



Fig. 1 Part of the deposit of drilled fragments from Saqqara (photo A. Ćwiek, 2000)

## Drilling for powder. Enigmatic limestone fragments explained

*Andrzej Ćwiek*

**Limestone blocks with traces of drilling operations, found at several sites in the Memphite necropolis, are still mysterious artefacts. Experiments made by Jean-Philippe Lauer using a hand-drill with a crescent-shaped flint point proved that the holes in these stones were made by this tool. The purpose of these stones, however, remains unexplained. They have been variously interpreted as devices for levering stones during building operations, traces of apprentices' work before drilling stone vases, or stones underlying unidentified objects that were being drilled through.**

Pieces of limestone bearing traces of drilling operations have been found at several sites in the Memphite necropolis. They were recorded first at Meidum by William Flinders Petrie (Petrie 1892: pl. XXXI, 26; Petrie – Mackay – Wainwright 1910: 5, pl. XX, 1). Petrie was also the first one to suggest an explanation of their purpose: “The blocks of limestone, pl. XX, 1 with round holes in them are found commonly in the masons’ chip heaps. They appear to have been used for pivot blocks to turn heavy levers on, in moving stones.” (Petrie – Mackay – Wainwright 1910: 5).

He repeated this notion several times, which obviously had an impact on later discussions: “No. 87 is a block of limestone from the pyramid waste at Meidum. Such pieces were probably used to pivot wooden levers upon, which served in moving large blocks.” (Petrie 1917: 46, pl. LIII, 87).

A fragment that comes from Meidum is on display in the Petrie Museum (UC 30857). However, the piece in London is obviously not the one illustrated in Petrie’s works: The fragment in the Petrie Museum is labeled as “Snefru pyramid waste. Limestone block, with hole in



Fig. 2 Drilled stone from Meidum (photo A. Ćwiek)

bottom, used as pivot block to turn heavy levers on in moving stones” and dated to the Fourth Dynasty, obviously on account of the find spot and the initial interpretation by Petrie.

During the excavations made at Meidum in the 1980s by Ali el-Khouli, more blocks appeared. A drawing of a “fragment of limestone with eight roughly circular grooves 33.0 × 20.0 cm” is published (Khouli 1991: 15 and pl. 41, no. 5). Another block can still be seen among the late sarcophagi exhibited to the north of the pyramid (fig. 2).

Numerous drilled stones were found at Saqqara during the excavations of Cecil Firth, James Quibell and Jean-Philippe Lauer in the enclosure of the Step Pyramid of Netjerykhet (Firth – Quibell – Lauer 1935a: 119, 124; Firth – Quibell – Lauer 1935b: pl. 93, 1–2). Some of the drilled blocks turned out to be boundary stelae of Netjerykhet (Firth – Quibell – Lauer 1935a: 119; Firth – Quibell – Lauer 1935b: pl. 86, 6). These stelae give only a *terminus post quem* for the date of the drilling, since they were obviously objects of temporary use that were dismantled before the final arrangement of the complex by Netjerykhet and used in the filling of constructions and dispersed around the site (Firth 1925: 149). Several fragments of such stelae were found in the area of the Polish excavations in the context of Sixth Dynasty tombs (Kuraszkiewicz 2006: 276–281; Myśliwiec 2013: 471).

Similar finds of drilled blocks were also made outside the Step Pyramid complex, e.g. in the mastaba of Perneb (MMA 14.7.146, Arnold 1991: fig. 6.21) and in the area of Gisir el-Mudir (Swelim 1983: 34). At Saqqara, many such stones can still be seen in and around the Step Pyramid enclosure (Romer 2007: fig. 127).

During the excavations made in 1945–1946 at Helwan, Zaki Saad found in a large stone tomb, “a large slab of limestone with round holes bored in it, presumably with flint instruments of crescent shape (...). Pieces similar to this were found in the Step Pyramid at Saqqara.” (Saad

1951: 5 and pl. IVa). Although the tomb was dated by the excavator to the late Second or early Third Dynasty, its description suggests rather a later Old Kingdom structure.

Already during the first discoveries at Saqqara, it was recognized that the holes were made by flint drills (Firth – Quibell – Lauer 1935a: 125–126). This was confirmed by experiments conducted by Lauer (Lauer 1936b: pl. XCVI, 2) using a hand-drill with a crescent-shaped flint point. The drill, which might have been used for various purposes and with various drill points (Stocks 2003: 142–148), was called *znht* (𓏏𓏏𓏏; Hannig 2003: 1159). The procedure of its use was described as *jr.t k3t m znht*, labeled thus in the scene of drilling stone vases in the tomb of Ti (Steindorff 1913: pl. 134; Wild 1966: pl. 173).

However, concerning their purpose, the limestone fragments with holes are still mysterious artefacts. Several hypotheses explaining their form and purpose have been developed since the first discoveries.

#### **1. Devices for levering stones during building operations.**

This idea was the first impression of Petrie, repeated by him several times and often cited since then in the Egyptological literature. Petrie described such a drilled stone as a “pivot block to turn heavy blocks on in moving stone” (Petrie – Mackay – Wainwright 1910: 5) or a “fulcrum block of pivoting lever” (Petrie 1938: pl. X. 60). However, the small size of many fragments, the softness of the material and the character of the holes (numerous, irregular and perforating stones on both sides) exclude such a hypothesis. Even if a procedure of turning heavy blocks that included the use of a stone underlay had existed, these artefacts could not have served that purpose.

It has generally been assumed that the drilled blocks found in the Step Pyramid complex and near the pyramid at Meidum must have been related to the building operations; thus, scholars usually date them to the reigns of Netjerykhet and Sneferu respectively. However, their relation to the royal buildings might easily have been a secondary one. The sites were simply a source of good

quality limestone blocks suitable for drilling, exploited in a later period and for a purpose other than the pyramid building.

**2. Pieces for training with traces of apprentices' work** (Firth – Quibell – Lauer 1935a: 119, 124–126). This idea was first suggested to Firth by Alfred Lucas (Firth – Quibell – Lauer 1935a: 126) and repeatedly comes back in the discussion of the subject.

Alternatively, they might have been:

**3. Pieces with traces of artisans' model drilling for the apprentices, or**

**4. Pieces for test-drilling, adjustment of the drill-bits.** When analysing the piece in Brussels (Musées royaux d'art et d'histoire, E 4291), which was of unknown provenance and curiously dated to “*époque prédynastique?*”, Stan Hendrickx made a review of the various hypotheses on the purpose of the drilling operations, coming to the conclusion that the hypothesis of *rodages de mandrins* met the least contradictions (Hendrickx 2000: 120).

All these three explanations assume that the drilling of these stones was a test or preliminary procedure that was carried out before turning to a real activity, which presumably was the production of stone vessels (Romer 2007: 260), or the levelling of the surfaces of the blocks at the building, or the dressing of the casing blocks (Firth – Quibell – Lauer 1935a: 125–126). However, although obviously the tool and technique was used for making stone vases (Stocks 2003: 139–168), the absence of such artefacts at sites where production of stone vases has been recorded, and their widespread distribution in other contexts, exclude the first theory. The second hypothesis, based on single traces of use of a flint drill on a block of the Step Pyramid (Lauer 1936b: pl. XCV, 3: “*traces de forets de silex sur les pierres du projet de mastaba initial M2*”), and elaborated by Firth and Lauer (speculating on the use of drills in the early phases of construction of the Step Pyramid, replaced later by copper chisels), simply does not conform to our present knowledge of the building procedures (cf. Arnold 1990). A citation from Firth may show how uncertain the grounds of interpretation were: “One of the crescent flints was found in a surprising position, viz. high up on one of the pyramid steps. It may of course have been carried up to the top by a tourist and then thrown away: if not it must have been used to dress blocks of the casing.” (Firth – Quibell – Lauer 1935: 126). If we exclude the procedure of drilling blocks of the pyramid, it follows that there was no need to train workers to do this, and in fact no drilled fragments have been found in an undoubtedly Third Dynasty context.

**5. Stones underlying the unidentified objects being drilled through.** This hypothesis was presented by Dieter Arnold in his *Building in Egypt*: “They mostly appear in irregular groups, some so close that they overlap. They look as if the stones had been under an object that was drilled in a way that the drilling tube completely penetrated the object and then reached the underlying stone. This underlying stone was apparently used for several drilling operations.” (Arnold 1991: 266). In fact, even if such an “overdrilling” (of an otherwise unspecified object) had happened from time to time, it would not have been produced such a pattern of holes in the stones, sometimes

“drilled to cobwebs” (Firth – Quibell – Lauer 1935a: 126), and the fragments drilled on both sides could not have served the suggested purpose at all.

All the proposed hypotheses have weak points. Probably for that reason Denys A. Stocks in his comprehensive work on Egyptian stonework simply described the artefacts, without giving an explanation of their purpose (Stocks 2003: 139).<sup>1</sup>

It seems that an explanation of the purpose and dating of these enigmatic drilled limestone fragments may be proposed on the basis of a discovery that brought to light a large number of them, as well as a contextualized feature. During the Polish excavations conducted in the area west of the Step Pyramid at Saqqara since 1987, numerous drilled limestone fragments have been found dispersed around the site of the Old Kingdom necropolis, as well as forming a large deposit in the courtyard of one of the Sixth Dynasty tombs (Ćwiek 2000: 117 and fig. 5). This deposit was discovered in 1999 between the mastaba of Vizier, Merefnebef and shaft 27 of an anonymous tomb XXXI (cf. Kuraszkiewicz 2013: 165–166). The deposit (numbered 3/99 in the field documentation) consisted of around one hundred fragments of soft white limestone (fig. 1). Its relation to the tomb complex of Merefnebef remains uncertain. It was located in the southern part of the vizier's burial ground, very close to shaft 27. The stratigraphic situation suggests that the stones were placed there after the area had been flooded and the superstructure of shaft 27 possibly destroyed, but still in the late Old Kingdom. The deposit, though it cannot be dated more precisely, is of crucial importance if one assumes that it probably rests at the site of the “production” of the fragments. A single piece of drilled limestone was also found inside the tomb chapel of the vizier (Myśliwiec *et al.* 2004: 193 and pls. LXXXVII, LXXXVIII), but this find indicates only a *terminus ante quem* as the piece was deposited there before the final closing of the chapel, which can be dated to the very end of the Old Kingdom or slightly later



Fig. 3 Small drilled fragment from Saqqara (photo A. Ćwiek)



Fig. 4 Small drilled fragment from Saqqara (photo A. Ćwiek)

(Kuraszkiewicz 2011: 54). An additional indication of the date is the discovery of a single piece of drilled limestone in the debris related to a burial in the chamber of shaft 14 of anonymous tomb XXI (unpublished; the find recorded by the present author), where the burial was probably made in the second phase of use of the tomb, dated to the middle years of Pepy II (Kuraszkiewicz 2013: 22–23, 131–132).

The abovementioned deposit included not only relatively large fragments but also many quite small ones, which probably resulted from stubborn drilling down to the complete destruction of a block (fig. 3). Many of these pieces bear traces of being drilled on opposite sides (fig. 4) (cf. Firth – Quibell – Lauer 1935a: 124), and the holes are spaced irregularly but very close together, covering and piercing virtually the entire stone. The location, number and characteristics of the fragments strongly suggest their purpose. It seems that a flint-pointed drill was used to obtain limestone powder in a quicker and more expedient way than grinding the stone, which could produce the same fine-grained, uniform material, but only after a longer time and necessary sieving.<sup>2</sup>

Large amounts of pulverised limestone, used extensively for the plastering and whitewashing of the tombs, were obtained in this way. Whitewashing might have been carried out for aesthetic purposes, but it was mainly done because of cultic/ritual reasons (Kuraszkiewicz 2002: 366–368; Kuraszkiewicz 2011: 533–534; Rzeuska 2003; Rzeuska 2006: 446–448). White plaster or paint might be applied to the walls of chapels and burial chambers as well as on false doors, offering tables and pottery. Of course, while the tool and source of material were at hand, the procedure of making powdered limestone might occur

at various times. In light of the discoveries at Saqqara, however, it seems to have been a particularly common activity at the end of the Sixth Dynasty, which agrees with the noticed increasing popularity of whitewashing for ritual purposes in this period. A hypothesis that the torrential rains at the end of the Sixth Dynasty caused a need to restore the lost purity of the offering places (Kuraszkiewicz 2013: 233) seems to be a plausible explanation.

It seems that the finds at Meidum may likewise be dated to the same time, related not to the pyramid building site, but to the Sixth Dynasty necropolis (cf. Rzeuska 2011). The hypothesis of a late Sixth Dynasty dating might also explain a surprising absence of the drilled stones at the sites of Giza, Abusir and Dahshur, where ritual activity was reduced at that time.

Limestone powder is an underestimated material. Plaster in tombs has too often been described as “gesso” and assumed to have been made of gypsum or lime. It is possible that the *bnz*-substance, referred to in texts and depictions of rituals, was not gypsum or natron, but only pulverised limestone (Ćwiek 2009).

#### Notes:

- <sup>1</sup> Preliminary results of research on the material being the subject of this article were presented by the author during the conference *Experiment and Experience: Ancient Egypt in the Present* held in Swansea in 2010. In the discussion, Denys A. Stocks expressed his agreement with the author’s interpretation.
- <sup>2</sup> The author had an opportunity to watch the procedure of grinding limestone pieces to obtain powder for conservation purposes (pigments for plaster) during the work in the temple of Hatshepsut at Deir el-Bahari. To get fine-grained powder must have involved repeated sieving.

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### Abstract:

Limestone blocks with traces of drilling operations, found at several sites in the Memphite necropolis, are still mysterious artefacts. Experiments made by Jean-Philippe Lauer using a hand-drill with a crescent-shaped flint point proved that the holes in these stones were made by this tool. The purpose of these stones, however, remains unexplained. They have been variously interpreted as devices for levering stones during building operations, traces of apprentices' work before drilling stone vases, or stones underlying unidentified objects that were being drilled through. At the area of the Polish excavations west of the Step Pyramid at Saqqara, numerous drilled limestone fragments were found dispersed around the site of the Old Kingdom necropolis, as well as forming a large deposit in a courtyard of one of the Sixth Dynasty tombs. Many of these pieces bear traces of being drilled on opposite sides, and the holes are spaced irregularly but very close together, covering and piercing virtually the entire stone. The location, number and characteristics of the fragments strongly suggest their purpose. It seems that the aim was to obtain limestone powder in a quick and expedient way. Large amounts of pulverised limestone were used extensively for plastering and whitewashing the tombs and in ritual practises. The end of the Sixth Dynasty was a period of a special need to restore the ritual purity of the offering places by whitewashing.

limestone – drilling – Saqqara – technology – limestone powder – plastering

**Andrzej Ćwiek** ([andrzejcwiek@yahoo.com](mailto:andrzejcwiek@yahoo.com))  
Adam Mickiewicz University & Poznań Archaeological Museum