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Centurions, Quarries, and the Emperor

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INTRODUCTION

The impact of Rome on the exploitation of natural resources remains highly visible in the many ancient stone and marble quarries dotting the landscape of the former empire. Not only do they reveal the techniques employed in separating the marble or granite from the rock face, the distribution of their output can still be traced. The progressively more scientific determination of type and origin of these stones used in sacred and profane architecture of the Roman Empire reveals an increasingly detailed image of the distributive patterns of coloured stones. Even so, the analysis of these patterns stays vexed: the written sources are frightfully mute on the core issues, expressly on the emperor's role in the quarrying industry and his impact on the marble trade. Scholarly discourse has oscillated between two positions: John Ward-Perkins argued that by the mid-first century AD all 'principal' quarries were 'nationalized', i.e. put under imperial control and leased out to contractors for rent; the quarries were a source of revenue for the emperor, the distribution of its output driven by commercial factors.¹ Clayton Fant, however, offered a different view: the emperor monopolized the use of coloured and white marbles and their sources not for profit, but for 'prestige', consolidating his position as unchallenged patron and benefactor of the empire. Beyond Rome, the emperor distributed prized marbles as a gift to communities of his choice.²

Both positions offer valid observations on the imperial involvement in stone quarrying and trade, but they do not need to be mutually exclusive. As shall be argued below, not all quarries supplying imperial building projects in Rome were necessarily under imperial oversight, and some imperial quarries

¹ Ward-Perkins 1951: 100; Dodge and Ward-Perkins 1992: 24f., 63. No differentiation is made here between the Roman state and the emperor; for a discussion cf. Hirt 2010: 82–106.

² Fant 1993a: 146, 154f., 2008: 126–9. However, Fant did allow for a partial commercialization during the second century AD, cf. Fant 1993a: 163f.

possibly generated revenue for the emperor/state. Moreover, the principles under which imperial quarries operated, that is, whether they were to generate revenue or merely supply imperial building projects with marble, probably varied from quarry to quarry. The main focus of this chapter, though, is on a particular group of extractive ventures, which we know were under direct imperial control. Written evidence pertaining to these quarries capture, I believe, a rare event—the direct intervention of the emperor Hadrian in ongoing quarrying operations. How Hadrian interfered in their operative processes and why he might have felt compelled to do so are the issues to be addressed.

POLYCHROME MARBLE AND THE ROMAN EMPEROR

In the Roman Empire the long distance trade or distribution of prized polychrome stones and white marble was exceptional.³ The majority of stones quarried and used in construction for the adornment of sacral and profane edifices derived from the vicinity of urban settlements; locally quarried produce was rarely traded beyond the local community.⁴ Since the late republic building projects in the city of Rome and throughout Italy fuelled the demand for foreign stones—a demand, which by the first century AD had increased significantly as the Roman emperors began to realize monumental construction schemes in the city.⁵ The allure of imported marble types lay in their exoticism, their distant origin, and ethnic connotations. Their use permitted the expanse of the empire to be visualized, thereby reaffirming, for Romans, the power and virility of their *princeps*.⁶ The demand for imported marble percolated into Italy and the provinces: by the early second century we find civic elites in the provinces using imported polychrome marble and stone for private or public display.⁷

Ben Russell argued that the spread of these exotic materials was uneven. The shape and weight of the product and the costs of transport and trans-shipment very much defined the patterns of distribution observed for marble produce traded over long distances; civic elites of urban communities in proximity to a harbour on the Mediterranean coast or a port on a river flowing into the Mediterranean Sea therefore had easier access to imported marble products. Beyond the Mediterranean shores the size and weight of imported marble

³ Fant 1988: 147; Russell 2009: 110.

⁴ Russell 2009: 110f.

⁵ Dodge and Ward-Perkins 1992: 15f., 21–30; Fant 1993a: 146–51, 1993b: 71–8; Maischberger 1997: 17f.; Pensabene 2002: 3–15.

⁶ Schneider 1986: 139–60; Fant 1993a: 146f.; Bradley 2006: 1–22.

⁷ Dodge and Ward-Perkins 1992: 31–8, 61–107, 129–52; Fant 1993a: 152f.; Pensabene 2002: 47–64.

pieces diminished significantly. The largest shapes to venture up the Rhône and down the Rhine, for instance, were sarcophagi and statues; the vast majority of prized stone materials was imported in the form of thin panels for wall veneer or *opus sectile*.⁸

In the Roman Near East one highly visible type of architectural element appears to defy this model: colossal monolithic columns made of coloured granite were transported over difficult terrain to provincial centres far from the Mediterranean coast.⁹ Most conspicuous are more than 180 tall red granite columns used in the *propylon* and the inner courtyards of the remote temple of Jupiter at Heliopolis/Baalbek.¹⁰ Given that the red granite originated from quarries in Syene/Aswan in Egypt, Henry Seyrig rightfully pointed out that the purchase and import of these columns would have been well beyond the means of this community in the Bekaa valley. He thus suspected the involvement of the emperor.¹¹ Exactly how the Roman emperor assisted in this specific case remains unknown; the epigraphic evidence falls silent. Elsewhere the written record details many shades of his participation in provincial building projects. We find the emperor shouldering all the costs for the construction of a given edifice or its restoration, contributing monies in concert with private donors or the local communities, or permitting communities to appropriate tribute monies owed to the state to building projects.¹² On occasion he even supplied building materials: Hadrian provided Athens with one hundred columns of Numidian marble for his library, another hundred columns of Phrygian marble for a colonnade and for the statuary representation of Persians in the Olympieion in Athens.¹³ An inscription from Smyrna commemorates the gift of seventy-two columns of Synnadian (i.e. Phrygian) marble, twenty of Numidian marble, and six of porphyry for the ‘anointing room’ of the gymnasium at Smyrna.¹⁴ In consequence, Heliopolis/Baalbek and other cities might also have been recipients of such columns.

How did the emperor acquire these materials? The distributive patterns of select polychrome marbles and granites used at Rome seem to imply that the emperor had monopolized their use. Perhaps the most patent illustration of this is provided by the granodiorite quarried at Mons Claudianus in Egypt.

⁸ Wilson 2008b: 402–5; Russell 2009: 117.

⁹ Freyberger 1982; Dodge 1984: 371–81, 1988: 227; Pensabene 1997: 413f.; Fischer 1998: 61–3; Williams-Thorpe and Henty 2000; King 2002: 44, 51, 55; Williams-Thorpe 2008. For Palmyra (‘Baths of Diocletian’, Tetracylon), cf. Dodge 1988: 223f. The columns of red Assuan granite, grey Troad (?) granite, and possibly ‘cipollino verde’ at Qaşr al-Ḥayr aş-Şarqī were probably removed from Palmyra (personal observation, Ralph and Maria Weber, October 2010).

¹⁰ Schulz and Winnefeld 1921: 77; Ess and Weber 1999: 64.

¹¹ Seyrig 1954: 95–8; Aliquot 2009: 283f.

¹² Horster 2001: 67–75, 208–21; cf. also Boatwright 2000: 108–43.

¹³ Pausanias 1.18.8–9; Millar 1992: 184, 420f.; Fant 1993a: 148 with n. 23, 156 with n. 73.

¹⁴ *IK Smyrna* 697+II 2 pp. 375f., ll. 40–2. Philostr. *V S* 1.25.530–44. Fant 1993a: 155f.; Barresi 2003: 446; Pensabene 2010: 85.

According to a recent spectrometric analysis of granite columns throughout the Roman Empire, granodiorite specimens were destined exclusively for use in a few public buildings in the city of Rome and in Hadrian's villa at Tivoli;¹⁵ similar claims can be made for red porphyry from Mons Porphyrites in Egypt.¹⁶ The emperor also enjoyed exclusive use of monolithic columns and statues made of yellow-pinkish *marmor Numidicum* ('giallo antico') from Chemtou/Tunisia,¹⁷ or of *marmor Phrygium/Synnadicum* ('pavonazetto') from Bacakale near Docimium in Turkey.¹⁸ Beyond Rome, only a few provincial capitals received columns made of Numidian marble, most likely as 'imperial gifts'.¹⁹ Ephesian senators, for instance, with close links to the emperor were able to secure columns of Phrygian marble ('pavonazetto') for building projects they sponsored in their home town.²⁰ Smaller pieces of these marbles, however, escaped imperial control: thin panels made from these same stones for *opus sectile* and veneer found a far wider distribution than the more heavy and sizeable shapes. Possibly deriving from salvaged blocks left over from imperial construction work at Rome's marble yards, these panels—which were far easier to transport and therefore less costly—were seemingly freely traded throughout Italy and the provinces.²¹

Imperial control of these polychrome granites and marbles reached beyond the monopolization of their use: written evidence attesting imperial oversight by military and civilian representatives of the emperor on site is abundant for Mons Claudianus, Mons Porphyrites, and Simitthus—less so for Bacakale/Docimium (see 1 and 2 in the section titled 'Roman Centurions and Imperial Quarries').²² Other quarries were simply expected to be under imperial control: Suetonius' claim that the emperor Tiberius had rid most communities and individuals of their *ius metallorum* (Suet. *Tib.* 49.2) was seen as evidence for the imperial appropriation of all mines and quarries. Fant and others have

¹⁵ Peacock et al. 1994; dataset of Williams-Thorpe 2008; on the stone 'granito del foro', cf. Pensabene and Bruno 1998: 10f.

¹⁶ Delbrueck 1932; Dodge 1984: 407–11; Klein 1988: 55–88, 95–114; Pensabene and Bruno 1998: 9f.

¹⁷ Ward-Perkins 1951; Dodge 1984: 365; Fant 1993a: 153f.; Pensabene and Bruno 1998: 13; Antonelli et al. 2010: 579.

¹⁸ Fant 1993a: 158f.; Pensabene and Bruno 1998: 8; Pensabene 2010.

¹⁹ Millar 1992: 184, 420f.; Fant 1993a: 148 with n.23, 156 with n. 7.

²⁰ For an overview, cf. Pensabene 2010: 83–5. E.g. Ti. Iulius Aquila (*I. Eph.* VII 2, 5101–14; Barresi 2003: 377–80); M. Claudius P. Vedius Antoninus Phaedrus Sabinianus (Steksal and La Torre 2008: 21, 64 with Kat. Nr. A 101 and Taf. 80.1–3, 303–8; Fant 1989a: 217, 1993a: 154); T. Flavius Damianus (Philostr. *V S* 2.25.605; Quass 1993: 166, 218 with n. 780; Fant 1993a: 156 n. 73; Barresi 2003: 374; Pensabene 2010: 84f.). For further evidence cf. *I. Eph.* 666 ll. 26–8; Fant 1993a: 156; Quass 1993: 217f., n. 777; Scherrer 1996: 12f.; Barresi 2003: 418–20.

²¹ e.g. Thür 2005: 144–51; Roffia et al., in Maniatis 2009: 568. For trade in marble panels in late antiquity cf. Fant 2008: 132f.

²² For these sites cf. Bülow-Jacobsen 2009; Serafino 2009; Bussi 2010; Hirt 2010 *passim*; Pensabene 2010; Summerer et al. 2012.

been critical of the weight granted to Suetonius' terse and conflating remark.²³ Fant compiled a list of extractive operations he thought were unquestionably or probably imperial.²⁴ Besides Simitthus, Bacakale, Mons Claudianus, and Mons Porphyrites, he included the 'cipollino' quarries near Carystus on Euboea;²⁵ the 'portasanta' quarries on Chios;²⁶ possibly the pits of 'porfido verde' and 'rosso antico' on the Mani Peninsula south of Sparta;²⁷ the 'africano' marble beds at Karagöl and Beylerköy near Teos;²⁸ possibly the grey granite quarries of Kestambol and Koçali in the Troad;²⁹ the red granite quarries of Syene/Aswan³⁰ and other minor granite and alabaster quarries in Egypt; and the white marble quarries of Luna/Carrara, on Paros, near Docimium and in the Upper Tembris Valley, on Thasos, on Proconnesus, etc.³¹

Fant saw production/transport markings or labels inscribed in Latin on marble output as important markers of imperial oversight.³² With the majority of polychrome stones (e.g. 'portasanta', 'africano') these labels are the only indication that the quarries were under imperial management.³³ For other quarries there is corroborative evidence: besides Latin labels on 'cipollino verde', inscriptions from Carystus attest the presence of imperial freedmen and a *centurio* at the quarries.³⁴ 'Porfido verde antico' from the Mani

²³ Dodge 1991: 32; Dodge and Ward-Perkins 1992: 22 n. 34, 24 with n. 13; Fant 1993b: 76; Hirt 2010: 84f.

²⁴ Fant 1993a: 157–67, 2008: 128.

²⁵ *marmor Carystium*, cf. Pliny, *Nat. Hist.* 36.48. On the quarries, cf. Papageorgakis 1964; Hankey 1965; Vanhove 1996; Pensabene 1998; Pensabene and Bruno 1998: 5f.; Sutherland and Sutherland 2002; Chidiroglu 2011.

²⁶ *marmor Chium*: Pliny, *Nat. Hist.* 5.136; Pensabene and Bruno 1998: 7; on the quarries cf. Pensabene and Lazzarini 1998: 151–3.

²⁷ 'porfido verde antico', 'serpentino'/*marmor Lacedaemonium*: Pliny, *Nat. hist.* 36.55; *I.Aphrodisias* 33.2; cf. Schneider 1990: 241; Pensabene and Bruno 1998: 6; on quarries, cf. Fant 1993a: 164 with nn. 113, 114. 'rosso antico'/*marmor Taenarium*: Propertius 3,2,11.

²⁸ *marmor Luculleum*: Pliny, *Nat. Hist.* 36.49f.; possibly *lithos leukolleia*, cf. Strabo 9.5.16, *I.Aphrodisias* 33.4; Pensabene and Bruno 1998: 8. On the quarries, cf. Fant 1989b; Pensabene and Lazzarini 1998: 142–51.

²⁹ *marmor Troadense*: *CTh* 11.28.99; Pensabene and Bruno 1998: 7; quarries, cf. Cook 1973: 190 with Area Map A 208, 211f.; Peacock et al. 1994; Ponti 1995.

³⁰ *lapis Thebaicus/Syenites/pyrrhopoecilus*: Pliny, *Nat. Hist.* 36, 63; Pensabene and Bruno 1998: 7. On the quarries, cf. Röder 1965; Klemm and Klemm 2008: 233–67; Bloxam 2007; Bloxam et al. 2007.

³¹ Bruno et al. in Hermann et al. 2002: 289–300, 347–58.

³² Fant 1993a: 158, 2001: 170–2; for labels in general, cf. Bruzza 1870; Dubois 1908; Drew-Bear and Eck 1976; Christol and Drew-Bear 1986, 1987, 1991; Fant 1989a; Drew-Bear 1994; Pensabene and Lazzarini 1998: 147–51; Hirt 2010: 328f; Pensabene 2010. On Latin in the East, cf. Millar 2006: 223–42.

³³ For quarry labels, cf. Hirt 2010: app. nos. 460–564 ('africano' and grey marble') and 565–600 ('portasanta').

³⁴ *CIL* III 12286 names Sergius Longus, the same *centurio* as in no. 3; the latter notes imperial oversight explicitly (l.1). *CIL* III 563, 12289; VI 8486; cf. also Chidiroglu 2011: esp. 79. On the labels: Hirt 2010: app. nos. 601–786.

Peninsula³⁵ and red granite from the quarries near Syene/Aswan are not labelled in Latin at all; yet imperial oversight is indicated by monuments inscribed in Latin found in the vicinity of these quarries: a votive inscription at Croceae documents an imperial *dispensator*,³⁶ and a Latin text from the temple complex on Philae near Syene announces new quarries, described as ‘imperial works’, being opened under the oversight of the *praefectus Aegypti*.³⁷ The spatial dispersion of cumbersome items made from these stones corroborates the notion that their production and distribution was largely under imperial control: ‘portasanta’, ‘africano’, and ‘cipollino’ were exported predominantly to Rome, to select Italian municipalities, and very few provincial centres—with ‘cipollino’ columns and column bases being more widely disseminated in the provinces.³⁸

For a minority of polychrome stones on Fant’s list of ‘imperial marbles’, written evidence for imperial control of their extraction is absent. The main argument for imperial management of their extraction and dissemination rests on their distributive patterns, with heavier shapes and forms occurring predominantly at Rome, and thin panels for veneer and floor tiles scattered widely throughout Italy and the provinces.³⁹ Fant believed that this general pattern—observable for most polychrome marbles—could not itself be explained by the economic pull of Rome and major provincial cities, but was largely determined by the monopolization of these goods by the emperor.⁴⁰ In comparison, the distribution of grey granite columns from the Troad quarries seems anomalous; it reveals conspicuous clusters around the Aegean Sea and in the Roman Near East.⁴¹ Outside Rome, red granite columns from Syene appear to be used primarily in public architecture of cities in the Roman Near East.⁴² Are these distributive ‘anomalies’ owed solely to the *liberalitas* of the emperor? Or could wealthy communities or elite benefactors (perhaps spurred on by inter-civic rivalries) request, perhaps even buy, granite monoliths from Syene and the Troad?

³⁵ Dodge 1984: 384–86; Lazzarini 2009: 464 with fig. 16.

³⁶ *CIL* III 493 = *IG* V/1 1569; Le Roy 1961: 212; Poulsen and Carlsen 1991.

³⁷ *CIL* III 75 = 6630 (early 3rd cent. AD). Direct evidence for imperial control at Syene remains absent, cf. *P.Bingen* 98 l. 3; *P.et O. Eleph. DAIK* 66; Locher 1999: 71, 92; *SB* VI 9230 = Porten and Farber 1996: 437 D16; Fournet 1996.

³⁸ ‘Portasanta’: Dodge 1984: 396f.; Lazzarini 2009: 464, 476. ‘Africano’: Dodge 1984: 344f.; Fant 1989b: 212f. with n. 44; Pensabene and Lazzarini 1998: 144f.; Lazzarini 2009: 463 and fig. 11. ‘Cipollino’: Dodge 1984: 350–7; Fant 1993a: 162; Pensabene 1997: 414; Lazzarini 2009: 464 with fig. 17.

³⁹ On ‘rosso antico’, cf. Lazzarini 1990; Pensabene and Bruno 1998: 6; Pensabene and Lazzarini 1998: 141f.

⁴⁰ Fant 1993a: 152–5.

⁴¹ Evidence for imperial oversight dates to the early fifth century AD, cf. *CTh.*11.28.99; Fant 1993a: 164 n. 118, 1993b: 77. Distribution of columns, cf. Williams-Thorpe 2008 with dataset. Lazzarini 2009: 471; for Rome and Ostia, cf. Peacock et al. 1994.

⁴² See n. 9; Dodge 1984: 371–6; Lazzarini 2009: 460f. with fig. 1.

We may rightly doubt whether municipalities could afford imported polychrome columns in the numbers needed for monumental construction projects like the Jupiter temple at Heliopolis; it does not follow, though, that monolithic columns could therefore only be acquired by imperial gift. The few imported columns of Syenite and Troad granite found at Palmyra, for instance, might well have been within the budget of this wealthy community.⁴³ As of yet, there is no textual evidence on whether marble or granite could be bought from imperial quarries. Yet Pensabene and Fant suggested that white marble quarried at Bacakale/Docimium was freely traded throughout Asia Minor in the shape of prefabricated sarcophagi, of statues, and other items.⁴⁴ This would establish the principle that some imperial quarries or parts thereof could generate revenue for the emperor—either because imperial officials ran workshops where different items were prefabricated and sold, or because the white marble pits were leased out. In theory then, wealthy communities could have acquired red granite columns in some form or another from the quarries near Syene. If so, imperial ‘generosity’ towards communities may have reached from a mere *placet* sanctioning the use of ‘imperial’ marble over sharing the costs of production and transport of the requested columns to covering all expenses.⁴⁵ The emperor may also have turned down such requests if the community was threatening to bankrupt itself and subsequently default on its tribute.⁴⁶

The Troad quarries present us with a different problem. Even though their granite columns were used in public edifices at Rome, it does not necessarily follow that they were imperial. The *Colonia Augusta Troadensis* might well have owned the quarries, which were opened within its territory.⁴⁷ The same applies to white marble from Thasos and the greyish-white marble from Proconnesus: again, we know that both were used at Rome extensively throughout the second century, and, again, imperial oversight is not documented during the principate.⁴⁸ In fact, sarcophagi of Proconnesian marble were traded widely throughout the Eastern Mediterranean in the second and

⁴³ Stoneman 1992: 51–63; Butcher 2003: 183–6, 206; Hoffmann-Salz 2011: 393–433.

⁴⁴ Waelkens 1982: 124–7 and table 31; Dodge and Ward-Perkins 1992: 66 fig 52; Fant 1993a: 158; Hermann and Tykot, in Maniatis 2009: 59–75; Pensabene 2010: 95.

⁴⁵ Horster 2001: 67–75, 208–21.

⁴⁶ On the imperial approval of building projects, cf. *Dig.* 50.10.3.pr-1; *Dig.* 50.10.7.pr; *Dig.* 50.10.6; Fant 1993a: 157 n. 76; Eck 1997: 127–31; Burton 2004.

⁴⁷ On the status of the *Colonia (Iulia) Augusta Troadensis*, cf. *Dig.* 50.15.7; *Dig.* 50.15.8.9; Riel 1997: 226f. For private/communal ownership, cf. *Dig.* 7.1.9.pr.-7; 7.1.13.5; 8.4.13.1; 18.1.77.pr; 23.5.18.pr-1; 24.3.7.13–4; 27.9.3.6–27.9.5.pr; 39.2.26.

⁴⁸ Bruno et al. in Hermann et al. 2002: 291 table 1; Attanasio et al. in Maniatis 2009: 357–69. By the early 5th cent. AD the *metalla* at Proconnesus were state-owned and contracted out: *AE* 2002: 1369–82 with Asgari and Drew-Bear 2002; Fant 1993a: 164 n.118, 1993b: 77; Attanasio et al. 2008; Kozelj and Wurch-Kozelj 2011.

third centuries AD—an indication that the quarries were run for profit.⁴⁹ It is not implausible to see these quarries as a communal, perhaps even private possession. In addition, there are precedents of non-imperial quarries supplying construction projects in Rome with white marble. The white marble outcrop of Luna/Carrara seems to have been owned by the *colonia Lunensis* at least until the early Flavian period;⁵⁰ and the white marble beds of the Pentelicon, which delivered architectural elements in the shape of capitals for public edifices at Rome, were also in private hands during the second century.⁵¹ It is therefore entirely possible, in my view, that Troad granite columns were sold to wealthy communities and their elites in the Roman Near East and elsewhere. The means by which the emperor secured Troad granite or Proconnesian marble for his purposes could have ranged from paying market prices to acquiring these stones via tribute.

To sum up—the available evidence does not allow for the categorical rejection of communal or private ownership of quarries providing stone for Rome's building projects. It remains possible that imperial quarries, or parts thereof, were leased out for profit, or offered marketable products directly to elite consumers.⁵² Most sites exporting polychrome marbles or granites to Rome, however, were undoubtedly under some form of imperial management, as Latin labels and/or inscribed monuments by and for imperial representatives clearly indicate. The emperor monopolized these materials, in particular the use of heavy and bulky shapes (e.g. columns and other architectural elements, statues).

ROMAN CENTURIONS AND IMPERIAL QUARRIES

On the involvement of the emperor and his Palatine bureaux in the takeover of existing and the opening of new quarries, our sources once more remain uncomfortably quiet. There are some muffled whispers, though, on the emperor opening new quarries or ordering quarry works to be undertaken. Names of quarries like Mons Claudianus or Tiberiane, both in the Eastern Egyptian Desert, imply them being opened on the orders of Claudius and Tiberius; we learn from Pliny that 'marble' was named 'Augustan' or 'Tiberian' because it was discovered during the reigns of Augustus and Tiberius in

⁴⁹ Dodge and Ward-Perkins 1992: 32–5, 60 fig. 50, 82f., fig 58, 59.

⁵⁰ Speidel 1994; Hirt 2010: 314–18.

⁵¹ The Pentelic quarries were possibly the property of Herodes Atticus; cf. Bruzza 1870: no. 291 = Dubois 1908: no. 255; Paus. 1.19.6, 6.21.2, 10.32.1; Philostr., *V S* 2.550, cf. Ameling 1983: 84–94, 216 no. 199; Fant 1993a: 167.

⁵² Brunt 1980: 86; Dodge and Ward-Perkins 1992: 25, 72f.; Fant 1993a: 162; Maischberger 1997: 52; Fant 2001: 170f.

Egypt.⁵³ The decision to open quarries or quarry sections—perhaps on the basis of samples being presented to the emperor⁵⁴—included the allocation of imperial personnel, soldiers, and, occasionally, convicts to these sites.⁵⁵

Moreover, the emperor or his Palatine bureaux probably outlined the mandate which freedmen procurators overseeing a quarrying district or the equestrian procurators supervising imperial assets in a province needed to follow.⁵⁶ The actual decision to contract out work, lease out parts of the quarries for rent, or to hire workers—often dependent on spatial and logistical constraints of the quarrying site—could well have been within the mandate of these procurators. The involvement of the emperor probably was limited to the occasional sanctioning of any increase in production costs.⁵⁷ Apart from the initial decision to open a quarry and the allocation of personnel to the site, our lacunose documentary and literary evidence does not attest the emperor taking an interest in ongoing quarrying operations—with one exception.

Three texts inscribed on stone shed light on a possible intervention by emperor Hadrian. The inscriptions were discovered in 1868–70 at Rome in a marble depot at a large wharf on the left bank of the river Tiber.⁵⁸

1. Fant 1989a: no.102/p.251,1a–c with photo = Bruzza 1870: no. 258 = Dubois 1908: no. 199 = Dessau, *ILS* 8716a = Hirt 2010: 378, no.115 (AD 137), inscribed on the underside of a ‘pavonazetto’ column.
L. Aelio | [C]aesare n(ostro) II et Bal|bino co(n)s(ulibus), rationi | urbanae, sub cur(a) Irenaei| Aug(usti) lib(erti) proc(uratoris), caesura Tulli| Saturnini (centurionis) leg(ionis) XXII Prim(igeniae) || officina) Pa(piani) | n(umero) LXXXVI || locus NII(?)CIA| loc(o) XVI b(racchio)
2. Fant 1989a: no.112/p.252f. no.2a–c = Bruzza 1870: no. 259 = Dubois 1908: no. 200 = *ILS* 8716b = Hirt 2010: 378, no.116 (AD 137), inscribed on the underside of a ‘pavonazetto’ column.
 - a) A[elio—] | Tu[lli—]
 - b) *L. Aelio Caesare n(ostro) II* | et Balbino co(n)s(ulibus), r(ationi) | urbanae, sub cur(a) Iren[aei], Aug(usti) lib(erti) proc(uratoris), caesura | [Tu]lli Saturnini (centurionis) leg(ionis) | XXII Prim(igeniae)
 - c) officina) Papi(a) | n(umero) XCIV | loco XX
(Year) Lucius Aelius, our Caesar, (for the second time), and Balbinus (are) consuls. For the account of the city (of Rome). (Stone column quarried) under the supervision of Irenaeus, imperial freedman and procurator; from the caesura of Tullius Saturninus, centurio of the legio XXII Primigenia, from

⁵³ Pliny, *Nat. Hist.* 36.55; cf. Bingen et al. 1992: 187; Bingen et al. 1997: 297; Cuvigny 2000: 314; Bülow-Jacobsen 2009: 245, 249.

⁵⁴ Pliny, *Nat. Hist.* 36.57. ⁵⁵ Hirt 2010: 332–6.

⁵⁶ Cass. Dio 53.15.3–4, 57.23; Tac. *Ann.* 4.15; Pflaum 1982: 21f., no. 49 bis; Millar 1992: 642f.; Eck 1997: 117; Schäfer 1998: 28–87; Eich 2005: 106–18.

⁵⁷ Hirt 2010: 338. ⁵⁸ Maischberger 1997: 67–84.

the workshop of Papias/Papianus, (serial) number 94, (from) “place” (number) 20.’

3. Bruzza 1870: no.1 = Dubois 1908: no. 278 = *ILS* 8717. Ward-Perkins 1992: 26, fig. 14 (Photo) = Hirt 2010: 412 no. 618; the inscription is set in a smoothed rectangular field on a block of ‘cipollino verde’.

ex M N Caesaris N R D A sub cur(a) C Caerialis pr(ocuratoris) | subseq(ue)nte
Sergio Longo 7 (centurione) leg(ionis) XXII Primig(eniae) prob(ante) | Cres-
cente lib(erto) vac n(umero) VIII || n(umero) VIII || CXXX n(umero) VIII (in red paint)

l.1: ex m(etallis) n(ovis) Caesaris n(ostris) r(ationis) d(omus?) A(ugustae?)
(Dessau)

‘From (the new quarries of our) Caesar *R.D.A.*(?). (Stone block quarried) under the supervision of *C(aius) Cerialis*, procurator, continued by *Sergius Longus*, centurio of the legio *XXII Primigenia*; inspected by the freedmen *Crescens*. Number 8, (serial number) 130.’

The first two inscriptions were found on the underside of column stumps with additional notations added on the shafts. The stone of which these elements were made is a white marble with greyish or purple veins, so-called ‘pavonaz-zetto’, deriving from the quarries of Bacakale near Docimium. The inscriptions 1 and 2, dated to the year AD 137, offer details on a procurator named Irenaeus, a freedman, presumably with overall responsibility for the imperial estates within the Phrygian district.⁵⁹ Epigraphic evidence locates the administrative headquarters of this district at Synnada, which might explain why Strabo claims that in Rome Phrygian marble was called *marmor Synnadicum*.⁶⁰ More importantly, 1 and 2 give the name of the person in charge of a *caesura*, a *Tullius Saturninus*, centurio of the legio *XXII Primigenia*. Among the 430 marble blocks from Bacakale engraved with formulaic labels—370 of which provide a continuous sequence of inscriptions for the years between AD 92 and AD 236—three labels dated to 136 name a *caesura* of a centurio *Tullius*.⁶¹ Although his troop affiliation is not given, the resemblance in type of marble, the conformity of gentile names, military rank, and consular dates, suggests the centurio *Tullius* attested at Bacakale to be our *Tullius Saturninus*. Thus, by 136/7 this legionary centurio of the twenty-second *Primigenia* was in charge of a *caesura* at Bacakale.

The appearance of *Tullius Saturninus*’ name on quarry labels from Bacakale coincides with a substantial change in the formula of these labels. Prior to the year AD 136, the notation system on quarried blocks is rather simple: the labels basically consist of one or more consular dates, name the *bracchium*,

⁵⁹ Hirschfeld 1905: 170 n.5; Strubbe 1975: 244 n. 60; Christol and Drew-Bear 1991: 122f.; Drew-Bear 1994: 814 with n. 240; Christol and Drew-Bear 2005; Pensabene 2010: 80.

⁶⁰ Strabo 12.8.14; on Synnada, cf. *CIL* III 7046, 7048; *MAMA* IV 53, 54, 62, 63; *SEG* XXVIII 1210; *IGRR* IV 704, with Boulvert 1970: 294 with n. 209.

⁶¹ Fant 1989a: nos. 66f., 69.

presumably the ‘arm’ or ‘branch’ of a quarry where the stone was extracted, and a serial number.⁶²

Fant 1989a: no. 40= Hirt 2010: app. no. 61

- (a) *loco IV b(racchio) III*
- (b) *Sur(a) III co(n)s(ule) II | CCXXXVIII* AD 107
- (c) *RMA Pal(ma) II co(n)s(ule)* AD 109
- (d) *VFR Vop(isco) co(n)s(ule)* AD 114
- (e) *b(racchio) tert(io)*
- (a) ‘Spot/serial-number 4, quarry-branch 3.’
- (b) ‘(Year) Sura (is) consul (the third time), 2(?). (Serial number) 238.’
- (c) *RMA*. (Year) Palma (is) consul (the second time)
- (d) *VFR*. (Year) Vopisco (is) consul.
- (e) ‘Third quarry-branch.’

After 136/7, the quarry labels begin to sporadically include two additional elements, which from AD 149 onwards appear regularly.

Hirt 2010: app. no. 227 with further references

Te[rt]ullo et Sacerdote co(n)s(ulibus) AD 158
ex of(ficina) Andaev(i) caesura Alex(andri)
loco XCIX b(racchio)R

‘(Year) Tertullus and Sacerdos (are) consuls. (Stone block) from the workshop of Andaevus, from the *caesura* of Alexandrus. Serial number 99. Quarry-branch. *R*’

The labels now use the term *caesura*, complemented with the names in the genitive case of Tullius Saturninus, Aelius Antoninus (a further centurio), and, by AD 149, of ‘civilians’. There is no indication, so far, that the names of the latter all belonged to imperial slaves or freedmen; some were probably those of private individuals.⁶³ The term *caesura*, a ‘cutting’ or ‘hewing’, once probably designated a section opened within a quarry. It might have gained a metonymical sense over time, perhaps identifying a responsibility assigned to the person named in the genitive case.⁶⁴ Also, the term *officina* was added. Usually designating a ‘workshop’, *officina* might identify the quarry section itself and the place where produce was dressed or hewn to its desired shape. The term is complemented by personal names, names of imperial families, their protective deities, or place names.⁶⁵

The addition of both elements, *caesura* and *officina*, is not merely an act of administrative window dressing, but might be reflective of profound changes to the directive and operative processes at Bacakale. Three texts engraved on

⁶² Hirschfeld 1905: 163 n. 4; Christol and Drew-Bear 1986: 84; Fant 1989a: 19 n. 8; Hirt 2010: 292f.

⁶³ Fant 1989a: 29–31; Hirt 2010: 293–5. For a different view, cf. Drew Bear 1994: 806.

⁶⁴ Cf. *TLL* III p. 115; Fant 1989a: 34; Hirt 2010: 295f.; Pensabene 2010: 97f. For Mons Claudianus where Greek *kopé* is the equivalent to *caesura*, cf. Bülow-Jacobsen 2009: 163–73.

⁶⁵ Christol and Drew-Bear 1991: 122 with n. 40; Hirt 2010: 297–9; Pensabene 2010: 98f.

quarried blocks and dated to AD 179 could hint at the sort of change that took place. In two quarry labels the phrase *recepta Tito nomene* (sic!) . . . is used, which one might translate as '(stones) received from Titus, in the name of someone?'.⁶⁶ Another label reads *recepti ex officina Prusaen[si—]/in loc{q}um lapidum quoş receperat promutuo Titus ex caesura Veteris*, or '(stones) received from the *officina* of Prusa [—] in place of the stones which Titus received as a loan (*promutuo*) from the *caesura* of Vetus'.⁶⁷

Even though the interpretation of these few texts is anything but clear, they do seem to indicate, first, that the accountant(s) at the quarry required a clear indication under whose responsibility and where the stone was produced. Second, the swap of quarried blocks between different *caesurae* and *officinae* and the notation of these exchanges on the stone itself indicate that the administration expected a fixed number of stones to be produced, prompting the holder of a *caesura* such as Titus⁶⁸ to loan stones from the *caesura* of Vetus to meet the set target. If this is so, then *caesurae* were perhaps contracted out on the basis of a *locatio conductio operis faciendi*, in which the contractor received a fixed payment in return for a set amount of quarried blocks to be delivered within a set period of time, probably within a year (which would explain the consular dates in quarry labels).⁶⁹ Prior to this change in epigraphic formula, there is little indication of how the quarries were organized. We often find multiple consular dates on one and the same block, which possibly resulted from regular inventories of the material stocked in the quarries.⁷⁰ One could imagine some form of direct exploitation prior to AD 136/7, that is, the use of imperial personnel and perhaps a hired workforce. Or the quarries were operated indirectly, i.e. were leased out to contractors on the basis of a *locatio conductio rei*, with 'pavonazzetto' being returned as a rent to the authorities and white marble being sold for profit (?).

Whatever was the significance of the change in formula, it appears to coincide with the arrival at Bacakale of Tullius Saturninus, whom I strongly suspect of having implemented this change. This suspicion is further nourished by his affiliation to *legio XXII Primigenia*. At the time of his assignment to Bacakale the legion was based at Mogontiacum/mod. Mainz on the Rhine frontier where it stayed put throughout much of the reigns of Trajan or

⁶⁶ Fant 1989a: no. 178 + Drew-Bear 1994: 809 n. 200 = Hirt 2010: app. no. 295; Fant 1989a: no. 176 = Hirt 2010: app. no. 296.

⁶⁷ Fant 1989a: no. 173 + Christol and Drew-Bear 1991: 122 n. 38 + Drew-Bear 1994: 808f. nn. 199, 200 = Hirt 2010: app. no. 300.

⁶⁸ The contemporary *caesura* of a Titus is attested from AD 177–180, cf. Hirt 2010: app. nos. 282–8, 290–3, 297–9, 301.

⁶⁹ Similar arrangements are known for pottery kilns in Roman Egypt or tile production at Rome, cf. *P.Oxy.* 3595–7; Strobel 1987; Aubert 1994: 232f.; Hirt 2010: 296f., 319f.

⁷⁰ Christol and Drew-Bear 1987: 105f.; Fant 1989a: 23f.; Drew-Bear 1994: 815–41; Hirt 2010: 302.

Hadrian.⁷¹ All in all, these observations suggest that Tullius Saturninus was not your regular *centurio* but possibly a specialist well acquainted with quarrying procedures. Stamped tiles and inscribed monuments of the twenty-second Primigenia found at quarries and construction sites throughout Upper Germany document its involvement in quarrying and construction activities: for example inscribed votive altars discovered in quarries of the Brohl valley in Upper Germany attest continued exploitation of the site by *vexillationes* of legions based in Upper Germany during the reign of Trajan.⁷² Besides many other construction tasks on the limes, a vexillation of twenty-second Primigenia, together with detachments from other German units, may have participated in the building of Hadrian's Wall.⁷³ Tullius Saturninus had ample opportunity to acquire knowledge or expertise in managing quarrying or construction tasks either during or prior to his centurionate in *legio XXII Primigenia*. The same seems to apply to Sergius Longus, another *centurio* of XXII Primigenia: according to the nicely engraved inscription no. 3 on a 'cipollino verde' block he is named together with a probator(?) Crescens who occurs in other quarry labels dated to AD 132.⁷⁴ Around that time Sergius Longus was seconded from Mogontiacum to the quarries near Carystus on Euboea.⁷⁵

At this point, we need to ask who ordered the secondment of these military specialists in quarrying management from Mogontiacum to quarries in Roman Achaëa and Asia. Some clues are provided by the inscription of Nonius Datus in Lambaesis/Numidia; it commemorates Datus' work as a *librator*, a leveller or surveyor, as soldier, then *evocatus*, and later veteran of the *legio III Augusta*. In c.AD 147 the presidial procurator of Mauretania Caesariensis requested Nonius Datus, then an *evocatus*, from the *legatus legionis III Augustae*, the de facto governor of neighbouring Numidia. On the orders of the legionary legate, Nonius Datus was seconded to Mauretania in order to sort out problems with an aqueduct project near Saldae.⁷⁶ It appears that in this case, and probably in others as well, the governor of a province without a legionary garrison could direct his request for help to a governor with military specialists at his disposal. In a similar case Emperor Trajan advised his governor in Pontus Bithynia, Pliny the Younger, to address

⁷¹ Franke 2000: 99, 2005: 321f.

⁷² Saxer 1967: 74, 79 with n. 440, nos. 194–203, 209, 211–16, 240–5, 248, 250–2; Franke 2000: 99 with n. 44; Matijević 2010.

⁷³ *ILS* 2726; Ritterling 1924–5: 1812f.; Franke 2000: 99.

⁷⁴ Bruzza 1870: nos. 4, 5 = Dubois 1908: nos. 283, 284 = Hirt 2010: app. nos. 603, 604.

⁷⁵ A T. Sergius Longus, centurio of *legio XV Apollinaris*, is attested in the quarry of Kilyndroi near Carystos (*CIL* III 12286) and on a lead tag on 'cipollino' marble, cf. Dubois 1908: no. 280; Franke 2000: 98; Wheeler 2000: 288f., with n. 174; Franke 2005: 321f.; Chidiroglou 2011: 76.

⁷⁶ *CIL* VIII 2728 = 18122 = *ILS* 5795, cf. Eck 1995b: 222f.; Laporte 1996: 737f.; Horster 2001: 175; Cuomo 2011.

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his request for a surveyor, not to the emperor but to the governor of the nearby province of Moesia inferior.⁷⁷

The assignment of Tullius Saturninus or Sergius Longus to Bacakale and Carystus respectively is unlikely to be the result of missives exchanged between governors of neighbouring provinces. Tullius' assignment probably involved the emperor and his Palatine bureaux (i.e. the staff of imperial slaves, freedmen and equestrians attached to the emperor). Once more, a letter from Pliny the Younger sheds some light on the matter: seemingly on Pliny's request, Trajan ordered the governor of Lower Moesia to detach a legionary centurion to Byzantium.⁷⁸ An Annius Rufus, centurio of *legio XV Apollinaris* clearly states on an inscribed monument set up at the quarries of Mons Claudianus that he was seconded there on the orders of emperor Trajan, *praepositus ab Optimo Imperatore Traiano operi marmorum monti Claudiano*, 'set in charge of the marble works at Mons Claudianus by the Best Emperor Trajan' sometime between c.AD 103 and 117.⁷⁹

We know from epigraphic evidence, first and foremost from the c.10,000 inscribed ostraca found there, that the quarries stood under the supervision of a freedman *epítropos tôn metállōn*, 'procurator of the mines' placed somewhere in the Nile Valley, who seems to have communicated with imperial officials at the quarries in the Eastern Desert through *tabellarii*, 'couriers'.⁸⁰ Security issues in the Eastern Desert were within the purview of equestrian commanders also in the Nile Valley whose duties included the quarrying districts.⁸¹ As for the men on the spot, a list of water rations of c.AD 110 renders the organizational hierarchy of the personnel on site.⁸²

According to the quantity of water they received, the post of *arkhitékton* 'engineer, architect' was one of the foremost positions at Mons Claudianus, followed by the infantry and cavalry soldiers garrisoned there, and imperial freedmen, slaves, as well as hired civilians in specialist quarry functions.⁸³ The ostraca divide the workforce at Mons Claudianus into two distinct groups: *paganoí*, 'civilians', and *fameliáριοι* (i.e. slaves, freedmen, and freeborn labourers making up the *familia Caesaris*, the 'family' in the service of the emperor).⁸⁴ The former consisted almost exclusively of stonemasons from Syene, Alexandria, Memphis, and Thebes.⁸⁵ The notation of their origin may indicate

⁷⁷ Pliny, *Ep.* 10.41–2, 61–2; Horster 2001: 176. ⁷⁸ Pliny, *Ep.* 10.77.

⁷⁹ *I. Pan* 39; Ritterling 1924–5: 1757; Maxfield 2000: 435; Wheeler 2000: 288–93; Franke 2005: 322–4.

⁸⁰ *Epítropoi/procuratores*, cf. Hirt 2010: 107–9; *tabellarii*, cf. Hirt 2010: 160.

⁸¹ Cuvigny 1992: 87, 2002: 240; Bülow-Jacobsen 2009: 178f.; Hirt 2010: 168.

⁸² Cuvigny 2005.

⁸³ *Arkhitéktones*: Cuvigny 2005; on specialized workers in quarries, cf. Bülow-Jacobsen 2009: 11f.; for imperial officials and subalterns on site, cf. Cuvigny 2000: 60–6. For military personnel, cf. Maxfield 2000: 429f.; Hirt 2010: 179–84.

⁸⁴ Cuvigny 2000: 11–53. ⁸⁵ Bülow-Jacobsen 1997: 140 with n. 3; Cuvigny 2005: 328f.

that these men were only hired on an irregular basis to work in the quarries, never really forming part of a permanent workforce living on site. Perhaps the military detachment, or part of it, and some members of the *familia Caesaris* were based at Mons Claudianus over a longer period, keeping check on the stone blocks stocked in the quarries (?).⁸⁶ The list of water rations puts the *centurio* and *decurio* at the pinnacle of the quarrying hierarchy. In spite of their privileged position, the *centuriones* and *decuriones*, seconded from legionary and auxiliary units in Egypt, were not involved in quarrying operations per se, but were charged with security.⁸⁷

The wording of the inscription by Annius Rufus, however, may suggest a different task. At the time he was seconded to the quarries at Mons Claudianus, the unit to which he remained attached was probably still based at Carnuntum on the Danube.⁸⁸ Rufus possibly gained significant experience in managing construction and quarrying processes as *centurio* first in *legio XIII Gemina* at Vindobona and later for the fifteenth Apollinaris at Carnuntum.⁸⁹ The specific reasons for his secondment to Egypt under Trajan could well be connected with the expansive construction projects Trajan undertook at Rome itself, like the Baths of Trajan, the Forum Traiani, and the Mercati Traiani.⁹⁰ These projects required granodiorite from Mons Claudianus and called for an experienced military man to oversee extractive procedures.

The assignment to specific quarries of these military specialists by the emperor raises further issues. First, there is only circumstantial evidence on who noted and recorded their special qualifications, and on how this collected information was made available to the emperor. The story of Nonius Datus and Trajan's responses to Pliny's requests imply that provincial governors had records of some sort on the specialists under their command—probably out of pure necessity. Ulpian indicates in his second book of *de officio proconsulis* that the governor was to provide assistance to municipal building projects within his province and deploy soldiers for such tasks when needed.⁹¹ Taking note of specific qualifications thus was a logical consequence, even though it may not have been systematic. Such information must also have reached the emperor and his Palatine bureaux: a number of inscriptions indicate that, on recommendation by the governor, legionary soldiers were promoted to the centurionate by the emperor; this surely left traces in gubernatorial archives and at the archives in Rome.⁹² Based on an epideictic poem by Statius to the *ab epistulis* Abascantus, some scholars suspected that the *ab epistulis* was charged with the commissioning of centurions and equestrian officers, and that this

⁸⁶ Bülow-Jacobsen 2009: 4, ⁸⁷ Bülow-Jacobsen 2009: 178–83; Hirt 2010: 168f., 179–84.

⁸⁸ Franke 2005: 326f.; Strobel 2011: 375 n. 10.

⁸⁹ Ritterling 1924/5: sp.1757; Wheeler 2000: 290; Franke 2005: 323f.

⁹⁰ Strobel 2011: 307–23. *LTUR* II pp. 348–56 (Forum Traiani); *LTUR* III pp. 241–5 (Mercati di Traiano); *LTUR* V pp. 67–9 (Thermae Traiani).

⁹¹ *Dig.* 1.16.7.1; Horster 2001: 168–87.

⁹² Haensch 1992: 264–74.

official ran something akin to a ‘human resources department’ for commissioned officers in the Roman Army.⁹³ Whether the potential files kept on centurions by such a department—provided it existed—would have included their respective expertise in quarry management and construction is beyond our knowledge.

A positivist reading of the three quarry labels naming Tullius Saturninus and Sergius Longus from *XXII Primigenia*, and the inscribed monument at Mons Claudianus by Annius Rufus of *XV Apollinaris*, would suggest that quarrying specialists of a certain calibre were only to be found at legionary camps at Mogontiacum or Carnuntum. However, written evidence shows that these particular skills were hardly limited to a few chosen centurions based in the northern provinces. Roman legionary and auxiliary soldiers in the Near East, Egypt, and Africa were just as involved in quarrying and construction projects as their brethren on the Rhine and Danube frontier.⁹⁴ Provided this supposition is not amiss, the assignment of two centurions from one and the same legion, *XXII Primigenia*, to different quarries under imperial control during the 130s looks rather suspicious. It raises the prospect that the selection process was perhaps less reliant on a central archive than on Hadrian’s personal experience and knowledge. He himself had served as legionary tribune with *XXII Primigenia* at Mogontiacum in AD 97/8 and returned to the German provinces in 121/2 on his way to Britain, perhaps stopping again at Mogontiacum.⁹⁵ His choice might also have been informed by the knowledge of members in his *consilium* possibly in combination with records at his disposal. Whether these centurions were regularly selected and summoned to Rome where they remained at the emperor’s beck and call; or whether they were assigned ad hoc from the legionary bases to quarries or construction projects when the need arose—both models seem possible.⁹⁶ Political circumstance may also have played a pivotal role in limiting the availability of specialists to centurions posted in the west. The Bar Kokhba revolt from 132 to 136 inflicted heavy losses on the legions and auxiliaries in Syria; the bloody suppression of the revolt and an attack by Alani on the northern Euphrates frontier in 135 tied down Roman forces available in and beyond the region.⁹⁷ Apparently, the Rhine frontier was calm; specialized centurions could be made available and detached from their units; this could explain the propensity for ‘Westerners’ being sent to eastern quarries.

⁹³ Stat. *Silv.* 5.1.94–98; Birley 1988: 207, 1992: 23f. 41–54, 2003: 3f. Eck 1995c: 139f., 2002: 101f. with n. 30.

⁹⁴ e.g. *III Scythica*: *IGLS* I 68–70, 77; III 1137; *AE* 1983: 927; Saxer 1967: 279–81; Speidel 1998: 177, no. 4, 2001: 153–5; Stoll 1998: 120–2; Horster 2001: 168–87 with bibliography; Hirt 2010: 176–8.

⁹⁵ Birley 1997: 37, 115.

⁹⁶ Domaszewski 1967: 104, 109; Franke 2005: 323.

⁹⁷ Birley 1997: 268–78, 287f.; Bosworth 1977; Eck 1999, 2002, 2007: 115–44.

Why legionary centurions such as Tullius Saturninus and Sergius Longus were seconded to the quarries at Bacakale and Carystus is nowhere stated explicitly. The impulse for their relocation, however, is less likely to have originated with the governors of the respective province and the procurators in charge of the quarrying ventures. In fact, a gradual change in the formula of quarry labels as observed around AD 136/7 on marble from the Bacakale quarries can be detected elsewhere. A significant alteration in the notation system occurs at the quarries of Simitthus in Africa proconsularis in 137. From as early as AD 64 formulaic inscriptions on blocks discovered at Ostia, Rome, and Simitthus render a consular date, a serial number, and the words *ex rat(ione)* followed by a personal name (PN) in the genitive form, e.g.

CIL VIII 14560 = Kraus 1993: 56f = Hirt 2010: app. no. 788.

Sura III et Senici(ione) II co(n)s(ulibus)

ex rat(ione) Felicis Aug(usti) ser(vi)

d(e) n(umero) DCXII XXX

(officina) Tiloris

‘(Year) Sura (for the third) and Senecio (for the second time) (are) consuls (AD 107). (Stone block) from / (credited) on the account of Felix, imperial slave; serial number 612, 30; from the workshop of Tilor(?).’

The term *officina* in the formulaic labels is often followed by personal and imperial names or names of divinities. At Simitthus the term designates a workshop and site within the quarry, since many stones of the same *officina* were found in clusters near different quarry faces.⁹⁸ The siglum *ex rat(ione)* complemented by a PN is understood to identify a private contractor of the quarries or a section thereof.⁹⁹ By AD 137 the labels on quarried products were rearranged and elements of the old formulaic text dropped. The emperor was now mentioned in the genitive case and the *ex rat(ione)* mark replaced with *sub cura* followed by the name of a procurator in the genitive case.¹⁰⁰ The replacement of *ex rat(ione)*-marks with *sub cura* could indicate that in 137 a procuratorship for an imperial freedman was established for the quarries; inscribed monuments indicate his presence on site.¹⁰¹ Again, the reason for this change in formula is not made explicit by our sources. Perhaps the establishment of what appears to be a procuratorial post created especially for the quarries at Simitthus might indicate a more direct form of exploitation, possibly accompanied by the introduction of forced labour. Excavations at the site yielded a military built tripartite camp in stone to the northeast of the quarry; possibly an *ergastulum*, a penitentiary complex for convicts condemned to hard labour, it was constructed in c.AD 170.¹⁰² Soldiers of *legio III*

⁹⁸ Dubois 1908: 32f.; Kraus 1993: 61; Röder 1993: 31, 33, 36, 38.

⁹⁹ Kraus 1993: 62; Khanoussi 1996: 1013. ¹⁰⁰ Kraus 1993: 62; Hirt 2010: 305f.

¹⁰¹ Hirt 2010: 117–9. ¹⁰² Rakob 1993; Mackensen 2005.

Augusta, VII Gemina and an auxiliary *cohors equitata* kept watch over the camp's inmates.¹⁰³ What this new regime replaced is not quite clear, but we may assume that prior to AD 137 the quarries would have been contracted out in some form or another.

The synchronicity of label changes at Bacakale and at Simitthus is unlikely to be accidental.¹⁰⁴ This is corroborated by the secondment of centurions roughly at the same time from Mogontiacum or Rome to Bacakale and Carystus, probably on the orders of the emperor. To my mind, all these events seem to mirror a central decision issued by Hadrian, in some instances implemented by military specialists seconded to select quarries. The simultaneous, but very different responses at Simitthus and at Bacakale may either suggest that the emperor intervened directly in quarrying procedures at each site; or (and perhaps more likely) a directive addressed a common issue at select quarries, which was then resolved differently at Simitthus, Bacakale, and Carystus. The thinking behind this directive is elusive. With the little written evidence available we can only attempt to sketch a hypothetical scenario.

HADRIAN'S 'INTERVENTION' OF AD 136/7—A HYPOTHESIS

The backdrop for this intervention surely was the public building projects at Rome, of which the emperor was the principal initiator. Hadrian's endeavours were not limited to Rome itself: he contributed monies for numerous building projects in Italy probably during his three sojourns on the Italian peninsula in 119/20 and in 127, and in his final years at Baiae (AD 136–8).¹⁰⁵ He also financed engineering projects (e.g. aqueducts), the construction or restoration of utilitarian buildings (markets, city walls and gates, grain storehouses), of theatres, amphitheatres, gymnasia, baths, temples, shrines, and tombs, at provincial cities. Athens, Smyrna, and Italica in particular benefited enormously from Hadrian's munificence. Athenians saw the Olympieion completed in 131/2, and further benefactions such as the 'Library', the 'Temple of Hera and Zeus Panhellenios', a pantheon, and a gymnasium constructed. Hadrian presented both Athens and Smyrna with columns of Numidian and Phrygian marble, as well as red porphyry.¹⁰⁶ His many building projects at Rome included the 'Temple for the Deified Trajan and Plotina', built adjacent

¹⁰³ Khanoussi 1991, 1997; Hirt 2010: 184f.

¹⁰⁴ Fant 1988: 151f.; Dodge and Ward-Perkins 1992: 25 n. 15.

¹⁰⁵ Boatwright 1989: 251.

¹⁰⁶ Boatwright 2000: 108–43, 144–57 and 167–71 (Athens), 157–62, (Smyrna), 162–7 (Italica).

to the Forum Traiani and dedicated before AD 128.¹⁰⁷ The Domitianic imperial residence on the Palatine also saw numerous modifications in c.126–32, as did the ‘Vestibule’ and Domus Tiberiana.¹⁰⁸ Two construction campaigns in AD 117–125 and 125–133 were needed for Hadrian’s villa at Tivoli.¹⁰⁹ Pons Aelius was finished in c.134 and Hadrian’s Mausoleum in AD 139.¹¹⁰ On the Campus Martius, Hadrian had built or refurbished the ‘Temple of Matidia’ and the Saepia Iulia in the early years of his reign, and he completed the Pantheon begun under Trajan.¹¹¹

The Pantheon itself may hint at potential difficulties in the supply of materials for building projects at Rome: its portico appears to have been planned originally with sixteen fifty-foot columns, but had to be completed with columns of only forty feet in height. Whether the intended columns were lost at sea, or there had been a false delivery, is not disclosed by the archaeological evidence.¹¹² What it does disclose, however, is that the building contractors in charge of the Pantheon site would not or could not wait for the arrival of new columns from Egypt, possibly because they worked under cost and time constraints.¹¹³ Provided the resulting compromise was not a unique event, it could be symptomatic of the partial slowness and inflexibility inherent to extractive procedures at imperial quarries. Given that the ‘Temple of Venus and Rome’ was once adorned with marble columns and architectural elements made of granodiorite, ‘cipollino’, Proconnesian marble, and many other polychrome stones, similar problems of supply may have plagued its construction. The temple was begun in AD 121 and it took almost two decades to complete.¹¹⁴ In comparison, the luxuriously adorned Forum Traiani, i.e. the Basilica Ulpia, its main court, and surrounding porticus, were built between c.107 and 112—much quicker than the *Templum Veneris et Romae* of similar size.¹¹⁵ The premise of the subsequent scenario therefore is that by 136/7 the

¹⁰⁷ Boatwright 1987: 74–98; *LTUR* II pp. 354f. (Forum Traiani).

¹⁰⁸ Domitianic palace: Boatwright 1987: 152; *LTUR* IV pp. 30f. (Palatium); ‘Vestibule’: Boatwright 1987: 112–8, 154; Domus Tiberiana: Boatwright 1987: 118f., 155; Richardson 1992: 137; *LTUR* II pp. 189–97.

¹⁰⁹ Boatwright 1987: 142; MacDonald and Pinto 1995; Opper 2008: 130–65; Ragni 2010.

¹¹⁰ Pons Aelius: Boatwright 1987: 176–8; Richardson 1992: 296; *LTUR* IV pp. 105f.; Mausoleum: Boatwright 1987: 168–76; Richardson 1992: 249.

¹¹¹ *Hist Aug., Hadr.* 19.10; Pantheon and Saepia Iulia: Boatwright 1987: 42–7; Richardson 1992: 283f.; on date of the Pantheon see now Hetland 2009: 114f. ‘Temple of Matidia’, cf. Boatwright 1987: 58f.; Richardson 1992: 246f.; *LTUR* III p. 233; Campus Martius, cf. Boatwright 1987: 33–98.

¹¹² Davies et al. 1987; Dodge and Ward-Perkins 1992: 13f. with n. 2; Wilson Jones 2000: 208–12, 2009: 83; Fant 2001: 195.

¹¹³ On building contractors and workforce in Rome, cf. Brunt 1980; Anderson 1997: 68–118; Daguet-Gagey 1997: 208–38; De Laine 2000: 120–5.

¹¹⁴ Boatwright 1987: 119–33; Richardson 1992: 409; *LTUR* V pp. 121–3; columns of ‘cipollino’: Dodge 1984: 355; capitals and columns of Proconnesian marble: Barattolo 1973; Dodge 1984: 402, 404.

¹¹⁵ Strobel 2011: 313 with bibliography.

supply of marble had somehow become inadequate for the simultaneous demands at Rome and in provincial centres, effectively slowing down construction activities.

The possible creation of a procuratorship for the quarries at Simitthus by AD 137, the change in formula of quarry labels, and the absence of contractors after 137 indicate a direct regime of quarrying operations. The probable use of convicts as a workforce and, at a later date, the establishment of a tripartite camp in stone, illustrate the commitment to a more permanent presence at the quarry. Convicts condemned to hard labour were perhaps on site as early as AD 137 and, as their punishment demanded, they undoubtedly were put to work with few intervals.¹¹⁶ Both the permanency and the resultant intensification of quarry work (implied by the use of convicts) meant that supply became partly dissociated from present demand at Rome. A similar argument can be made for Bacakale: the military specialists seconded there in 136/7 surely altered the operative process.

To what effect remains initially unclear, but by the late 140s there are indications of private contractors being employed to quarry an agreed amount of blocks in a set period of time in return for a fixed sum. This might also reflect an overall intensification of quarry work at Bacakale. Whether this new system too was dissociated from actual demand is more difficult to say; the *locatio conductio operis faciendi* ensured production in a pre-agreed amount of units, which is inherently less responsive to demand. If applied prudently the authorities would have planned production to safely exceed foreseeable demand at Rome. This might be reflected in the 376 dated ‘pavonazetto’ blocks found at Bacakale: in the period of *c.*40 years after 136/7, their number almost doubles in comparison to the same period preceding 136/7. The same at Simitthus—of the fifty-one dated quarry labels on ‘giallo antico’ blocks fourteen date to the *c.*30 years before, twenty-eight to the *c.*30 years after 137.¹¹⁷ Even though the latter sample is not statistically representative, it may indicate intensified extraction and an increasing trend to stock quarried items at Simitthus and Bacakale. Together with the change in production system at both sites one might tentatively argue for a ‘quarry-to-stock’ system being implemented in 136/7 at both sites.

Our lacunose evidence leaves us in the dark on whether or not this was an actual improvement to the organizational measures at Bacakale and Simitthus. As for Bacakale, we are at a loss on how to interpret the little information the quarry labels provide for quarrying arrangements before 136/7. The multiple consular dates ranging from AD 92 to 113 engraved on blocks are said to be

¹¹⁶ On *damnatio in metallum*, cf. Mommsen 1899: 47f., 960–3; Millar 1984; Gustafson 1994, 1997; Salerno 2003.

¹¹⁷ Hirt 2010: app. nos 1–376 (‘pavonazetto’), app. nos 787–838 (‘giallo antico’).

the result of repeated inventories.¹¹⁸ This phenomenon could be explained by the rare presence of imperial officials taking account of the quarried items; being on site only for limited periods of time made it necessary to recheck and take inventory again of the available produce on site. Whether this also reflected a general discontinuity of quarrying operations at Bacakale is not clear. It is entirely possible, though, that imperial quarries, like local quarries, experienced a hiatus in production after building projects were completed. At Mons Claudianus, for instance, the quarry operations may have ceased in the later years of Trajan, only to be reopened in AD 118 on the orders of Hadrian. The commencement of dated receipts for advanced payments to *fameliárioi* in AD 136 might also reflect a period of intensified quarry operations.¹¹⁹

At Simitthus the disappearance of the element *ex rat(ione)* + PN from ‘giallo antico’ labels is significant. Understood to indicate the contractor of a quarrying lease, it being dropped from the quarry labels was thought to mirror a change to a direct regime of exploitation.¹²⁰ However, the element ‘*ex rat(ione)* + personal name’—which also occurs sporadically in quarry labels on polychrome marble from Bacakale, Carystus, Teos, Chios; or on white marble from Paros (?)—may not refer to private quarry contractors at all. The name of the same person complementing *ex rat(ione)* can appear on stones of different origin.¹²¹ Fant assumed that these men were large-scale lessees, operating simultaneously at different quarries.¹²² In my view, the private individuals and the imperial slaves and freedmen named with *ex ratione* marks were based not in the quarries but at Rome. They were probably involved in ordering marbles for building projects in the capital city.¹²³ If we entertain this hypothesis further, the notation of their *rationes* (‘accounts’, ‘lists’, ‘registers’) on ‘giallo antico’ implies that before AD 137 the quarries at Simitthus responded directly to incoming orders from different building projects in Rome or the provinces—a ‘quarry-to-order’ system, so to speak. The advantage of such a system is that production met actual demand at Rome, production costs were kept down, and the quarries were worked when necessary, i.e. when an imperial building project was being realized. On the downside, the quarries would have been slow to pick up production after a lull, possibly because contractors and/or a workforce needed to be brought in again. Also, the response to an uptick in demand would be sluggish since the produce was not on stock but needed first to be quarried.

¹¹⁸ Fant 1989a: 29; Drew-Bear 1994: 837–41; Hirt 2010: 302.

¹¹⁹ *I. Pan* 42 l.2; Cuvigny 2000: 6–10, 22; Bülow-Jacobsen 2009: 4; Hirt 2010: 310f.

¹²⁰ Fant 1989a: 18–20; Hirschfeld 1905: 166 with n. 1.

¹²¹ cf. *ex rat(ione) Laet(i)* on ‘africano’ from Teos (AD 65, 75–80): Hirt 2010: app. nos. 462, 463, 467, 475, 476, 536–9, 543; on ‘giallo antico’ from Simitthus (AD 64): app. no. 787. *ex rat(ione) Cl(audii?) Zel(oti?)* on ‘pavonazetto’ (AD 142, 150): Hirt 2010: app. nos. 140, 141, 207; on ‘africano’ from Teos (AD 150): app. no. 495. *ex rat(ione) Sext(i) et Herm(ae?)* on ‘africano’ (AD 162): app. nos. 499, 500; on Parian marble (AD 164): app. nos. 1243, 1244.

¹²² Fant 2001: 174.

¹²³ Hirt 2010: 323–8.

Whatever the exploitation regimes at Simitthus and Bacakale were before AD 136/7—the few traces left in the epigraphic and archaeological records hint that after 136/7 the authorities in charge did not await incoming orders to commence extractive work but operated the quarries permanently, possibly quarrying to stock. If so, they could react more quickly to orders of marble, or replace damaged or lost material more easily. As a result the supply of ‘giallo antico’ and ‘pavonazetto’ became more agile and swift—but also more costly.

The working hypothesis presented here rests on the supposition that the emperor aimed to resolve delays plaguing the supply of choice polychrome marbles to public building projects in Rome. Reasons for him to do so were manifold. Apart from the general embarrassment and loss in prestige one might expect to result from unfinished or mismanaged public building sites, long delays created an additional problem—these extensive building programmes also provided work for many citizens of Rome. Peter Brunt even argued that the initiation of such projects also helped secure support among the Roman populace.¹²⁴ There are few indications that this was a major concern of Hadrian; perhaps his (re-)organization of workers in the building trades along military lines may reflect a genuine interest.¹²⁵ His intervention in quarrying operations also befits this context: if a hiatus in construction work occurred because of problems in the supply of imported marble, this could result in workers being laid off—hardly an outcome to be desired. Another concern may have prompted Hadrian’s intervention in 136/7: by then Hadrian must have realized that his end was near.¹²⁶ On his return from the East to Rome in AD 134 the construction of the ‘Temple of Venus and Rome’ was still ongoing; work was soon to begin on his mausoleum; and he is said to have built an ‘Athenaeum’ at an unknown site in Rome (Aurelius Victor, *de Caes.* 14.1–7). Apart from affairs of state to be brought in order, such as the appointment and adoption of a successor, Hadrian may also have sought to bring these construction projects to an end by speeding up the supply with the required marbles.

Hadrian’s intervention in quarrying affairs can also be seen as part of a more principled approach to the management of imperial and public assets: the *lex Hadriana de rudibus agris*, for example, mentioned in inscriptions from North Africa, allowed *coloni* to occupy, use, and bequeath parts of centuriated land left unfarmed for ten years by the large-scale contractors.¹²⁷ As Egyptian papyri seem to suggest, this *lex Hadriana* was also implemented in other parts of the empire, probably in an attempt to optimize returns from

¹²⁴ Brunt 1980 on Suet. *Vesp.* 18; Kienast 1980: 399; Skydsgaard 1983; Steinby 1983; Boatwright 1987: 20f.; Mrozek 1989: 95; Kolb 1995: 483–5; Winter 1996: 130; Martin 2000: 212f.; Drexhage et al. 2002: 32.

¹²⁵ *Epit. de Caes.* 14.5. ¹²⁶ Birley 1997: 289.

¹²⁷ *CIL* VIII 25943, 26416; Flach 1978: 468f., 1990: 111–17; Kehoe 2007: 59–62.

public land.¹²⁸ In Book 3 of his four volume work *De iure fisci et populi*, the Severan provincial jurist Callistratus notes that a rescript by Hadrian branded as ‘inhuman’ the practice of forcing farmers of public taxes and lands to continue to lease after expiration of contract. Hadrian is quoted as saying: ‘For [tax] farmers will more readily be found if they know that if they should wish to leave at the end of the five-year period, they will not be kept on against their will’ (*Dig.* 49.14.3.6).¹²⁹ The emperor seemingly wished to make the lease of public land for private contractors more attractive.

A similar policy might be reflected in the *lex metallis dicta* (ll.4–7), a fragmentary law on the procurement of rights to and on the running of silver and copper mines in the mining district of Vipasca/mod. Aljustrel in Portugal: Hadrian’s generosity (*liberalitas*) is noted in the context of the ‘down payment’ of 4000 HS for the price owed to the state for the procurement of the rights to a silver mine; we can only assume he reduced the amount of the initial down payment. His action may have lowered the financial bar to acquire ownership of silver mines and thus made it easier to find potential ‘buyers’ of mining plots at Vipasca and throughout Southern Spain.¹³⁰ In summation, the lowering of financial hurdles and the ‘cutting of red tape’ in the exploitation of landed estates under imperial control emerge as part of an overarching ‘policy’ to increase output (and, therefore, revenue). The same principle could apply to Hadrian’s intervention at Simitthus and Bacakale, although these imperial quarries probably did not generate profit for the imperial treasury.

CONCLUSION

‘Efficiency’, generally defined as the state of achieving maximum productivity with a minimum of wasted effort, time, and expenses, has become the standard measure by which economic activities in ancient and modern societies are compared—irrespective of whether the concepts ‘time’, ‘effort’, ‘waste’, or ‘efficiency’ are at all known to the societies in question. In new institutional economics (NIE) the economic efficiency of a society is deemed to be in an inverse correlation with its *transaction costs*, i.e. the time, effort, and expenses spent on activities associated with transactions.¹³¹ A ‘transaction’ can in turn be defined as: (a) a simple delivery of a resource, product, or service from one person or workplace to the next; or (b) the transfer of rights of ownership of

¹²⁸ Scholl and Schubert 2009.

¹²⁹ Trans. Watson 1998; cf. Kehoe 1997: 163 with n. 61.

¹³⁰ Hirt 2010: 265, 339f. For a different view, cf. Flach 1979: 414, 423; Domergue 1983: 134–7, 161.

¹³¹ Cf. Zuiderhoek with bibliography, Chapter 1 in this volume.

things.¹³² The transaction costs are shaped and impacted by ‘institutions’, i.e. formal and informal constraints (laws, social norms, conventions, traditions, etc.) arising from shared value systems and beliefs.¹³³ Conventionally, transaction costs are grouped into *internal* and *external* transaction costs, i.e. costs arising from transactions within an organization or company (*managerial transactions*) and from *market transactions*.¹³⁴

The adaptation of this analytical framework to the extractive operations of stone and marble throughout the Roman Empire is jeopardized by the lack of textual evidence on most transactions of quarried material. Although the majority of transfers were undoubtedly *market transactions* conducted either among private or between private and public actors, the textual dearth curtails our capacity to convincingly identify most constraints governing these recurring transactions or the modes of production in privately or communally owned quarries.¹³⁵

As for quarried products made of polychrome stones, there is conclusive evidence that the emperor monopolized most of their use. This monopolization of use was perhaps never formalized in legal terms; it flowed from his extraordinary political position and his coercive powers over members of the Roman and provincial elite, ultimately granting him the right to deny or permit access to the most prized of marbles. In order to meet public expectations of generosity (*liberalitas*) and patronage, emperors pursued monumental construction schemes, thus becoming the principal sponsors of building projects in the city of Rome. Bound by informal conventions established by elite protagonists of the late republic and amplified by Augustus, they were compelled to continue the practice of displaying imported coloured marbles in the public sphere. The nearly exclusive demand and use by the emperor, including the constraints of building conventions and public expectations, thus emerges as one of the main *institutions* governing transactions in coloured marbles. Ultimately, this translated into an almost complete ownership and control of the existing polychrome marble quarries and the opening of new quarries by the imperial state.

In 136/7 Emperor Hadrian decided to intervene per ‘directive’ in ongoing quarrying operations at Bacakale and Simitthus; the directive appears to have affected the way in which these imperial quarries were run. I speculated that its purpose was to address inefficiencies, symptomized by delays and

¹³² For a more complex definition, cf. Furubotn and Richter 1998: 49f.; Allen 2000.

¹³³ Furubotn and Richter 1998: 49.

¹³⁴ An overview of transaction costs analysis and institutions, cf. North 1990: 1–72; Furubotn and Richter 1998; Frier and Kehoe 2008; Ménard and Shirley 2008: 1–18.

¹³⁵ In Roman Egypt, written contracts—if they were a legal or social norm for these specific trades—probably drove up bargaining costs (*P.Oxy.* III 498); and the requirement to direct a written request to communities for payment after the delivery of building materials increased policing costs for quarry owners (*P.Hib.* II 273 + 217). Cf. Hagedorn 1993; Hirt 2010: 90 n. 196.

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interruptions of construction work, which by 136/7 had presumably arisen from the internalized system of production, movement, and use of coloured marble goods, at least temporarily. This was done by intensifying production and decoupling it partially from actual demand at Rome by quarrying normed shapes to stock. If at Bacakale and Simitthus blocks and normed columns were quarried to stock, reaction time to orders from Rome would have been lowered significantly compared with a quarry-to-order system, in which the desired output was produced *after* the orders arrived. The decision to intensify production at these sites might well have originated with said directive, a suspicion further underpinned by Hadrian's changes to regulations governing imperial estates and mines under imperial control: he appears to display a genuine interest in intensifying the exploitation of natural resources on imperial lands.

Provided this argument is at all valid, the question arises whether these measures improved overall efficiency of the imperial system supplying Rome (and other sites) with prized marble. If production time at quarries was reduced, then it was bought off with the quarrying and preproduction of waste products, which were lying idle in the quarries and needed to be stapled on site. Moreover, organizational changes set in place to intensify production altered the makeup of transaction costs associated with these organizations. The decision to contract out quarry *sections* at Bacakale to private individuals probably resulted in high search and information, bargaining and decision making, along with supervision and enforcement costs. However, the transaction costs arising from the managerial activities of imperial agents on site, limited to ensuring the contractors fulfilled their contractual obligations, were minimal. At Simitthus things present themselves differently: quarrying activities there were organized exclusively under a 'governing hierarchy',¹³⁶ that is, imperial officials and military personnel, headed by a procurator, arranged the production process, and logistical operations. Market transaction costs were minimal if not absent, but managerial transaction costs—arising from setting up and maintaining a quarry organization, constructing a guarded facility, sustaining and guarding convicts, supervising subalterns, monitoring the execution of orders and the movement of products, or ensuring sufficient supplies in materials, convicts, food, and water, were high.

We do not know whether Hadrian's 'directive' affected the organization of extraction procedures at other quarries. The written evidence from Mons Claudianus, for example, seems not to indicate any significant changes to the way quarrying operations were run.¹³⁷ For most other sites we know little about their internal organization, mostly because the informative quality and

¹³⁶ Ménard and Shirley 2008: 4.

¹³⁷ As of yet, we can only observe the commencement of dated receipts for advanced payments to *famelíarioi* in AD 136; cf. Hirt 2010: 310f.

quantity of inscribed quarry labels is insufficient. More disappointingly, we do not understand how things were done at Simitthus and Bacakale prior to the changes of 136/7. It is probable that quarry work was most likely contracted out. Employing contractors was the default setting of decision makers within the imperial administration, an established institution even for tasks central to the imperial state (collection of taxes and duties, running mining operations and landed estates). Most imperial quarry operations were possibly contracted out in their entirety to private individuals or ‘companies’.

With Mons Claudianus and other quarries in the Eastern Egyptian Desert this was not the case. Given the remoteness of these quarries, the transaction costs of contracting out quarry work would probably have been prohibitively high: private contractors would have needed to set up their own organization, hire and supply quarry workers with water and foodstuff, housing them, arrange transport of materials and people, etc. It thus appears to have been less costly for the imperial state to have imperial officials and military personnel organizing and running quarrying operations directly. I thus argue tentatively that suitable environmental conditions were a necessary prerequisite, i.e. the quarry needed to be situated in a populated area in order to attract suitable contractors.¹³⁸

Currently, the question regarding which of the modes of production was most efficient or whether overall efficiency of quarry operations after 136/7 was improved cannot be answered satisfactorily. Without the means to guess-timate the size of internal and external transaction costs, without data on the size of output, expenses in cash, or indications of the time it took to quarry and dress a column under these very different modes of exploitation, comparisons cannot venture much beyond taking stock of differences in the make-up of transaction costs.

Would a market-based solution to the supplying of coloured marble to Rome have been more efficient? Given the circumstances, the monopolization of use of most prized coloured stones by the emperor made a market-based solution unviable; the focalization of demand factually created a monopsony, which allowed the emperor to set the prices. For any private or communally owned quarrying venture, production would arguably have been unprofitable and over time unsustainable. Running most quarries of prized coloured marble as subsidiary formations of the imperial state with localized organizational solutions was, under the given circumstances, if not an efficient, then the only, way to guarantee the supply of imperial building projects in Rome.

¹³⁸ Hirt 2010: 365f. Even though Simitthus was adjacent to a sizeable settlement, imperial agents planning extractive operations there also possibly found it difficult to find appropriate contractors. Perhaps Simitthus was competing with other imperial estates for a shrinking pool of capable contractors, lost out, and opted for the use of convicts instead.