Who were the pharaohs’ quarrymen?
Elizabeth Bloxam

The monumental statuary, pyramids, temples and other major structures made of stone are among the most arresting and well known of the cultural achievements of ancient Egypt. The production of these involved the quarrying, preparation, transport and skilled working of huge masses of very hard rock. How were such massive rocks quarried and by whom? How were the quarries of ancient Egypt organized? These are some of the questions explored here.

The pyramids, obelisks, colossal statues and temples of ancient Egypt are testament to an outstanding cultural heritage made of stone. Although much is known from the architectural and building achievements behind such monuments, the actual quarries from which the stone is derived are mainly the forgotten archaeological sites. The logistical and technical feats involved in quarrying and transporting large quantities of stone, sometimes over distances as great as 1,000km, and the social organization behind these activities, have been poorly understood.

Recent archaeological research of three major quarries in Egypt at Widan el-Faras, Chephren’s quarry and Gebel Gulab (Fig. 1), exploited between the third and second millennia, has produced new perspectives into stone-quarrying techniques and the social organization underlying these activities.1 Consumption of stone extracted from these quarries was mainly for elite purposes. Widan el-Faras in the northern Faiyum Desert supplied the basalt used on mortuary-temple floors in some of the Old Kingdom2 pyramid complexes (Fig. 2). Chephren’s quarry near Abu Simbel is the source of the famous blue Chephren Gneiss used for royal statuary and vessels of the Old Kingdom (Fig. 3), and Gebel Gulab in Aswan was the source of silicified sandstone (often termed quartzite) appropriated in the New Kingdom3 mainly for obelisks and statues.

The written sources

In general, knowledge of the social organization and logistics behind stone quarrying in Egypt has mostly been derived from written records and iconographic depictions of the process. Typically these come from the second millennium (Middle Kingdom) quarry inscriptions in the Wadi Hammamat region of the Eastern Desert. One such expedition, which Senusret I ordered to acquire greywacke for sphinxes and statues, records over 18,000 people being involved and organized along strict hierarchical lines.4 In the tomb of the noble Djehutihotpe (Middle Kingdom) at Deir el-Bersha,5 the depiction of his colossal statue being drawn from the travertine quarries at Hatnub on a sledge by almost 200 people (Fig. 4) is often used to explain how stone was transported from quarries. Yet, can these written and iconographic sources be taken as a literal explanation of the quarrying process? Can such large numbers of unskilled workers, strict hierarchies and logistics be perceived in the archaeological record in the quarry sites? Was large-scale quarrying achievable only if centrally organized by the state?

Quarrying techniques: skilled practice?

Quarrying of hard stones, such as granites, gneisses, silicified sandstone and basalt, prior to the Roman period (when tools made of metal took precedence), was an undertaking of immense skill that was mainly accomplished using stone tools and fire. The use of fire as a primary extraction technique and to remove the outer weathered surface of granites, silicified sandstone and gneisses, is evident at Chephren’s quarry, Gebel Gulab and the Aswan granite quarries.6 The fires were skilfully concentrated and targeted by being enclosed by mudbricks, which focused the heat. At the Aswan granite quarries, evidence of fire setting can be observed from the stratigraphies of charcoal, burnt pieces of stone, and fired bricks. Fire setting to extract the large boulders of Chephren Gneiss is also implied from the large deposits of charcoal found inside the extraction sites and in the surrounding spoil heaps. Further shaping of blocks into rough objects combined the use of fire and trimming with stone pounders; the marks left by these tools are still clearly visible.

A geological awareness of the stones’ properties can also be attested in many instances in the quarries. At Widan el-Faras the basalt quarries are located along the top of an escarpment, 300m above sea level, meaning that extraction required almost

Figure 1  Egypt, showing ancient quarries mentioned in the text.
acrobatic skills, as the stone had to be worked from the edge of the escarpment back into the deposit (Fig. 5). Yet, this part of the deposit seems to have been specifically selected because of the highly fractured nature of the stone making it easy to wedge out blocks not larger than 1 m³, the average size used to pave the temple floors. Reducing the amount of block working after extraction seems to have been an important consideration of the quarrying stage, as evidence of further trimming is minimal. Stone tools found in the quarries comprised mainly large and small stone axes, with contracted necks making it possible to attach a handle. Presumably, these tools were used in one or more of these extraction stages. It is interesting to note that all the tools would have been transported to the quarries over quite large distances, as they are of especially hard materials, such as gabbro, gneiss and diorite, which have sources 800 km to the south in the Aswan region.

Forethought to the final crafting process and to the aesthetic appearance of the final product is exemplified at Chephren's quarry, because discarded blocks and partially worked objects seem to have been abandoned if they had been penetrated by unsightly pink granitic veins. These veins are zones of weakness that make the stone more susceptible to fracturing during the stages of final crafting and are never seen in finished objects. The finishing of objects in the quarries seems to be dependent upon how far the stone had to travel to the Nile. At the Aswan granite quarries, which lie directly on the Nile, objects seem to have been almost completed in the quarries. The famous unfinished obelisk and New Kingdom Osirid statue, which still lie attached to the bedrock, are such examples (Fig. 6).

In quarries outside of the Nile Valley, evidence from discarded objects suggests that they were completed only partially to form rough outlines of their intended final form, probably to reduce the transport weight (Fig. 7).

**Logistics: roads, ramps and harbours**

Transport infrastructure in quarries can vary according to the nature of the ground surface and steep descents over which the stone had to travel on its journey to the Nile. At Gebel Gulab there is an intricate network...
proximity of these raw materials. The environs surrounding the terminus of the road at a quay are situated within a natural inlet, probably utilized as a harbour at a time when the levels of Lake Moeris were at 22–23 m above sea level. Although determining the levels of the Nile flood during the Old Kingdom still remains controversial, there is indirect evidence to make a correlation between high Nile floods and the transport of basalt on a large scale to the pyramids on the Giza Plateau at this time. Moreover, basalt is not exploited on such a large scale again in the pharaonic period or even by the late Old Kingdom, when records suggest low Nile floods. Black limestone, probably more locally procured, replaces basalt in the Sixth Dynasty mortuary temple of Pepi I.

The archaeological problem still remains as to what type of vehicle was used to transport the stone along the roads at Widan el-Faras and Gebel Gulab, as no trackmarks are visible on the surfaces. Yet at Chephren’s quarry, where no paved roads were constructed, excavation to the base of two loading ramps in the Old Kingdom quarries revealed deep and wide tracks cut into a hard calcrite surface immediately in front of them, suggesting that a vehicle other than a low-lying sledge (as depicted in the iconography) was used (Fig. 9).

Size of labour force and hierarchies

It would be anticipated that large settlement areas and hierarchical structures would exist at the quarries, particularly if the large labour forces described in the written sources were to be accommodated. Yet, such features have not been found in any of the quarries studied. An encampment at Widan el-Faras, consisting of six highly weathered basalt stone circles, is the only evidence of habitation at the basalt quarries (Fig. 10). These single-level stone features were either supports for windbreaks or were tent footings for temporary dwellings. A hearth and plentiful amounts of charcoal were found and small surface scatters of pottery dating between the Fourth and Fifth Dynasties, consistent with the peak in exploitation of Widan el-Faras basalt. The encampment’s small size suggests that between 20 and 25 people could have been accommodated here.

At Chephren’s quarry a similar situation has been observed with only two camps,
New Kingdom paved road at Gebel Gulab, Aswan.

located 4 km apart along the ancient track leading from the quarries to the Nile, constituting dwellings for no more than 25 people. Each camp comprises a semicircular dry stone wall 1.5 m high by 70 cm thick; partial excavation revealed that a third of each camp was devoted to food production, in particular that of breadmaking. Breadmoulds dating between the Third and Fifth Dynasties formed the bulk of the pottery and were found more or less where they were left 5,000 years ago, embedded in a thick ashy layer. Wells to a depth of 1 m below the ground surface are associated with each camp, implying that water, vital for the labour force, was easily accessible. The shallowness of the wells has important implications for the climatic conditions that prevailed during the Old Kingdom exploitation and could indicate seasonally wetter conditions.

Who were the quarrymen?

There are clear discrepancies between how the written and iconographic sources portray raw-material acquisition when compared with the archaeological evidence at the rock sources. A high visibility of the state, deploying large labour forces to extract stone within high levels of social organization, cannot be archaeologically attested. A problem then arises when the quarrying process shows skilled practice, as described above, but undertaken by small groups within low levels of social organization.

If the Middle Kingdom quarry inscription of Senusret i in the Wadi Hammamat is examined more carefully, the actual number of people designated with the title “stoneworkers” is only 100, with another 100 designated as “quarrymen.” Hence, actual quarrymen are a mere 200, or less than 10 per cent of the very large detachment of 18,628 people listed in the inscription. If this relatively small number of quarrymen is compared with the archaeological record at Widan el-Faras and Chephren’s Quarry, the gap between the numbers mentioned in the inscription becomes closer to the archaeological data. It could be argued that the quarrymen were in fact small groups of specialists, rather than a motley crew of unskilled workers. These groups, loosely structured around kinship ties within well developed social identities, might explain the evidence for skilled transmitted practice. In Mesoamerica, where stone acquisition played an important part in the centralized state of Teotihuacán in the Classic Period, research of quarry sites has similarly emphasized the role of kin groups in the quarrying process.

Quarrying for high-status objects in hard stone during the third and second millennia seems to have been campaign-based for specific purposes, given the standardization of object blanks, seen particularly at Chephren’s quarry. Perhaps the deployment of specialists was more regionally based and not necessarily from central administrative or royal capitals. Maybe the northern Faiyum could have been one such regional base, because the stone tools used in the quarries at Widan el-Faras, as well as the nearby Old Kingdom gypsum quarries at Umm es-Sawan, can be sourced to Aswan and Chephren’s quarry, some 1,000 km away (Fig. 1). This could imply a connection between the Old Kingdom stoneworkers, either through trading between specialists of prized stone tools, or alternatively the northern Faiyum was a centre where such people resided and from where they were deployed.

Understanding the social and organizational dynamics behind ancient quarrying, and also the role of the state in such activities, are still a continuing field of research, as many important questions remain to be answered. For example, the quarry inscriptions raise some questions, including what symbolism and ideology were attached to the quarrying campaigns, and what the intended audience for these inscriptions was.

Quarries under threat

The significance of quarries as archaeological sites that can enhance our understanding of the technologies and social context of stone procurement in antiquity has been greatly undervalued. In the Eastern Mediterranean as a whole, ancient quarry sites are mostly invisible, undocumented and unprotected, and are being destroyed by activities such as modern development and quarrying. An EU-funded...
The QuarryScapes project titled QuarryScapes, in which the Institute of Archaeology (UCL) is a partner, brings together professionals from academic and other institutions in Egypt, Jordan, Turkey, Belgium, Italy and Norway, to focus specifically on the documentation, conservation and heritage management of these fragile archaeological sites.

Notes
1. Tom Heldal and Per Storemyr have been inspirational colleagues in the field surveys of these quarries, especially with regard to the technical aspects of this work. Thanks also to Thilo Rehren and Stephen Quirke for valuable input into aspects of this research from technological and Egyptological perspectives respectively. Fieldwork colleagues: lan Shaw (director, Chephren’s Quarry Project), Richard Lee, Richard Jones, Adel Kelany, Angus Graham, Judith Bunbury and Ashraf el-Senussi have also contributed greatly. I gratefully acknowledge the support and cooperation of the Supreme Council of Antiquities: Zahi Hawass, Magdy el-Ghandour, Hossam el-Din Ali and Moei el-Din Mustapha. Many thanks also to the Leverhulme Trust for funding my postdoctoral research.

2. Outline chronology of pharaonic period Egypt: Old Kingdom (c. 2630–2150) Third–Sixth Dynasty; Middle Kingdom (c. 2040–1762) Eleventh–Twelfth Dynasty; New Kingdom (c. 1570–1070) Eighteenth–Twentieth Dynasty.


8. See Bloxam & Storemyr 2002 (n. 6 above).


11. Calcrete, sometimes termed “duricrust”, is the case-hardened crust of soil formed in semi-arid climates by the cementation of gravel and other residual deposits by calcium carbonate.

12. For more information on excavations of the loading ramps at Chephren’s quarry and discussion about the vehicle used to transport statue blocks to the Nile, see E. G. Bloxam, “Transportation of quarried hard stone from Lower Nubia to Giza during the Egyptian Old Kingdom”, in Current research in Egyptology 2000. A. McDonald & C. Rigg (eds), 19–27 (Oxford: Archaeopress, BAR International Series 909, 2000); also see I. M. E. Shaw & E. G. Bloxam “Survey and excavation at the ancient pharaonic gneiss-quarrying site of Gebel el-Ast, Lower Nubia”, Sudan and Nubia 3, 13–20, 1999.

13. See Bloxam & Storemyr 2002 (n. 6 above).


16. See Coury & Montet (1912) and Goyon (1957) in n. 3 above.


18. The QuarryScapes project was designed by Elizabeth Bloxam, Tom Heldal and Per Storemyr, and further information about it can be obtained from the website: www.querystapes.no.