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*The Economic History of Byzantium:
From the Seventh through the Fifteenth Century*

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Mining

Klaus-Peter Matschke

The Byzantine Empire was heir to the highly developed and diversified Roman mining tradition, in which large-scale mining districts—yielding gold, silver, copper, iron, and other metals—were found alongside many small and even tiny units of production. Large mining operations controlled and managed by the state coexisted with individual and collective leaseholds on ore mines and with mining that was pursued by peasants as a secondary occupation. A complex administration had developed to organize state-controlled mining operations, to collect special property taxes from owners of ore-rich land and production levies from mine operators, gold prospectors, iron gatherers, and others involved in the extraction of ores, and to ensure that the entire output of precious metals was transferred into the hands of the state.¹

Archaeological finds reveal that this tradition continued at least into the early Byzantine period. Surface surveys and mapping of a settlement of Byzantine gold miners near Bir Umm Fawakhir in the central Eastern Desert of Egypt have recorded more than one hundred buildings and recovered extensive pottery remains that probably date back to the late fifth and sixth centuries. A number of granite blocks with faint surface depressions have also been found. The gold ore was probably crushed on these blocks in a preliminary processing step right outside the entrances to the mines on the slope of the valley in order to remove the matrix and retain the smaller quartz lumps that would repay the effort of further reduction. Rotary mills or querns may have been used to grind these lumps into finely granulated ore. This mining center in Wadi Hammamat may have been part of a large military-industrial complex that was located in the desert east of the Nile and on the Red Sea coast, complete with fortifications, waystations, and port facilities. It was from here that the early Byzantine state procured, at least for a short time, some of the precious metals it needed for its mints and imperial workshops.²

This chapter was translated by Thomas Dunlap.

¹ Cf. J. F. Healy, *Mining and Metallurgy in the Greek and Roman World* (London, 1978); J. Ramin, *La technique minière et métallurgique des anciens* (Brussels, 1977); J. C. Edmondson, "Mining in the Later Roman Empire and Beyond," *JRS* 79 (1989): 84–102.

² Cf. C. Meyer, "The Bir Umm Fawakhir Survey Project," *The University of Chicago, The Oriental Institute: Annual Report, 1992–1993*: 21–28; idem, "Gold, Granite, and Water: The Bir Umm Fawakhir Survey Project, 1992," *AASOR* 52 (1994): 37–92.

The rich gold deposits in the border regions of Armenia were so important to the early Byzantine state that the conflicts with the Persians/Sassanids, which dominated political events from the fifth to the seventh century, at times took on the character of economic wars.³ According to John Malalas, the gold was so close to the surface on some mountain slopes that it was washed out by heavy rain and could be simply picked up from the ground.⁴ It appears that the Persians initially leased ore-rich mining areas from the Byzantines. Later we also hear that sites were jointly granted to private Persian and Byzantine operators, with the annual rent of 100 pounds of gold divided between the licensors. Unilateral violations of these agreements, and the hope by both sides to exploit the mineral deposits exclusively, led to endless military clashes and weakened political control in the border areas. Around 530, a local mine operator by the name of Symeon tried to take advantage of this situation: by placing himself and his business operations under Byzantine authority he avoided paying the Persians the agreed-upon rent for the *kastron* and the mines of Pharangion. However, having done so, he also refused to hand over the gold he mined to his new masters.⁵

The existence of a special *comes metallorum per Illyricum* in the fourth century shows that mining in the Balkans was of special importance to the early Byzantine state.⁶ Archaeological research has confirmed that a small gold mine—or perhaps more likely a smeltery—protected by a rampart and tower was in operation in the region of Kraku’lu Yordan at the upper reaches of the Pek River until the end of the fourth century.⁷ Gold was panned from the sand of the Hebros and some of its tributaries already in the early Byzantine period.⁸ Fourth-century written sources mention Thracian gold prospectors,⁹ individuals expert in following veins of gold,¹⁰ and state mine administrators in Macedonia, Moesia, and in other provinces in the prefecture of Illyricum.¹¹ All these references confirm the wide distribution of mining activity and the diversity of mining operations in these core areas of the Byzantine Empire.

A number of other metals were mined in addition to gold and silver. The church father Basil of Caesarea (in Cappadocia), in a letter written in 372, described the Taurus Mountains in Asia Minor as rich in iron, and he asked Modestos, the *praefectus praetorio Orientis*, who was officially in charge of supervising the mining and supply of base metals, to reduce the taxes on iron mining (*siderou synteleian*) to a tolerable

³ S. Vryonis, “The Question of the Byzantine Mines,” *Speculum* 37 (1962): 5.

⁴ *Ioannis Malalae Chronographia*, ed. L. Dindorf (Bonn, 1831), 455–56.

⁵ Prokopios, *De Bello Persico*, ed. J. Haury and G. Wirth (Leipzig, 1962), 1.15.27–29.

⁶ *Notitia dignitatum*, ed. O. Seeck (repr. Frankfurt, 1962), 13.11. Cf. O. J. Belous, “Ob upravlenii gornymi predpriiatiiami v pozdrei Rimskoi i rannei Vizantiiskoi imperiiach, IV–VI vv.,” *ADSV* 24 (1988): 147.

⁷ M. R. Werner, “The Archaeological Evidence for Gold Smelting at Kraku’lu Yordan, Yugoslavia, in the Late Roman Period,” *British Museum Occasional Paper* 48 (1985): 219–27; cf. Edmondson, “Mining,” 93–94.

⁸ P. Soustal, *Tabula Imperii Byzantini*, vol. 6, *Thrakien* (Vienna, 1991), 152.

⁹ *Theodosiani libri XVI cum constitutionibus Sirmondianis*, ed. P. Krüger, T. Mommsen, and P. M. Meyer, 2d ed., 2 vols. (Berlin, 1954), 10.19.7.

¹⁰ Ammianus Marcellinus, *Römische Geschichte*, ed. W. Seyfarth, 4 vols. (Berlin, 1968–71), 31.6.1–6.

¹¹ CIC, *CI*, 11.7.4

level;¹² the taxes in question could have been either the *ferraria praestatio* levied on local landowners or the *metallicus canon* imposed on miners and mine operators.¹³

In the seventh century, the Byzantine Empire lost a number of its most important mining regions to Arabs, Slavs, and other peoples. The political situation in the remaining parts of the empire was marked for some time by a high degree of instability, which must have greatly impeded the orderly working of ore deposits and the establishment of costly installations for extracting metals.¹⁴ Still, mining activity did not cease entirely. In the early 1960s, S. Vryonis speculated that mining continued in different forms and on a different scale,¹⁵ and recent studies on the composition of coins bear him out. They show that over the following centuries, Byzantine minting did not rely only on precious metals already minted, on hoarded and captured treasures, and on the occasional tribute in the form of foreign coinage, but that, at certain times and in certain economic situations, large amounts of newly mined gold and silver were supplied to the mints.¹⁶ However, it seems clear that the tendency toward simpler organizational forms, already evident in the early Byzantine period, intensified further and that mining was once again more closely linked to landownership and frequently was an activity that peasants pursued on the side.¹⁷ The state largely withdrew as a mining operator and limited itself essentially to controlling taxes and regulating the trade in precious metals. This led to an inevitable decline in public interest in mining. We hear nothing more about military activities aimed at safeguarding and acquiring ore beds, even if such activities may well have continued on a smaller scale.¹⁸

References to mining in the literature from the middle Byzantine period suggest very simple production methods and organizational forms. Eustathios of Thessalonike, in his twelfth-century description of the possibilities of mining, mentions only grains

¹² Saint Basile, *Lettres*, ed. Y. Courtonne, 3 vols. (Paris, 1957–66), 2: no. 110, pp. 11–12. Cf. F. Hild and H. Hellenkemper, *Tabula Imperii Byzantini*, vol. 5, *Kilikien und Isaurien* (Vienna, 1990), 1:116.

¹³ For more on these state levies, see Edmondson, "Mining," 98; J. Karayannopoulos, *Das Finanzwesen des frühbyzantinischen Staates* (Munich, 1958), 60.

¹⁴ For more on the sociopolitical conditions surrounding mining activity, see Edmondson, "Mining," 95–97.

¹⁵ Vryonis, "Mines," 16–17.

¹⁶ C. Morrisson, "Numismatique et histoire, l'or monnayé de Rome à Byzance: Purification et altérations," *CRAI* (1982): 203–23; C. Morrisson, J. N. Barrandon, and J. Poirier, "La monnaie d'or de Constantinople: Purification et modes d'altération, 491–1354," in C. Morrisson et al., *L'or monnayé*, 2 vols., Cahiers Ernest-Babelon 2 (Paris, 1985), 1:113–87; C. Morrisson, J. N. Barrandon, and C. Brenot, "Composition and Technology of Ancient and Medieval Coinages: A Reassessment of Analytical Results," *ANSMN* 32 (1987): 181–209; A. A. Gordus and D. M. Metcalf, "The Alloy of the Miliarion and the Question of the Reminting of Islamic Silver," *HBN* 24–26 (1970–72): 9–23.

¹⁷ Cf. the agricultural and mining community on the southern coast of Cyprus in the 6th/7th centuries, mentioned in an excavation report: see M. McClellan and M. Rautman, "Kalavassos-Kopetra, 1990," *AJA* 95.2 (1991): 302.

¹⁸ Theophanes, *Chronographia*, ed. C. de Boor, 2 vols. (Leipzig, 1883–85; repr. Hildesheim, 1963), 1:179, reports in the 9th century on the economic background of the Persian wars of the 6th century. His description of contemporary conflicts on the eastern border of the empire gives no indication, however, that mineral deposits and mining played any role. For information on Byzantine castles whose purpose may have been to safeguard mining activities, see, among others, F. Hild and M. Restle, *Tabula Imperii Byzantini*, vol. 2, *Kappadokien* (Vienna, 1981), 159.

of gold and silver washed to the surface by rain.¹⁹ Around 940, Niketas Magistros described coastal dwellers of the Propontis who collected lumps of iron from the sand of an estuary and roasted them first in a fire and then in a smelting furnace (perhaps to form a doughlike ball); this pig iron was then heated once again (and possibly beaten into ingots) in preparation for being worked by specialized craftsmen.²⁰ These coastal people were thus producing iron in a fashion similar to that of west European peasants of the early and high Middle Ages, whose Catalan process involved the use of bloomery hearths. Byzantine ironworkers may also have used bellows: Eustathios mentions them in another passage, naming them *akrophysia* in contrast to the *akrostomia* used by blacksmiths.²¹ The monastery of St. Phokas in Trebizond had a *proasteion* in the ninth century where iron was produced (probably by dependent peasants) and handed over to the monks (possibly as rent).²² Already during the crusades, western iron seems to have been superior in quality to Byzantine iron: Anna Komnene speaks of the *agathos sideros* ("good iron") that was used in the army of the Norman leader Bohemond I.²³ A larger number of silver, tin, and gold mines has been found by recent surveys in the Bolkar-dağ district, not far from the Byzantine fortress of Lulon. Most of them were fairly small, but at least they were still active in the eighth century.²⁴ Their existence also increases the likelihood that mining continued in the Taurus Mountains until the fourteenth century, when various mines supplied large amounts of pure silver to the area's Mongol rulers and their governors.²⁵ Recent archaeological work has revealed traces of (middle) Byzantine mining also in northwestern Asia Minor between the Hellespont and the Gulf of Adramyttion,²⁶ near Kinyra on the island of Thasos,²⁷ and near Perist-

¹⁹ *Eustathii Thessalonicensis Opuscula*, ed. F. L. Thomas (repr. Frankfurt, 1964), 251. Cf. A. Kazhdan's review of Vryonis in *VizVrem* 25 (1964): 259–61, with reference to I. P. Medvedev, "Problema manufakturny v trudach klassikov marksizma-leninizma i vopros tak nazyvamoj vizantijskoj manufakturny," in *V. I. Lenin i problemy istorii* (Leningrad, 1970), 407.

²⁰ Niketas Magistros, *Lettres d'un exilé, 928–946*, ed. L. G. Westerink (Paris, 1973), 65. Cf. A. M. Bryer, "The Question of Byzantine Mines in the Pontos: Chalybian Iron, Chaldian Silver, Koloneian Alum and the Mummy of Cheriana," *AnatSt* 32 (1982): 133.

²¹ *Eustathii metropolitae Thessalonicensis commentarii ad Homeri Iliadem*, ed. G. Stallbaum, 4 vols. (repr. Hildesheim, 1960), 3:83. Cf. G. Weisgerber and C. Roden, "Griechische Metallhandwerker und ihre Gebläse," *Der Anschnitt* 1 (1986): 5.

²² A. Papadopoulos-Kerameus, "Συμβολαὶ εἰς τὴν ἱστορίαν Τραπεζοῦντος," *VizVrem* 12 (1906): 140. Cf. A. Kazhdan, *Derevnja i gorod v Vizantii IX–X vv.* (Moscow, 1960), 192.

²³ *Anne Comnène, Alexiade*, ed. B. Leib, 3 vols. (Paris, 1937–45), 3:225. Cf. P. Schreiner, "Zur Ausrüstung des Kriegers in Byzanz, im Kiewer Rußland und in Nordeuropa nach bildlichen und literarischen Quellen," *Figura* 19 (1981): 225.

²⁴ K. Aslihan Yener and A. Toydemir, "Byzantine Silver Mines: An Archaeo-Metallurgy Project in Turkey," in *Ecclesiastical Silver Plate in Sixth-Century Byzantium*, ed. S. A. Boyd and M. M. Mango (Washington, D.C., 1993), 155–68; Edmondson, "Mining," 101 n. 143.

²⁵ Cf. Vryonis, "Mines," 8. To the sources mentioned we should add K. Jahn, *Die Frankengeschichte des Rašid ad-Dīn* (Vienna, 1974), 45.

²⁶ E. Pernicka et al., "Archaeometallurgische Untersuchungen in Nordwestanatolien," *JbZMusMainz* 31 (1984): 533–99.

²⁷ G. Weisgerber and G. A. Wagner, "Die antike und mittelalterliche Goldgewinnung von Paläochori bei Kinyra," in *Antike Edel- und Buntmetallgewinnung auf Thasos = Der Anschnitt*, suppl., 6 (1988): 141, 152.

era outside Thessalonike;²⁸ even the first elements of a specifically Byzantine mining technology have come to light.²⁹ We know that the Byzantines also took a strong interest in buried treasures. But while the royal claim to the ownership of treasure trove became a source for the royal mining regale and the freedom to prospect in the West during the high Middle Ages,³⁰ comparable developments did not occur in the *heuresis thesaurou* in Byzantium, or at least were unable to make headway.³¹

Numerous written sources from the middle Byzantine period attest the existence of separating works for the production of refined gold (*chrysepseteia*) or experts engaged in gold purification (*chrysoepsetai*),³² albeit not at the gold mines themselves but instead near the mint in the capital; evidently these activities were distinct from the mint itself. These installations are undoubtedly identical with the *chrysoplysia* mentioned by Niketas Choniates,³³ while the *chrysochoeion* was more likely the imperial jeweler's workshop, which was run by a special archon.³⁴ During the middle Byzantine period, as well, a special *zygostates* was charged with monitoring the purity of precious metals.³⁵

The disintegration of Byzantium into a number of component states beginning in the early thirteenth century created new constraints on the development of mining. We are not certain where the empire of Trebizond obtained the silver to mint its silver coins. Since the gold content of fourteenth-century silver coins from Trebizond is higher than in comparable coins from the thirteenth century, Trebizond is more likely to have had its own silver mining during this period, but so far the locations of these mines is a matter of conjecture.³⁶ It is highly unlikely, though not impossible, that the surge in Balkan mining initiated by Saxon miners still reached the empire of Constantinople—restored in 1261 and, from the early fourteenth century on, limited to its European lands—during the last hundred years of its existence.³⁷ Dendrological analysis of charcoal remains in the area of Siderokauseia on the Chalkidike do not rule out the possi-

²⁸ K. Theocharidou, “Εγκατάσταση βυζαντινού ορυχείου στην Περιστέρα της Θεσσαλονίκης,” in Πέμπτο Συμπόσιο Βυζαντινής και Μεταβυζαντινής Αρχαιολογίας και Τέχνης: Περιλήψεις ανακοινώσεων (Athens, 1985), 27–28; cf. AA 42 (1987): 408.

²⁹ Cf. Pernicka, “Archaeometallurgische Untersuchungen,” 571.

³⁰ Cf. D. Hägermann, “Deutsches Königtum und Bergregal im Spiegel der Urkunden,” *Der Anschnitt*, suppl., 2 (1984): 13–23.

³¹ Cf. C. Morrisson, “La découverte des trésors à l’époque byzantine: Théorie et pratique de l’heuresis thesaurou,” *TM* 8 (1981): 322–43, and G. G. Litavrin, *Vizantijskoe obščestvo i gosudarstvo v X–XI vv.* (Moscow, 1977), 133, 199.

³² *Georgii Acropolitae Opera*, ed. A. Heisenberg, corr. P. Wirth, 2 vols. (Stuttgart, 1978), 1:163. Morrisson, Barrandon, and Poirier, “La monnaie d’or,” 127, with references.

³³ *Nicetae Choniatae Historia*, ed. J.-L. van Dieten (Berlin–New York, 1975), 347. The different terms used to describe these *ateliers de purification*—“gold washing” and “gold boiling”—may indicate different *méthodes d’affinage*. For more information, see R. Halleux, “Méthodes d’essai et d’affinage des alliages aurifères dans l’Antiquité et au Moyen Age,” in Morrisson et al., *L’or monnayé* (as above, note 16), 39–77.

³⁴ In contrast to the view of Morrisson, Barrandon, and Poirier, “La monnaie d’or,” 127.

³⁵ *Ibid.*

³⁶ Bryer, “Mines,” 138–46.

³⁷ On this question I am not as certain as L. Maksimović, “Charakter der sozial-wirtschaftlichen Struktur der spätbyzantinischen Stadt, 13.-15. Jh.,” *JÖB* 31.1 (1981): 160 n. 53.

bility that the new developments in what was later to become a center of mining began as early as the fourteenth century.³⁸ However, when the first Greek owners of modern mining works appear in the written sources, the area was no longer in Byzantine hands.³⁹ Although iron mining and iron smelting furnaces are attested in various areas during the late Byzantine period,⁴⁰ the reforms proposed for the Peloponnese by the Byzantine bishop and Latin cardinal Bessarion indicate that the technology of water-powered bellows and mechanical mills for extracting ores and processing metals had not reached the Byzantine provinces even by the fifteenth century.⁴¹ The mining of alum in Nea Phokaia on the west coast of Asia Minor, in the interior of Anatolia, and in various European coastal regions of the Aegean was for the most part also a post-Byzantine development and began with the appearance and settlement of Italian entrepreneurs in these mining areas.⁴² Nevertheless, one could still grow rich from the exploitation of gold and silver mines in the late Byzantine period, as the aristocrat John Laskaris Kalopheros did around the middle of the fourteenth century.⁴³ And when Theodore Moschampar administered the *chrysepseteion* in Constantinople around 1310, perhaps for a *syntrophia* of leaseholders or beneficiaries, his acquaintances expected that he would now be able to pay off older debts.⁴⁴ Not one but several *chrysepilektai* are attested in Thessalonike a short time after, and they, too, belonged to the city's upper classes.⁴⁵

While the late Byzantine state progressively lost its influence over mining and metal processing and was unable to enforce the ban on the export of precious metals, a few late Byzantine groups of entrepreneurs seem to have made at least modest profits from the processing and sale of metals extracted from the remaining ore deposits in the empire. Some individuals even managed to become involved in the development of mining beyond the borders of the ever-shrinking empire.⁴⁶

³⁸ G. A. Wagner et al., "Archäometallurgische Untersuchungen auf Chalkidiki," *Der Anschnitt* 5/6 (1986): 167f.

³⁹ *Actes de Xéropotamou*, ed. J. Bompaire, Archives de l'Athos (Paris, 1964), 214–18 (no. 30). Cf. K.-P. Matschke, "Zum Anteil der Byzantiner an der Bergbauentwicklung und an den Bergbauerträgen Südosteuropas im 14. und 15. Jahrhundert," *BZ* 84/85 (1991–92): 54ff.

⁴⁰ Cf. A. Guillou, "Siderokausia," 2 vols. (unpublished manuscript, Paris, 1977–79); J. J. Vin, "Sel'skoe remeslo i promysly v pozdnei Vizantii, XIII–XV vv.," *VizVrem* 48 (1987): 86f.

⁴¹ L. Mohler, *Aus Bessarions Gelehrtenkreis* (Paderborn, 1942), 448 (no. 13).

⁴² Bryer, "Mines," 146–49.

⁴³ *Démétrius Cydonès, Correspondance*, ed. R.-J. Loenertz (Vatican City, 1956), 1:104–7 (no. 73). Demetrios Kydones, *Briefe*, trans. F. Tinnefeld, vol. 1, pt. 1 (Stuttgart, 1982), 336 n. 16.

⁴⁴ *Georgii Lacapeni et Andronici Zaridae Epistolae XXXII cum epimerismis Lacapeni*, ed. S. Lindstam (Göteborg, 1924), 145–47 (no. 23); cf. S. I. Kourouses, *Τὸ ἐπιστολάριον Γεωργίου Λακαπηνού—Ἀνδρονίκου Ζαρίδου (1299–1315 ca.) καὶ ὁ ἱατρὸς: Ἀκτουάριος Ἰωάννης Ζαχαρίας* (Athens, 1984), 355 f, whose interpretation of this part of the letter differs somewhat from mine.

⁴⁵ *PLP* 5:10015, 10:24078.

⁴⁶ Matschke, "Zum Anteil," 57ff.