

SUDAN & NUBIA

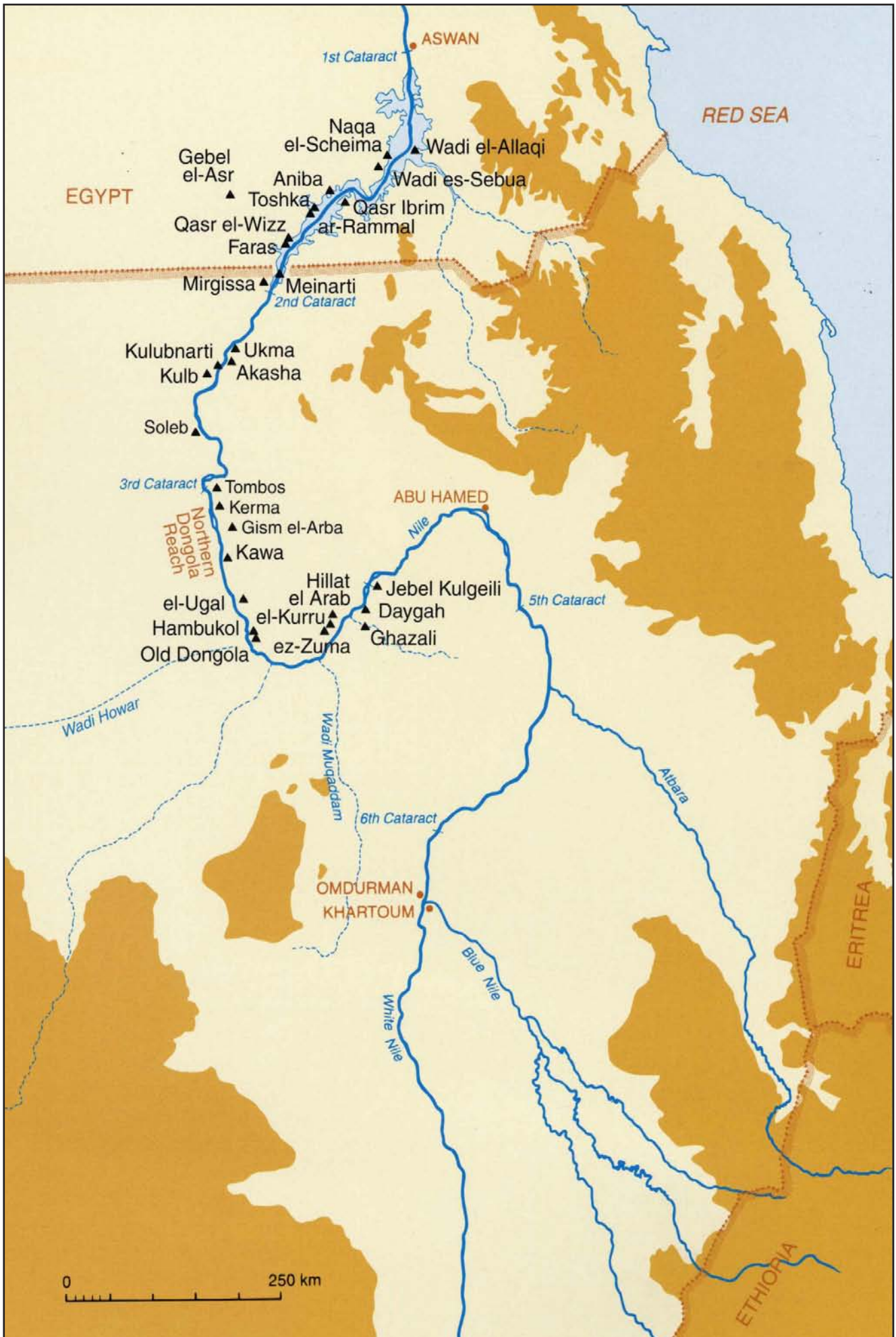
The Sudan Archaeological Research Society



Bulletin No. 3

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SUDAN & NUBIA

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Front Cover: Temple of Amenophis III at Soleb visited by
F. W. Green in 1909 (Photo D. A. Welsby).

Introduction

As the contents of this year's issue clearly demonstrate, *Sudan & Nubia* goes from strength to strength with a developing international profile. The Society's own work in the Dongola Reach is represented by two papers; the first, based on the analysis of human remains, provides fascinating insights into living conditions during the Kerma Period (Judd); the second outlines progress on the continuing research into the geomorphology of the region (Treves *et al.*). A complementary project, carried out in the same region by a French Expedition, has among other things identified a rare native settlement dating to the period of Egyptian conquest (reported on by Gratien). At Kerma itself, exciting new work, uncovering remains of the Napatan and Meroitic Periods, is dramatically extending the history of the site (Salah Ahmed), while of equal importance historically are the results from Hillat el-Arab (near Gebel Barkal), a cemetery with elite burials of the New Kingdom and very earliest Kushite Period (Vincentelli). Research into quarrying and stones receives fresh impetus from work at Gebel El-Asr in Lower Nubia (Shaw and Bloxam) and in Tombos and Daygah at the Third and Fourth Cataracts respectively (Harrell). Surveys in the latter region, threatened by a new dam, are confirming its great archaeological potential (Abdel Rahman and Kabashy Hussein). Among other possibilities, sites in the Abu Hamed Reach can be expected to shed important new light on Nubian monasticism, until recently a neglected subject (Julie Anderson). Further north, Qasr Ibrim, which has long been partially submerged, continues to repay the Egypt Exploration Society's commitment under difficult circumstances (John Alexander). Far from the Nile Valley, museum basements can also be a source of significant 'discoveries' (Wardley and Davies), as may unpublished archival material and archaeological diaries (Welsby Sjöström).

During the course of the year, SARS suffered a serious blow with the passing of its distinguished President, Sir Lawrence Kirwan. Larry was a source of encouragement, support and inspiration for us all. We salute his memory and his contribution to Sudanese and Nubian archaeology (see Obituary, by Harry Smith). We also regret the loss of Prof. Jack Plumley, a specialist in Christian Nubia, who for many years directed the EES excavations at Qasr Ibrim (see Obituary, by John Alexander).

Ancient Stone Quarries at the Third and Fourth Nile Cataracts, Northern Sudan

James A. Harrell

Introduction

Sandstone was the principal building material used for ancient temples and pyramids between the Third and Fourth cataracts on the Nile River in northern Sudan. It is a relatively soft stone, making it easy to quarry and carve, and is also widely available. It is for these attributes, rather than any aesthetic qualities, that sandstone was so popular. However, when appearance and durability were important, such as for royal statues, stelae, altars and sarcophagi, harder stones were preferred. Hardstones were brought into Kush from Egypt during the 18th Dynasty, and these were the familiar pink granite and black granodiorite from the Aswan quarry. The same two stones were again imported into Kush during the 25th Dynasty but not afterwards.

Other hardstones came from the Nile cataracts in northern Sudan. The Tombos quarry, at the south end of the Third Cataract, supplied granite gneiss and granite, and the Daygah quarry, at the western end of the Fourth Cataract, yielded another variety of granite gneiss (Fig. 1). Both quarries were active during the 25th Dynasty and subsequent Napatan and Meroitic periods, but Tombos was also worked in the 18th Dynasty. Together these two quarries provided

nearly all the indigenous hardstones used between the Third and Fourth cataracts, with the majority of the material coming from Tombos.

Tombos quarry

The existence of an ancient quarry at Tombos has long been known, but its many visitors focused only on the unfinished statue lying within the quarry and the several nearby 18th Dynasty rock-cut inscriptions (e.g., Cailliaud 1826, 233-235; Hoskins 1835, 213-218; Lepsius 1853, 234; Breasted 1908, 45-48; Dunham 1947; Edwards and Osman 1992, 17-26). Almost nothing had been reported on the quarry workings themselves or the stones they produced, and this was the impetus for the author's visit to Tombos in 1996 (Harrell 1999). The name Tombos may be of ancient origin. Macadam (1955, 241) suggests that it is derived from *T3 3t nt Pr-nubs*, meaning "the beginning of Pnubs", the Kushite nome that included the stretch of Nile Valley between the Third Cataract and Dongola with its capital at Tabo.

The Tombos quarry includes workings on the East Bank just north of Tombos Sharq village (sites A-C), on the adjacent Tombos (site D) and Dabaki (sites E-F) islands, and on the West Bank in the North Akkad district (Fig. 2). The West Bank workings (designated UCLA 97/84 on the map) were discovered by Stuart Tyson Smith (University of California at Santa Barbara), Bruce Williams (University of Chicago) and Julie Anderson (Royal Ontario Museum) during the 1997 Dongola Reach Survey sponsored by the University of California at Los Angeles. The main part of the Tombos quarry is on the east side of the Nile and is centered at about 19° 42.8' N, 30° 23.3' E.

The quarrying areas shown in Figure 2 do not represent continuous excavations but rather places where there are small (typically 5-10m across), scattered and disconnected workings. Those on Tombos Island (site D) supplied granite with a uniform, medium-grained texture (grains up to 4mm across with most less than 2 mm) and moderate gray colour (Colour Plate X). All except one of the other workings (site B) produced a very different-looking stone, known as gneiss, which has a larger grain size (up to about 10mm) and alternating, often contorted, bands (a few millimetres to a few centimetres thick) of pink, light gray and black minerals (Colour Plate XI). Compositionally, this stone varies from granodiorite gneiss to predominately granite gneiss, but to simplify the terminology, only the latter rock name will be used here. The petrological nomenclature used throughout this paper is consistent with the widely adopted IUGS rock-classification system (Streckeisen 1973), and is based on mineral percentages obtained from thin-section point counts of rock samples collected from the quarries. Granite like that on Tombos Island also occurs on the East Bank, but the only evidence of quarrying is on the north edge of Tombos Sharq village (site B) where there is a single, well-chiseled block of a pink variety of the granite.

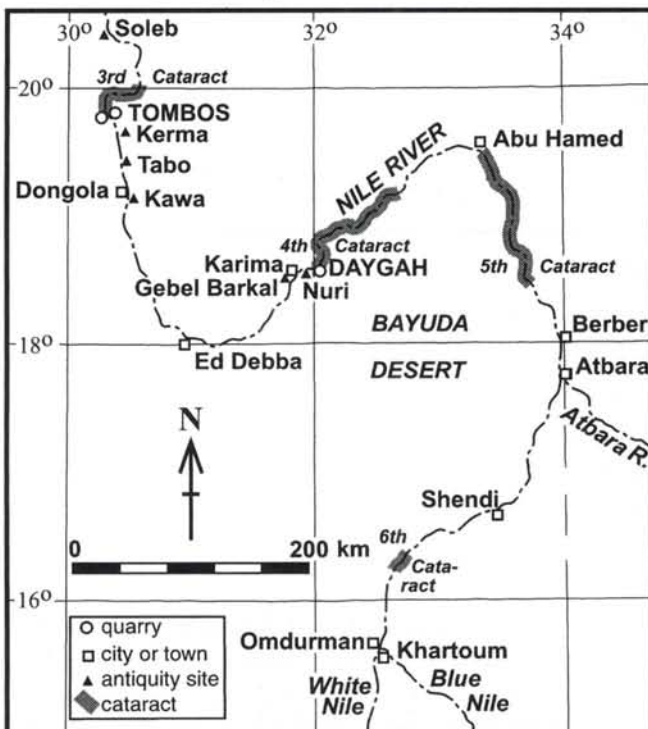
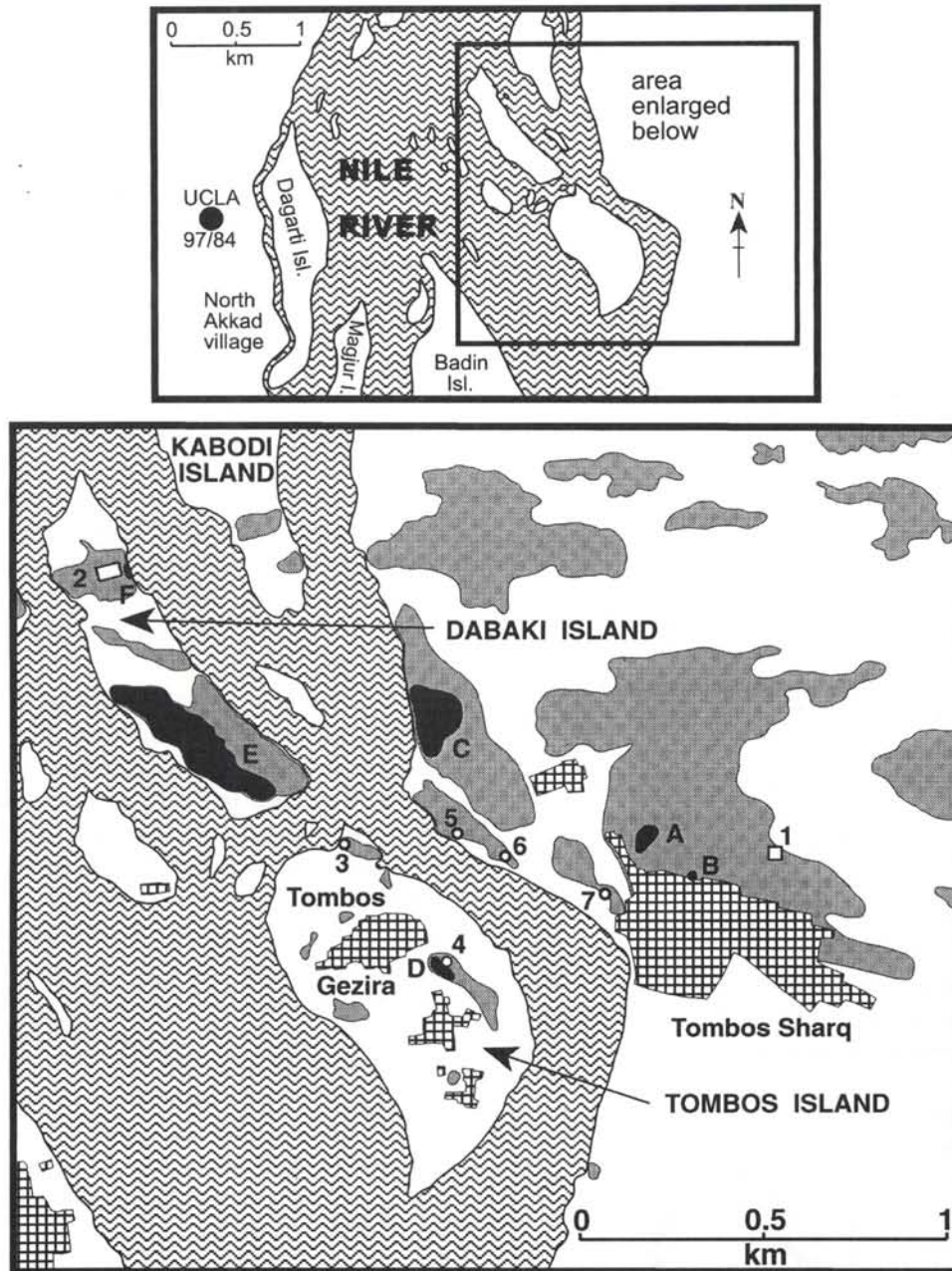


Figure 1. Map of a portion of northern Sudan showing the localities mentioned in this paper.



LEGEND







-  modern village or buildings
-  outcrop of granite gneiss and/or granite
-  alluvial sediment or wind-blown sand
-  area with ancient quarry workings (A-F)
-  18th Dynasty cemetery (1) and fort (2)
-  18th Dynasty rock-cut inscriptions (3-7)

Figure 2. Map of the Tombos quarry.

The age of the Tombos quarry is well established from the many objects made from its stones: statues, stelae and altars from the Soleb, Tabo, Kawa and Gebel Barkal temples, and sarcophagi and stelae from the Nuri necropolis (for more information see Harrell 1999). For example, objects examined by the author include those dedicated to the 18th

Dynasty kings Tuthmosis III and Amenophis III, the 25th Dynasty king Taharqo, and later Napatan and Meroitic kings Anlamani, Aspelta, Siaspiqa and Tanyidamani. Tombos also produced the granite gneiss used for the two largest stone objects ever quarried in ancient Sudan, the colossal statues (about 7m high) of the gods Sebiuemker and Arensnuphis

from the Tabo temple and now in the Khartoum Museum (no. 23983). These are of uncertain age but were almost certainly carved sometime during the first three centuries BC. Within the quarry itself (site A) lies another colossal statue (3.85m high) that is uninscribed but otherwise finished except for the uncarved and broken head (Colour Plate XII). It has been dated, on stylistic grounds, to the 25th Dynasty (Dunham 1947, 64-65). Based on the objects known to have been carved from the two Tombos stones, it is evident that the quarry was active during the 15th to 14th and 7th to 1st centuries BC with the peak activity from the early 7th to mid 5th centuries BC. Consistent with the earliest activity at Tombos are the presence within the quarry of ten 18th Dynasty rock-cut inscriptions (all concerned with matters unrelated to quarrying) dating to the reigns of Tuthmosis I, Tuthmosis III, Amenophis II and Amenophis III (sites 3-7), and also an 18th Dynasty cemetery (site 1) just east of the quarry and a fort (site 2) of possibly the same age on Dabaki Island (Edwards and Osman 1992, 18-29; Harrell 1999). Quarrying at Tombos may actually predate the 18th Dynasty if Reisner (1923, 7, 24 and 45) is correct in his assertion that Tombos stone was used for some Kerma II-IV phase objects (17th-16th centuries BC) from nearby Kerma.

Granite gneiss is the predominant rock type in this part of the Third Cataract region with granite occurring only as veins cutting through the gneiss (Hume 1934, 38-39; Hume 1935, 337 and 485-486; Vail *et al.* 1973, 7-14). Outcrops of these stones occur at Tombos both as attached bedrock masses and as piles of large, loose boulders resting on top of bedrock. Both occurrences were quarried as indicated by lines of wedge-shaped holes cut into the bedrock, and accumulations of rock chips produced by dressing boulders and extracted bedrock blocks. The holes are rectangular in plan view and trapezoidal (tapering downward) in cross section, and have well-rounded edges and corners (Plates 1

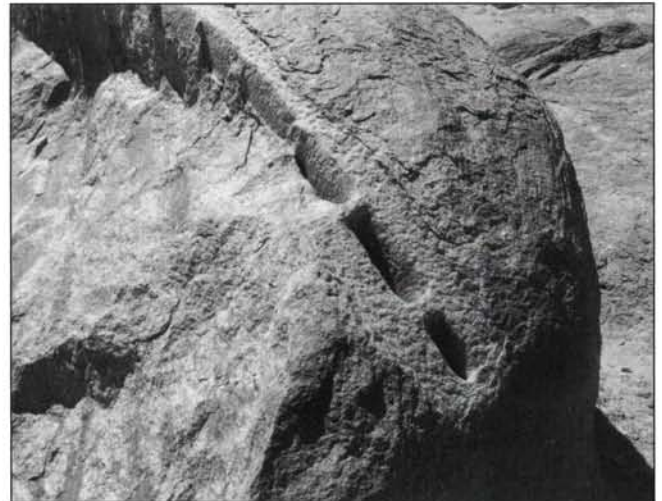


Plate 1. Wedge-holes in the granite gneiss of the Tombos quarry (site A in Fig. 2).

and 2). Overall, they range in size from 80-270mm long (parallel to the line of holes) and 30-40mm wide at the top by 50-120mm deep and 20-30mm wide at the bottom, and are separated from adjacent holes by 30-50mm. On any one line, however, the holes are of relatively uniform width, depth and separation but commonly vary in length. The holes were cut to take iron wedges which, when hammered, split the rock (see a later section for further discussion of the iron-wedge technology). All the wedge-hole lines in the quarry are oriented so as to cause only vertical fracturing. The lines commonly range in length between 3.5 to 5.5m with the longest observed at 6.5m long. Where the outcrops had an outer weathered layer, this was first chipped away to produce a shallow trough exposing fresh rock at its bottom, and it was into this that the wedge holes were cut (Plates 1 and 2). At site C rounded pits (200-300mm wide and deep) were cut along one side of a 5.3m-long wedge-hole line and these

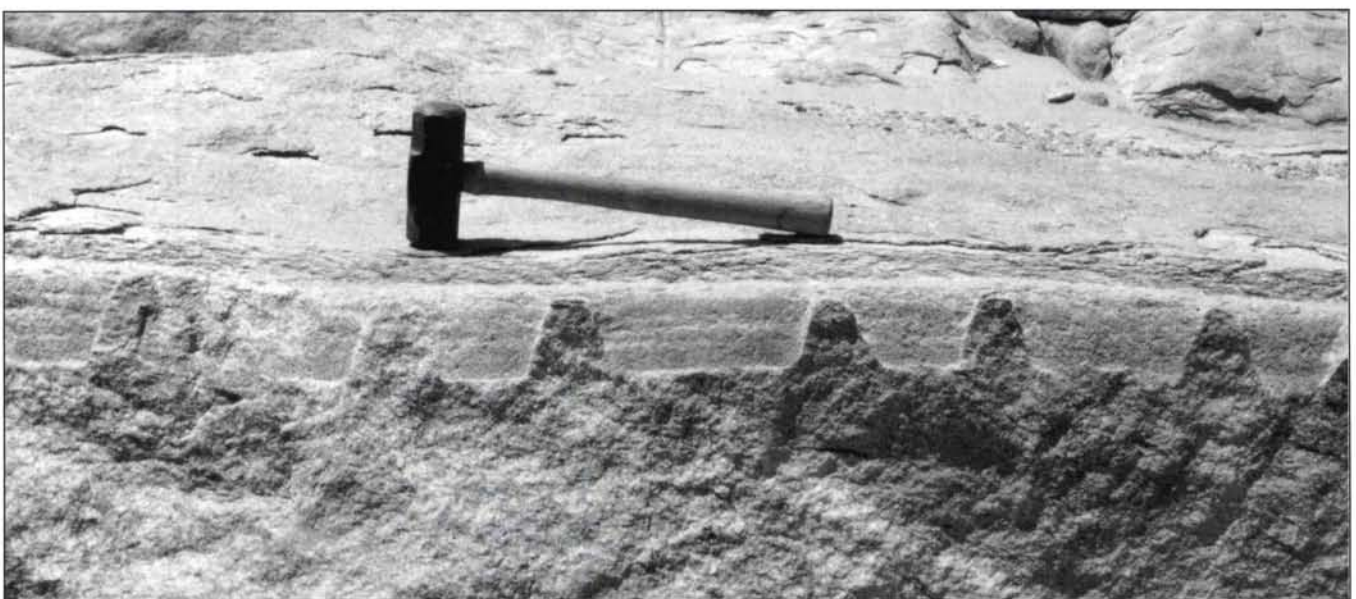


Plate 2. Wedge-hole cross sections in the granite gneiss of the Tombos quarry (site C in Fig. 2).



could only have been for the insertion of levers, probably wooden poles, which would have been used to separate the block from the bedrock after the wedges split it (Harrell 1999).

Daygah quarry

Until visited by the author in 1997, the Daygah quarry had never been described or precisely located. The only previ-

ously published reference to it is Reisner's (1923, 24) passing mention of the "granite quarries of Bellal, south of Nuri" (i.e., upriver). The quarry is actually located 3.2km east of Nuri, in the El Ballal district, and on an outcropping of rock known locally as Daygah (18° 33.8' N, 31° 56.8' E; Fig. 3). The name Daygah means "the narrows" and refers to the narrowing of cultivatable land where the crystalline bedrock extends all the way to the river.

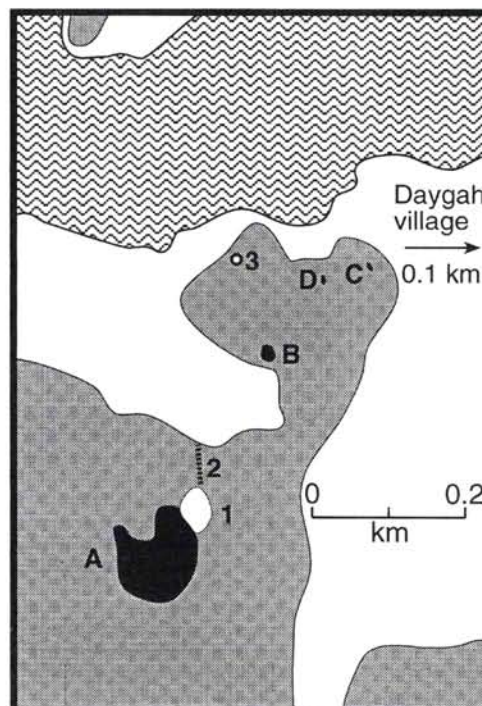
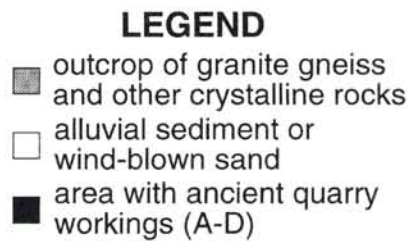
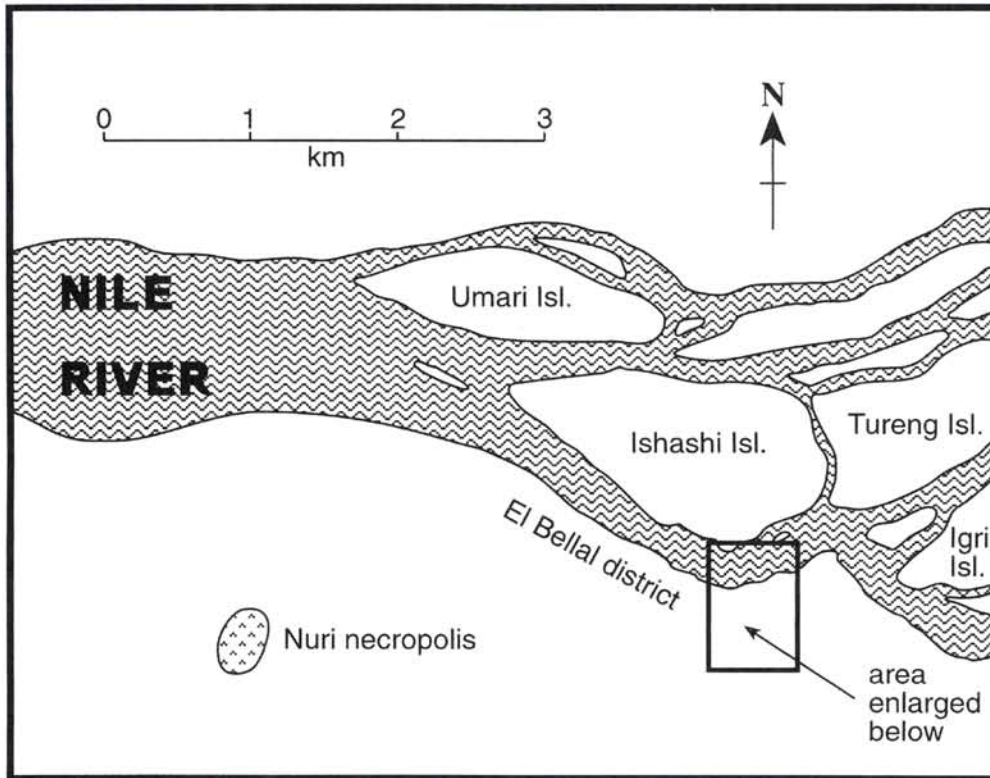


Figure 3. Map of the Daygah quarry.

As at Tombos, the individual workings are small and scattered, and are indicated by both wedge-hole lines (Plates 3 and 4) and accumulations of rock chips. Only one type of stone was extracted and this is a gneiss that has a medium-grained texture (grains up to 5mm across with most less than 2mm) and varies compositionally from granodiorite to predominantly granite (Colour Plate XIII). Although in these respects similar to Tombos granite gneiss, the Daygah stone looks very different. It lacks compositional banding and instead the metamorphic foliation, which defines the stone as a gneiss, is manifested as parallel streaks of lighter and darker minerals. From a distance, the stone appears dark gray or even black.

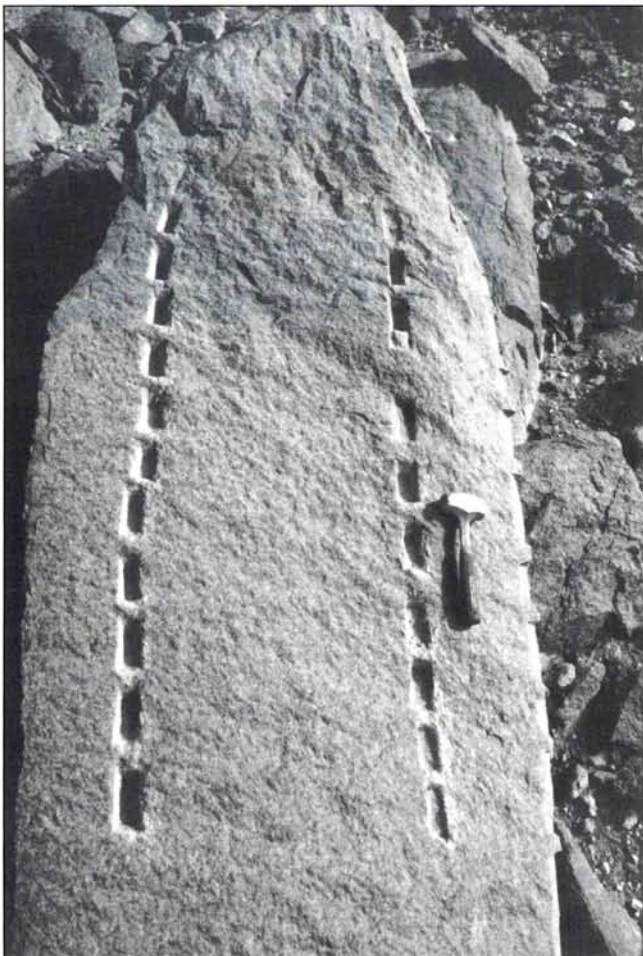


Plate 3. Wedge-holes in the granite gneiss of the Daygah quarry (site A in Fig. 3).

The wedge-hole lines commonly range from less than 1m to 3.5m in length with the longest spanning 5m. As at Tombos, the lines are straight with the holes sometimes cut at the bottom of shallow troughs. All lines are oriented for vertical fracturing and, in places, pairs of lines intersect each other at right angles. The holes have the same shape, and similar ranges in dimensions and separation as at Tombos, but are somewhat more consistent in size with lengths of 90-100mm and depths of 50-70mm predominating. At two sites within the quarry (B and D) there are large chiselled-

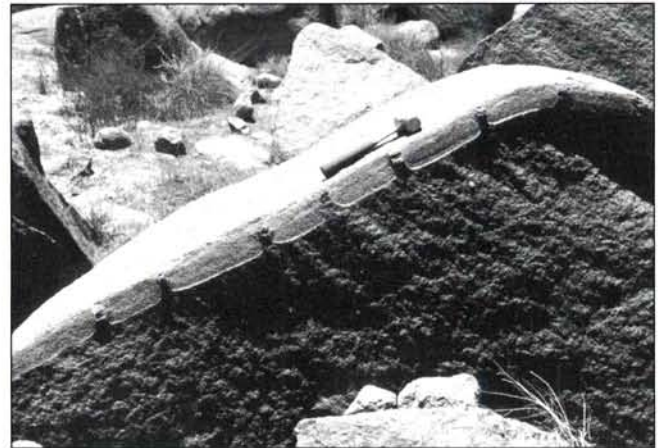


Plate 4. Wedge-hole cross sections in the granite gneiss of the Daygah quarry (site B in Fig. 3).

out trenches (150-200mm wide, about 100mm deep and 700-800mm long; Plate 5) that are very different from the shallow troughs cut elsewhere to get through the weathered outer layers of stone. Perhaps these are aborted attempts at quarrying by trenching rather than by wedging?

The Daygah quarry is much smaller than the one at Tombos, and the number of objects made from its stone are

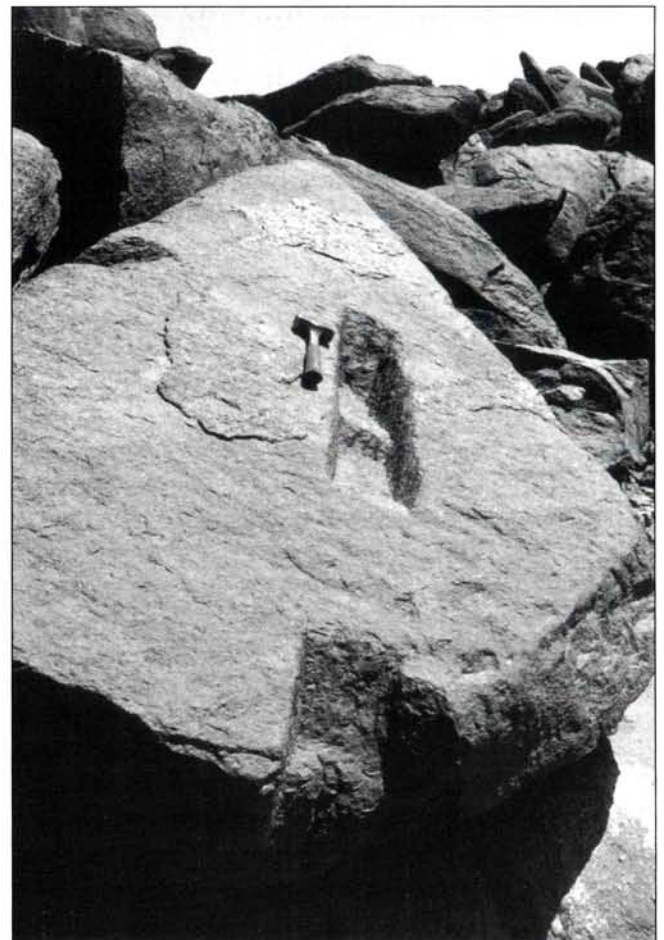


Plate 5. Chiselled trenches in the granite gneiss of the Daygah quarry (site D in Fig. 3).



correspondingly fewer. Those examined by the author include, from Gebel Barkal, colossal statues of kings Senkamenisken (Boston MFA 23.731) and Aspelta (Boston MFA 23.730), a large altar of king Atlanersa (Boston MFA 23.728), stelae of kings Piye (Cairo JE48862) and Aspelta (Cairo JE48866), and several small objects dating from the 4th to 2nd centuries BC (all in the Boston MFA). The Atlanersa altar is especially notable because its inscribed text refers to the Daygah granite gneiss (Reisner 1918, 105) as *m3t* or *matj*, which is usually translated as “granite” because it was commonly applied anciently to the Aswan granite (Harris 1961, 72-74). Still *in situ* at Gebel Barkal and also of Daygah stone are the large, broken altar of king Piye and a few column bases in the Amun temple and, in a nearby shrine (Reisner’s Temple B700), a smaller altar of uncertain but probably Meroitic date. From Nuri comes an offering table of king Atlanersa, a baboon of king Taharqo and a offering basin of Saasarqa (an otherwise unknown individual, probably from the Napatan period), all now in the Khartoum Museum, and a funerary stela of queen Batahaliye (4th century BC; Boston MFA 21.3231). Based on these objects, it appears that the Daygah quarry was active from at least the 8th to 2nd centuries BC with peak activity perhaps during the mid 8th to early 6th centuries BC. The onset of quarrying here may thus predate by a few decades the reactivation of the Tombos quarry in the 25th Dynasty.

The only carved object found in the Daygah quarry (site A) is a fragment of an offering basin similar in size and form to that of Saasarqa in the Khartoum Museum. No inscriptions were found in the quarry, but a relief of sorts was discovered on the upper surface of a large, flat-topped boulder of granite gneiss (site B; Plate 6). On the same surface are also some cut grooves and one of the two large chiselled-out trenches mentioned earlier. The relief resembles the double crown of Upper and Lower Egypt but differs in some important details. It cannot be a graffito intended for others to see because it is not visible to anyone standing on the ground beside the boulder. A large, flat, sand-covered area (site 1) beside the main workings (site A) probably served as a workshop and staging area for the quarry. Leading from it to the alluvial floodplain below are traces of what may be an ancient slipway (site 2) along which the stone was moved on its way to the river.

The granite gneiss in the Daygah quarry is cut by numerous veins of a very coarse-grained rock known as granite pegmatite, and in many places these have been excavated to depths of up to about 1m. This was not for the quarrying of stone blocks but rather for the extraction of either muscovite mica (which is common at Daygah) or gold (which sometimes occurs in such pegmatitic rocks). The age of the granite pegmatite workings is unknown. At one site (3), where an especially thick vein of granite pegmatite occurs, there is a great accumulation of chippings which gives the impression that this stone was actually quarried for blocks. There are, however, neither bedrock wedge-holes here nor known

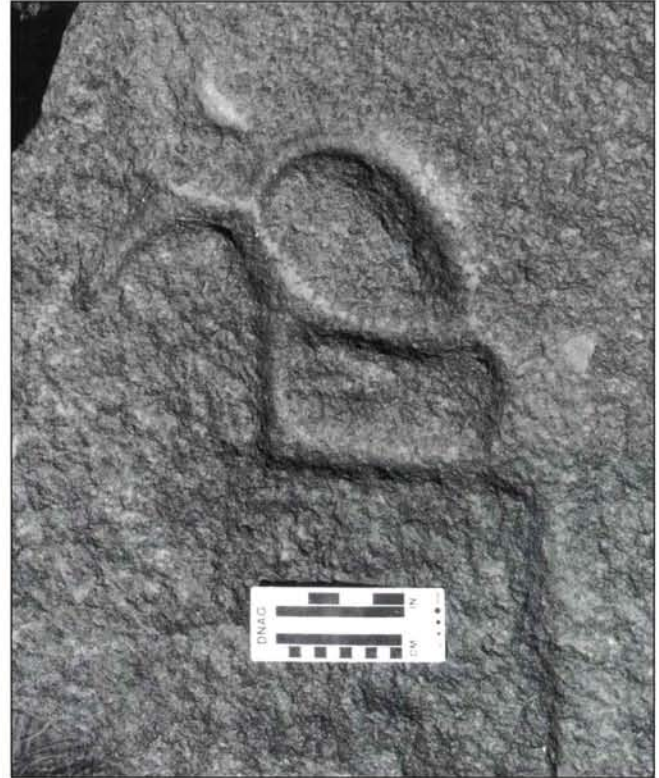


Plate 6. Relief carved into the granite gneiss of the Daygah quarry (site B in Fig. 3).

objects made from this stone.

Quarrying technology

Throughout the ancient world, wedge-shaped holes in quarries are an indication that iron wedges were used to split the stone. The quarrying process was as follows: a series of holes was cut along a straight line, and wedge-shaped pieces of iron were then set into the holes and hammered until the stone broke along the line of holes. As has been done in recent centuries, wooden or iron “feathers” may have been placed on each side of the wedges to increase the splitting force but so far their use in antiquity has not been documented. Many early writers have suggested that the holes were cut for wooden wedges which, when wetted, expanded and split the stone. It has now been amply demonstrated that wedge-holes of the size, shape and spacing seen at Tombos and Daygah could only have been intended for iron wedges (Vandeput 1987-88; Waelkens *et al.* 1988, 103-106; 1990, 62-65). The fact that some of the holes are cut into the steeply sloping sides of outcrops (e.g., Plates 1 and 4) is a further indication that they were never intended to hold water.

The first evidence for the use of iron wedges is found in Greek quarries and dates to the early 6th century BC (Waelkens *et al.* 1990, 62-63), but the technology may have originated as much as a century earlier. This period corresponds to the first widespread smelting and utilitarian use of iron in the Eastern Mediterranean region. The earliest docu-

mented use of iron wedges in Egypt is mid-4th century BC (Harrell and Brown 1999) but the technology probably arrived by the end of the 26th Dynasty (late 6th century BC) when Egypt had close commercial ties to Greece. The technology could also have been adopted in Sudan at this same time but its importation may have been delayed until the late 5th or early 4th century BC when Kushite iron working first became commonplace (Shinnie and Kense 1982, 19-21).

Prior to the advent of the iron-wedge technology, hardstones were quarried with hand-held stone mauls. As can still be seen in the Aswan and other Egyptian quarries, the mauls were used to pulverize the bedrock and in so doing excavate trenches and produce leveled or shaped surfaces (Clarke and Engelbach 1930, 26-30; Röder 1965, 479-492; Arnold 1991, 36-40). The distinctive traces left by such activity are not seen on the bedrock outcrops at Tombos and Daygah. This suggests that the earliest quarrying at these sites, during the 18th and 25th dynasties, was done on loose boulders where such activity would only leave piles of chippings and dust. The more difficult-to-work bedrock outcrops would not have been exploited until iron tools became available.

If it is correct that iron tools were not generally available in Kush until the late 5th century BC at the earliest, then this means that all the wedge-holes in the Tombos and Daygah quarries are no older than this date and were made well after the periods of peak activity in these quarries. This, however, is an unsatisfying conclusion because, with the notable exception of the Tabo colossi, only a few, small objects of Meroitic date are known to have been made from the quarry stones. This raises two provocative questions: did the iron-wedge technology come into use in Kush earlier than generally accepted for iron tools, and did the application of this technology in Kush precede its first use in ancient Greece? More fieldwork is needed before these questions can be answered.

Acknowledgements

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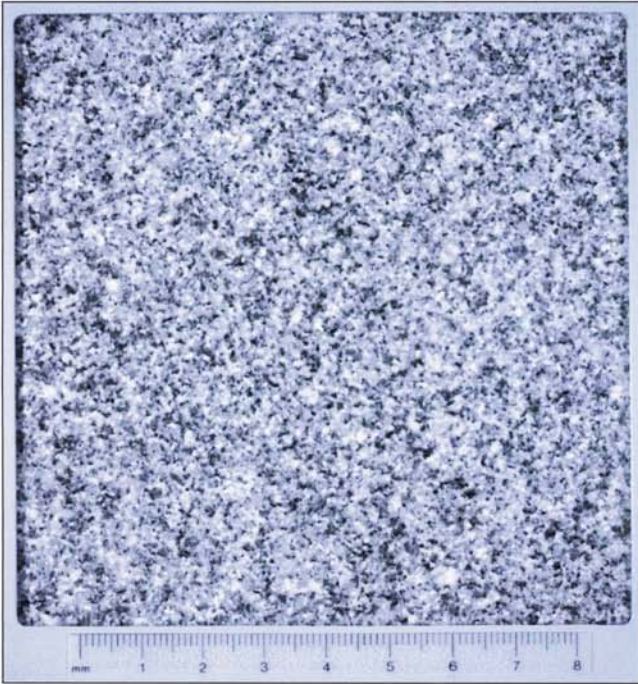


Plate X. Tombos. Granite from the quarry.

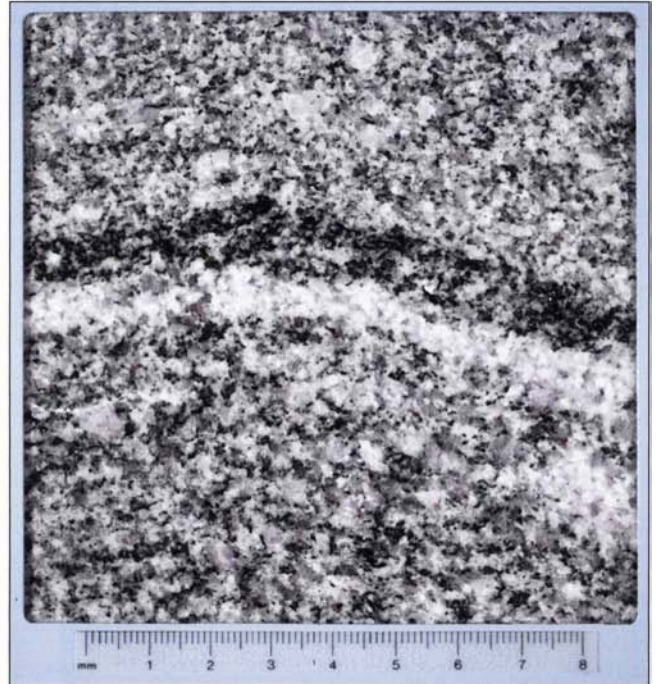


Plate XI. Tombos. Granite gneiss from the quarry.



Plate XII. Tombos. Unfinished colossal statue of a 25th Dynasty king in the quarry (site A in Fig. 2).



Plate XIII. Daygah. Granite gneiss from the quarry.