Transactions in stone: making sculpture in Athenian society in the sixth and fifth centuries BC
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Citation for published version (APA):
II Choices in marble

1 History, marble and the ancient economy

One of the most conspicuous influences on the appearance of sculpture is the material. The stone of a statue is in a way a primary source, a direct result of a choice someone made 2,500 years ago. Not that these choices are a simple matter. First, the material had to be decided on (by patrons, or sculptors, or perhaps by both). Then its provenance and availability needed to be examined; transport had to be arranged and costs addressed in various quarters, followed by agreements about the design. Only after all this did the carving start – during which phase the stone might yet be discarded. All the choices made during this process are reflected in the finished product as preserved today. External sources on transport, quarrying practices and remains of workshops can complement the picture.

The people who make these choices can be patrons, sculptors and their co-workers in sculpture workshops, specialised painters and letter-cutters and possibly dowel-makers, in short, all those who are engaged in a practical way in the sculpting or decorating of a statue. Apart from artists or craftsmen, there is support personnel. The crew of cargo ships, blacksmiths, or pigment traders are slightly further away from the manufacture of the statue but still instrumental in it. Right at the beginning of the chain are the patrons, who will be dealt with in a later chapter. Besides deliberate action on the part of the people concerned with sculpture production, on a different level historical circumstances play their role. For Athens, the Persian War is the most obvious example, but certainly not the only one. An excellent illustration of the possible influence of historical events on sculpture is the story of Athens’ relation with the Cycladic islands, specifically Naxos and Paros (map 13b).

In the early sixth century, Naxos had been a major exporter of local marble: many votives in Naxian marble from this period can be found at the pan-Hellenic sanctuary of Apollo on Delos.\(^293\) Around 540 BC, the local aristocrat Lygdamis was established as the tyrant of Naxos with some help of Peisistratos, although Aristotle suggests Lygdamis himself

\(^{293}\) Kokkorou–Aletras 2000, 146–7.
was quite demagogical enough to achieve his goal. Once in power, one of his first acts was to exile many of his fellow aristocrats. It appears this had the purpose of making a profit on the sale of their estates, while at the same time, it offered him a chance to rid himself of his most prominent competition. Once he found that nobody was willing or could afford to buy the land, at least not at a ‘fair’ price, he sold it back to the original owners. According to the story, sculptures were present ‘in certain workshops’ on the exiles’ estates, and were waiting to be dedicated at sanctuaries. Afterwards, Lygdamis ordered that the statues be sold to the former owners or to whoever else would have them, and to allow the buyers to engrave their names (ὡστ’ ἐπιγραφήται τὸ τοῦ πριαμένου ὄνομα) or in other words, dedicate them.

In itself this is simply the behaviour of an archaic tyrant, and as such hardly exceptional. Nevertheless, some aspects of the story are curious to say the least. For one, it is very unusual that sculpture is mentioned in ancient texts at all, especially in such a relevant way and in a relatively early period. From the point of view of art worlds, Herodotos does not mention sculpture in contexts even remotely as informative as the brief story by Aristotle, even though he does describe Lygdamis and his ascent to power briefly. This can either

294 Lygdamis had helped install Peisistratos as a tyrant in Athens, and supposedly, the latter returned the favour in this way. See Hdt. 1.61–4; Ath. Pol. 15.2; Kokkorou–Aletras 1995, 39 n. 34; id. 2000, 148. On Lygdamis in general, see e.g. De Libero 1996, 236–43. The two tyrants exchanged hostages (sons of rival aristocratic families) to stabilise their positions (Cawkwell 1995, 78).

295 Arist. Oec. 2.2 ‘... Λύγδαμις Νάξιος ἐκβάλων φυγάδας, ἐπειδὴ τὰ κτίσματα αὐτῶν οὐδεὶς ἤθελησεν ἀλλὰ ἡ βραχεός ἀγαράζειν, αὐτοῖς τοῖς φυγάσαν ἀπεδότο τα τα ἀναθήματα, δόσα ἢν αὐτῶν ἐν ταῖς ἐργαστηρίοις τιμίργα τιμακείμενα, εἰπώλει ταῖς τις φυγάσαι καὶ τῶν ἀλλῶν τῶν βουλομένων ὡστ’ ἐπιγραφήται τὸ τοῦ πριαμένου ὄνομα’. Lygdamis of Naxos, after driving into exile a party of the inhabitants, found that no one would give him a fair price for their property. He therefore sold it to the exiled owners. The exiles had left behind them a number of works of art destined for temple offerings, which lay in certain workshops in an unfinished condition. These Lygdamis proceeded to sell to the exiles and whoso else would buy them; allowing each purchaser to have his name engraved on the offering (transl. G. C. Armstrong). Anathemata applies to other types of votives too (see ch. III), but considering that Naxos was famous for marble rather than for metals, and that pottery would hardly have raised the kind of funds Lygdamis seems to be after, sculpture is the most likely possibility. Furthermore, τιμίργα indicates that the votives were half completed. Vases or bronze statues in that state would be rather unsaleable, whereas statues which e.g. only needed to be polished were not.

296 Hdt. 1.61, 1.64. He does mention a few statues, but never because sculpture is the subject. For example, a lion dedicated by Kroisos (1.50) is mentioned because it expresses how grateful (and short-sighted) Kroisos was to the oracle at Delphi. Dedications of Amasis in Egypt (2.176) show how impressive his building policy was. Kleobis and Biton illustrate the awe which their death inspired with their fellow-citizens I.31). An exception in the naming of craftsmen by Herodotos is Theodoros of Samos, who made a gold bowl (1.51.14–5).
mean that the story is apocryphal and Herodotos had not heard of it, or that he knew it but did not think it interesting enough for his narrative. In view of the general scarcity with which he mentions sculpture, the second option is likely. Thus, it may be assumed for now that what Aristotle describes happened, and Lygdamis brazenly tried to auction off the votives of the gods to fill his coffers.

The fact that he bothered to confiscate the statues can again be interpreted in two directions. First, he may have had the idea of selling them right away, and his motive may have been greed. That would imply that they were worth something even in an unfinished state, and apparently enough to take the trouble of a sale. Second, it is possible that Lygdamis thought it wise not to allow his exiled opponents to leave conspicuous symbols of status standing around while he was settling in as a tyrant. Once he had sold them back their own former possessions and they were presumably no longer in a position to mount any resistance, he could safely let them have their sculpture. In that case, the story would imply that under certain circumstances, a monumental sculpted votive at around the middle of the sixth century was considered enough of a status symbol to prevent its dedication if the patron needed to be kept on a short leash.

Another element in this story touches directly on the subject of this chapter. The text states that ‘the exiles had left behind them a number of works of art destined for temple offerings, which lay in certain workshops in an unfinished condition.’ The suggestion is that the workshops in question were on the aristocratic estates and that the sculptors were travelling craftsmen who had set up shop there temporarily, either near their patrons’ homes or near the quarry or close to both. It has been argued that the Naxian quarries were in this period situated on land owned by the aristocracy. Marble had been a major export product for Naxos in the seventh century: by the middle of the sixth century, the island had a considerable fleet carrying the marble abroad. As a result, economic opportunities for whoever controlled the quarries would have been excellent.

However, commercial activity of this kind was apparently of no real interest to Lygdamis. He temporarily prevented the completion of unfinished votives and the erection of

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finished ones on the island, which presumably had been an activity for the wealthier inhabitants now in exile. Thus, a severe blow was dealt to the Naxian marble industry. The ensuing lull in production gave Paros a chance to move into a position of prominence in the marble trade which it would not relinquish.\footnote{Kokkorou–Alewras 2000, 148. The island of Delos had a constant number of votives in Parian marble from the third quarter of the sixth century onward, yet no contemporary votives in Naxian marble. Earlier in the sixth century, the Naxian presence still predominated the dedicatory sculpture there. It will be discussed below in how far numbers of votives on Delos as well as on the Athenian Akropolis are usable for this argument (cf. p. 104).} In the Naxian sculpture trade, the popularity which its marble had enjoyed until the middle of the sixth century was lost, even after Lygdamis was deposed probably in 524 BC.\footnote{Although the timing of the crisis in Naxian sculpture is implied in the present dataset and in Delian material (see previous note), there may have been more reasons why it occurred and why Naxos did not recover. Cf. below p. 104; Leahy 1957, 272–3 (date); Ashmole 1972, 15.}

The tyrant’s apparent lack of economic foresight ties in with a discussion which extends widely over scholarship in the last century regarding the nature of ancient Greek economics. The central question is whether the economy of the Greeks should be called embedded, i.e. bound to traditional social or cultural values, or disembedded, a ‘proper’ economy with market tendencies. Without going into this argument too thoroughly, a brief sketch of the main directions in it is useful, because the wider scope of the ancient Greek economy encompasses some of the practice of crafts. In the case of sculpture, it is particularly the quarrying, transport and trade of stone which are relevant. In other words, any argument about professionalism or lack thereof in the sculpture network of ancient Athens benefits from a wider economic and geographical perspective.

In the second half of the 20\textsuperscript{th} century, the embedded view of ancient economies has been most emphatically represented by M. I. Finley. In his perspective they were mostly determined by agricultural produce, because any other economic activity than land–holding was frowned upon by the higher classes.\footnote{Finley 1973, e.g. 17–34, 133–40.} Technology, trade and craft stood in very low regard. Of course, an overview like the current one does not do justice to the arguments which Finley and others developed over many decades, from a discussion with a considerable history of its own;\footnote{The discussion has often been outlined in various degrees of thoroughness: see among others Austin and Vidal–Naquet 1972, 11–30; K. Hopkins, Introduction, in Garnsey et al. 1983, IX–XXV;} but Finley’s adamant dismissal of certain factors in ancient economy is important here.
The first of these factors is the supposition that the ancient ‘drive to acquire wealth was not translated into a drive to create capital.’ In other words, the general mentality in antiquity prevented the rise of a use of resources which could have led to a true market in the modern sense. Finley contends that the character of ancient economies is rooted in the tendency to let external considerations, for example, of a social nature (or political, or religious) prevail over profitability. This, in turn, is the case because economic activities are embedded in social structures and intertwined with the views on land, labour and wealth mentioned above.

A second contention of Finley’s which has particular relevance for this study is this: like capital, technology and craft in general were not a driving force in ancient economies. Thus, innovations or efficient ways of implementing such improvements which were discovered in antiquity were not exploited fully. Advances in craft ‘were all accomplished without any technical innovation, by greater mastery of already known processes and materials, and, above all, by greater artistry.’ The role of manufacture in ancient economy is therefore minor: ‘There were no business cycles in antiquity; no cities whose growth can be ascribed, even by us, to the establishment of a manufacture.’ This may be true in a modern economic sense, but the question is what such a stance will add to our knowledge of the functioning of trades like sculpture in antiquity. The practicalities of ancient economic life are more traceable than Finley sometimes suggested, as has been noted in more recent studies about the role of workshops and even manufacturing plants in antiquity.

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304 Finley 1973, 144. Though the remark regards the Roman republic and early empire, it is extended to all of antiquity; for an example ibid. p. 122. Cf. also Austin and Vidal–Naquet 1972, 28; Hopper 1979, 104, 129.

305 Finley 1973, 138. Contra Cohen 1992, 3–11 for the particular case of banking in Athens; Börner 1996 for economic infrastructure at Athens; and Loomis 1998 for professions in ancient Greece. For more detail with regard to sculpture workshops and/or shops, see ch. III.


307 Ibid. 139–40.


309 Finley 1973, 23; cf. Schneider 1992, 26

information in this field, being derived from physical remains and therefore excavation, steadily expands. And though often illuminating, the discussion about how well ancient practices fit modern theories should not hamper assessment of the actual material.

In the case of sixth and fifth-century Athens, fundamental changes took place in the organisation of its arts or crafts. In accordance with the dynamics of art worlds, technical aspects of archaic and early classical sculpture in Athens were not advanced exclusively by master sculptors. On the contrary, related activities contributing to the final product changed too, if only because they were a part of the wider socio-political shifts of their time. As will be argued below, the chain of supply of stone for Athens offers an interesting (though partial) view of the way in which the Athenian sculpture world and its participants operated. Ancient sources sometimes add to this picture, but mostly it is the sculpture and excavation records which provide an idea of the developments in marble trade. The predominance of certain types of marble in certain periods, differences in marble for sculpture or for pedestals, traces of the methods and techniques applied to extract and transport the stone: all these aspects reflect both external influences and internal choices in the art world of Athenian sculpture. The following sections will consecutively address the variations in the types of marble used for the sculpture in this study, their provenance, quarrying methods and transportation, and finally the people who worked in these branches.

2 STONES AND MARBLES

Most Athenian sculpture was made in marble, but other types of stone occasionally were used: most important is the soft limestone common to Greece, poros. Both this type of stone and marble are traditionally classified according to regions of provenance, for example, island marble of the Cyclades or the Attic types of Pentelic or Hymettian (maps 13b–14a). However, this apparently straightforward categorisation is somewhat misleading. Determination of provenance is often based on simple visual observation. Though chemical show that the practical side of trades in ancient Greece has been studied consistently throughout the last half century.

311 For example, the study of workshops by Zimmer (1990) or ongoing excavations like the Agora, cf. Mattusch 1975 and 1982, or Pheidias’ workshop in Olympia (Mallwitz and Schiering 1964; Schiering and Letsch 1991).
and geophysical methods are available, the old classification is commonly used, including to a large extent in the present study. Nonetheless, marble types in the record are mainly based on publications from the 20th century, whose authors had ample knowledge and experience in classifying them. Modern research techniques and their results are of obvious importance. One of the most common tests for establishing the provenance of marble is stable isotope analysis, which investigates the presence and levels of specific chemical components of the marble, usually carbon and oxygen. These were included in the stone during its formation, when the calcite which is the main ingredient transformed under high temperatures and extreme pressure into crystalline marble. Traces of carbon and oxygen are always present in marble, but in varying quantities depending on the circumstances and place of formation. Consequently, each marble type has isotope signatures for carbon and oxygen which are characteristic for its particular region and even for its quarry. However, variations within a region can be too small to distinguish various types of marble by means of isotope analysis. Therefore, the question arises as to how specific and reliable geochemical and other methods of analysing the composition are for establishing exact provenances of marble? Second, and more important for the present study, is the question how the classification of marble types in older publications holds up against the new methods?

In the 19th and the early 20th century, archaeologists classified types of marble by comparing their structure and colour to samples in marble collections. One such collection, compiled by German geologist Richard Lepsius for his *Griechische Marmorstudien*, is nowadays kept in the Ny Carlsberg Glyptotek in Copenhagen. Recently, Norman Herz has reinvestigated the provenance of these marble fragments, initially through stable isotope and microscopic analysis. Most of the time Lepsius turned out to have labelled so-called lower

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312 E.g. Langlotz, Schuchhardt and Schrader (AMA), Richter (1960, 1962), Raubitschek (DAA). The great knowledge and experience of conservators of Athenian museums have been wonderful in checking marble provenance.


314 Analysis with other chemical components is possible too, but carbon and oxygen have proven most consistent for this technique: Herz 2006, 294.

315 For ancient words denoting colours of marble and their survival in later periods, Crescenzo 2006.

316 Cf. Lepsius 1890. It is clear that some of the samples in this collection are chips of originals in the Akropolis museum and the National museum in Athens. Unfortunately it is rarely possible to verify which statues and which samples belong together (Moltesen, Herz and Moon 1992, 277).

Pentelic (the most frequently used Attic marble in antiquity) and Parian II marble correctly.\textsuperscript{318} Mix-ups in Lepsius' assessment were often within one region, for example, a piece of Hymettian marble he considered Pentelic, or one from Naxos he thought to be Parian.\textsuperscript{319} Another type of marble, from the island of Thasos, was unknown to Lepsius altogether: this led to a lot of mislabelling, because Thasian marble was quite popular in antiquity.\textsuperscript{320}

So, on closer inspection, Herz concluded that Lepsius' visual analysis was often correct in determining the region of origin of the marble, but less so where the provenance within one region was concerned.\textsuperscript{321} Since the colours of various marble types from one region may vary a great deal, this is hardly surprising.\textsuperscript{322} Grain size (often visible with the aid of a looking glass) and foliation, i.e. the layering of the crystals, provide additional information to fine-tune the assessment of the provenance. In short, well-informed visual analysis is a valuable tool for determining marble provenance, as Herz and other scholars have frequently attested.\textsuperscript{323}

That being said, the results of Lepsius' work and similar studies are imperfect. Geochemical and other techniques can be used for a twofold purpose: to check whether the listed provenance is correct, and to specify the provenance to a particular quarry within a geological region. It is common to take the best known exponent of a marble type as representative of all marble from that region. A famous example is Parian marble, which is known as a beautiful, almost translucent white marble with a rosy patina. This type, known as Lychnites, is quarried underground at the Spilies quarry on the plain of Maráthi on Paros (map 13c), from veins which have been exploited ever since the sixth century.\textsuperscript{324} However, there are in fact many other marble types from quarries on Paros.\textsuperscript{325} To give an example, one

\begin{itemize}
\item \textsuperscript{318} Moltesen, Herz and Moon 1992, 278.
\item \textsuperscript{319} An overview of visible characteristics of the most important marble types used in antiquity is presented in Herz 2006, 287–8 table 1.
\item \textsuperscript{320} Herz 2006, 278–9.
\item \textsuperscript{321} Herz 2000, 31.
\item \textsuperscript{322} Herz 2000, 29 and id. 2006, 288; e.g. the colour indication of Chorodaki (Paros II, below n. 326).
\item \textsuperscript{323} E.g. Kokkorou–Aletras et al. 1995, 95; Palagia and Herz 2002, 241, where a number of marble objects from Delphi turned out to have isotope analysis results matching their marble listings from visual analysis. Recently, Herz has revised this argument and contested the use of such analysis: Herz 2006, 280–1, 285–6.
\item \textsuperscript{324} Schilardi 2000a, 35. Its quality was already famous in Antiquity: cf. Kokkorou–Aletras 2000, 147.
\item \textsuperscript{325} Including Lakkoi and Thapsana: see Schilardi 2000a passim. He notes that Lychnites (Paros I) is studied most often because of its aesthetic quality (ibid. 35) and frequent use in major monuments throughout antiquity.
\end{itemize}
produces a bluish-grey marble quite distinct from Lychnites. This blue-grey Parian was often used in antiquity as well, but visually its provenance is not as recognisable as Lychnites. Similarly, the colour of Hymettian marble (map 14a) is most widely known as grey-blue, but one quarry on Mt. Hymettos produces a white marble which is easily mistaken for Pentelic. When some of the marble from a specific quarry region looks different from the most famous type from the same area, isotope analysis and similar technologies are especially valuable.

Paradoxically, the results of isotope signature analyses can also add to the confusion. The scattering patterns of isotopes sometimes overlap, even very much so, in marble samples which are from very different regions and look very dissimilar. For example, the isotope signatures of some types of Naxian marble resemble those of Pentelic. In this case, the fabrics of the marbles, and most notably their grain sizes are clearly different, which can be established with a microscope or even with a looking glass. The combination of all available methods is therefore preferable: marble provenance indications based on observation with the naked eye, as listed in the corpora of Greek sculpture, should ideally be complemented with petrochemical analysis and should be matched with marble samples of which the provenance is established with all available methods. Since the full marble database that is required for such thoroughness is underway but incomplete, the more immediate question is how traditional provenance listings may be used responsibly.

In the case of Lepsius’ collection, the comparison of his classification with the chemically established provenances has often been positive and when the attribution turned out erroneous, the mistake often regarded the quarry, but the region was correct. The main lapse resulted from the absence of Thasian marble in Lepsius’ system, and this has been corrected in more recent publications on Athenian sculpture. Since in the present study the

326 Herz 2000, 28–9. This marble from the Chorodaki quarry is also known as Paros II.
327 Goette et al. 1999, passim.
328 Gorgoni et al. 2002, 125. There is a difference in the negative oxygen isotope (−11) and also in the variety of the isotopes, which is much smaller than that of Pentelic marble. See also Palagia and Herz 2002, 240–2 for several examples of marble from Delphi where isotope values in the artefacts are very similar, although the marble is from different regions.
329 For example, in the Asmosia series: see abbreviations.
precise quarry where the marble came from is less important than the general region (e.g. Paros, Naxos, or even ‘the islands’), mistakes which mainly occur within one region are quite acceptable for the purposes pursued here.

Four main types of marble occur in the data record. The first two, Pentelic and Hymettian, are from the mountain ranges East and South of Athens respectively (map 14a). The outward appearance of marble types from one region may vary a great deal: and this is the case for both Pentelic and Hymettian marbles. The latter has – in its most common variant – a bluish hue, while the best-known Pentelic marble is white when cut. Moreover, Hymettian lacks the mica flakes which give Pentelic a slight glimmer. In Athenian sculpture from the archaic period, the two most widely used marbles from the Cycladic islands are Parian and Naxian. The latter is usually a greyish white with conspicuously large grains. Parian may be either white and translucent or white-grey, depending on the quarry: the former type, Lychnites, was, and still is, the most appreciated. The remaining stone types are grouped here as Other Marble or as Other Stone. Among the latter is soft limestone or

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331 To avoid confusion, the category Insular or Island marble (all from the Cyclades except for what is definitely from Paros or Naxos) is indicated by the capital I. When the lower case is used, the marble from the Cyclades in general is meant (so all insular marble). Attika, one geographical region, does not need such a distinction.

332 Herz 2006, 287–8 table 1. As far as available in the publications or from observation by the author, the characteristics of the marble (mainly its colour) have been noted in the database field Material, while in the field Material 2, a simplified (and geographically less detailed) category has been indicated.

333 Korres 1995, 74–5. According to Mr. Illos (pers. comm. 2004, workshop on Od. Anapavseos in Athens), the Pentelic marble used nowadays, from the Dionysos quarry, is especially suitable for sculpting and inscriptions because the grains are quite small and the crystals less oblong in shape than is often the case in Greek marble. A sculptor who has worked in both Greek and Italian marble (the latter of which often lacks oblong crystals altogether), Mr. Schonk from the Netherlands, agrees with this view (pers. comm. 1998, workshop Nieuwe Kerkstraat at Amsterdam). Mr. Illos remarked that sculptors who are used to Island marble in his experience preferred it. I wish to thank both sculptors for sharing their expertise.

334 Above n. 324. In this study, Parian and Naxian fall under Island marble: the islands’ proximity makes transport circumstances to Athens alike. By contrast, quarries on on island may not be equally accessible from the sea.

335 Herz concludes in his article on the Lepsius Marbles (Herz 2002) that some of the Other marble category may be from the island of Thasos. Since I have not seen the pieces involved, an assessment on my part is unwarranted. For the category Other Stone, cf. below p. 99. On the marble from Thasos among other authors: M. Brunet, Les carrières de marbre de Thasos, DossAtParis 173 (1992) 40–45; J. Herrmann, The export of dolomitic marble from Thasos. A short overview, in Matières premières et technologie de la préhistoire à nos jours. Actes du colloque international, Thasos, Liménaria (1999) 57–74; id. in True and Podany 1990, 73–100 (cf. above
poros (pl. 8b). Although it is related to marble, working this limestone is quite different from cutting marble, which is why it has been put in the category of Other Stone.

A comparison of stone types of gravestones and sculpted dedications immediately shows that in each group one material prevails (table 3a). Out of 338 votives 172 were made in island marble. Interestingly, approximately half of all gravestones are in Attic marble (table 3b), leaving island marble (c. 17 percent) and Other Marble (c. 28 percent) far behind. However, numbers of gravestones are too low for these percentages to be fully representative, as chart 3b shows. Developments in marble types of gravestones are better illustrated by each type’s percentage of the total of gravestones from the quarter century to which it belongs. Thus calculated, the averages of the Attic Marbles and of Other Marble each end up close to a third of all gravestones, while Island Marble averages about a fifth. Slightly under a tenth of all gravestones is in Other Stone (table 3b, chart 3b.1).

Evidently, the three main categories of marble were used in relatively equal measure for Athenian gravestones in entire two-century period studied here, even though each type has its highs and lows in absolute numbers. Average percentages indicate that in funerary sculpture, the spread of marble types over all quarter-century periods is relatively even, except in the last quarter of the fifth century (chart 3b). The highest number of one type of marble before this time are 11 gravestones in Island marble from the last quarter of the sixth century. In no other period does one type of marble exceed ten gravestones, not even if subdivisions like Parian or Naxian in island marble are taken together as a single category.

In votives (table 3a), percentages offer a better reflection of the pattern of marble types, because numbers are high enough to be representative. The average of Attic marble in votives is about a third of all dedications; approximately 15 percent is in Other Marble, while just over half of the votives from the whole period are in island marble (chart 3a.1). The percentages are similar to those in gravestones, except for the preference for island marble over Attic in votives. It must be noted that in the latter, too, periods with very little material


336 The average is calculated by adding up the percentages from each quarter century per marble type and dividing them by eight.

337 Attic: 252/8, 31.4 percent. Insular, 164/8, 20.5 percent. Other Marble: 224/8, 28.0 percent. Other Stone, 60.5/8, 7.6 percent. For the percentages per quarter century see table 3b.
present a somewhat skewed image, as for example the second quarter of the fifth century: three quarters of all votives in island marble in reality comes down to six examples. As is to be expected with the higher numbers, the alternative method of analysis of averages of each marble type per quarter century offers results which are quite close to the marble types’ percentages of all votives.

Numbers of votives in Attic and Island Marble run approximately parallel from the early sixth century until its last quarter, but from this time until the middle of the fifth century, there are two to three times more votives in various types of Island Marble than there are in Attic. After the mid–fifth century, the use of various types of Island Marble declines. Pentelic marble occurs in 42 out of 56 votives, i.e. about three–quarters of the total of votives at this time (table 3a). In gravestones, the change at the end of the fifth century is just as radical: the total number of gravestones from this period is 77, of which 56 are in Attic marble. For grave monuments this is the first period with a real wealth of sculpture; therefore the prevalence of Attic Marble at this time has a great impact. Votives from the late fifth century are also largely in Attic Marble, but this cannot compensate the preceding century and a half of Island Marble as the preferred material for votives.

Votives in Other Marble appear 51 times in the record; 45 gravestones fall into this category (table 3a–b). In light of the total number of votives, 51 seems modest; for grave sculpture, on the other hand, 45 is considerable. Most votives in Other Marble are from the final quarter of the sixth century, or from the first or last quarters of the fifth century (chart

338 Three of these, EM 6542, EM 6556 and EM 6536 are fragments of basins (cat. V 306, 314 and 315 respectively: all Island Marble). The other three are: Mourning Athena relief, Akr. 695 (cat. V 158, Parian), archer, Akr. 599 (cat. V 160, Insular), and a relief with a banquet scene, NMA 4802 (cat. V 245, Insular: possibly Naxian marble).

339 In votives, the averages are: Attic marble 30.1%, Island marble 53.4% and Other marble 16.5%. Compared to 34%, 50.9% and 15.1% respectively, the coverage seems good in this case. See for the numbers table 3a.

340 Three examples of 450–425: three heads from the Akropolis, of a youth (cat. V 163, Akr. 699); of an Athena (cat. V 155, Akr. 635); and of a goddess (cat. V 278, AM S 2094) are in Parian marble. Two examples date to 425–400: the statue of a girl Akr. 1310 (cat. V 255), and the goddess AM S 1882 (cat. V 256), found in the Agora near the post–Herulian wall, both in Parian, too.

341 From the point of view of average percentages over the whole period, the peak in Attic gravestones at the end of the fifth century is not enough to compensate either, but this is due to the fact that in two periods, 600–75 and 475–450, the percentage of Attic gravestones is nil. Other marble on the other hand has only one period where the percentage remains at zero, 475–450, and thus evens the score somewhat.
Similar to other trends in the gravestones in this study, Other Marble follows an irregular pattern most of the time, although its share increases steadily in the second half of the fifth century. Marble types of gravestones seem to develop with less uniformity than those of the dedications, but they are more evenly spread over the sixth and fifth centuries (charts 3a–b). It is noteworthy that in the last quarter of the fifth century, there are slightly more gravestones than votives in Other Marble. A similar development takes place in Attic marble. Without a doubt, this must be explained by the circumstance that the final quarter of the fifth century is the only period in the archaic and early classical period when sepulchral monuments outnumber votives considerably.

Unlike insular and Attic marble, Other Marble is not a uniform category at all. Some types of marble which are unusual by Athenian standards feature in the sculpture from this group at the end of the fifth century. Some of the gravestones from this time are made of entirely different stone than marble (namely, Other Stone: table 3b). Overall, Attic and in particular Pentelic marble is most prominent in the last quarter of the fifth century in both gravestones and votives. Low numbers of Other Stone appear in grave sculpture, but the few votives that are not Attic are made of Insular marble, which has by that time disappeared from the sepulchral record. Contrary to gravestones, the evidence seems to suggest that votives were made exclusively in marble in the sixth and fifth centuries, even if the provenance of this marble varies.

Of the local marble types from Attika, Pentelic is clearly the most popular, with 95 out of 115 votives and 77 out of 89 gravestones (tables 3a–b). Hymettian only occurs in two dedications, one from the second quarter of the sixth century and the other from the first

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344 For example below p. 99.

quarter of the fifth,\textsuperscript{346} as well as a gravestone from the third quarter of the sixth century.\textsuperscript{347} The marble from Hymettos was apparently much less popular among Athenian sculptors and patrons. The final quarter of the fifth century, however, produces seven gravestones in Hymettian marble, which in view of the low numbers throughout is noteworthy.\textsuperscript{348}

Unspecified Attic marble consists of sculptures or bases whose marble cannot be attributed to one particular quarry in the Attica. Nevertheless, the development of this category over time has some interesting features. First, it only occurs four times in funerary sculpture, all relatively modest pieces.\textsuperscript{349} In the late fifth century it disappears altogether. Since this is the same time as the unexpected rise of gravestones in Hymettian marble, one might suspect that some Hymettian marble is among the unspecified Attic marble. Secondly, there are 18 votives made in the latter, all of them from before the second quarter of the fifth century.\textsuperscript{350} Among these are several famous and well-preserved sculptures, which have been much studied and extensively published.\textsuperscript{351} In view of the similarities between less famous and less clearly identified types of Hymettian and Pentelic, and better-known marble from these locations, caution in determining the provenance is laudable;\textsuperscript{352} but the general consensus is that the marble comes from Attika, although from which part exactly is not quite certain.

Although the categories Attic and Insular both represent non-specified marble from a general region, they differ in one aspect. Attika has no major marble quarries apart from

\textsuperscript{346} Surprisingly, the Moschophoros, cat. V 2, Akr. 624 was made from Hymettian marble. From the first quarter of the fifth century is an owl, cat. V 201, Akr. 1355, 245.
\textsuperscript{347} The Chairedemos stele, cat. G 34, NYMM 12.158, AM S 1751, NMA 4808.
\textsuperscript{351} See e.g. cat. V 110, Akr. 575–580, horses of a chariot; or a relief with the Graces, cat. V 132, Akr. 586 and 587.
\textsuperscript{352} See above n. 327.
Hymettos and Pentelikon. Island marble, though in practice most often Parian or Naxian, can come from quite a few other Cycladic islands, too. In other words, where Attic marble just means unspecified, but most likely Hymettian or Pentelic, the category Island marble can contain marble from many Cycladic destinations except Naxos or Paros.

Of course, the odds are that island marble is Parian, since already in antiquity it was reported as one of the most favoured marbles. Naxian was used only in six votives in the sculpture record, while there are 49 in Parian marble. The bulk of votives in Island marble, 117 examples, as well as most of the Parian marble date to the last quarter of the sixth century and the first quarter of the fifth (table 3a, chart 3a). Funerary sculpture shows a similar pattern, but in much lower numbers. The difference is that hardly any island marble occurs in gravestones from the first quarter of the fifth century (table 3b), while 47 examples in contemporary votives survive. In total, 60 votives from this period are in various types of

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353 Limestone used in some of the older buildings on the Akropolis comes from the hills near Piraeus, and dark limestone of good quality was quarried near Eleusis (cf. Ampolo 1982; Korres 2000, 10). See below p. 125.

354 E.g. the Cycladic island of Tinos has marble quarries which though not very famous, were used in Antiquity (L. Lazzarini and F. Antonelli, Petrographic and isotopic characterization of the marble of the island of Tinos (Greece), *Archaeometry* 45 (2003) 541–552. None of the marble from this and similar areas can be found in the database: this may be the result of a research tradition overly focussed on certain quarrying regions, or it may actually be the case that many quarries on other islands mostly produced marble for local use. The case of Thasos (above p. 91) seems to lend weight to the first reason, though. Much work still is necessary in this area.


356 In island marble, 525–500, 50 examples; 500–475, 47. In Parian marble 525–500, 23 votives; 500–475, 13.

357 Two gravestones in Island marble: from 500–475, cat. G 106, AM S 1942 (Parian); from 450–425: fr. of basin, cat. G 130, KM P 1374 (Insular). AM S 1942 is a lion which might have been a votive, or part of an architectural group (Harrison 1965, 29–30 no. 92). It was listed as a gravestone here because it cannot be linked to a building. The relation with workshops like that of the sima lions of the Ares temple in the Agora is irrelevant: these workshops would also have worked on free-standing statues. Moreover, the interpretation of this piece as a relief is not quite convincing, and it is more likely that it stood on its own.

358 Seven gravestones of Parian marble date to 525–500: kouros, cat. G 2, KM P 744–6; unfinished head, cat. G 14, AM S 30; head of male statuette, cat. G 15, AM S 1185; lion, cat. G 23, KM P 1053; rel. with warrior, cat. G 35, NMA 4801; the so-called Rayet head, cat. G 100, NCG 418; and the Marathon runner rel., cat. G 175, NMA 1959. Of the same date in the category Island marble are: fr. of kouroi, cat. G 13, AM S 1890; rel. with warrior cat. G 83, NMA 34; Man and dog stele, cat. G 40, AM S 1276b; fr. of rel., cat. G 82, NMA 87. For votives in island marble, see the Votives table in the database on the CD.
island marble, but in the second quarter of the fifth century they drop to six.\textsuperscript{359} This is
doubtlessly the result of the general fall in votive numbers. Afterwards, all island marbles
disappear from the record except for Parian marble, of which votives continue to be made in
very small numbers throughout the fifth century (table 3a).\textsuperscript{360}

Despite the popularity of marble, other stone types sometimes appear in the
sculpture record. In the first quarter of the sixth century, poros is relatively important for
gravestones: it is used in four out of nine statues from that period (table 3b), which makes it
the prevalent material for that time.\textsuperscript{361} This proportion of poros drops in the later sixth
century (despite the general increase in sculpture), but even in the fifth century it is still
occasionally used.\textsuperscript{362} Given the common association of poros with the early stages of Attic
sculpture this may seem odd, but in gravestones, peculiar choices of stone occur more often
than in votives.\textsuperscript{363} For example, two stelai from the end of the fifth century were made from
‘dark stone’ (pls. 8c–d).\textsuperscript{364} One of these, the stele of Dorkion and Kallis, is unlike any other
material found in Athens and certainly not marble. It looks as if it was eroded by water, with
what might be described as a bubbly top surface.\textsuperscript{365} The breaches are very smooth, though
split off rather than polished. The provenance for this material may be Tanagra,\textsuperscript{366} a Boeotian

\textsuperscript{359} See above n. 338 for votives in Island marble from 475–450. The only two other sculpted votives
from 475–450 are: cat. V 250, AM S 218 (small bearded head: Pentelic); diskos, cat. V 338, EM
6058 (Other marble: white).

\textsuperscript{360} See above n. 340.

\textsuperscript{361} Cat. G 20, KM I 461, st. of Semiades; cat. G 96, KM P 1133, poros st. with incised floral motifs;
plain st. in the Kerameikos museum (cat. G 135, KM P no. ?; listed limestone); frs. of lion (cat. G
103, KM no.).

\textsuperscript{362} Two limestone gravestones from 425–400: cat. G 155, EM 487 (listed as poros: \textit{IG I}\textsuperscript{3} 1363f; Salta
1991, 175 n. 1777); cat. G 161, EM 1795 (\textit{IG I}\textsuperscript{3} 1237; cf. Salta, 173 n. 1765).

\textsuperscript{363} E.g. cat. G 169, EM 496, grave st. of Apollodoros: unworked ‘crude stone’, inscription in Boeotian
script (\textit{IG I}\textsuperscript{3} 1363e; Salta 1991, 174 n. 1775, 175 n. 1785). Wycherley 1974, 59; Ridgway 1993,

\textsuperscript{364} The st. of Pherenika, cat. G 154, EM 491; st. of Dorkion and Kallis, cat. G 156, EM 489 (see next
note). The former is dark–grey, like slate or basalt, with jagged breach surfaces (\textit{IG I}\textsuperscript{3} 1363f, Salta

\textsuperscript{365} EM 491 (cat. G 154) looks like a kind of limestone or even marble. The light grey colour suggest a
provenance outside of Attika. The conservator of the collection, Mrs. M. Tsouli, is of the opinion
that this material looks Tanagraean (pers. comm. at the Epigraphical Museum, 2004), as
suggested in \textit{IG I}\textsuperscript{3}. I wish to thank Mrs. M. Tsouli for her help and interesting discussion of these

\textsuperscript{366} Cf. Salta 1991, 174 n. 1771, 175 indicates that the stele was found with several others which
seem to have been erected for Boeotians, e.g. the stele of Pherenika, cat. no. G 154, EM 491, \textit{IG I}\textsuperscript{3}
ring to the names inscribed may support this suggestion. A dark stone like this occurs in the corpus of Boeotian votive and grave reliefs, especially some incised stelai typical of the later fifth century.\textsuperscript{367} The inscription, roughly carved with a blunt pointed chisel, has a graffito-like quality which is also unusual in the fifth–century gravestones of Athens.

Summarising, marble from Attika is the most common in Athenian sculpture with in total 204 votives and gravestones. Of these, 172 are in Pentelic marble. Considering that the quarries were conveniently nearby and known since the seventh century, the advantages of Attic marble are obvious. Nonetheless, the various island marbles come second only just, with 201 pieces. Most of these are votives from the Akropolis, dating before the mid–fifth century. Attic marble often occurs among these archaic votives, too, but its bulk is from the later fifth century. Gravestones have more variation in marble types than votives and even some other stones than marble, especially in the late fifth century.

In the sixth and fifth centuries, the inhabitants of Athens moved from island marble imports to local marble for their sculpted votives; and although for their gravestones they preferred Attic marble, at the same time they widened the range of stones used for sepulchral monuments. The question is why they did so. Did the aesthetic quality of the island marble no longer suit their taste? Was island marble no longer acceptable, for example because of political reasons? Or is it because gravestones were more personal than votives, and the choice of marble less important? These questions are connected to the exploitation of quarries and more general historical circumstances. Fashion was probably a factor as well, to be discussed later in this chapter. It is likely that the provenance of types of stone was linked to their value, not only from an aesthetic or a technical point of view, but also commercially and in terms of status. If a type of marble was considered less beautiful or cheaper, some patrons may have preferred to use it only for bases: and this would give an important insight into their choices.

\textsuperscript{367} For examples of these stelai see Schild-Xenidou 2008, 290–6 pls. 20–6. Dr. V. Stissi (pers. comm.) of the Tanagra Survey informs me that this stone occurs among the survey material.
THE MATERIAL OF BASES

The preceding overview of marble use has shown the main difference in materials for votives and gravestones: in the latter, other stone than marble is sometimes used, while no such category exists in the votives. Apparently, the Athenians were more flexible when choosing the material for a gravestone than when doing so for a votive. In this section, the material of the bases and pedestals will be investigated, in order to find out whether the stone which was chosen is more similar to the pattern of the votives or to that of the gravestones.

Numbers of gravestones in Other Marble are higher than those of votives. In this category, the provenance of the marble is unclear, which nowadays mainly means it is hard to recognise; this will have been the same in Antiquity. If it mattered at all to patrons which material was used for their gravestone or votive, it stands to reason that the marble’s quality had to be recognisable. That said, much of the surface would have been invisible, covered almost completely by paint which hid its texture and translucence. Bases, on the other hand, are more likely to have been left unpainted, except for their inscriptions; this may have added to the importance of the choice of material for bases. A final factor is the structure of the stone which had to be suitable for carving or for an inscription.

Contrary to votive sculptures, approximately three quarters of the votive bases are made of Attic marble: 196 out of 246 (table 3c, chart 3c). Of these Attic bases, 185 are in Pentelic marble. Second and third among the votives bases are island marble and limestone, with 33 and 14 examples respectively. Other Stone appears three times in votive bases.

Naturally, this does not prove that in sixth and fifth-century Athens, no other stone than marble was ever used for votive sculpture, but it cannot have been often, because Other Stone is now absent from the record.

This aspect will be addressed in the discussion on co-operation and organisation of crafts. See below, ch. IV.3.

It should be noted that some bases are decorated with carved reliefs (e.g. the ball-players’ base, NMA 3476, cat. B 27, or the base with horsemen, KM P 1001, cat. G 26); this suggests that bases with smooth surfaces which now appear undecorated might have been painted with similar motifs. Cf. below p. 213.

Pedestals are usually investigated separately from the objects they supported, with sporadic cross-references where the link between sculpture and base is certain (e.g. Keesling 2003). It is doubtful that pedestals were looked upon similarly in antiquity, let alone that there is evidence for any such attitude regarding bases.

There are only 42 funerary bases (charts 3c–d), but the difference in development is clear. 

Out of 15 sepulchral bases in Attic marble, 14 are Pentelic. There is only one base in Island marble; 373 ten bases are in limestone 374 and 16 in Other Marble. As in sepulchral sculpture, the division of materials is much more even than in votives, and a preference for one material is absent. Again, unusual types of stone appear more often than in votives, although the difference is smaller than in sculpture.

Developments of funerary bases and sculpture run parallel until around the middle of the fifth century (table 3e, charts 3e.1–2): the bulk of sepulchral bases is from the sixth century, while grave sculpture peaks in the final quarter of the fifth century. After the middle of that century, practically no sepulchral bases are preserved, while grave sculpture flourishes and a preference for Attic marble develops. In short, the similarity in materials continues as long as sepulchral sculpture and bases evolve along the same lines, and ends when the two trends diverge. Poros or limestone is used occasionally in funerary bases but no obscure stone types occur, as was the case in funerary sculpture. 375 For grave bases, choices are apparently limited to limestone or Attic marble; the rest is unspecified.

The discussion in this section has shown that the stone types of funerary sculpture are more varied than those of dedications: not only does a group of non-marble gravestones exist, but also, the proportion of Other Marble (potentially not a major marble type) is much larger in gravestones than in votives (table 3e). A third point is that the division of the marble types in grave monuments (both sculpture and bases) is on average quite even until the middle of the fifth century. In votives, on the other hand, island marble dominates in the sixth century and Attic in the fifth, leaving no room for an even spread of materials over the period studied here. The choice of stone in votive bases is even more monopolised by Attic marble with about four fifths of votive bases.

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373  Cat. B 263, KM I 322, for votive in honour of an Olympic victor (Jacob–Felsch 1962, 39 n. 124.1; Willemsen 1963, 110 no. 2; McGowan, AJA 99 (1995) 615 n. 2; Kissas 2000, 48–50 no. 16).


375  That being said, there is one case where the marble is described as dark grey, which suggests at least an unusual type of marble: the base for the stele of Lampito, which was carved by Endoios (cat. B 126, EM 10643; cf. IG I 1380; Jeffery 1962, 130 no. 24; Kissas 2000, 66 no. 36).
In gravestones, the main categories of marble appear in similar numbers (except in the final quarter of the fifth century) and some unusual stones occur, suggesting that patrons could choose whatever stone they wanted. For votives there was either less to choose from, or a more restricted sense of what was and was not fitting. Apparently, Athenian sculptors carved gravestones from a wide range of stone types, whereas they were unwilling or unable to do so in votive monuments. The patrons’ role in this is hard to establish; but if, for example, popular supply regions of marble to Athens were prevented from delivering because of historical events – the example of Lygdamis springs to mind, or the Persian wars – it might have been a matter of necessity rather than choice on their part. Whether the marble trade was indeed subject to such factors will be discussed in the next section.

3 WORK IN THE QUARRIES

Most marble used in Athens arrived in one of two possible ways. Locally, at Pentelikon and Hymettos, marble was lowered down the slopes of the two mountain ranges (east and south of the city; maps 14a–b) by means of carts or sleds. Island marbles had to be shipped to Attika, then hauled to the city from Piraeus, which presumably drove up the effort and cost. In this section, several aspects of these procedures of transport are discussed: who decided on the marble type, the practicalities of supply, the cost of marble and transport, and whether the latter affected the choice of materials. The first two aspects bear on the division of labour and the ensuing status of craftsmen. If the patron determined which marble would be used for his or her statue, the chain of production would be different from one in which sculptors decided. A crucial factor is the role of quarrymen. Their labour, the transport of marble and its cost belong to the work of the support personnel. These aspects will be investigated below to obtain a more complete view of the course of the marble from the quarry to the workshop.

The marble quarries which came into use when monumental stone sculpture emerged in Greece after the Early Iron Age were on the Cycladic islands (maps 13b–c).376

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376 Fuchs and Floren 1987, 8–10; Martini 1990, 39; Kokkorou–Alewras 1995, 40. Quarrying during the Bronze Age was small-scale, as far as can be established, and seems to have come to a halt after the Mycenaean period: for example, Waelkens et al. 1988, 88; id. 1990, 47, 50–1.
The island of Naxos is frequently mentioned as the main provenance for marble in this early period of archaic sculpture, before the emergence of Parian and somewhat later of Pentelic marble. A schematic view of the development of marble use (Naxian, then Parian, then Pentelic marble) is not warranted, at least not in Athens. Most Naxian pieces on the Akropolis date to the seventh or early sixth centuries (tables 3a–b). Three votives in Naxian marble date to the first quarter of the sixth century, two to the second quarter and one to the fifth century BC. In gravestones Naxian marble appears in four examples from the first and second quarters of the sixth century. These low numbers, however, do no impair the importance of Naxian marble for the rise of Greek sculpture: the early exploitation of Naxian quarries is certain.

Carving techniques as well as methods of extraction of stone from quarries were adopted from the Near East and Egypt. The influence of the latter is generally believed to have gained momentum in the seventh century, as a result of the trade settlement at Naukratis in Egypt, of Greek mercenaries who had fought for pharaoh Psammetichos I. In Egypt, systematic quarrying had been practiced for centuries, so it stands to reason that aspiring Greek sculptors would have learned the craft there – especially since the beginnings of monumental Greek sculpture probably coincide with the Greek settlement at Naukratis.

However, recent studies suggest a slightly different picture. Cutting and extraction techniques which are used in early–archaic Greece have parallels in Hittite rather than Egyptian quarries. The Egyptians, Greeks and Hittites separated blocks from the surrounding

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377 See e.g. Ridgway ASGS 46; Kokkorou–Alewras 1995, 37; Sturgeon 2006, 32.
378 Chemical analysis of marble labelled insular could pinpoint provenance and thus support such predominance.
381 Earlier examples of stone sculpture in Greece, particularly of the Daedalic style in Crete, are usually linked to the Near East, mainly Syria and, to a lesser extent, Anatolia. See e.g. Ridgway ASGS 29–36; Boardman GSAP, 13. For architectural sculpture from this period, e.g. I. Beyer, Die Tempel von Deros und Prinias A und die Chronologie der kretischen Kunst des 8. und 7. Jhs. v. Chr., Freiburg 1976.
383 Cf. Casson 1933, e.g. 198; Richter SSGT, 51; Ridgway 1969, 98; Hurwit 1985, 197; Martini 1990, 104–5; Waelkens et al. 1990, 52–4 n. 50; Boardman GSAP, 18. For the presence of workshops at Naukratis see Mattusch 1996, 2–4 (bronze working); Statti 2002, 86–92, 124–44 (pottery); Sturgeon 2006, 33, 36.
384 Waelkens et al. 1990, 48.
stone by cutting narrow trenches around them, before splitting them off by means of wedges (pl. 9a).\textsuperscript{385} Egyptian quarrymen mainly used punch mallets to remove the stone in the trenches.\textsuperscript{386} In the Near East and Greece, on the other hand, early tool marks in quarries indicate that the main implement used to cut out trenches was a light pick hammer.\textsuperscript{387} Moreover, the Greeks appeared to have made their tools in iron from the start, including the wedges for splitting the blocks from the rock face; the evidence suggests that the Egyptians used bronze tools and wooden wedges until a relatively late date.\textsuperscript{388} So, quarrying techniques as applied by the Greeks in the seventh century were widely spread in the eastern Mediterranean at that time and had come to Greece through various trade routes rather than exclusively from Greek apprenticeship with Egyptian sculptors.\textsuperscript{389} Naturally, this does not preclude that some skills were learned directly from Egypt.

One way or the other, Naxos (and some other regions in Greece, e.g. Samos) had thriving sculpture workshops in the seventh century, connected to their ample supply of local material. Early development in places where good marble is available and conveniently positioned for transport cannot be a coincidence; and since quarrying, once mastered, is a repetitive rather than a complex procedure, it did not take long before many quarries were operational after the know–how had spread to the Cyclades. Nonetheless, acquiring these skills cannot always have been easy. A daunting aspect of quarrying is the appraisal of the marble, which will often have cracks or flaws hidden beneath the surface. To find a block large enough for a statue without faults in the marble which might ruin the statue in an

\textsuperscript{385} Kozelj 1988, \textit{passim}. Another possibility is to drill rows of holes around the block in which wedges are placed. The block is split by pounding on the wedges. This is called the pointillé technique. Though time–consuming, this method wastes a minimum of marble and is efficient in small quarries. Among the examples from archaic Greece is Apollonas on Naxos. Cf. also Adam 1966, 42–4; Coulton 1977, 45; Waelkens \textit{et al.} 1988, 106–7 (use of wedges: 1003–4); id. 1990, 63–4; Schneider 1992, 159.

\textsuperscript{386} Waelkens \textit{et al.} 1990, 54.

\textsuperscript{387} Ibid. 52–3. The horizontal grooves left by this method of using the pick is in some quarries still visible. See also Adam 1966, 5; Sturgeon 2006, 33.

\textsuperscript{388} Waelkens \textit{et al.} 1990, 88.

\textsuperscript{389} E.g. Adam 1966, 5–11; Ridgway 1993, 35–7; the latter believes the Greeks learned in Egypt, from where the skill spread to Greece, initially to Naxos or Samos (ibid. 33–8). Cf. Coulton 1977, 45; Waelkens \textit{et al.} 1990, 52–3. The role of Cyprus in this transmission of skills should not be underestimated, as was pointed out me to by Dr. Fanni Faegersten of Lunds Universitet, Sweden, in a paper given at the Amsterdam seminar \textit{Local Colour. Ancient painted sculpture from East to West: Painted and Inlaid Statuary of the First Millennium BC} (March 2006). See also I. Jenkins, \textit{Archaic Kouros in Naucratis: The Case for Cypriot Origin}, \textit{AJA} 105 (2001) 163–79.
advanced stage of carving, demands much skill and experience.390 Another tricky moment is when the block is undercut to split it off from the rock face (pl. 9a): apart from the obvious danger involved, most stones tend to split in a specific direction, which must be found out and used for good result.391 It has been argued that for large blocks, this is so difficult and requires such teamwork that it was probably performed by closely related groups of workers, for example families, among whom the skill was passed on from generation to generation.392

The origins of quarrying techniques in Greece and the exploitation of quarries in the seventh century are particularly relevant for the early stages of Greek sculpture as well as its subsequent development. The strict hierarchical organisation of quarrying in Egypt was, according to some, taken over by the Greeks. If true, this would explain certain aspects of Greek quarrying and sculpture practices.393 Most important is the division of labour between sculptors and quarrymen, and the practice of pre-cutting statues in the quarry. Did sculptors go to quarries to choose the marble or even extract blocks themselves or did they only provide specifications from a distance? Or did, on the other hand, quarry masters do all this work and more, roughing out statues until relatively close to the final surface?

Several archaic Greek quarries have yielded unfinished, sometimes colossal archaic sculpture. A famous example is the Dionysos or Hermes in a quarry on the north side of the island of Naxos (map 13b) on the coast near the village of Komiaki.394 The statue was carved to a surprising level of finish, but was evidently abandoned before anyone attempted to move it: it is still attached to the surrounding bedrock. The reason for this lies probably in cracks in the marble of the head,395 though other impediments for such a large project can quite easily

390 Blümel 1927, 5; Ashmole 1972, 16.
392 Burford 1962, 76; Waelkens et al. 1990, 62. The question is what role slave labour played in Greek quarries. Waelkens suggests slaves mostly worked in removing debris, but opinions vary: e.g. Schilardi 2000, 45; for a slave as a sculpture patron, see below ch. IV.4.
393 Ridgway 1993, 37–8, suggests that the Greeks initially worked in quarries to learn the craft by doing preliminary work. The differences in details of Greek and Egyptian kouroi would result from this workshop hierarchy: details which the Greek apprentices were not allowed to do by the Egyptians, they created their own designs for. She immediately indicates the problems adhering to the theory, however. Cf. below p. 114.
394 Pedley 1976, 18; Kokkorou–Alewras 1995, 40 (and cat. K 60). There are more examples on Naxos, e.g. the kouroi near the village of Melanes in the west of the island. For an overview see Kokkorou–Alewras 1995.
395 Blümel 1927, 6; Ashmole 1972, 19–2 (flaws); Boardman ASGS, 19 (accidents). The statue is dated to the early fifth century BC.; earlier examples prove similar practices in the sixth century (Kokkorou–Alewras 1995).
be thought of. This example and others show that in archaic times, monumental statues were
in principle pre-shaped in the quarry.\textsuperscript{396} The reasons for doing so are evident: carving a
block to a few inches from the intended surface lowers its weight substantially, and may even
halve it.\textsuperscript{397} In view of the effort and the high cost of transport of heavy freight,\textsuperscript{398} any
opportunity for a reduction would have been made the most of.

The next question is who performed the on-site carving. In his analysis of archaic island
workshops, J. G. Pedley suggests that: ‘A foreign master ... may have been allowed to
visit Naxos to supervise the cutting of blocks to his specifications by Naxian quarrymen.’\textsuperscript{399}
Other scholars propose similar scenarios, some of them based on more recent and therefore
better known sculpture practices, such as Michelangelo’s complaints about the long wait in
the quarries while searching for and extracting suitable – inspiring – blocks of marble.\textsuperscript{400} The
degree of similarity between ancient practices and later parallels is difficult to determine.
Ancient authors hardly wrote on this subject, and though many sculpture techniques have
changed remarkably little or not at all since antiquity, there is no guarantee that all aspects of
the work have stayed the same over time.

In fact, interesting developments in quarrying are attested from the archaic to the
Hellenistic period. The light quarry pick, a sharp tool used in the archaic period to cut the
splitting trenches, was gradually replaced by a bulky pick–hammer. While this tool expedites
extraction, it also produces more waste than the light pick. Because of the bulkiness of the
pick–hammer, it has a slight outward tendency when used, which is remedied by regularly
changing the direction of the strokes (cf. pls. 9b–c).\textsuperscript{401} As a result, the cutting trenches are

\textsuperscript{396} Blümel 1927, 6–16; Forbes 1966, 179 (speaking mainly of Roman quarrying methods); Ridgway
1969, 100–1; Burford 1962, 76; Kokkorou–Aletras 1995 \textit{passim}; Korres 1995; Sturgeon 2006,
33–4. Cf. Wurch–Kozelj 1988; and Schneider 1992, 159 for similar procedures in architecture,
e.g. capitals and column drums. Kurtz and Boardman 1971, 137 suggest that this practice
continued in the Classical period.

\textsuperscript{397} Ridgway 1969, 101; Ashmole 1972, 17–8. Coulton 1977, 45 argues that the custom of pre-
cutting in quarries only developed in the later sixth century (with regard to architectural blocks).
\textit{Contra} Schneider 1992, 159.

\textsuperscript{398} For a discussion of transport and its cost ancient Greece see below p. 123–7.

\textsuperscript{399} Pedley 1972, 19.

\textsuperscript{400} E.g. Ashmole 1972, 16–7. An interesting experiment by Tony Kozelj resulted in an extraction time
of twenty–two and a half hours for a block of 1.0 x 0.50 x 0.25m by two men. He found the work
very heavy and impossible to do for very long stretches. It required at least two men for a block
this size (Kozelj 1988, 36–9).

\textsuperscript{401} Waelkens et al. 1988, 97–8. The light pick leaves neat horizontal strokes while traces of the pick–
hammer are groups of curved grooves (\textit{a festoni}) at irregular angles. See pls. 9b–c.
wider and extraction is less economic; but the need for increased quarry output apparently outweighed the greater loss of stone. In the Spilia quarry on Mt. Pentelikon (pl. 9d), parallel grooves typical of the light pick were found in the upper regions of the quarry, while curved traces of the heavier axe are preserved in lower, slightly more recent parts.\footnote{Ibid. 97–102; Korres 1995, 78–91.}

In the Spilia quarry, this new technique was first used some time between the archaic and Hellenistic periods. The transition occurred at different times in various parts of the Mediterranean, and even in different quarries of a single region.\footnote{Waelkens et al. 1988, 101. Schilardi 2000, 52 notes that lower quarry beds need not even be later than higher ones in all cases (although it mostly holds true for the Spilia quarry).} This lack of standardisation of tools and methods of quarrying illustrates the importance of the quarrymen’s individual choices. Knowledge of what worked on ‘their’ stone and preferences for certain cutting techniques were decisive, even if new methods came into use elsewhere. Perhaps it is unjustified to view innovations in ancient quarrying technology through modern eyes, as changes in procedure which aim to improve efficiency and to maximise profit, which inevitably makes them normative if they prove to work well.\footnote{See e.g. Greene 2000 and above p. 88.} At least until Roman times, quarrying in Greece seems to have been a highly individual matter. Nonetheless, it would be rash to categorise this individualism in quarrying practices in Finley’s terms, as nothing more than improved technical skill and greater artistry. The adoption of a faster if less frugal method of extraction at a major quarry like the Spilia on Mt. Pentelikon suggests that here, at least, production speed was more important than preventing waste. Whether commercial considerations could have been at the root of stepping up the output of the quarry will be discussed later in this section.

In any case, the persons in charge of the quarries seem to have had a great deal of freedom in choosing their methods of extracting the stone, and this, in turn, implies they were free men.\footnote{Cf. Ashmole 1972, 18, who argues that in architecture, the masons came with the marble, based on the peculiarities of the clamps and dowels.} The skill and experience required for proper supervision of the work may have brought them a certain status within their craft. About the labourers lower in the quarry hierarchy, hardly anything is known. After the disastrous Athenian expedition to Sicily in 413, Athenian hostages were forced to work in the quarries of Syracuse or imprisoned there.\footnote{Thuc. 7.86.1–87. Quarries were regularly used to hold large groups of prisoners of war; e.g. the limestone quarries at Piraeus for the Syracusans (Xen. Hell. I.2.14).}
Thucydides describes how of all the captives, only the Athenians and their Italiote allies were not sold into slavery but held in the quarries indefinitely, which probably meant they worked at extracting the local stone.\textsuperscript{407} The treatment they received from the Sicilians, however, would have made these hostages a particularly unfit workforce, suggesting emotional or political rather than economic motives for keeping them at the quarries. In ancient mining, slaves are known to have formed most of the labour force, for example, extracting silver at Laureion in the south of Attika.\textsuperscript{408} Mining was a particularly unpleasant job and mines were places where criminals and hostages were sent. Moreover, the exploitation of mines, though profitable, was considered unworthy of the leisured class.\textsuperscript{409}

The comparison of mining and quarrying is, however, questionable. First, quarrying requires more technical insight and experience than mining, if the mine is established and certainly in open air mines. The majority of miners could be slaves without relevant skills. It is likely that in quarries, too, specialised foremen supervised workers who lacked such technical expertise. However, quarrying would have been impossible without the day-to-day presence of at least some skilled masons to supervise the work.\textsuperscript{410} In a large quarrying operation there are tasks, such as clearing debris and pulling ropes, which anybody can do. Few people would have volunteered for these jobs, and so it is quite likely that slaves or criminals were made to do them. Reversely, some of the workers possessed high levels of skill: the building accounts of the Erechtheion mention citizens, metics and slaves working together on the architecture and sculpture of the temple.\textsuperscript{411} Apparently, slaves found enough motivation to do a good job in these projects, and some of them must have had ample knowledge. In sum, quarrymen were in all likelihood a mixed group: experienced surveyors and quarry masters (locals and non-locals) led the work, and both free men and slaves cut and extracted the stone, while inexperienced apprentices, or slaves and other forced labour were mostly set on tasks for which little particular skill was required.

\textsuperscript{407} Forbes 1969, 177 contends the Athenians worked the limestone quarries on a large scale. For a nuanced picture cf. Burford 1962, 75–6; Lolos 2002, 204.
\textsuperscript{408} See Forbes 1969, 231–2; Austin and Vidal–Naquet 1972, 140; Schneider 1992, 74–5; and Schilardi 2000, 54.
\textsuperscript{409} Forbes 1969, 228–9 n. 37. Regarding the gentility cf. Burford 1962, 43. This was not limited to quarrying: any ‘industry’ was deemed inappropriate. Also Davies 1984, 69–71, 97, 116–7.
\textsuperscript{410} Cf. Burford 1963, 32.
\textsuperscript{411} IG I\textsuperscript{2} 472–4; Burford 1962, 42; Lauter 1974, 12–5. More on this inscription below, p. 188.
It is commonly assumed that the techniques of quarrying changed only marginally before Roman times. As was mentioned earlier, however, the evidence suggests otherwise. Although technical change before the Roman period is not spectacular, it does occur: the types of tools as well as their uses changed over time, which had positive consequences for the extraction output. More importantly, the scale of quarrying changed in the course of the sixth and fifth centuries. Marble went from a rather exclusive commodity to a basic material for both sculpture and up-scale architecture. Influenced by the growing market, quarrying operations had to expand and quarries became potentially valuable assets. This development is illustrated by the rare sources on exploitation of quarries and marble prices.

Whether a block of marble was more expensive in the early sixth century or in the late fifth is unknown. The commercial value of marble is not commented on in surviving sixth and fifth-century literary sources: stone seems to have held little interest for ancient authors. In the rare cases where it is mentioned, it is in a practical sense (for example, how hard a stone is or how difficult it is to work it) or because of unusual characteristics, like fire-resistance. Despite this literary neglect, the knowledge of stone in the field must have been impressive. In the temple of Asklepios at Epidaurus, at least four types of stone were used. The core of the platform of the temple of Asklepios, the stoiba, was built of limestone, probably local. Poros from Corinth was used for the steps, the colonnade and the cella walls; the pediments and akroteria were made in Pentelic marble, and dark grey limestone from Argos served to lay the pavement in the cella of the temple. In many cases the inscriptions reveal that masons and sculptors from the region of the quarry came over to work the stone. In view of the wide range of stones used in the project, each with their own intrinsic qualities, and the lack of experienced resident stoneworkers at Epidaurus, this was probably a wise strategy.

Epigraphic testimonia of stone construction are inconclusive about marble prices. As a rule, transport constituted a large part of the budget; in building accounts, prices

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413 Ashmole 1972, 12–5; Snodgrass 1983, 18.
416 Burford 1969, 57, 169, 193 table VI.
417 Cf. below p. 123.
418 In contrast to precious metals: Aleshire (1992) has shown that by the Hellenistic period, the votives of the Athenian Asklepieion in precious metals show a pattern where lighter (i.e. cheaper)
sometimes include the cost of the stone. More often, however, no specification for the stone is given, and listed prices apparently covered only quarrying and transport.\textsuperscript{419} If the actual cost of the stone itself was hidden in this way, perhaps it did not amount to much. This is also suggested by delivery prices in building records where transport is listed separately.

Some quarries were owned by sanctuaries, or controlled by them through the political channels of their polis.\textsuperscript{420} In her study of the builders of the Epidaurian Asklepieion, A. Burford argues that quarries generally operated within the economic structure of the city in whose territory they were situated.\textsuperscript{421} That is not to say that either party actually derived income from the quarries. Rather, it seems to have been standard practice to use available stones mostly for local building projects, probably without charging fees for the stone proper. Naturally, the final accounts of a newly built temple would in such cases be settled cheaper than if the stone had had to come from elsewhere, making a substantial difference in the overall cost to the sanctuary or polis. However, regular profits could only be obtained by selling the marble, which would entail systematic export: the quality of the stone in question had to be quite high.\textsuperscript{422} For those poleis which had good quarries on their territory, the monetary value of marble appears to have depended on export more than on local usage.

When the Parians first exported their marble in the early sixth century, it may have been for trade or exchange.\textsuperscript{423} By the end of the sixth century BC, however, they began to sell their marble commercially, and the ensuing economic growth of the island suggests that it was profitable.\textsuperscript{424} Ownership of the island quarries in the sixth century is uncertain, but it has been proposed that they were the property of the landholders on whose estates they were located.\textsuperscript{425} Perhaps in the fifth century, but certainly by the fourth, this seems to have

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examples cluster into a few peaks, while more expensive, heavier dedications are much more evenly spread, suggesting that the former were bought ready-made for an equivalent price in drachmai, while the latter were commission-made.
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\textsuperscript{419} Burford 1969, 175.
\textsuperscript{420} As in Eleusis, where the deme Eleusis decided about the quarry rather than the sanctuary: Ampolo 1982, 252.
\textsuperscript{422} In view of this, Glotz 1926, 153 suggested that only marble and hardstone quarries were brought under polis control, while those of less exportable stones were allowed to remain in private hands. For evidence to the contrary see below p. 112); also Burford 1969, 173 n. 4.
\textsuperscript{423} Tomlinson 2000, 139 suggests gift exchange, at least in the earlier sixth century.
\textsuperscript{424} Schilardi 2000, 53.
\textsuperscript{425} Above n. 298.
changed. By then, stone was often sold for cash, which went to the polis. An example of this is the so-called _aktites petra_, a limestone from the Akte peninsula close to Piraeus (map 14a). In fourth-century inscriptions from the Asklepieion at Piraeus, the _demos_ stipulates that monies generated by the quarries would pay for building sacrifices in the sanctuary’s new-build.\(^{426}\) Thus, the Piraean quarries must have been rather lucrative, even though they produced limestone rather than the more desirable marble. Since the proceeds went to the _demos_, the quarry must have been publicly owned. Another indication that this was the case is the fact that they were used to detain prisoners of war.\(^{427}\)

In the fourth century, quarries near Eleusis were the property of the sanctuary and leased out for exploitation.\(^{428}\) Here too, earnings were used for a religious festival in honour of Herakles in Akri, to whom the quarries were dedicated.\(^{429}\) Public or sacred control of quarries was apparently widely spread in ancient Greece. The exploitation of quarries, however, was often left to private contractors. Because of the lack of documents, it is difficult to establish who was responsible for what in quarries. For example, an unfinished limestone column drum from a quarry south of Assos near Corinth was commissioned by, or belonged to, the people: it is inscribed with the letters _ΔΑ_ (for _ΔΑΜΟΣΙΟΝ_, the people’s).\(^{430}\) But as Yannis Lolos points out in the publication of the piece, this can be interpreted in various ways. The whole quarry may have been state property and the drum served as a boundary stone. Alternatively, it may have been private property, but the owner had to provide material to the state, one of which was this column drum.\(^{431}\) Finally, the state might have bought this drum. A problem of the latter two views is that the block was left behind: if it was sold or offered as payment for the lease, why was it not used? Lolos rightly argues that the size of

\(^{426}\) IG II\(^\sharp\) 47, lines 28–32; Ampolo 1982, 252–3; Lolos 2002, 204.

\(^{427}\) Burford 1969, 173–4; Ampolo 1982, 255; Lolos 2004, 204. The quarries on Sicily where Athenians were held after 413 BC were also state-owned. The silver mines at Laureion were under control of the polis. They were leased out to contractors who ran them (Lolos 2004, 206 n. 19 with ref.). Alternatively, at Ephesos in the third century BC, the land around a quarry was let while the quarry remained polis property; the city of Troizen exploited a privately owned quarry around the mid-fourth century: Lolos 2004, 206; also above n. 409.

\(^{428}\) Ampolo 1982, 252–4; Lolos 2002, 204.

\(^{429}\) Ampolo 1982, 253–5; Lolos ibid.

\(^{430}\) Lolos 2002, 201–3. This inscription is unique since no other examples of a similar kind are known from the pre–Roman period in Greece. For an interesting Roman example, see Asgari 1988, 119. The inscription in that case is _INPA_, the meaning of which has proven elusive so far.

\(^{431}\) In later times, this was not uncommon. Sometimes the land was rented out without use of the quarries, as in Ephesos in the early third century BC (Lolos 2002, 205).
the quarry belies a lease or private ownership. Public ownership of this quarry is therefore plausible, but the fact that the site had to be marked by means of an inscribed column drum suggests that other quarries in the Corinthia were in private hands. Had they all been polis property, there would have been little need for a mark.

By the late fifth century and further into the fourth, quarries which produced usable stone could be commercially profitable if properly exploited. Marble and limestone were commodities which had to be paid for, except of course if one held regalian rights over a quarry. It follows that even though some quarries may well have been privately owned, most of those who needed marble for building or sculpture paid for the material. Self-evident as this might seem from a modern perspective, in ancient Greece it was probably seen differently: it is quite dubious whether stone had to be paid for in the early archaic period. Admittedly, no quarrying records survive from the sixth century, and from the early fifth century there is only the odd mention in historical texts. It is all the more worthwhile to examine the archaeology of the quarries and the evidence of the sculpture proper.

As was shown in the previous section, the 'private sector' of Athenian sculpture preferred island marble in the sixth and early fifth centuries, especially in votives from the end of the archaic period. In this category, insular marble occurs two to three times more often than Attic marble. The islands from which this marble came had sculpture schools well before any of the mainland centres evolved, thanks to the large available stock of marble nearby. However, the expanding production of island sculpture cannot be attributed to the presence of good material alone; demand for the product was another crucial factor. Since quarries of high quality like Naxos or Paros were still small in the early archaic period, the most desirable marble was relatively rare. In the course of the sixth and fifth centuries, the output of these quarries increased, and this development raises questions. Who fetched stone at the quarry in the sixth century and did this change in the fifth? Did the increasing scale of quarries influence the way in which sculpture was ordered by patrons? Was stone ordered regardless of the sculptor or did the sculptor come with the stone?

432 Lolos 2002, 206
433 It must be said that most of the evidence dates to the fifth century and later. Cf. above n. 423.
434 E.g. Hdt. 2.180 and 5.62 on the Parian marble which the Alkmaeonids commissioned for the front of the Apollo temple in Delphi.
435 See above p. 94.
436 As noted by Pedley 1972, 19.
In the early stages of archaic sculpture, Greek sculptors took on Egyptian proportion standards known as the Canon, which served to set up the design and roughly place the anatomy of the figure on the block. The Canon made it easy to pre-cut statues in the quarries, since the position of protruding parts was determined by generally known and applied rules. Later, when designs of statuary became less standardised (as, for example, in the group of Theseus and Prokrustes on the Athenian Akropolis (pl. 10a), pre-cutting would be difficult for anyone except the sculptor himself; and the risk of damage during transport would be unacceptably high. Obviously, this does not apply to objects such as small stelai, which constitute a large part of Athenian votive and sepulchral sculpture from the later fifth century. Thus, the need for sculptors to come to the quarry to rough out their sculpture would seem less pressing in the classical period.

Most of the marble delivered to Athens in the second half of the fifth century came from the Pentelic mountains, where large-scale quarrying had developed for the fifth-century building projects. Had sculptors wanted to go and fetch the marble, it would have been easily accessible; but as it was delivered to the city anyway, they may hardly have needed to go there. The building projects on the Akropolis had provided Athens with a regular supply of stone, and potentially with marble leftovers from construction. That marble intended for architecture was sometimes reused for private monuments is illustrated by the gravestone of Nautes, son of Eudemides of Torone, which is in fact a reused marble roof tile.

Changes in quarrying procedure probably started after the middle of the sixth century, when many Greek poleis began stone construction in earnest. Quarries were undoubtedly smaller in extent, capacity and number of workmen before then, and may have been under control of private landowners rather than the state. Most Athenian votives from the late seventh and early sixth centuries are made of island marble and relatively small, usually lamps or basins: the blocks of stone required were manageable and for many of these pieces it is possible that they were exported as finished or nearly finished products. If this

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437 Adam 1966, 6; Guralnick 1973; Martini 1992, 42–3; Ridgway 1993, 33–5; Boardman GSAP.
438 The complete design of this statue (cat. V 119, Ak. 145, 370) we can unfortunately only guess at: part of one hand is all that remains of Prokrustes.
439 Hollinshead 2002, 227, points out that even in Roman times there is no conclusive evidence as to whether sculptors came to the quarry or quarrymen prepared the stone on-site before shipment.
440 Cat. G 148, NMA 2588. The shape indicates it was a roof tile. Regrettably, publications do not provide specifications as to the marble type. For the status of the deceased see below ch. IV.4–5.
441 Apart from the famous perirrhanterion Ak. 592 (cat. V 1) there are four lamps: cat. V 122, Ak. 190; cat. V 156, Ak. 225–6; cat. V 223, Ak. 3869; and cat. V 222, Ak. no. ? The other votives
was the case, it was less necessary for sculptors to travel from region to region looking for work at the beginning of the sixth century, like they are known to have done in later times.\textsuperscript{442} As yet there was little competition from local sculptors – at least in many parts of Greece – and patrons may have visited the islands to order votives or gravestones.\textsuperscript{443} However, two korai in Naxian marble (one in pl. 10b) are among the votives of Athens in the second quarter of the sixth century, and they were larger and more risky to export in a finished state.\textsuperscript{444} It is more likely that they were roughed out at the quarry, but finished in Athens.

At Delphi, votives in Naxian marble show that it was rarely used by sculptors who did not have any ties with the island, either by birth or because they had worked there.\textsuperscript{445} In the early period, there is evidence of sculptors who went to Samos and Delos to finish and set up large votive statues which they had made.\textsuperscript{446} Workshops on the islands thus may have been relatively sedentary until the second quarter of the sixth century, in particular the ones near the great sanctuaries.\textsuperscript{447} At the religious festivals of these locations, Athenian and other mainland visitors could be introduced to island sculpture and persuaded to commission pieces for dedication on the island or at home. This ties in with the ancient custom of

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\textsuperscript{442} Signatures attest to sculptors' mobility: below ch. III.3. For itinerant bronze workers in earlier times (notably from the 11th to 8th century BC) see De Polignac 1996, 60.

\textsuperscript{443} The monumental kouroi of the early Kerameikos would be an exception (e.g. cat. G 5, NMA 71; cat. G 6, NMA 3372, 3965, the Dipylon Kouros (pl. 4c); or cat. G 19, KM P 1698, the Kouros of the Sacred Gate (pl. 27c). For the origins of the sculptors in question see: Deyhle 1969; Richter 1960, 46 no. 6, 47 no. 9; Boardman \textit{GSCP}, 23–4 fig. 62; Floren 1987, 251 n. 3, 252 n. 8; Niemeyer 2002, 23–30, 40–6.

\textsuperscript{444} Authors agree that the statues, Akr. 619 and Akr 677 (cat. V 15 and V 16 respectively) were made by a sculptor from the islands, perhaps a Naxian, who was probably influenced by sculpture from Samos. See for example Schrader \textit{AMA} 63–4 nos. 22–3, pl. 33–4; Richter 1968, 47 nos. 58–9, figs. 194–200; Rolley 1994, 178, 247, 252, 280, 283, fig. 281; Ridgway 1993, 143, figs. 148–9.

\textsuperscript{445} Palagia and Herz 2002, 243. The examples they mention are the group of Klobis and Biton in Delphi, whose signature is connected to the Argolid, and early–archaic Naxian pieces on the Athenian Akropolis (see n. 441). Many of the latter are lamps; and though at least one of them (Akr. 3869) is related to Samian types, this can also mean that a Naxian sculptor was influenced by Samian sculpture. Moreover, since small objects could have been shipped from the islands as finished products, they need not have been produced in Attika at all. It is dubious whether these actually are made by non–Naxians; even if they are, they are very rare.

\textsuperscript{446} For example, sculptors from Chios working in Athens and on Delos: below p. 158.

\textsuperscript{447} Cf. Risberg 1992 for the presence of bronze workshops in sanctuaries.
combining religious festivals with markets. Thus, sculptors in the seventh and early sixth centuries who were trained on the islands could stay, if they wanted; they could have made a living from commissions by other islanders and periodic assignments from elsewhere. It was at sanctuaries that sculptors’ services were most required, so it made sense to live nearby.

After the first decades of the sixth century, Athens and other poleis got their own thriving sculpture manufacture. Competition from the locals became stronger, and the sculptors of the islands had fewer commissions from poleis further away. On an island like Naxos, without a sanctuary of Pan–Hellenic stature of its own, this new situation may have prevented the local workshops from recovering after the rule of Lygdamis; many sculptors may have taken up travelling as a result. Another reason why sculptors at the beginning of the sixth century might have been more sedentary than their successors could be their connection to the quarries. Naturally, sculptors who were trained in the local marble knew it better than anyone, and preferred to work in their material. Unfinished statues in several quarries have been cut with much knowledge about the effects of carving the stone, not just about extraction. This suggests that in early archaic sculpture, the extraction and pre-carving of statues before transport was done at least in part by the sculptors. Moreover, until the era of stone temples, the demand for island marble was hardly so great that large-scale quarrying operations were necessary or economically interesting. In the early sixth century, many of the larger pieces for export travelled with their sculptors to other islands, avoiding transport by land as much as possible. Smaller ones, like lamps, appear on mainland sites, one of which is the Athenian Akropolis.

Because of the rise of marble architecture and of the large Pan–Hellenic sanctuaries, the market for marble expanded. More marble had to be extracted; it was shipped to more remote places; and sculpture became larger and more complicated. The latter development perhaps increased the need for sculptors to get the marble themselves and deliver and

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449 Above n. 394. The example is later: the early period is represented by several pieces in the article by Kokkorou–Alewras from 1995, e.g. 40–3 and ibid. cat. K 17, K 21 and K 26. The evident order of the cutting, with a good deal of carving done before the statue was even cut loose, also points in this direction.
450 For example, the earliest evidence for quarrying in tunnels at Maráthi on Paros is from the late archaic period (Schilardi 2000, 53). The veins which were accessible from ground level were apparently used up by that time.
451 The development can be traced in the database. Architectural sculpture may have added to the expanding scope of Athenian free–standing sculpture in size and design from c. 550 onwards.
complete commissions at their final destination. Sculptors could, of course, have opted to send their specifications to the quarry, especially if they knew the men who worked there. For travelling island sculptors, however, their ties to home would have made such visits appealing, providing them with a good excuse to get the marble personally. Once local centres of sculpture production emerged, as in Athens, this type of connection was severed; and the relation between quarrymen and sculptors must have changed with it.

Sculptors could obviously not travel for commissions and work in the quarries at the same time. Therefore, when considerable numbers of signatures of island sculptors start appearing on monuments from the mainland, the two groups must have become more separate. Only in the early sixth century can they have overlapped to a large extent, when sculptors as yet seem quite settled on the islands, close to their local quarries. Later in the sixth century, travelling sculptors still visited to get marble from home. But by the fifth century, sculptors and quarrymen had grown apart. For example, the majority of sculptors who worked on the Parthenon are highly unlikely to have visited the Pentelic quarries. In sum, the connection between quarrymen and sculptors, mostly islanders, had been strong in the early sixth century and their activities may have overlapped quite a lot. By the end of the fifth century, however, Athens had quarry masters who supervised a workforce of slaves and day-labourers extracting stone for the city. By then, the division of labour of the ancient sculptors and quarrymen was as complete as it would ever be.

Master builders and sculptors undoubtedly still went to the quarries at times to select stone and specify their wishes, but they probably did so less than their predecessors in the early sixth century. In the case of Athens, there was little need. The regular marble supply to the city functioned smoothly. Moreover, the presence of excess marble in the city, in part leftovers from the building programme, allowed Athenian sculptors, especially those who did relatively standard and smaller work, to design their pieces to fit an available block rather than vice versa. The range of their activities narrowed while their specialisation grew.

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452 Interesting evidence is given in Abraldes 1998 on the cooperation between sculptors in Delphi and Epidauros. However, by the late fourth century, a sculptor named Molossos apparently sent finished or near-finished work to Olympia: the inscription lists the cost of the wrapping materials (FD III, 5.30; Abraldes 1998, 18).

453 See below p. 119.

454 On specialisation, also in other trades in the research period, Harris 2002; for sculptors see below, p. 150.
In sum, the sixth and fifth centuries saw an expansion of quarrying. Sculptors who had initially had close relations to quarries spread out over Greece from the second half of the sixth century on, by and by leaving the quarrymen the specialists of their trade. Stone architecture was a crucial factor in this process. By the end of the fifth century, it is unlikely that marble for large building projects was quarried under direct supervision of a master sculptor or architect, who was needed at the building site at least as much as in the quarry. As a result, much of the extraction work must have been left to quarry masters. The process of choosing stone in the quarry thus went slowly out of the sculptors’ hands. Around the same time, the masons at some quarries, for example at the Spilia quarry in the Pentelic mountains, apparently started to use a less time-consuming but more wasteful method of extracting the marble. Evidently, speed became an important factor.

Thus, quarrying developed higher levels of specialisation and labour division, and an increasingly commercial approach to both the execution of the work in quarries and their management. The great demand for stone in the later sixth and fifth centuries (mostly driven by architecture) resulted in more quarries, larger workforces, and expanding infrastructure.

4 TRADE AND TRANSPORTATION

Technical advances in the transport of marble in the sixth and fifth centuries partly developed as a result of its rising popularity in the sixth century and partly from growing engineering skills. Both the marble supply and the infrastructure needed to meet requirements of ever more ambitious building projects and statuary at the time.455 Some early quarries on Naxos, e.g. the Apollonas quarry where the abandoned statue of Dionysos lies, are practically on the sea shore (map. 14a).456 As demand grew and veered towards specific types of marble (e.g. later in Athens, island marble was replaced by Pentelic), quarries were opened which were not so conveniently located. The largest group of marble from one island in the record, Parian, comes from various quarries in different parts of Paros (map 14b). Most of these opened later

455 As in quarrying, many early methods of transporting stone were derived from the Near East and Egypt. See also Coulton 1974, passim.
456 Above n. 394.
than the quarries on Naxos, but their eventual exploitation was much more extensive both in geographical scope and in time.

Already in the second quarter of the sixth century, dedications on the island of Delos are more often in Parian marble than in Naxian.457 By the third quarter of the sixth century, no votives in Naxian marble can be found on Delos, a situation which is very similar to Athens (chart 3a). It is interesting that Parian marble in general became so popular in the sixth century, for by no means all of the Parian quarries produce marble of Lychnites quality, and some are difficult to reach. Most of the better known marbles come from quarries in the centre of the island, near the villages of Lakkoi (Chorodaki, Paros II; map 14b) and Maráthi (Lychnites or Paros I).458 The latter site is about four kilometres from the nearest ancient port which had sufficient infrastructure to load the heavy blocks of stone onto vessels, which is Naoussa on the north coast of the island. Lakkoi is situated only slightly west of Maráthi, but has relatively easy access to the port of Paroikia on the west coast, only two and a half kilometres away.459 The stretch from Lakkoi to the port is downhill, whereas Maráthi lies across a ridge further east. So, from the Lychnites quarries, the shortest stretch as the crow flies was not the most accessible route, since it entailed hauling the stone over a steep hill. There was much less effort in following the four-kilometre route to Naoussa down a torrent-bed which is now blocked.460 This may well explain why the Lychnites quarries came into use later than the Chorodaki ones, or than the more easily accessible quarries on Naxos.

Some time after quarrying on Paros began, the infrastructure of the transportation routes on the island was improved with paved slipways.461 Although the pavement does not survive on Paros, some of the postholes used for securing the cargo with ropes have been

457 Although in small numbers: nine Parian against four Naxian votives (Kokkorou–Alewrás 2000, 148). In later times, Parian marble remained popular: it was exploited on a large scale in the Roman period (Sturgeon 2006, 44). Herz 2000, 31 points out that of the 118 samples of the Lepsius collection (see above p. 90), 106 were Parian. Of these, 53 were from the Lakkoi quarries, i.e. Chorodaki marble, while only three were Lychnites.

458 Schilardi 2000, 35–6. Two more types of marble at least were quarried on the island in Antiquity, one near Aghios Minas (Paros III) and one near Thapsana (Herz 2000, 27–9; Gorgoni et al. 2002, 125–6). According the authors of the latter article, the outcomes of petrochemical research on marble from Chorodaki and Aghios Minas turn out very similar; the fourth marble type from Paros has been little researched but is, according to the authors, very different. Cf. also Herz 2006, 288.

459 Schilardi 2000, 53.

460 Ibid. 37.

461 Ibid. 53. The exact moment is unclear, but quarrying at Maráthi went underground in the late archaic period: indicating a higher level of technological development and expanding exploitation.
found. In Attika, *lithagoria* roads are better preserved (map 14b). In order to avoid that loads would pick up too much speed, some slipways, for example those at Delphi or on Paros, meandered down the mountains: a few extremely steep slopes needed to be overcome to get the stone from the quarry or to its destination. In the case of the road from the Pentelic mountains to Athens, however, this was apparently deemed unnecessary, as it ran relatively straight downhill (map 14b). For the stretch from the quarry to the beginning of the road itself, sledges were sometimes used which were pushed over wooden tracks to facilitate the dangerous job of clearing large blocks from the quarry (pl. 11a). A construction in wood or stone would even out the terrain to facilitate the movement of blocks to the start of the road. They were then loaded onto sledges or carts by means of a ramp (pls. 11b, 12a–b). If the track went down, the sledges could be used for the next part of the journey too, but if a level area had to be traversed, carts were more common (pls. 12a–b). It was important to complete the transport during the summer months, when the roads were dry and hard.

The Pentelic *lithagoria* roads in some places had cut-out ruts corresponding to the axle width of the carts, and postholes which held poles for securing loads every so many metres (pls. 13a–c). Similar installations have been found at the diolkos in Corinth. Draught animals, most often oxen, were requisitioned from local farms for large building projects, or in prestigious cases, the animals’ owners may have volunteered. If the road

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463 Details of the route in Korres 1994, 70–1.
465 Coulton 1977, 141. He also describes methods where the block would be built into a large roller (141–3 fig. 62), if the pressure in the axle of normal carts was untenable. Cf. Schneider 1992, 163, 237 fig. 17.
466 Korres 1994, 38, 104.
468 Burford 1969, 185. Blocks for the column drums of the Telesterion in Eleusis were brought from Pentelikon by somewhere between 19 and 37 yoke of oxen (*IG* 11 1673; Schneider 1994, 163). If the farms were leased from the sanctuary, the use of the animals may have been part of the contract. See for such dealings e.g. J. Harvey Kent, The Temple Estates of Delos, Rheneia, and Mykonos, *Hesperia* 17 (1948), 243–338.
469 Burford 1963, 33; id. 1969, 185, 189. In Epidaurus volunteering may have occurred, but it is hard to establish because there is no notion of standard prices (Burford 1969, 36, 87). Payment ensured that the person’s name was recorded, so some monetary compensation was often expected. Korres 1994, 38 and 104 contends that in the case of the Akropolis, carts were drawn by mules rather than oxen.
system from the quarries to the construction site was sufficiently well-equipped, as between Mt. Pentelikon and Athens, Eleusis or Piraeus, hoisting devices such as pulleys and winches could be used to unload the blocks directly onto the site once they had been delivered nearby.\textsuperscript{470} If the destination of the marble was a longer distance away, as Epidauros was from Pentelikon, or Athens from the islands, it had to be loaded onto ships.

Blocks of marble for life-size figures, not to mention the larger-than-life kouroi or korai which were occasionally made in the sixth century, can weigh half a ton or more.\textsuperscript{471} Consequently, it was essential that blocks were lowered extremely carefully and under no circumstances were allowed to fall, not even for a few centimetres onto the cargo ship’s deck.\textsuperscript{472} A safe method was to load the ship with sand, raising its water line: the block would be dangled just above the deck, and the ship was made to rise to the stone by pouring out the sand.\textsuperscript{473} This was safer than shifting the blocks aboard on rollers, which could easily cause the ship to capsize. Unloading blocks equally brought the risk of damage: a fall could make the stone worthless instantly.\textsuperscript{474}

By the end of the sixth century, Paros was selling local marble for revenue to among other places Delphi, where it was used, for example, in treasuries and for the front of the Apollo temple.\textsuperscript{475} As far away as Selinus on Sicily, details of the metope figures on the temple of Hera were made of Parian marble.\textsuperscript{476} Paros would retain this prominent position in the marble trade for a long time. In the early fifth century, the Athenians used Parian marble for their treasury at Delphi, and later for parts of the entablature and sculptural decoration of the

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\textsuperscript{470} Burford 1963, 29–33 (Parthenon: 10 km distance from the Pentelic quarries); also Wurch-Kozelj 1988, 57–8. Cranes were known at least from the end of the sixth century BC onwards (Coulton 1974, 18; id. 1977, 144).

\textsuperscript{471} Snodgrass 1983, 21–2, suggests a quarter ton for a life-size kore after completion of (most of) the carving. Pre-cutting would reduce weight considerably. One m\textsuperscript{3} of marble weighs c. 2.75 tons (Schneider 1992, 162).

\textsuperscript{472} Burford notes that similar precision was needed when loading stone on or off carts, as is illustrated by the specification of the loading costs of Pentelic marble for the Parthenon (IG i\textsuperscript{2} 339–353; Burford 1963, 24, 33). Of course, reducing the weight by pre-cutting would be impossible for architectural materials.

\textsuperscript{473} As in Egypt and the Near East: see for example Humphrey et al. 1998, 462 (Plin. HN 30.67–70); Heizer 1966, 825.

\textsuperscript{474} Burford 1969, 188.

\textsuperscript{475} Tomlinson 2000, 139.

\textsuperscript{476} Ashmole 1972, 12–4: in the Heraion at Selinus, the uncovered skin of female figures in some of the metopes was of Parian marble in the otherwise limestone temple.
Hephaisteion and the figures of the Erechtheion frieze. In all these cases, the Pentelic quarries were operational and could have provided the Athenians with the necessary stone. Their reasons to choose Parian marble can be many: they may have preferred it (though they did not use it for the Parthenon), or they may have stocked up Parian marble for some years, so that they had a ready supply for the details of the Hephaisteion and the Erechtheion.

To reach the sanctuary at Delphi, Parian marble had to travel three legs on land and two by sea. Lychnites had to be brought down from Maráthi to Naoussa and loaded onto ships. The freighter passed the diolkos at the Isthmus of Corinth, whose ruts eased the run of ships across the Isthmos. Either the entire ship would be hauled over, or the cargo would be offloaded, transported and reloaded. After landing at the port of Kirrha in Phokis, depending on the route a distance of twelve kilometres or more had to be traversed to reach Delphi at an altitude of 550 metres above sea level. Despite all this, Parian marble was applied lavishly in Delphi’s treasuries (which had smaller, manageable blocks) and the Apollo temple. Marble and transport of the latter were paid for by the exiled Alkmaeonid family.

In view of these difficulties, it is obvious that transport costs loomed large in the budget of both ancient sculpture and stone construction. In building accounts, the material itself is far less conspicuously expensive. Nevertheless, ambitious projects involving marble were taken on all the time. The Naxians erected a kouros on the island of Delos of which hardly anything survives now; but the size and weight of its base make one marvel at the technical prowess of Greek shipping crews and carters. Snodgrass suggests that this may

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477 Palagia 2000, 350; for the Hephaisteion see Wycherley 1974, 64.
478 Palagia 2000, 348. In the later fifth century, Paros paid twice as much tribute as Naxos (a larger island) to the Delian League. It has been suggested that this was the price Paros paid for the wealth it had acquired from the marble trade (Schilardi 2000, 53). Palagia (ibid.) argues that the tribute was due to Paros’ ties to Persia.
479 As suggested by Palagia 2000, 350. In the Erechtheion frieze, some of the white figures are in Pentelic, which may suggest that the Parian was left–over stock and that it had run out.
480 Burford 1969, 185; Ashmole 1972, 21–2; Schneider 1994, 173. The location of Kirrha would have made it impractical to sail all the way around the Peloponnese, although some captains may of course preferred this.
481 Coulton 1977, 146; Schneider 1992, 163.
482 Hdt. 5.62.3.
483 The base is 5.14 x 3.47 x 0.71m, i.e. 12.5m³ (Coulton 1974, 17) and weighs approximately 34 tons according to Snodgrass 1983, 22; the weight is 34.8 tons if the specific weight of marble is set at 2.75 tons/m³ (as in Schneider, above n. 471). Kirrha, the port of Delphi, was later equipped with a special unloading installation (Burford 1969, 188 n. 2; cf. E. Bourguet, FD III.5 no. 19).
be a case where a so-called ‘round ship’ was built, a special pontoon which kept an oversized block partly immersed and so reduced its weight; regular ships from the archaic period are unlikely to have been large enough for blocks like the base of the Naxian colossus. This monument was exceptional, and a majority of statues required blocks of more manageable proportions, of which ordinary freighters could carry several. Moreover, marble was next to metal ore among the most common cargoes from the middle of the sixth century until at least the fourth century, so the expertise of marble transport was well developed.

As the discussion above has shown, one of the most valuable sources about the transport and quarrying of marble, as well as quarrying the actual carving, are building accounts. A considerable number of construction-related inscriptions is preserved from Epidauros, Delos and Athens. These are of particular interest here, because they outline the costs of the whole process from quarry to final product. However, they also have limitations. First, most accounts mention blocks for architectural use rather than for sculpture, so unless the sculpted temple decoration is the subject of the agreement, the comparison does not really apply. Second, building accounts seldom specify the different tasks involved in a job, nor particulars like the cost of transporting one cubic metre of marble one kilometre. Third, many accounts date after the fifth century.

Examples of fourth-century accounts are almost all of the Epidaurian building agreements. At that time, the sanctuary of Asklepios was given monumental architecture befitting its importance. Each of the types of stone used there had, as one would expect, its own price; but in the accounts, the same stone may vary in price too, even in the course of

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484 Snodgrass 1983, 22; also Wurch-Kozelj 1988, 56 fig. 4, 63. Burford 1969, 185–6 refers to an average shipping capacity of 70 to 130 tons, which would theoretically allow for transport of the Naxian base; but Snodgrass rightly objects to this because the block was too big for those ships. The kouros for this base, now lost, is estimated by Richter (Kouroi 51–3 no. 15) at approximately 7m high (four times life-size); it would have weighed c. 23 tons. Of course this is an estimate, and the kouros may have consisted of separate pieces; but even so the achievement is remarkable. Cf. Coulton 1974, 10 n. 52.

485 Snodgrass 1983, 22.

486 Ibid. 18. Other cargoes, e.g. pottery, required fewer runs even if there was more demand because of the lower weight. Ships could carry a limited number of blocks. At the height of archaic sculpture and temple-building, demand was great and extended over a large geographical area. Cf. Schneider 1994, 142–5.

487 Epidauros is discussed in Burford 1969; for Delos see J. Harvey Kent, Hesperia 17 (1948), 243–338 (though mostly Hellenistic); and for Athens Stanier 1953; in general also Loomis 1998. Cf. IG IV² nos. 913–23.

488 See above p. 110.
a few months. For example, the local stone for the core of the colonnade, the stoiba, cost 2,400 drachmai for 73 cubic metres. The stoiba of the cella cost 1,485 drachmai for at most 39 cubic metres.\textsuperscript{489} According to Burford’s calculations, the price of the second batch of stone exceeded the first by at least four drachmai per cubic metre.\textsuperscript{490}

Stone prices usually include quarrying (the extraction, possibly basic carving, and the stone itself), transport, and setting the stone in place. Some records show that the wages paid to those who transported stone were quite low, although freight seems slightly more lucrative than transportation of people.\textsuperscript{491} However, complete specifications, i.e. the cost of transport per mile for one ton of stone is only preserved in the accounts of Epidauros. The records state that Pentelic marble for the coffering of the ceiling of the temple was brought from the harbour of Epidauros to the sanctuary – a journey of just over eleven kilometres – at 1.75 drachmai per ton per kilometre, which came down to 25 drachmai per block and 1,775 in total.\textsuperscript{492} The Corinthian limestone used in the same temple was delivered at about 0.3 obol per ton per kilometre, resulting in a total of 1,700 drachmai for 407 tons which had travelled (by land) further than the Pentelic marble.\textsuperscript{493}

Part of this difference in price may be due to the season: rain was a particular problem when hauling heavy loads up or lowering them down a mountain, so expense would have gone up considerably in winter.\textsuperscript{494} Moreover, depending on the agricultural calendar there would have been a shortage of oxen in the ploughing season, which slowed down the work and increased its cost.\textsuperscript{495} In short, stone transport was seasonal work. As a result,

\textsuperscript{489} IG IV\textsuperscript{1} I.1; the second batch is described in lines 9–10 of the same inscription. See also Burford 1969, 193–4.
\textsuperscript{490} She found that in the first case, the stone cost 34 dr. 1 ob. per m\textsuperscript{3} while in the second it cost at least 38 dr. per m\textsuperscript{3}. The description is identical, so the stone is most likely the same in both cases. However, the calculation is based on a reconstruction of a damaged part of the inscription (Burford 1969, 193 n. 2).
\textsuperscript{491} Loomis 1998, 201–2 notes that one of the reasons why it was so cheap to travel for people may be that there was no specialised transport, and they just went along on boats and carts which travelled anyway. He lists, only one reliable price/weight relation known: for red ochre to be brought from Keos to Piraeus, 1 obol per talent was paid (Loomis 1998, 196; IG II\textsuperscript{2} 1128, 11114).
\textsuperscript{492} Burford 1969, 190: 25 divided by c. 1.75 is c. 14.3, divided by 11 is c. 1.9 tons per block. The contractor Megakleides transported 70 of these blocks to a total 140 tons.
\textsuperscript{493} Precise calculations (in miles) in Burford 1969, 190.
\textsuperscript{494} Ibid.; also Korres 2000, 40.
\textsuperscript{495} The ploughing for which oxen were needed would usually have been done in the fall, before the winter rains started (Xen. Oec. 16.10–17.2); however, the inscriptions do not record when exactly which activities were executed, only their chronological order. All we know is that the Pentelic
carters would have gained experience in handling the stones if a nearby quarry was used regularly, as on Paros or in the Pentelic mountains: in Epidauros, the Asklepieion was the only project on this scale, and the skills acquired were of no further use once the sanctuary was completed, except for an occasional sculpted votive in a more or less finished state.

Most quarries were seldom used for large projects and mainly served small-scale construction. Consequently, it is to be expected that no standard price for stone or its transport existed, not even when the same stone from the same quarry was brought along the same route to the same project. The only thing that stands out from the Epidaurian building accounts is that sea passage was always cheaper than transport by land; this is confirmed by other epigraphic evidence.\(^\text{496}\) For example, building accounts from Eleusis, dated 333/2 BC, list roof tiles brought in from two places, Lakiadai north-west of Athens, and Corinth. While for one hundred Corinthian-style tiles from Lakiadai in Attika, forty drachmai had to be paid, two hundred of the same type of tile were delivered by ship from Corinth for a total of six drachmai and four obols.\(^\text{497}\)

The marble from Pentelikon which was used in Athens had to travel a distance of eighteen kilometres and down from a height of 600 m;\(^\text{498}\) the distance from and elevation of the Hymettian quarries is similar.\(^\text{499}\) Beside these famous marble quarries, there are various limestones in the hills of Attika\(^\text{500}\) and the Piraean limestone quarries mentioned above, whose stone was used for the foundation of the old Athena temple on the Akropolis.\(^\text{501}\) A dark grey limestone is found near Eleusis (\textit{eleusiniakos lithos} or \textit{melas lithos}). It was sometimes used for dramatic effect, as for example in the background of the frieze of the marble was delivered earlier in the year than the Corinthian limestone. Possibly, the season influenced the price.

\(^{496}\) Loomis 1998, 191–202. Burford 1963, 33 suggests that there were no professional transport companies in ancient Greece and all transport at Epidauros was done by farmers. However, in Athens it is possible that some people lived off transport. Accounts for transportation of people (over land) seem quite professional (Loomis 1998, e.g. 194 nos. 7–8, 196 no. 11). Heavy fines on delays in the delivery of shipments hardly seem like a sign of dilettantism (Burford 1962, 27; id. 1969, 92, 189; also \textit{IG} II\textit{2} 1678, 18).

\(^{497}\) Loomis 1998, 198–9. Of course we do not know what personal reasons the shipper may have had to give a discount to his clients.


\(^{499}\) Sturgeon 2006, 44–5 colour pl. 1.

\(^{500}\) For example, the so-called Karas stone from the foothills of Hymettos, described by Wycherley 1974, 57–8.

\(^{501}\) Wycherley 1974, 59; Korres 2000, 10. See above p. 112.
The quarries on Mt. Hymettos and Mt. Pentelikon each had several veins of usable marble. Marble from one vein may look quite different from other marble from the same area, while both were in use simultaneously. Moreover, both mountain ranges also produce limestone which was quarried in antiquity. Burford contends that no Attic limestone quarries were exploited commercially, except those near Piraeus. It is likely that the polis controlled all quarries in Attic territory, but this does not mean that quarrying proper was carried out by the state. Direct contracting between poleis and construction workers is rarely attested, and no trace of it can be found in such records as the accounts of Epidauros or Delphi.

Athens was exceptional in matters of contracting for building projects. The Parthenon accounts show that for the Periklean building programme, the city hired craftsmen directly. In other cities, contractors were the standard. The organisation of construction in fifth-century Athens was different from the rest of Greece because the city’s exceptional economic and cultural activities at the time (and to a lesser extent in the sixth century) offered sufficient work for a large body of resident craftsmen. Not only was this impossible in more remote, non-urban sanctuaries like Delphi or Epidauros; many other cities could not sustain such a workforce either. They would send out messengers to broadcast major building projects when the occasion arose, to invite craftsmen from elsewhere for the specialised construction work, including sculpture. Once finished, the building experts would move on to the next job.

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502 Shoe 1949, 347; Ampolo 1982, 251-4. To my knowledge, no private sculpture made in this material survives. In view of the varying stone types of sepulchral monuments, however, it is very well possible that they were produced in antiquity.

503 Wycherley 1974, 54, 56, 62-4. A limestone conglomerate from Hymettos, possibly lithos agryleikos was used, but only in later times, and mostly in foundations because the pebbles in it prevent a smooth finish.

504 Burford 1965, 29; id. 1969, 173-5.


506 IG I 3 449 (Parthenon); IG I 3 474 (Erechtheion). Stanier 1953, Burford 1963, 28; id. 1969, 111-2; Lauter 1974, 1.23-4; Coulton 1977, 22.

507 Burford 1969, 112.

508 Stanier 1953, 68; Burford 1962, 32; id. 1969, 112. A certain Philon was paid 1.5 obols to announce work opportunities on the Epidaurian tholos in Athens (Burford 1969, 160-1). Like elsewhere, contracts were auctioneered to the craftsman or contractor with the best offer.
Under these circumstances, contracts were essential. They provided a guarantor, usually a local citizen, who was liable if craftsmen left without fulfilling their obligations. At Athens craftsmen were numerous and many lived there permanently, at least in the fifth century; it was easy to find a replacement for anyone who failed to do their work properly or on time, or who left. Therefore, the need for a contract or a guarantor was less pressing in the city. Another reason for this exceptional situation can be found in Athenian building accounts of the Parthenon and the Erechtheion. The Parthenon's are among the oldest extant building records, followed by those of the latter. The only potential mention of a building contract of sorts in fifth-century literary testimonia is in Herodotos' *Histories*, when he describes how the Alkmaeonids served more or less as contractors (or as guarantors?) for the reconstruction of the temple of Apollo at Delphi in the mid-sixth century. The story of their decision to have the front of the temple made in Parian marble out of their own funds suggests much personal involvement: the important role of aristocrats in archaic building projects is confirmed by other sources as well. How much and specifically which work the noble Alkmaeonids did, however, is dubious. It is hard to imagine them driving ox-carts hauling marble from Kirra to Delphi.

The nature of a project like the temple at Delphi, with such high-born contractors or financers, contrasts with the more businesslike approach in the accounts of the Asklepieion at Epidauros, or of the Erechtheion. In the latter, a contract naming a guarantor is drawn up for only one particular job, the ceiling coffers: the rest of the work is paid in daily wages or per job, but always directly to the craftsmen. In the accounts of the Asklepieion at Epidauros, this has changed to contracts and guarantors for most of the work. The Athenians from the late fifth century hired relatively few individuals for large jobs, but in the fourth century, the economic climate had become less prosperous. To cut the risk for both the sanctuary and the guarantors, many small agreements were made with many craftsmen, rather than only a few for bulk jobs with contractors. This means that more information is available about construction in the late fifth and the fourth centuries. Moreover, the many

509 This subject is discussed below, ch. III.4.
510 Burford 1969, 112.
511 Ibid. 111.
512 Hdt. 2.180; 5.62.3.
513 Coulton 1977, 22.
514 Randall 1953; Burford 1969, 111.
515 Randall 1953, 210; Burford 1969, 112-3; Coulton 1977, 21-3.
agreements for small jobs indicate increasing caution in contracting, as well as attempts to spread the financial risk. Thus, the organisation of temple-building appears to become increasingly professional from the sixth to the fourth centuries.516

How does all this translate to private sculpture in Athens? There are no contracts or accounts regarding the transport of stone for private gravestones or votives. Only when a polis dedicated statues or other sculpted monuments, accounts may sometimes have been used for individual sculptures. Widely spread state ownership of quarries allowed sanctuaries or the demos to take what stone they needed for free, while private commissioners are more likely to have paid for the stone. They almost certainly had to cover the entire cost of extraction and transport, although the relevant records are lost. A large construction project required much of a polis’ resources for transport, but stone for a single votive of a reasonable size could be moved in a sturdy cart even by the patron personally, if necessary. If the patron preferred island marble, getting it to Athens was potentially more complicated. But as will be discussed shortly, in the fifth century all kinds of materials were transported individually for a small fee paid to a skipper or carter.517

Attic patrons who preferred their local marble had every opportunity to get material for sculpture if they wanted. Whether they actually did so is a different story. On the slipway from the Pentelic mountains, built to ensure the marble supply for Athens’ public building projects, private transports are not likely. For smaller sculptures, left-over marble from construction or marble ordered along with the building material would suffice, and many sculptors may have had some marble in stock.518 The use of left-over stone from a sacred building for a private votive or gravestone would have posed few problems; it remained within a religious sphere.519

If the stone available in Athens was insufficient, it could be ordered in the desired size and shape from a quarry and brought down along with construction blocks. Apart from the price tag, there were no problems in this. By contrast, a patron manoeuvring his own cart and team of horses through the traffic on the slipway may have been allowed. But to do so was rather dangerous, and the traffic of public carriers would have deterred many, especially

516 The many detailed job descriptions also suggest growing craft specialisation; more on this subject below, ch. III.
518 This happened elsewhere too, e.g. at Delphi: Abraldes 1998, 135–6.
519 For attitudes toward stone which was earmarked for sacred purposes, see Burford 1972, 120–3, 237 n. 317; Lolos 2002, 205. Also above n. 477.
in view of the difficulties of two carts passing each other on the road in opposite directions. The advent of ‘professional’ quarrying for building purposes and the development of the equivalent infrastructure is likely to have curtailed individual transport by sculptors or patrons. By the late fifth century, a well-run transportation system appears to have been in place at most of the larger quarries and certainly in the Pentelic mountains. Combined with the experienced professional carters who worked the *lithagoria* road, it would thus have been unnecessary for the Athenians to fetch their own stone.

5 \textbf{Conclusion: sculpture and the marble trade}

From the beginning of the sixth century, supply routes of stone to Athens were gradually improved. Early on, the possibilities of quarrying were limited due to the small scale of quarries and a lack of technique and infrastructure. It remains uncertain whether demand for marble was low at this time as a result of these limitations, or little effort was made to overcome them because there was no real demand. However, after the middle of the sixth century the market expanded dramatically thanks to developments in architecture, creating new opportunities for the production of private sculpture. Slipways, loading ramps and port installations were built during the fifth century, facilitating large-scale exploitation of quarries and trade in stone. In some quarries, such as those on Mt. Pentelikon, transport became quite sophisticated, and surplus from construction in Athens could be sold for private commissions. These developments illustrate the growth of the market for high-quality marble and a demand which was strong enough to overcome any limitations in technology. There is no evidence that marble quarries in ancient Greece were left unexploited because of technical problems.

The earliest preserved text sources on ownership of quarries date to the end of the fifth or from the fourth century, and these show that most Athenian quarries were the property of cities or sanctuaries. Their day-to-day management was left to officials of the deme in which the quarry was situated, or leased out by the deme. No sources survive on what was customary in the sixth century but it is possible that in archaic times, quarries belonged to the owners of the land on which they lay. If this was the case, the marble may have been free of charge if the landowner allowed it, and perhaps even have played a part in diplomatic gift exchange. By the fourth century, there are no signs of such private use.
anymore. Publicly owned quarries like those near Piraeus or Eleusis sold stone for money, which was admittedly used to finance festivals and other religious duties.

In cases like the fifth-century building programme on the Athenian Akropolis, polis ownership of quarries meant a reduction of the cost of the project, although prices of the marble proper seem to have been relatively low anyway. It was transport that made stone expensive: ancient literary texts and inscriptions rarely mention its intrinsic value.\(^{520}\) The figures in building accounts often include extraction, transport and delivery as well as the cost of the stone in a lump sum, and the share of each expense item in the total price can only be guessed at. However, in the fifth century stone must have become a commodity which required payment, if religious festivals could be financed from quarry revenue.

Growing efficiency in the supply of Pentelic marble partly explains why so much Athenian sculpture from the later half of the fifth century was made in this material: availability was a great incentive. Pentelic was already used from the middle of the sixth century for bases of votives and to a lesser degree of gravestones (tables 3c–d). A relatively well-organised system of quarrying and transportation of marble from Pentelikon must have been in place by the final quarter of the sixth century at the latest, because more bases from the late sixth and early fifth century are in Pentelic marble than in any other type.

Since many subtypes of Pentelic proved outstanding for sculpture in the fifth century, lack of quality cannot have been a reason why late-archaic sculptors and patrons in Athens preferred island marble. But if Pentelic marble was and is more than adequate for inscriptions as well as for high-quality carving, and the infrastructure to the city was in order, why did island marble stay in favour until the end of the archaic period? One answer to this may be that shipping made island marble cheaper than marble transported by land in the late archaic period. Stone which came by sea only had to be brought to Athens from Piraeus: a more or less flat stretch of about ten kilometres, compared to 18 kilometres downhill. That being said, the difference in transport cost of local and island marble cannot have been very great.

A potential reason for the disappearance of island marble after the archaic period could theoretically lie in the changing relations between Athens and the islands. In the story of Lygdamis, the latter was helped by Peisistratos to become the tyrant of Naxos. The close ties between the two could have affected the import of Naxian marble to Athens in the second half of the sixth century. However, most sculpture in Naxian marble which can be

\(^{520}\) Pliny does mention white marble of the island of Paros called Lychnites (HN 36.4) and refers to Varro’s explanation of the name (the stone was quarried at night by lamp light).
found in Athens dates to the beginning of the sixth century, well before Lygdamis came into power. For bases, Naxian marble occurs in the record only once, for a votive base (table 3c). That being said, votives in island survive in similar numbers to those in Attic marble in the sixth century (table 3a). Only in the third and final quarters of the sixth century, votives in island marble gain considerably on attic marble – but whether this marble is Naxian or from other islands cannot be determined. Even if it were Naxian, however, the deposition of Lygdamis around 524 BC and of the Peisistratids shortly after makes it unlikely that their influence is behind this increase. So, there is no evidence that the relationship between the tyrants contributed anything to the Athenian–Naxian marble trade.

Lygdamis’ treatment of the exiles’ confiscated land suggests that he was partial to economic gain, from these estates, the sculptures or otherwise, but not that he stimulated the Naxian sculpture trade. The fact that he allowed the Naxian nobility to dedicate the votives once they had bought them back shows that he had lost interest in their status at that point, perhaps because the impoverished elite was no longer a threat. He apparently considered their dedications harmless by then, if not earlier, too. In Athens, although many of Peisistratos’ opponents were apparently exiled, there is no evidence that the tyrant stopped anyone from offering even quite lavish sculptures, nor from setting up impressive grave monuments.\textsuperscript{521}

The unfinished votives which Lygdamis had confiscated were, according to Aristotle, placed in workshops, implying that the sculptors in question had set up shop at convenient locations. This was most likely near the quarry, where the statue was to be roughed out before transport. Once the mass was reduced as much as possible, it was brought to a port for further shipping, or set up at a local sanctuary or cemetery. Considering the travelling habits of archaic sculptors and the early development of Greek sculpture close to the sources of marble, it is probable that early-archaic sculptors worked intensively with the quarrymen. As will be discussed in the next chapter, travelling sculptors from the islands did not always stick with their original marble types. Especially later in the sixth century, as they went to work on the mainland or in the great pan-Hellenic sanctuaries, their signatures occur on statues in marble from various origins.

In the second quarter of the sixth century, the use of marble shifted from mainly insular to about half insular, half Attic (chart 3f). This development reflects the growing

\textsuperscript{521} Cf. for dedicants’ names below, ch. IV.4.
versatility of sculptors as well as the beginnings of an Athenian sculpture world whose sculptors resided locally. Their preference for working with a stone they knew well would never disappear, but became less pressing as the market grew for both private sculpture and for carving in large architectural projects, which involved working with whatever stone had been chosen for the building.\(^{522}\) Moreover, sculptors from Athens were trained in Attic marble in the course of the sixth century, while initially they may have gone to the islands to learn. Once this development started, the rise of Pentelic marble was merely a matter of time.

By the second half of the fifth century, the shift was complete. Sculptors no longer needed to visit quarries to fetch stone: during the dry season marble was brought to the city frequently as long as construction went on. What was left over from building projects could be bought, or one could order blocks to be fetched down with the building stone. The practice of pre-cutting statues in all likelihood became rarer in Athens, at the latest when quarrymen and carriers of Pentelic and Hymettian marble became used to delivering building blocks as a standard.\(^{523}\) Master sculptors may only have gone to the quarries if there was a special order requiring marble of exceptional quality or size, or simply if they wanted to keep an eye on things. It is interesting to realise that even if a block was not up to the expectations of the sculptor, transporters could probably easily sell it elsewhere for smaller commissions: in Athens, enough sculpture was going on to handle labour and supply loosely.

Similar conclusions can be drawn from the direct dealings of the Athenian state with contractors. Other poleis were eager to avoid liability, because there, it was not so easy to replace materials or a workforce. In Athens, sculptors, suppliers and carters – the artists and support personnel of this sculpture world – could afford to stay and make a living from making gravestones, votives and occasional commissions of architectural work. The marble for Athens was provided on a regular basis to the city from the Pentelic mountains, and by then only rarely from elsewhere.

Even though this explains the popularity of Pentelic in the later fifth century, it remains puzzling why such highly praised island marble as Parian, which continued to be exported to places like Delphi and Delos, was now practically absent from Athenian private sculpture. Only a handful of votives in Parian marble from the second half of the fifth century can be found. An explanation seems to offer itself in the history of Paros in the early fifth

\(^{522}\) See also below, n. 582.

\(^{523}\) For standardised architectural elements such as column drums or capitals, the practice was continued. See also Korres 1994, passim.
century. Shortly after the battle of Marathon, Miltiades set out on an ill-fated attempt to invade Paros, which according to Herodotos was thwarted by the Parians' ingenuity at building defences.\textsuperscript{524} The reason was supposed to be the help which a Parian trireme had offered to the Persians at Marathon; and true or not, the Parians certainly aided the Persians later on, during the final years of the Persian War.\textsuperscript{525}

Practically speaking, it is likely that the marble trade was hardly affected by such obstacles. Even the siege of the main port of Paros (presumably modern Paroikia) would not have interrupted the export of Lychnites which was shipped, after all, from Naoussa. In any case, Greek city–states rarely let diplomatic squabbles interfere with economic interests,\textsuperscript{526} except perhaps where essential supplies of war were concerned: grain, metal or shipbuilding materials. The Athenian campaign against Paros need not have been an impediment for the export of marble. If anything, after the Persian wars ended and the island became conscripted to the Delian League, they needed as much income as they could get for their high tribute fees.\textsuperscript{527} Nevertheless, the Athenians never again became as partial to Parian marble as they had been in the sixth century. Whether patriotism or convenience were more influential in this must remain undecided.

A noteworthy aspect of the evidence for marble types is the material of the bases, in particular those for bronze sculptures. As was discussed in the previous chapter, the supposition that bronze took over from marble for private sculpture in the course of the sixth century is too simple. Though bases for bronze votives start slightly later than those for marble dedications, they generally follow a very similar trend (table 1b, chart 1b). Of the 75 votive bases from the last quarter of the sixth century, 47 are in Pentelic marble. In the first quarter of the fifth century, 84 out of 88 are in this material. Marble from Pentelikon was thus readily used for bases, even at times when sculpture was mostly in insular marble. Perhaps this is an indication that sculptors and letter–cutters were not the same people, and the latter may have been local and used to working with pentelic marble, but this will be explored in the next chapter. From an economic point of view, it looks like patrons allowed the material for bases to be cheaper than that of the statues.

\textsuperscript{524} Hdt. 6.132–135.
\textsuperscript{525} E.g. Hdt. 8.67.
\textsuperscript{526} Illustrated by e.g. imports of Athenian pottery in Corinth during the Peloponnesian War: MacDonald 1982.
\textsuperscript{527} Cf. above n. 478.
Sixth-century patrons preferred Parian marble for sculpture in Athens, and so did the sculptors who worked there. A main reason for this is supposedly the luminous quality of the stone. And surely, Parian marble is beautiful; aesthetic appreciation must have played its part. Pentelic marble, on the other hand, was used for bases throughout the sixth century: therefore patrons and sculptors were aware that it was available and usable. Its quality offers no reason why sculptors would not have switched to Pentelic for their sculpture earlier. Pentelic would have been cheaper in transport, which they knew because they used it for bases. So, although the quality of Pentelic was satisfactory and it was less expensive, patrons still preferred marble from further away for sculpture, while using the local marble only for bases and pedestals. Had they wanted to drive display of expensive marble to the top, they could have chosen the precious island marble for the bases, too, but this was apparently not deemed necessary.

Technical aspects may well have influenced these choices as well. Pentelic marble is more suitable for carving inscriptions than Parian and especially Naxian, because of the shape of the crystals. The many documents which were carved in Pentelic in fifth-century Athens shows that letter-cutters were by that time at the latest familiar with this advantage of the local marble. Second, the improved infrastructure built for the mid-fifth century construction programme at Athens was a great impetus to the quarries in the neighbourhood. A third reason may lie in the composition of the letter-cutters and sculptors working in Athens in the sixth and fifth centuries. If the sculptors were mostly from the island, but those who carved and inscribed the bases were local, bases could almost be seen as a training ground on which the stoneworkers in Athens learned to carve their local marble. The investigation which this suggestion calls for will follow in the next chapter.

The numbers of those who worked in sculpture in Athens (or in related fields) must have increased over the sixth and fifth centuries. The evidence shows that changes in the materials of their sculpture develops parallel to wider patterns of demand and supply. From the middle of the sixth century onward, both the demand for stone and the expectations regarding its quality grew. As a result, the extraction, transportation and delivery of marble became a smoothly running operation, in which specialist tasks were performed by experienced craftsmen. This would not have occurred without the rise of architecture in marble. But as will be argued below, it is also unlikely that it would have occurred, at least in Athens, without the craze for marble votives or grave monuments. Between these two incentives for the marble trade, practices of quarrying and transport became increasingly specialised and professional.