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The trial trenches at Ari/Charvalo in 2016 and the excavation by E. and O. Kakavogianni at Frankolimano Thorikou 1969/70: Preliminary results

ABSTRACT: *As part of the research project of the University of Bochum at Ari (Lavreotiki/Attica), an ancient ore-washery was excavated there in 2016. According to the findings, it was only superficially disturbed by later activities and is preliminarily dated to the 4th and early 3rd century BC. The findings settle the long-debated question of how the ore washeries worked: They were so-called plain tables or buddles, on which the ore was separated by density on the washing surfaces, using a water film, and without sluices.*

Another project started in 2017 and concerned an old excavation at Frankolimano Thorikou near Lavrio. The archaeological finds from a battery of melting furnaces and other ancient buildings are currently under evaluation. For the time being, they can be dated to the advanced Hellenistic period. Archaeometallurgical investigations are under way in close cooperation with specialists at the NCSR Demokritos.

KEYWORDS: ARCHAEOMETRY, ARCHAEOMETALLURGY, ARI, LAURION, ORE WASHERIES, SMELTING FURNACES

Introduction

In 2014 at Ari to the North of Anavyssos, a survey was started as a joint venture between the Ephorate of Antiquities of East Attica, represented by Dr. E. Andrikou and Dr. A. Kapetanios, the Athens Department of the German Archaeological Institute and the Ruhr University Bochum (Germany), represented by H. Lohmann. For a short preliminary report on the survey see H. Lohmann (2020; this vol.). A full report on the survey will be published in a forthcoming volume devoted exclusively to Ari. Here, I wish to report shortly on a trial excavation in one of the numerous ancient ore washeries at Ari and on the evaluation of material from an old (1969/1970) excavation by O. Apostolopoulou-Kakavogianni and E. Kakavogiannis at Frankolimano near Thorikos.

The trial trenches at Ari 63

The excavation took place in September 2016 under the license of the *synergasia* mentioned above. Prof. A. Kapetanios, representative of the Ephorate and field director, and Prof. H. Lohmann from the Ruhr University Bochum directed the excavation. The first target was a facility that had been cleaned and surveyed the year before and was catalogued as “Ari 63A”. Its rectangular ground plan (Fig. 1) shares similarities with other metallurgical workshops known from the Laurion region which were analysed by J. E. Jones and illustrated by examples from the Agrileza valley and other parts of the Laurion region (Jones, 2007). Rooms of different sizes are arranged around a central courtyard. The excavation site (Lohmann, 2016; 2020, pp.53–54, figs.12–13; Hulek, 2020) lies on the north-western spur of Mt. Charvalo, on a natural graded terrace at about 120 m above sea-level (Fig. 2). The terrain is rather flat there and thus was convenient for building purposes. Water for an ore washery came from the neighbouring steep slopes and was stored in a cistern, as elsewhere in the Laurion region (cf. Kakavogiannis, 2005, pp.225–229; 2013; Van Liefferinge, et al., 2014). A second cistern was left unfinished, but likewise shows the large demand for water.

The amount of debris and the well-built walls suggest that at least part of the complex had an upper, second storey. There are indications, e.g. building joints, that the rooms in the southwest were added later. The building was presumed to be a workshop for ore enrichment, a so-called Ergasterion, due to the ground plan, the two large rectangular cisterns, and the remains of waterproof mortar in one of the rooms (Lohmann, 2020, pp.53–54).

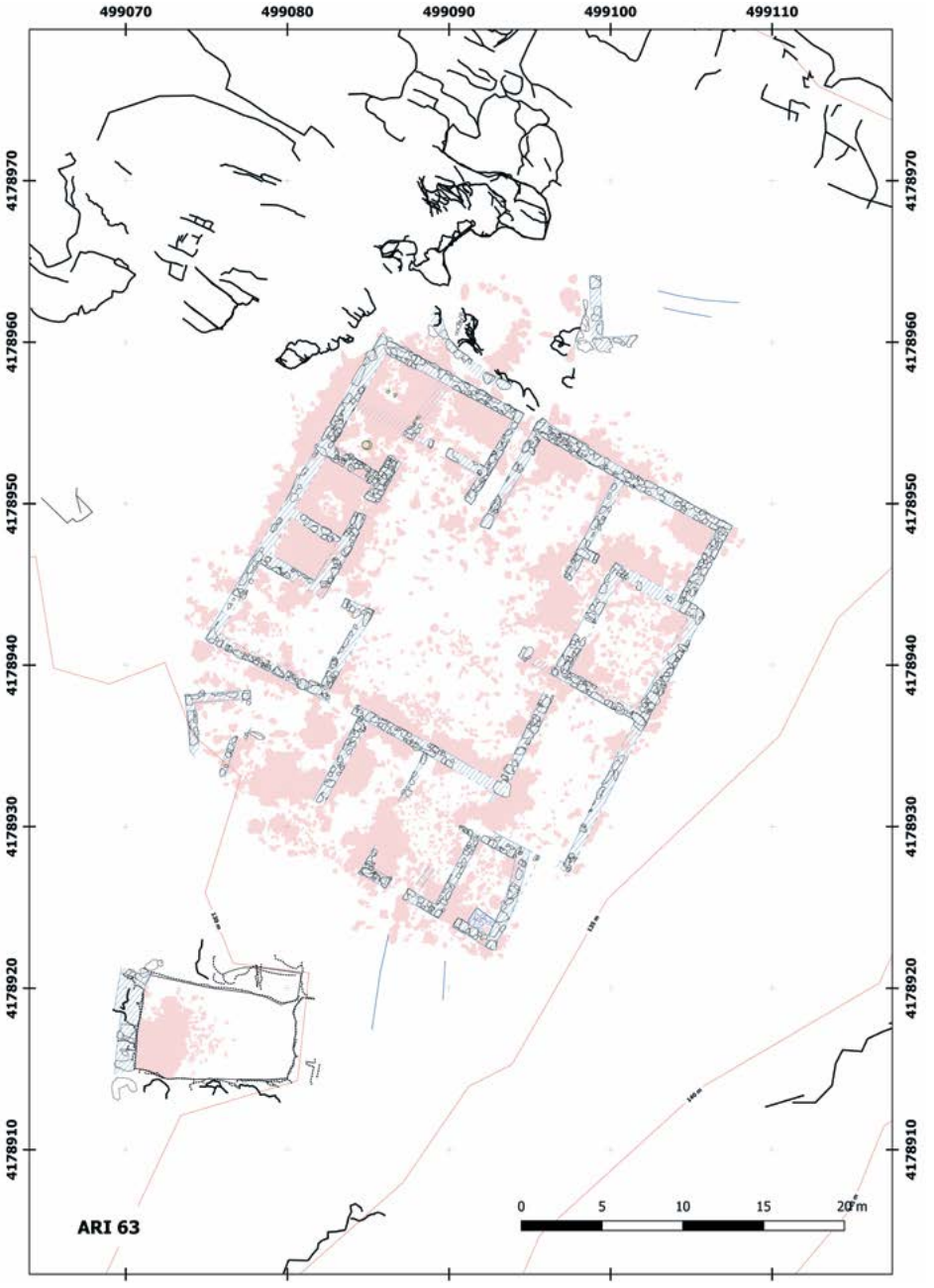

Fig. 1: Workshop Ari 63A, ground plan (Ari-Project, Bochum, drawing: H.-P. Klossek). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

In the room where the ore washery was assumed to have been located, the first trial trench was opened. The other trenches were located in the two neighbouring rooms in the east and the corridor in the west (Fig. 3). During excavation, the complex turned out to be only superficially affected by later activities. The stratigraphic layers showed the expected sequence of top soil, collapse, then the stones of the walls and at the bottom the clay of the mud bricks. Only two areas in the centre of the washery and in its eastern corner had been disturbed. However, this disturbance did not take place in modern times, but according to the ceramics found could be connected to treasure hunters in the early Middle Ages.

As the trench was planned as a trial excavation, we excavated only the south-eastern half of the washery. Its ground-plan corresponds to the well-known type of rectangular ore washeries of the Laurion region (Fig. 4; Negris, 1881; Conophagos, 1980, pp.224–247; Domergue, 1998; Rehren, et al., 2002; Kakavogiannis, 2005, pp.229–253; Nomicos, 2021, pp.63–68). In front of the water tank was the washing area, followed by a channel, which in this type of washery is generally linked to a perpendicular channel. This can therefore be presumed in the unexcavated half of the washery. Generally, the latter runs into a basin linked to a second basin, connected by the third water channel. The second basin is also to be found in the excavated

Fig. 2: Aerial View of ancient workshops Ari 63A (centre right) and Ari 64 (left) on the Charvalo hill at Ari (photograph: D. Gansera, No. DG15_P1070840). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

Fig. 3: Workshop Ari 63A, Orthophoto of excavation trenches in the washery (centre), adjacent rooms 2 (right) and 3 (right down) and the corridor (up left) (Ari-Project, Bochum, processing by M. Korczyńska). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

half of the washery. After another channel, the third and last basin is reached. From there, water could be taken and reused again in the water tank. The channels thus surround a rectangular area, the drying surface.

The washery was about 10 m long and 5 m wide. It is comparatively well preserved; as mentioned before, the late Antique/early Byzantine activities destroyed part of the surface of the drying area and of the wall separating the washery from room 2 on the eastern side. Also, the front wall of the water tank is missing. No observations of reconstruction or repairs of the washery were made. The surfaces, channels and basins were all completely covered by waterproof mortar, which is common in hydraulic installations in the Laurion region. The water channels had been dug into the natural soil, while the slightly sloping surfaces were underlain with medium sized stones in the foundations and small sized stones in the upper layers, mixed with clayey soil.

In ancient Laurion, ore was mined with hammer and pick, coming out of the workings about fist-sized and smaller

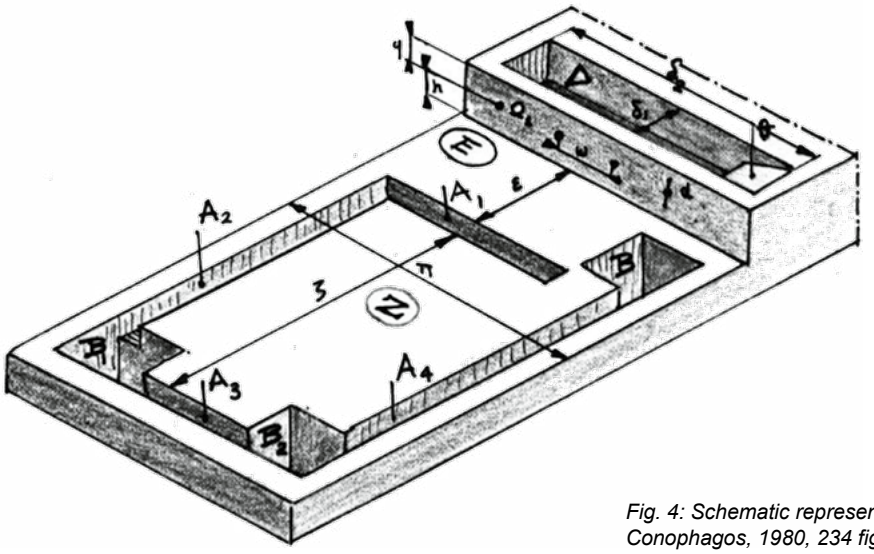

Fig. 4: Schematic representation of an orthogonal washery (after Conophagos, 1980, 234 fig.10-16).

(Conophagos, 1980, pp.166–212; Morin, et al., 2013, p.20; Lohmann, this vol.). A coarse sorting by grade took place already underground. Above ground, the ore had to be crushed and enriched. It was first spalled, implying smashing with an iron hammer or stone tools. Rock holes formed by this process were discovered for the first time in the Laurion above ground during the survey at Ari (Lohmann, 2020, p.48, fig.5; this vol.; Nomicos, 2021, p.46, pl.7,1; cf. underground in the mines at Velatouri/Thorikos: Morin and Delpech, 2018, p.44).

In a second step, the spalled ore was ground. The resulting ore grains measured about 1 mm and resem-

Fig. 5: Workshop Ari 63A, Room 3. Grinding table with hollowed-out surface (photograph: H. Lohmann, No. N16_6707). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

bled coarse sand. It can be ascertained that a 1 m wide limestone block with a hollowed-out and smooth surface found in room 3 served to grind the ore (cf. Nomicos, 2021, pp.47–48). It is also possible that so-called Olynthian mills, which are ubiquitous in the ancient workshops in the Laurion mining region, were used for this activity, as K. Konophagos has proposed (Conophagos, 1980, pp.220–223; Lynch and Rowland, 2005, p.3; Van Liefferinge, et al., 2013, pp.68, 70, 73 fig.18; Nomicos, 2021, pp.48–49). Fragments of this type of millstones were found at the Ergasterion Ari 63A and analysed by Dr. A. Hein of the NCSR Demokritos by means of a portable XRF analyser, but their surface showed a lead concentration of 0.7%, equivalent to the lead pollution of the soil (Lohmann, 2020, p.48; this vol.). Thus, the final proof for the use of so-called Olynthian mills for grinding not only cereals but also ore is still missing.

Room 3 was built next to the ore washery on three different levels formed by the terraces of the natural rock. The limestone block mentioned above stood in a corner of the room on the middle terrace, built on a small platform of smaller stones (Fig. 5). A door next to it linked room 3 and room 2. A storage installation in room 3 constructed from fieldstones was found empty, so we do not know its exact use. In room 2, which lies between this room and the washery (Fig. 3), there were no tools or technical installations found during the excavation. However, the floor was lined with the same waterproof mortar that was used in the ore washery. It could be interpreted as a bathroom for the workers or a storage room for the ore powder.

The ore washing process

In many ores, the metals and their compounds are the fractions with the highest specific gravity, such as in Laurion, where argentiferous lead minerals are found in carbonates. They can, therefore, be separated from the gangue material by a density separation in flowing water. According to a thesis put forward by K. Konophagos, the density separation was achieved on sluices, wooden gutters with small hollows, in which the denser material remained, while lighter particles were washed away (Konophagos, 1970, esp. pp.7–13; Conophagos, 1980, pp.224–245; Rehren, et al., 2002, pp.38–40; Mussche, 2006, pp.229–230; Papadimitriou, 2017, p.401; cf. Domergue, 2008, pp.150–151 fig.95; Van Liefferinge, 2018a, p.91; Hauptmann, 2020, pp.83, 168). There is no archaeological evidence so far, however, as to

Fig. 6: Ari 63A, Washery. Water basin (left), washing surface (centre), last basin (top centre), and first channel (right) both still filled with rubble. The smooth part of the washing surface exactly in the centre, the roughened below, with the folding rule (photograph: H. Lohmann, No. N16_6568). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

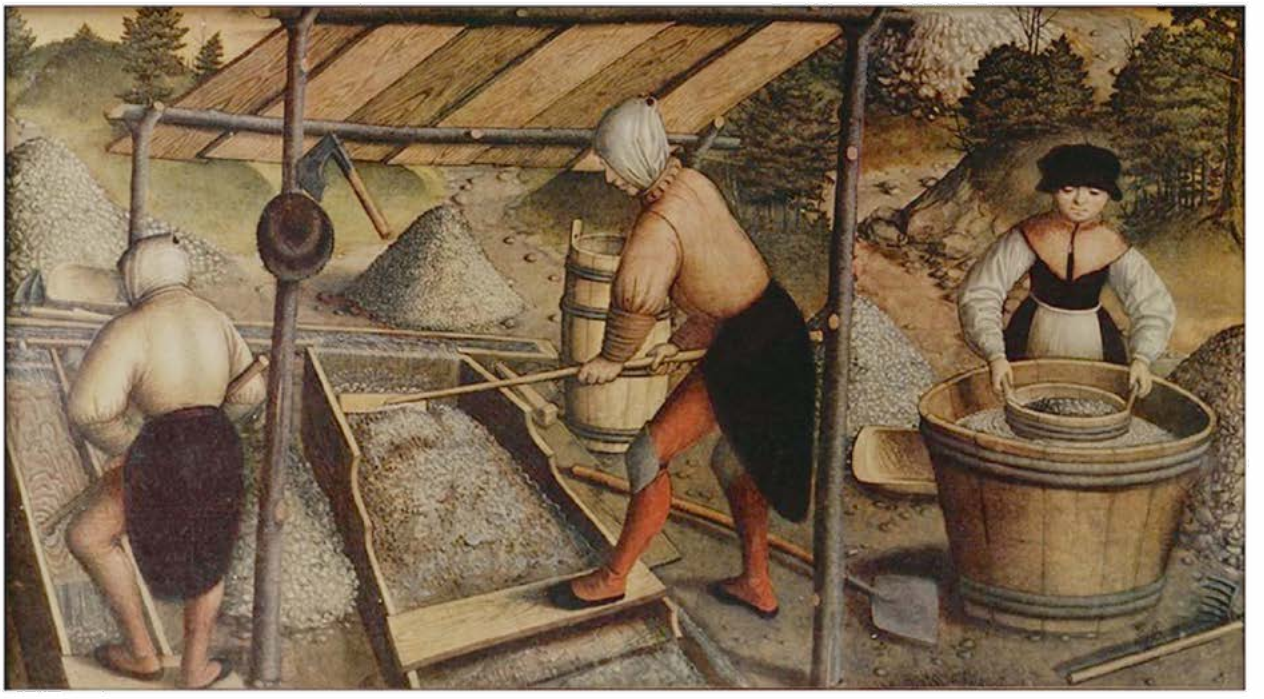

Fig. 7: St. Anne's Church, Annaberg-Buchholz (Saxony), altar piece, rear side, detail: Ore washery with plane tables (artist: Hans Hesse, 1522; rights holder: Evangelical Lutheran Congregation Annaberg-Buchholz).

how these assumed sluices were installed on the washing surfaces in front of the wall of the water tank (Lohmann, 2005, pp.114, 130; 2020, p.51; this vol.; Domergue, 2008, p.150; Nomicos, 2021, pp.64–65). Another interesting opinion was put forward by E. Kakavogiannis, who suggested that the ceramic bowls (*lekanai*) found in the ancient workshops may have been used in a similar way to washing pans for washing gold in placer deposits (Kakavogiannis, 2001, pp.367–368; 2005, pp.230–242; but cf. Domergue, 1998, p.39; Tsaïmou and Fragkiskos, 2001; Nomicos, 2021, p.66).

An older thesis was established in the 19th century by the engineer Ph. Negris, who assumed that the ground ore was spread out on the slightly inclined surface of the washing surface in front of the tank and that the water flowing out of the jets in the front wall of the tank then carried away the lighter particles. The medium-heavy particles remained in the channel in front of the washing surface and had to be washed once more. Further medium-heavy particles (so-called middlings) were swept away into the three successive basins. The residues collected there were washed again (Negris, 1881; Ardaillon, 1897, pp.68–70; Wilsdorf, 1951, p.118; Marinos and Petrascheck, 1956, pp.9–10; Trikkalinos, 1978, pp.54–55, 67–68; Kalcyk, 1982, p.187; Photos-Jones and Jones, 1994, pp.353–354; Domergue, 2008, pp.149–150 fig.92; Lohmann, 2020, pp.51–52; this vol.; Nomicos, 2021, p.67; this vol.). The material with the highest density and therefore richest material remained on the washing surface. Regrettably, Ph. Negris did not further elaborate the considerations on which he based this explanation, but he possibly made similar observations as we did during the excavation and additionally had the installations of the early modern ages in mind, the so-called plane tables or buddles (cf. Morin-Hamon, 2013, p.38; in prep.; this vol. p.213; Lohmann, 2020, pp.51–52, fig.11; Nomicos, 2021, p.67 pl.26,1).

At the washing area of Ari 63A, again any evidence for the application of sluices is missing. But one notices that except for a 40 cm wide strip next to the edge of the neighbouring basin, the entire plaster surface is strongly abraded and roughened, as if someone had rubbed or swept something there again and again (Fig. 6). During the excavation, this already brought early modern drawings like one by the mining specialist Georgius Agricola (Agricola, 1556, p.237; Hoover and Hoover, 1950, p.302) or on the Annaberg altar piece in the Saxonian Ore Mountains (Fig. 7) into mind, showing workers in a contemporary ore washery moving the slurry with a horizontal board on a rod. This method, which is not used any more nowadays, is explained in a textbook by the professor of mining science at the Freiberg Mining Academy, E. Treptow (1925, pp.95–100). He describes that in the plane tables, the sand-like fine ground material is first applied to a slightly inclined surface and covered with a flowing film of water. In a further step, one moves it with a broom or a wooden scrubber and sprays fresh water on it again to bring the material into motion, letting the water wash away the lighter particles or buddle waste (Treptow 1925, pp.97–98; cf. the English handbook Le Neve Foster, 1900, p.579). In our opinion, it was precisely

this process that caused the wear marks on the washing surface of the excavated ore washery. Treptow goes on to explain that during this process a good part of the richer ore particles remain on the surface, while another part is washed into the basin in front of it and settles there. Yet another part is transported even further, which is why he suggests to add further basins to catch it. Therefore, the basins of the Laurion ore washeries served not only for the settling and recycling of the used water but also to collect ore rich particles that had been washed away (cf. Negris, 1881, pp.160–161; Treptow, 1925, pp.97, 174–175; cf. Rihll, 2001, pp.118, 137 n.12).

The archaeological finds corroborate the thesis that the washery worked like a plane table: A very fine, sintered layer with a slight metallic gloss has settled at the bottom of the first channel, and a similar residue could be found on the bottom of the basins. A. Hein (NCSR Demokritos, Athens) analysed thin-sections (microsections) of these residues with an optical microscope, a scanning electron microscope and an X-ray spectrometer device (SEM-EDS). They show a layered structure, which actually turned out to be high in lead. However, further analyses are still pending, so that it cannot be completely ruled out that the residues were formed as a result of post-depositional processes after abandonment of the ore washing. Yet, according to A. Hein, the clearly separated layers and the relatively homogeneous grain size distribution within the layers speak against this. Similar results are known from the excavations of E. Photos-Jones and J. E. Jones at Agrileza (1994, pp.331–356; Nomicos, 2021, p.64 n.708; cf. already Kordellas, 1888, p.33).

If the number of workmen Treptow states as necessary for the process is applicable to the ancient washeries, this reconstruction of the washing process means that a small workforce did all the ore washing. The mining specialist relates that a single workman could operate two plane tables simultaneously (Treptow, 1925, p.99; cf. Domergue, 1998, p.41). At the Laurion washeries, at least another, but unskilled worker was necessary to scoop the processed water back into the tank. This would be an effective process management, especially when compared to the up to fourteen workers of Konophagos' reconstruction (Conophagos, 1980, pp.345, 237, fig.10-20 as opposed to Domergue, 2008, p.151, fig.94).

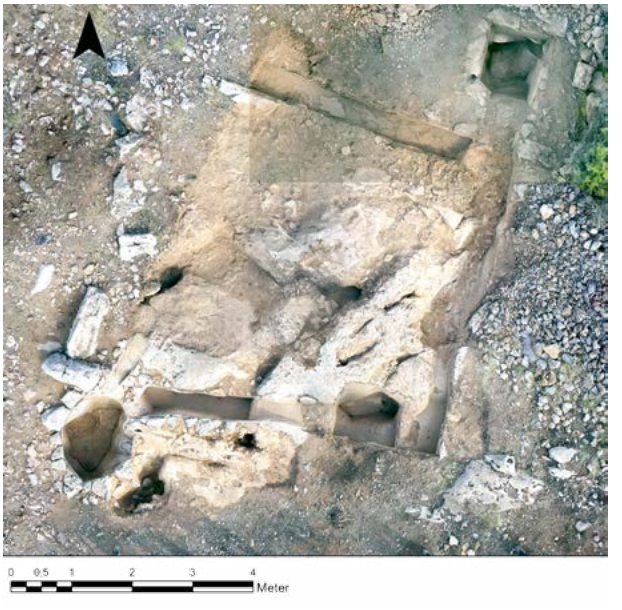

Fig. 8: Ari 76, non-canonical ore washery. Orthophoto of excavation in the washery. Areas interpreted as washing surface (up), channels, basins and drying surface (centre) degraded down to the bedrock, and modern tailings pile (right) (Ari-Project, Bochum, processing by M. Korczyńska and F. Hulek). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

Chronology

During the excavation in the three rooms of the workshop Ari 63A, only few fragments of pottery were found. If any conclusions can be drawn based on such a small trial excavation of a minor part of the complex, the small number of finds might be explained by the function of the rooms as workplaces, which had been tidied up regularly during their use and emptied, when the building was finally abandoned. The largest part of the pottery dates from the second quarter to the end of the 4th century BC, while some shapes are extending into the first decades of the 3rd century BC. This corresponds to the pottery finds of the extensive survey and from the excavation of K. Tsaïmou at Ari III (Lohmann, 2020, pp.51, 53; Nomicos, 2021, esp. p.116; this vol.; Kapetanios, this vol.).

Unfortunately, the construction of the complex could not be dated exactly, but the evaluation of the totality of the pottery found will at least give an indication. There are some ceramic bowls, *lekanai*, which according to the parallels offered by G. Lüdorf (2000) might date either to the 5th or the 4th century BC. One of the youngest pieces is a nearly complete one-handler (inv.-no. Ari 63A–3A–63:1; cf. Rotroff 1997, p.329 no.864, fig.58: 300–275 BC), which was found pressed flush under the debris of the ground floor of room 3 and is therefore to be interpreted as a possible terminus post quem for the abandonment of the workshop. Scattered in the disturbed parts of the washery, some pottery fragments from the 6th or 7th century AD were observed, many of them fragments of one jug.

Trenches at Ari 8 and Ari 76

On the other, south-western flank of Mt. Charvalo, the remains of a smelting furnace battery (Ari 8) and a non-canonical ore washery (Ari 76) were also investigated by two trial trenches. Conspicuously, the ore washery Ari 76 shows non-orthogonal channels. Both objects were unfortunately heavily disturbed by the activities of modern mining activities. The shape of the ore washery,

Fig. 9: Ari 8, Furnace battery. Fragment of furnace wall with lead containing coating (photograph: H. Lohmann, No. N16_6832). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

however, which has been stripped down to the bedrock by bulk earthworks in modern times (Fig. 8), may at least indicate that it could be older than the rectangular ones. The oldest fragments of pottery found there, mixed with modern debris in unstratified contexts date to the late 6th/ early 5th century BC.

At the smelting furnace battery Ari 8, numerous fragments of slabs of volcanic rock were found, each of which had a brownish or yellowish coating on one or more surfaces (Fig. 9). Analyses carried out by A. Hein at the NCSR Demokritos (Athens) proved the coating to be lead-rich slag, thus the stone slabs can be interpreted as walls or floor of a smelting furnace. Close to the furnace battery Ari 8, two worked stone blocks were found which strikingly resemble the anvil stones of Roman stamp mills found at Três Minas in Portugal and in other mining regions within the Roman Empire (cf. Nomicos, 2021, pp.57–58, pl.18,1; Lohmann, this vol.; for Roman stamp mills cf. Wilson, 2002, pp.21–23 fig.3; Domergue, 2008, pp.144–145, fig.87; Wahl-Clerici, 2020, pp.190–191, 203–208 figs.4.0.8–18)

The excavation at Frankolimano in 1969/70

In the summer of 1969, the Public Power Corporation of Greece (ΔΕΗ) started to build a power plant north of the town of Lavrio at a small bay called Frankolimano (for the name, cf. Kakavogiannis, 1985, p.82). The Ephor of Antiquities at the time, E. Mastrokostas, enforced a rescue excavation on the building plot, which was situated close to the archaeological site of Thorikos, against the will of the construction supervision and the authorities (cf. Kakavogiannis, 2005, pp.270–271 n.668; Apostolopoulou-Kakavogianni, 2008, p.37).

This resulted in the archaeologists O. Apostolopoulou and E. Kakavogiannis excavating ancient buildings, two cemetries, a rectangular ore washery and above all a battery of five smelting furnaces (Fig. 10) and a presumed cupellation furnace. So far, only brief remarks on these excavations have been published (Liagkouras and Kakavogiannis, 1972, p.150; Konophagos, 1974, pp.268–271; 1975, p.344 fig.3, p.361; Trikkalinos, 1978, pp.59, 72–73, tab.12; Conophagos, 1980, pp.280 (note), 288; Kalcyk, 1982, pp.144, 149, 208 fig.24, p.211; Kakavogianni, 1985, p.51; Kakavogiannis, 2005, pp.262, 270–271 n.668; Lohmann, 2005, p.132 n.69; Nomicos, 2021, pp.114, 117, 179 no.52). O. Apostolopoulou-Kakavogianni kindly allowed me to study and publish the material and the excavation documentation. This, and especially the detailed excavation diaries and photographs by the excavators, will offer the opportunity to explore the smelting of the ore and the production of metallic silver.

The furnace battery (Fig. 10) is located on a small tip of land in the northern part of Frankolimano and consists of the east-west oriented foundation walls of at least five chambers (each about 5.0 m × 3.2 m in size) which open into a walled courtyard facing South. At least a sixth chamber can be assumed, but this side of the complex has been eroded by the sea; it is preserved for a length of 37.5 m and has an overall width of 18 m (Konophagos, 1974, pp.269–271, figs.3–4; cf. Kakavogiannis, 1988, pp.31–32). The foundation walls are made of local limestone and, above all, granite-like stone. On the northern wall of each chamber, traces of the smelting furnace proper have been preserved in semi-circular recesses where the natural rock and stones are reddened by the heat and fired clay and oxidized coatings were observed. The furnaces themselves were built of a thick clay layer, probably in addition to mud bricks. To the north behind the chambers are two parallel corridors from which the charging of the furnaces was carried out. The furnace battery is preserved as a fenced archaeological site within the power plant compound.

Museum Campaigns 2017 and 2019

The campaign in the Archaeological Museum of Lavrio in summer 2017 lasted four weeks. Priority was given to processing finds from the battery of smelting furnaces and a presumptive cupellation furnace.

Based on the pottery, the amphora stamps and some coins, the chronology of the smelting furnaces probably goes back to the first half of the 2nd century BC, the time when the so-called New-Style-tetradrachms began to be issued (early 2nd century BC according to Thompson, 1961, esp. pp.107–132; later chronology starting 164/163 BC.: Lewis, 1962, p.275; Boehringer, 1972, pp.28–31; van Alfen, 2012, pp.98–99; middle chronology Mørkholm, 1984, p.42; cf. Flament, 2007, pp.146–147; Börker, 2018,

Fig. 10: Frankolimano Thorikou (near Lavrio), ancient smelting furnaces during excavations 1969. From South (Archives of the Ephorate of Antiquities of East Attica, photograph: E. Kakavogiannis, DEI-excavation No. 8). The rights of the monuments depicted belong to the Greek State and the Ministry of Culture and Sports (Law 3028/2002).

p.70). The same seems to be true for some of the other smelting furnaces on the coast (Konophagos, 1974, p.266: 3rd century BC or later; Salliora-Oikonomakou, 2004, p.62; Lohmann, 2005, pp.127–128; Van Liefferinge, 2018b, p.550; Börker, 2018; Nomicos, 2021, pp.110–111; Tsaïmou, et al., 2015, p.118 tab.1, p.125 for Ari in the hinterland; but cf. Mussche, 1998b, pp.65–66; Conophagos, 1980, p.288; Salliora-Oikonomakou, 2004, pp.70, 74–75). In these cases, they are most probably the remains of a later reuse of the Classical slag heaps and washing residues. The finds of the old excavation also include intermediate products of smelting and remains of the furnace walls. Analysing them will make it possible to reconstruct the smelting process.

Another, single furnace, which was labelled as a cupellation furnace during excavation, was located about 30 m north of the smelting furnace battery, where today the cooling water of the power plant is discharged into the sea. According to common opinion, in Antiquity silver was separated from the argentiferous work lead in cupellation furnaces by oxidizing the lead to lithargite and draining it. In a second cupellation step, the enriched argentiferous lead is again oxidized and silver, as the nobler (i.e. more resistant to oxidation) metal, is left behind (Konophagos, 1959, pp.259–261; Conophagos, 1980, pp.308–327; Pernicka and Bachmann, 1983; Hauptmann, 2020, pp.342–343; cf. Nomicos, 2021, pp.73–74). However, according to the preliminary analyses by E. Filippaki, the furnace in question could also be related to iron metallurgy, i.e. an iron smelting furnace or a forging furnace. There is a similar finding at nearby Thorikos in the theatre necropolis (Mussche, 1998a, pp.44–45, 64–65; Varoufakis, 2014). Cupellation furnaces from Laurion have not yet been documented in the literature, probably because they have been destroyed entirely during the 19th and early 20th century, when the workmen of the modern mining companies collected the litharge found within them (Cordella, 1869, p.103; Kordellas, 1888, p.87; Conophagos, 1980, p.308; Mussche, 1998b, p.67; Kakavogiannis, 2005, pp.273–274; Nomicos, 2021, p.73).

The chronology of this site remains unclear up to now, as some contexts contain both Hellenistic and early Byzantine pottery of the 6th or 7th century AD. A Hellenistic date of this small furnace together with the smelting furnace would result in a harmonious ensemble of metallurgical installations, while a late Roman or early Byzantine date would illuminate another phase of metal production in the Laurion. D. Morin has observed oil lamps with Christian symbols in the antique shafts at Thorikos (Morin and Delpech, 2018, pp.44–45; see also Butcher, 1982; Mussche, 1998a, p.65; Konstantinidou, et al., 2018, pp.53–54; cf. Mattern, 2010; Docter, et al., 2013; this vol.; Kakavogiannis, 2013; Lagia, et al., 2016; Nomicos, 2017, p.225; 2021, pp.121–127; this vol.; Lohmann, this vol.; Kapetanios, this vol.), which speak for a reopening of mining in the late Antique or early Byzantine period. Finally, Paul the Silentiary claims that the »…veins of the mountains of Sounion had to open again…« for the silver of the Hagia Sophia church in Constantinople, which is another hint to a renewed use of the mine workings in the time of the emperor Justinian I. (Paul. Sil. Ecphr. 679–680; de Stefani, 2011, p.46).

The second campaign took place during two weeks in early autumn 2019. The recording of the finds from the old excavation was continued, with priority given to the finds from the so-called “Building 1”. According to the excavator O. Kakavogianni, referring to its ground plan, the building could be an ancient farmstead, but numerous metallurgical finds were also made. It can be hoped that an analysis of the finds will help to determine the function and chronological classification, which will allow us to determine more precisely the relationship with the smelting furnaces.

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