the 64th year of his life. An extremely solemn funeral took place four days later. The coffin was accompanied by a procession, preceded by two bursars with university sceptres in their hands. Professor Erazm Majewski was bid farewell by many, including his friends, representatives of the academia, art, press, industry, members of societies and associations, delegates of state institutions, as well as members of the Parliament and the Senate.

Fig. 10. Włodzimierz Antoniewicz
(source: National Digital Agency)

[62] Kozłowski 2004; Kozłowski, Sytnyk 2010.
[63] Kozłowski 2009.
[64] Krajewska 2010.

Department of Prehistoric Archaeology at the University of Warsaw

After Majewski's death, Antoniewicz took full charge of the archaeology department, which was named as the Department of Prehistoric Archaeology. The Department's headquarters was moved to a three-room study in Staszic Palace, which also hosted a library full of German and Polish synthetic works on relevant topics and Central European periodicals. The base for studies conducted at the Department was the former Archaeological Cabinet of the Tsarist University of Warsaw as well as collections of the State Conservatories of Prehistoric Monuments founded in 1920.[65] Soon, with the help of Erazm Majewski's widow, Lucyna, the collections of the Erazm Majewski Museum of Prehistory, which did not reopen until 1932, became the main source of research material. Together with Majewski's journal *Światowit*, these provided Antoniewicz with full scholarly independence. In the early days of the institution, lectures were attended by a handful of people, and interestingly enough, these were only female students. They dealt with prehistoric times, Europe in the Neolithic, the Lusatian Culture in Poland, the origin and culture of the Slavs, the La Tène culture, the emergence of European prehistoric art, or archaeology of the southern and eastern Baltic countries.[66] Slides were an important part of the classes, and Antoniewicz collected glass slides for this purpose. The Antoniewicz's wife, Jadwiga, and his first assistant, Zofia Podkowińska, helped with the work.[67] Students were also involved, including the future professor, Janina Rosen-Przeworska (1904–1991).[68] In 1924, Antoniewicz became a professor, which increased his possibilities, including financial ones. Thanks to this, he organised numerous field trips and museum queries spanning Poland, Czechoslovakia, Lithuania, the Eastern Borderlands, and Yugoslavia. Eventually, he also began to conduct his own excavations. In addition, Antoniewicz himself would travel a lot for scholarly purposes and publish. In the 1920s, he authored the first Polish synthesis on the most ancient history of the Republic, and in the late 1930s he also became Rector of the University of Warsaw. The outbreak of the Second World War put an end to the teaching and research diversity of the Department of Prehistoric Archaeology, forcing researchers to cease their activities (with the exception of a few personalities involved in rescuing the most valuable artefacts).[69] The conflagration of the war consumed collections and institutions, which dealt a blow to the Warsaw archaeological community. Nevertheless, the end of the war sparked hope for new research initiatives. However, all of them had to confront a new phenomenon — the "ideologising" of research which was brought by Marxism-Leninism.[70]

Conclusions

When speaking of the formative period of the archaeological discipline in Warsaw, one must go back to the history of interest in the subject of the most ancient history of the Polish lands. For it was this early interest that had the most decisive influence on the events which led to the establishment of the first chair of archaeology in the capital. The most significant, from the perspective of the beginnings of the process of forming professional scholarly structures in this field, was the time of the reign of King Stanisław August Poniatowski, who personally strove to acquire antiquities and broaden knowledge about them.[71] His collecting and scholarly activities expanded the knowledge of the most ancient history of the world among the Poles, especially

[65] Karczewski 2015.
[66] Lewakowska 1962; Kozłowski 1993; Kozłowski 2009, pp. 54–55.
[67] Podkowińska 1993.
[68] Rosen-Przeworska 1993.
[69] Abramowicz 1991, pp. 139–145.
[70] Abramowicz 1991, pp. 146–161.
[71] Abramowicz 1987, pp. 15–32.

regarding ancient civilisations. The period of the Partitions of Poland and the collapse of the state halted development of academic institutionalism for many years, yet it also made the Poles focus and intensify interest in their own history. The numerous private collections related to the history of the Polish-Lithuanian Commonwealth which were initiated at that time strengthened hearts and gave hope for liberation. This was fostered by the first scholarly societies, whose aim was to develop national collections. However, the political situation and outbreaks of successive uprisings in the nineteenth century effectively prevented the functioning of these institutions, which for many years limited academic pursuits, including archaeology, to the private interests of the wealthy social strata. The lack of free flow of information, control, and growing export of valuable artefacts by the Russian partitioners slowly split the Polish archaeological heritage. Nevertheless, thanks to an active foreign forum, Polish researchers were able to exchange views and update their knowledge, partly thanks to discoveries of the earliest areas inhabited by humans. This encouraged them to deepen their own investigations and undertake more extensive research, which later attracted wide international interest. However, the lack of research continuity and successors caused a scholarly stagnation in the whole country at the end of the nineteenth century. In Warsaw, the mainstay of interest was the work of Erazm Majewski, an entrepreneur, chemist, and self-taught genius, who with his own effort and financial resources managed to maintain the high scholarly quality of Warsaw archaeology. Nevertheless, it was not until the beginning of the twentieth century that the state-induced restrictions were lifted, as a result of an internal crisis in the Russian Empire. It initiated a wave of academic revival in Warsaw and the creation of new scholarly institutions — the Laboratory of Anthropology in the Museum of Industry and Agriculture and the Archaeological Laboratory were established, the Warsaw Scientific Society was reactivated, and, thanks to Majewski, one of the first archaeological museums in Poland was created. Young adepts of archaeology began to gather around experienced archaeologists, who in later periods became their new mentors. No previous hope for the revival of the scholarly independence in Warsaw, however, was equal to that raised by the First World War. As early as 1915, when the German army was advancing on the city abandoned by the Russians, the foundations of a department were lain. Despite perturbations related to the lack of formal education in the candidate, i.e. Majewski, the project came to fruition in the second half of 1919. Professor died soon afterwards, leaving behind a young docent habilitated in Poznań. The dynamic Włodzimierz Antoniewicz gave Warsaw archaeology a new framework, keeping it in touch with researchers in other anthropological disciplines, while drawing on the use of methodical analogy as the main research tool. The interwar period saw a gradual increase in the interest in study of the past. Lectures devoted initially to a single student were attended by others. The library and archaeological collections grew, only to deteriorate again in the conflagration of the Second World War.

Bibliography

Abramowicz 1983 — A. Abramowicz, *Dzieje zainteresowań starożytniczych w Polsce. Od średniowiecza po czasy saskie i świt oświecenia*, part I, Wrocław –Warsaw – Cracow – Gdańsk – Łódź.

Abramowicz 1987 — A. Abramowicz, *Dzieje zainteresowań starożytniczych w Polsce. Od średniowiecza po czasy saskie i świt oświecenia*, part II, Wrocław –Warsaw – Cracow – Gdańsk – Łódź.

Abramowicz 1991 — A. Abramowicz, *Historia archeologii polskiej — XIX i XX wiek*, Warsaw – Łódź.

Bardach 1971 — J. Bardach, *Wacław Aleksander Maciejowski and His Contemporaries* (= *Monographs on the History of Science and Technology* 81), Wrocław – Warsaw – Cracow – Gdańsk.

Bulyk, Lech 2011 — N. Bulyk, J. Lech, "Karol Hadaczek (1873–1914) and the beginnings of archaeology in universities of the North-East borderland of the Austro-Hungarian Monarchy", *Archaeologia Polona* 47, pp. 58–89.

Chochorowski 2015 — J. Chochorowski, "150 years of prehistoric archaeology at the Jagiellonian University", *Recherches archéologiques* NS 7, pp. 7–36.

Dołęga-Chodakowski 1818 — Z. Dołęga-Chodakowski, *O Sławiańszczyźnie przed chrześcijaństwem* (= *Ćwiczenia Naukowe* 5), Warsaw [reedition with introduction: Warsaw 1967].

Karczewski 2015 — M. Karczewski, "Państwowe grono konserwatorów zabytków archeologicznych i Państwowe Muzeum Archeologiczne: ich rola w ochronie zabytków archeologicznych", *Seminare* 36/4, pp. 183–197.

Kolendo 1993a — J. Kolendo, "Archeologowie działający na Uniwersytecie Warszawskim w latach 1816–1915", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 9–26.

Kolendo 1993b — J. Kolendo, "Zbiory zabytków archeologicznych oraz kolekcje numizmatyczne na Uniwersytecie Warszawskim w latach 1816–1915", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 27–40.

Kostrzewski 1949 — J. Kostrzewski, *Dzieje polskich badań prehistorycznych*, Poznań.

Kostrzewski 1970 — J. Kostrzewski, *Z mego życia. Pamiętniki*, Wrocław.

Kozłowski 1993 — S. K. Kozłowski, "Korespondencja dotycząca początków dydaktyki archeologicznej na UW", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 93–106.

Kozłowski 2004 — S. K. Kozłowski, "Obrazki z dziejów warszawskiej archeologii wczesnych lat 1920-tych", [in:] *Hereditatem cognoscere. Studia i szkice dedykowane Profesor Marii Miśkiewicz*, ed. Z. Kobyliński, Warsaw, pp. 182–193.

Kozłowski 2009 — S. K. Kozłowski, *Włodzimierz Antoniewicz. Profesor z Warszawy*, Warsaw.

Kozłowski 2012 — S. K. Kozłowski, *Tak wiele, tak nieliczni. Młoda archeologia polska 1905–1928*, Warsaw – Łódź.

Kozłowski 2016 — S. K. Kozłowski, *Almae Matris Varsoviensis Studium Praehistoricum MCMVII–MCMLXIII*, Warsaw.

Kozłowski, Lech 1996 — *Erazm Majewski i warszawska szkoła prehistoryczna na początku XX wieku*, ed. S. K. Kozłowski, J. Lech, Warsaw.

Kozłowski, Sytnyk 2010 — *Profesor Leon Kozłowski*, ed. S. K. Kozłowski, O. Sytnyk, Lviv – Warsaw.

Krajewska 2010 — M. Krajewska, "Sylwetka Erazma Majewskiego (1858–1922)", *Mazowsze. Studia Regionalne* 5, pp. 219–228.

Krajewska 2013 — M. Krajewska, "Archeologiczne Muzeum Erazma Majewskiego w Warszawie", *Światowit* 9 (50), fasc. B, pp. 19–49.

Lech 1997–1998 — J. Lech, "Between captivity and freedom: Polish archaeology in the 20th century", *Archaeologia Polona* 35–36, pp. 25–222.

Lewakowska 1962 — J. Lewakowska, "Zajęcia (W. Antoniewicza) na Uniwersytecie Warszawskim (w latach akademickich 1920/21–1960/61)", *Światowit* 24, pp. 12–18.

Matlęgiewicz 2012 — T. Matlęgiewicz, "Idee słowianofilskie w Warszawskim Towarzystwie Przyjaciół Nauk (1800–1830)", *Athenaeum* 33, pp. 91–110.

Mikocki 1993 — T. Mikocki, "Historia zbiorów starożytniczych Uniwersytetu Warszawskiego", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 41–51.

Mikulski 2007 — Z. Mikulski, "Z życia nauki i z życia Towarzystwa: Jubileusz stulecia Towarzystwa Naukowego Warszawskiego (1907–2007): 100 lat Towarzystwa Naukowego Warszawskiego (1907–2007)", *Rocznik Towarzystwa Naukowego Warszawskiego* 70, pp. 9–14.

Modrzewska 1983 — H. Modrzewska, "Erazm Majewski — badacz starożytności i twórca muzeum archeologicznego w świetle swego *Notatnika*", *Wiadomości Archeologiczne* 48, pp. 163–189.

Podkowińska 1993 — Z. Podkowińska, "Fragmenty pamiętnika", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 119–134.

Rosen-Przeworska 1993 — J. Rosen-Przeworska, "Moje uniwerki, czyli o archeologii z epoki przedhistorycznej", [in:] *Dzieje archeologii na Uniwersytecie Warszawskim*, ed. S. K. Kozłowski, J. Kolendo, Warsaw, pp. 135–150.

Sobieszczański 1845 — F. M. Sobieszczański, "Badania archeologiczne o stanie sztuki i przemysłu na ziemiach Słowian przed chrześcijaństwem", *Przegląd Naukowy* 3, pp. 830–938.

Szczerba 2010 — A. Szczerba, "Rola Carskiej Komisji Archeologicznej w ochronie zabytków archeologicznych na terenie Imperium Rosyjskiego", *Analecta. Studia i Materiały z Dziejów Nauki* 19/1–2, pp. 7–21.

Woźny 2018 — M. Woźny, *Włodzimierz Demetrykiewicz (1859–1937). Prehistoryk z przełomu epok*, Cracow.

Wrońska 1986 — J. Wrońska, *Archeolodzy warszawscy na początku XX wieku*, Wrocław.

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Errata in fasciculo 28/2017

1.

W artykule Renaty Ciołek „Collection of 48 provincial coins from Novae (Bulgaria), Sector XII. Numismatic study" podano (na s. 79) błędną angielską nazwę Narodowego Centrum Nauki.

In Renata Ciołek's article "Collection of 48 provincial coins from Novae (Bulgaria), Sector XII. Numismatic study" a wrong English name of the National Science Centre was used (p. 79).

Powinno być: / Should read as follows:

Paper written based on the results of research within the frame of a project funded by the National Science Centre, Poland, grant no. 2016/21/B/HS3/00021: "Monetary circulation in Moesia and Illyria. The case of the finds from Novae (Bulgaria) and Risan (Montenegro)".

2.

W artykule recenzyjnym Renaty Ciołek „Some remarks on a recently published volume of studies on coins from Pharos" (s. 185–189) zabrakło wzmianki:

In Renata Ciołek's review "Some remarks on a recently published volume of studies on coins from Pharos" (pp. 185–189) the following information was lacking:

Paper prepared for publication thanks to funding by the National Science Centre, Poland, grant no. 2016/21/B/HS3/00021 "Monetary circulation in Moesia and Illyria. The case of the finds from Novae (Bulgaria) and Risan (Montenegro)".

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np. Kolendo 2008 — J. Kolendo, „Novae during the Goth raid of AD 250/1 (Iordanes, *Getica* 101–103)", [in:] *A Companion to the Study of Novae*, ed. T. Derda, P. Dyczek, J. Kolendo (= *Novae. Legionary Fortress and Late Antique Town* 1), Warsaw, s. 117–131.

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к	k
л	l

м	m
н	n
о	o
п	p
р	r
с	s
т	t
у	u
ф	f
х	h
ц	c
ч	č
ш	š
щ	ŝ (rosyjski); št (bułgarski)
ъ	” (rosyjski); ă (bułgarski)
ы	y (rosyjski)
ь	’
э	è (rosyjski)
ю	û
я	â
ђ	đ (serbski)
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Footnotes at the bottom of the page should include, beside relevant text, bibliographic references following the model below:

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>
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e.g. Parnicki-Pudełko 1990 — S. Parnicki-Pudełko, *The Fortifications in the Western Sector of Novae*, Poznań.

2. Book in series

F. Last name, *Title* (= *Name of series* number in series), place of publication.

e.g. Kunisz 1987 — A. Kunisz, *Le trésor d'antoniniens et de folles des 'Principia' de la légion de Novae (Bulgarie)* (= *Studia Antiqua* 10), Warsaw.

3. Article/chapter in collective work

F. Last name, "Title of article/chapter", [in:] *Title of collective work*, ed. F. Last name, place of publication, page range.

e.g. Dyczek 2005 — P. Dyczek, "On the genesis of Roman legionary hospitals", [in:] *Limes XIX, Proceedings of the XIXth International Congress of Roman Frontier Studies, Pécs, Hungary, September 2003*, ed. Z. Visy, Pécs, pp. 871–881.

4. Article/chapter in collective work published in a series

F. Last name, "Title of article/chapter", [in:] *Title of collective work*, ed. F. Last name (= *Name of series* number in series), place of publication, page range.

e.g. Kolendo 2008 — J. Kolendo, "Novae during the Goth raid of AD 250/1 (Iordanes, *Getica* 101–103)", [in:] *A Companion to the Study of Novae*, ed. T. Derda, P. Dyczek, J. Kolendo (= *Novae. Legionary Fortress and Late Antique Town* 1), Warsaw, pp. 117–131.

5. Article in periodical

F. Last name, "Title of article", *Title of periodical* number of periodical, page range.

e.g. Lemke 2009 — M. Lemke, "Stone projectiles from Novae", *Novensia* 20, pp. 209–219.

6. Article (item) in encyclopedia

F. Last name, "Title of article (item)", *Title of encyclopedia* volume number (optional), place of publication, page or column range.

e.g. Cermanović-Kuzmanović 1976 — A. Cermanović-Kuzmanović, "Risinium", *The Princeton Encyclopedia of Classical Sites*, Princeton, p. 760.

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Proper names (geographical names, personal names and last names) in the Cyrillic alphabet should be transliterated according to the following rules:

Cyryllic alphabet	transliteration
а	a
б	b
в	v
г	g
д	d
е	e
ж	ž
з	z
и	i
й	j
к	k
л	l
м	m
н	n
о	o
п	p
р	r
с	s
т	t
у	u
ф	f
х	h
ц	c
ч	č
ш	š

щ	ŝ (Russian); št (Bulgarian)
ъ	” (Russian); ă (Bulgarian)
ы	y (Russian)
ь	’
э	è (Russian)
ю	û
я	â
ђ	đ (Serbian)
ѓ	g’ (Macedonian)
љ	lj (Serbian)
њ	nj (Serbian)
ћ	ć (Serbian)
ќ	k’ (Macedonian)
џ	dž (Serbian)

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