NEW EVIDENCE OF ROMAN QUARRYING FROM THE EL-MINYA BASALT FLOW, TILAL SAWDA, MIDDLE EGYPT

P. Storemyr (1), T. Heldal (2), E. Bloxam (3) & J. A. Harrell (4)

(1) Expert-Center fuer Denkmalpflege, CH-8005 Zurich, storemyr@ecd.ethz.ch
(2) Geological Survey of Norway, N-7491 Trondheim, tom.heldal@ngu.no
(3) Institute of Archaeology, University College London, London WC1H 0PY, UK, 101367.1074@compuserve.com
(4) The University of Toledo, Toledo, Ohio 43606-3390, USA, JHarrel@UTNet.UToledo.Edu

Fig. 1: Landsat satellitte image of Middle and Lower Egypt. Important basalt flows and basalt quarries are marked (brown/red)

THE DISCOVERY

During a survey of Egyptian basalt outcrops in June 2002 a small quarry was found in the El-Minya basalt flow at Tilal Sawda near El-Bahnasa and the former Graeco-Roman city of Oxyrhynchus in Middle Egypt. As evidenced by pottery scatters, the quarry appears to have been opened in the Roman period and its small size suggests that only a very short extraction campaign was carried out at the site. However, modern quarrying may have destroyed similar, nearby quarry sites. Thus, the discovered quarry may have belonged to a larger group of quarries at Tilal Sawda.

The discovery of the Tilal Sawda quarry is important insofar as it widens the picture of Roman basalt quarrying in Egypt. Until recently the only known basalt quarry in the country was the Old Kingdom Widan el-Faras quarry in the northern Faiyum desert. This quarry provided stone for mainly Old Kingdom mortuary temples (Harrell & Bown 1995, Mallory-Greenough et al. 2000, Bloxam & Storemyr 2002). Surveys carried out in 2001 and 2002 show that the Romans reopened a part of this quarry, as evidenced by pottery scatters, quarry layout and the presence of a few Roman wedge marks (Bloxam & Storemyr 2002). Together, these discoveries suggest that Roman basalt sculpture found during excavations, especially in the Faiyum (Dimai) and at Oxyrhynchus, may also have been worked from "fresh" basalt and not only from re-use of Old Kingdom blocks, of which there were many suitable at the pyramid fields in Giza, Sakkara and Abu Sir, as well as in the vicinity of the Widan el-Faras quarry.

Fig. 2: The Roman quarry site is located on the top of the small hill. Black pebbles along the hill. Weathering of the basalt flow has given black pebbles strewn along the slope. Note the larger basalt blocks along the slope below the Roman quarry

THE TILAL SAWDA QUARRY SITE

Tilal Sawda is located near Bahnasa, about 1 km to the west of the desert highway between Beni Suef and Minya on the west bank of the Nile. The basalt flow probably consists of two or more units, and although it is difficult observe details because of sand dunes in this undulating terrain, it appears that the upper unit is most homogeneous most suitable for stone extraction. The flow is thickest close to the highway, where modern quarrying operations are currently taking place (fig. 13), and thins out towards the northwest and the Roman quarry site. Here the thickness is only a few metres.

The surviving quarry workings are modest. A main extraction site measuring some 10x15 m is located in the top flow of the basalt, on the top of a small hill (fig. 2). There are no traces of quarry marks, thus extraction was obviously undertaken with simple means, using wedges to split open existing, well developed columnar joints (fig. 3).

Scatters of Late Roman to Early Islamic pottery can be found in the quarry area, as well as along the scree of waste with larger blocks from the quarrying operation. Here it seems that the pottery belongs to a large Roman amphora (fig. 4).

Other quarries have not been found in the vicinity, but the top flow of basalt appears to have been systematically tested, as evidenced by tiny extraction sites on the nearby hills.

Fig. 4: Pottery fragments from the quarry, probably belonging to one Roman amphora →

Fig. 3: The face of the Tilal Sawda quarry, showing well developed columnar jointing

Fig. 5: Remains of basalt floor at Userkaf's pyramid in Sakkara. The Step pyramid in the background

Basalt in Ancient Egypt

PREDYNASTIC PERIOD AND THE OLD KINGDOM
Basalt was an important material to the ancient Egyptians. It was initially used for a great number of vessels in the Predynastic and Early Dynastic periods (Aston 1994). The boom in basalt consumption occurred during a 150-170 year period between the 4th and 5th dynasties. In this period basalt was applied for floors, retaining walls and other architectural elements in four pyramid complexes: Khufu at Giza, Userkaf at Sakkara and Sahura and Nyuserra at Abu Sir (Mallory-Greenough et al. 2000, Bloxam & Storemyr 2002). Basalt use in this period may have had aesthetic and symbolic reasons; perhaps symbolising the earth, identified with the god Geb or Aker (Hoffmeier 1993).

MIDDLE KINGDOM TO THE GRAECO-ROMAN PERIOD
Although only representing a quantity of perhaps 2-4.000 m3 (Bloxam & Storemyr 2002), the Old Kingdom use of basalt was never equalled. Some statuettes and reliefs are known from the Middle Kingdom, New Kingdom and the Late Period (Aston et al. 2000), but it is likely that these were carved from re-used Old Kingdom temple blocks or leftover blocks by the main basalt quarry at Widan el-Faras. In the Graeco-Roman period basalt was used again on a somewhat larger scale. Now it is used predominantly for statuary, of which there are many fine examples in the Graeco-Roman Museum in Alexandria and in the Egyptian Museum in Cairo.

BASALT AND OTHER STONE
The use of basalt in Ancient Egypt has sometimes been overestimated. One reason is the difficulty of distinguishing between basalt, black granodiorite from Aswan and dark greywacke from Wadi Hamamat by visual inspection (Harrell & Bown 1995). Our observations indicate, for instance, that many sarcophagi and pyramidions, often believed to have been made from basalt, were rather produced from other dark stone.

SOURCES OF BASALT
There are many basalt flows in Egypt. Most of the flows, which are relevant as possible sources of artefacts and building stone, are of Tertiary (Cenozoic) age (Meneisy 1990) and occur as shown on the map in fig. 1. The Oligocene (c. 25 m.y.) Haddadin flow, with the Widan el-Faras quarry, in Northern Egypt is until now the only one that has been positively identified as a source for vessels building stone (Mallory-Greenough et al. 2000, Greenough et al. 2001). Although no other quarries have been found in the Haddadin flow, it is likely that outcrops by e.g. Abu Roash and Abu Zabal (now inaccsessible or destroyed) would have provided some stone, at least for vessels. Based on visual inspection it appears that many Greek and Roman sculptures on display in the Egyptian Museums have been carved from Haddadin basalt. The likely sources are thus the newly discovered Roman quarry at Widan el-Faras and reused Old Kingdom blocks. No statuary visually looking like basalt from the newly discovered quarry at Tilal Sawda has yet been located.

Fig. 6: Greek statue in the Egyptian Museum: The priest Horsahor, c. 40 BC, found at Alexandria (JE38310)

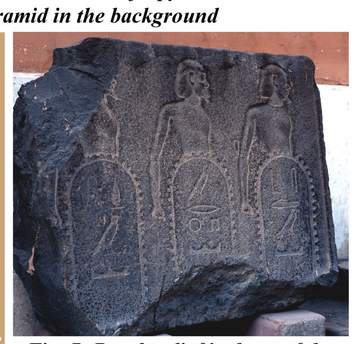

Fig. 7: Basalt relief in front of the Egyptian Museum, probably from the New Kingdom (Amenhotep III, from the Ptah Temple at Memphis)

Fig. 8: The Roman part of the Widan el-Faras quarry

Fig. 9: Roman wedge hole used for splitting at Widan el-Faras

Petrography and geochemistry

The Tilal Sawda and the Widan el-Faras basalts are mineralogically and geochemically quite similar; both are olivine basalts, containing plagioclase, clinopyroxene (augite), orthopyroxene and Fe-Ti oxides as their primary minerals. Texturally, however, they differ significantly. *The Widan el-Faras basalt* displays a porphyritic texture with interstital groundmass. The characteristic plagioclase phenocrysts measure up to 10 mm, whilst the plagioclase in the groundmass rarely exceed 0,5 mm. Patches of glass and alteration products from glass are common. *The Tilal Sawda basalt* displays a porphyritic to glomeroporphyritic texture, grain size much smaller than the Widan el-Faras (less than 2 mm for phenocrysts/glomerocrysts, matrix grain size less than 0,2 mm). In addition, the Tilal Sawda basalt (the extracted part) has vesicular cavities filled with zeolites. Small patches of altered glass is common in the groundmass. In addition to the textural differences between the two, Mallory-Greenough et al. (1999) have shown that the composition of augite can be useful for differentiating between the two basalt sources.

The microphotographs to the left show the two basalt types.

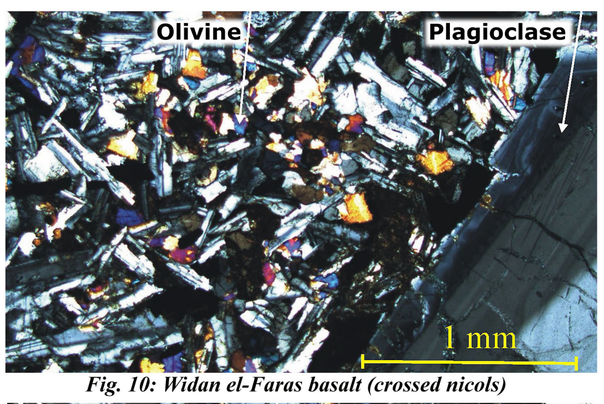

Fig. 10: Widan el-Faras basalt (crossed nicols)

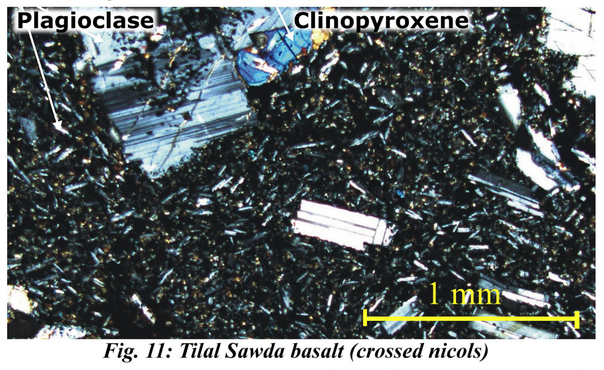

Fig. 11: Tilal Sawda basalt (crossed nicols)

Destruction of the basalt quarries

Like many ancient archaeological sites in Egypt, the basalt quarries are heavily threatened by modern development. Parts of the Tilal Sawda quarries may have been destroyed by modern quarrying (fig. 12) and we will never know how large these quarries once were. Recently, modern quarrying also commenced in the basalt quarries at Widan el-Faras (fig. 13). Significant parts have already been heavily damaged, but efforts are now undertaken to try to stop the works in the actual ancient quarry site. There are vast amounts of good basalt just nearby.

The great problem with ancient quarry sites in Egypt – and elsewhere – is that they are rarely registered as archaeological sites. Moreover, they are very easily overlooked by laymen and companies wanting to develop such areas, as well as by authorities giving permissions for such development.

The Supreme Council of Antiquities recently launched the Egyptian Antiquities Information System (www.eais.org.eg), which aims at establishing a Geographic Information System to aid the management of historical sites in Egypt. This is the first step in trying to protect also the ancient quarry sites, and the authors therefore co-operate with EAIS in order to achieve this aim.

Fig. 12: Modern basalt quarry by Tilal Sawda

Fig. 13: Clearing of the ancient basalt quarry at Widan el-Faras in order to make way for modern quarrying

REFERENCES
Aston, B.G. (1994): *Ancient Egyptian Stone Vessels: Materials and Forms.* Heidelberg: Heidelberger Orientverlag. - Aston, B. G., Harrell, J. & Shaw, I.M.E. (2000): 'Stone' in: Nicholson, P.T. & Shaw, I.M.E (eds.): *Ancient Egyptian Materials and Technology,* pp 5-77. Cambridge: Cambridge University Press. - Bloxam, E. & Storemyr, P. (2002): Old Kingdom Basalt Quarrying Activities at Widan el-Faras, Northern Faiyum Desert. *Journal of Egyptian Archaeology*, 88, pp. 23-36. - Greenough, J.D., Gorton, M.P. & Mallory-Greenough, L.M. (2001): The Major- and Trace- element Whole-Rock Fingerprints of Egyptian Basalts and the Provenance of Egyptian Artefacts. *Geoarchaeology*, 16, 7, pp. 763–784. - Harrell, J. & Bown, T. (1995): An Old Kingdom Basalt Quarry at Widan el-Faras and the Quarry Road to Lake Moeris. *JARCE*, 32, 71-91. - Hoffmeier, J.K. (1993): The Use of Basalt in Floors of Old Kingdom Pyramid Temples. *JARCE*, 30, 117-123. - Klemm, R., & Klemm, D.D. (1993): *Steine und Steinbrüche im Alten Ägypten*. Berlin: Springer-Verlag. - Mallory-Greenough, L.M., Greenough, J.D. & Owen, J.V. (2000): The Origin and Use of Basalt in Old Kingdom Funerary Temples. *Geoarchaeology*, 15, 4, pp. 315–330. - Meneisy, M.Y. (1990): Volcanicity. In: R. Said (Ed.), *The geology of Egypt* (pp. 157–172), Rotterdam: A.A. Balkema.