The Abusir Drill Core Survey, Egypt

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The Abusir Drill Core Survey was an investigation of the geoarchaeological deposits in the valley floor of the Abusir pyramid complex, at the apex of the Nile delta in Lower Egypt. The project, part of the author's PhD research, was graciously funded by the London-based Egypt Exploration Society (E.E.S.). David Jeffreys of the Institute of Archaeology, UCL, supervised the survey, in conjunction with his on-going E.E.S. Survey of Memphis project.

The project's objective was to systematically test the Abusir valley floor using a manual drill core, to settle a debate regarding the ancient landscape of Abusir during the Old Kingdom, circa 2 400 BCE. There are two sides to this debate. On the one hand it is argued that a large settlement, a pyramid town, was directly associated with the pyramid complex, probably located on the valley floor (Goelet 1999; Stadelmann 1991), on the other, it is proposed that a large lake existed at the foot of the desert escarpment at that time (Goedicke 2000; Verner 1992). The intention of the survey was to establish an archaeo-landscape reconstruction for the Old Kingdom.

Because of topographical restrictions and rapid urban development a random sampling strategy was used. The survey boundaries were established at the Abu Ghorab sun temple of Niuserre, the Abusir Raneferef pyramid and a two kilometre radius to the east of the desert escarpment (fig. 1). The surveyed valley floor measured a total of 3.4 square kilometres, from which 28 cores were extracted.

The perceived level of Old Kingdom occupation in the Memphite region has been established at four metres under the present ground level (Jeffreys 1997, 3). As a result of the annual inundation, the floodplain was aggregated at an average rate of 10 cm per century or one metre per millennium (Butzer 1976). This estimate would place approximately four metres of sediment on top of any settlement dating to the second millennium BCE. In this context, traditional excavation techniques would be too expensive, impractical and time consuming to be employed. Additionally, since the construction of the Aswan high-dam in 1968, the level of the water table has risen significantly to approximately 50 cm below the modern ground level (Málek 2000). Considering these conditions, drill core testing is the best available technique for extracting geoarchaeological samples and allows a large subsurface area to be surveyed within a relatively short period of time.

Technique

The drill core equipment is a manual hand auger. The drill fits into plastic tubes (8cm in diameter by 100cm in length) that are inserted into the ground to prevent contamination from the upper strata. The various drill-head options measure 8 x 20 cm and are open with a sharp tip. This drill head collects the sediment as it is pushed further into the ground. Approximately every 10 - 20 cm, the drill-head is extracted

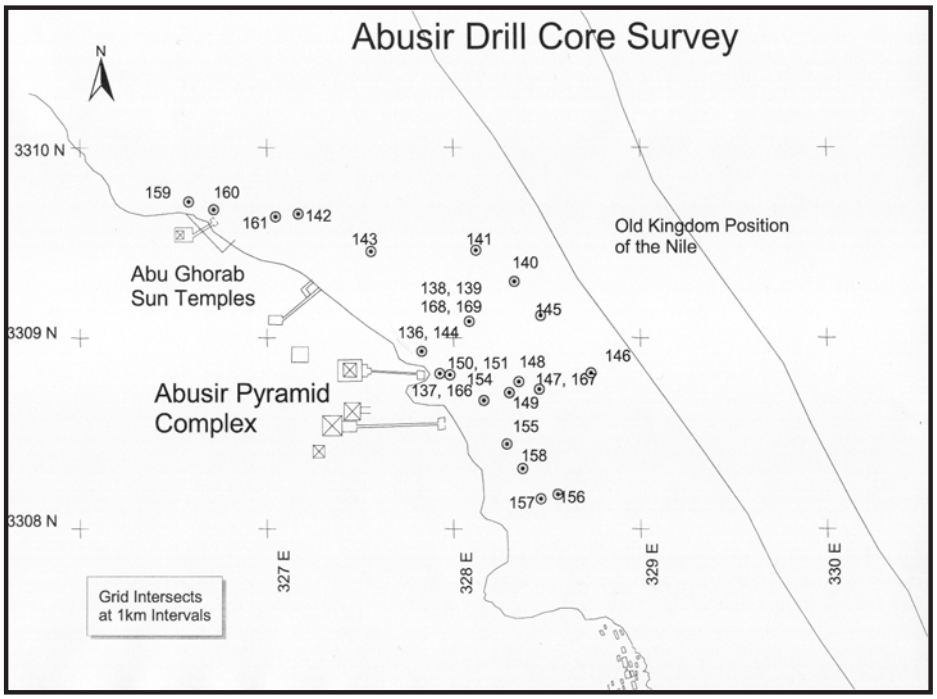

Figure 1. Map of the Abusir Drill Core Survey

and detailed descriptions of the sediment colour, texture and particle size are recorded, as well as any inclusions. It is best if the core is extracted in one attempt, without interruption, especially in waterlogged deposits where the walls of the drilling cavity tend to cave in and contaminate the sample (Jeffreys and Málek 1988, 19). The method provides a detailed stratigraphic account of subsurface deposits.

Drilling Results

Of the 28 cores recovered, only 14 cores penetrated past a surface depth of four metres, the expected Old Kingdom ground level. Of the other 14 cores, eight had a profile of solid, clean, sand. These eight samples were consequently abandoned before a depth of four metres because the core cavity would collapse as a result of a waterlogged, sandy deposit. Although these cores did not penetrate into the Old Kingdom levels, they contributed crucial information regarding the depositional history of the site. The remaining five of these 14 cores were similarly abandoned because of sand, but had a band of dark grey clayish-silt at a depth ranging between 18.5 and 16.4 m ASL (above sea level).

Only three sediment types retrieved from the cores were clean, yellow-brown aeolian sand, brown silt and grey clay deposits. The sequence of strata appeared in a fairly consistent pattern of clays, sands and silts in all 28 cores. Ceramic inclusions were typically small, non-diagnostic Nile-silt body sherds. Other inclusions were limestone fragments, shell and charcoal. Since many of the ceramic inclusions were very small, rounded fragments typical of alluvial deposits, they were probably waterborne in origin, introduced to the site from the river.

The drill-core evidence has confirmed the presence of a lake associated with the Ptolemaic and Hellenistic periods that had survived into modern times. 57% of the 28 cores had a horizon of clayish-silts at a shallow depth between 18.9m and 15.8m ASL, with an average thickness of one metre. 75% of these cores demonstrated a uniform horizon of clean, coarse, grey, brown and yellow aeolian sands lying directly underneath the silt deposits. This consistent sand horizon, ranging from 17.8 to 15.6m ASL represents an arid desert environment. Considering that the sand is found under the Ptolemaic lake deposit, it is likely to represent a dry and arid environment during the preceding periods. The sand horizon implies that the lake was a relatively recent landscape feature.

Discussion

The absence of settlement remains in the area clarifies issues concerning the presence of a lake at Abusir. The drill core evidence might support Verner's (1992) explanation that the absence of funerary architecture between North Saqqara and Abusir is a response to the existence of a lake at the foot of the Abusir escarpment. There are two sources of textual references to the Abusir lake. The earliest reference occurs in utterance 610 (§1712) of the Pyramid Texts as a title or epithet of Sokar, "Sokar who presides over the P<u>d</u>w-š" (Faulkner 1969, 253), where P<u>d</u>w- š is interpreted as the "lake of Abusir" (Gaballa and Kitchen 1969, 5, n.6). Secondly, New Kingdom and Late period texts cite toponyms from the Memphite Necropolis in association with the sanctuary of Sokar, which is most likely to have been at Saqqara (Posner-Kriéger 1976, 71, n.1). Thus, the notion of a lake at Abusir was derived from the translation of the title or epithet of the god Sokar.

The second source of textual references to the Abusir lake is from demotic ostraca, recovered from *The Archive of Hor* at Saqqara, where there is mention of the "Lake of Pharaoh" (Ray 1976, 153). Ray (1976; 1978, 153) concludes that the "Lake of Pharaoh" confirms the existence of a lake at the foot of the Saqqara-Abusir desert escarpment. The presence of a lake is considered necessary to breed the sacred ibis birds, as offerings to the Sacred Animal Necropolis. There are over one million mummified ibis burials within the extensive catacombs of the Sacred Animal Necropolis on the north Saqqara –south Abusir desert plateau. Historical maps refer to the "Pool of Abusir" and in *The Archive of Hor* there is a mention of "the great goddess (of) the wady of the lake", which Ray (1976, 150) interprets as the "Pool of Abusir", in association with the Ptolemaic temples of Thoth and Isis at Saqqara.

The drill-core evidence supports the existence of this "Lake of Pharaoh" during the Late Period. However, the sand lens under these lake deposits may imply that the lake was a recent development (Ray 1976, 1978). Furthermore, the sand horizon confirms that this lake could not have survived from ancient times, as suggested by Emery (1965, 8), and that the area is more likely to have been dry and arid during the classical Pharaonic period. When considered alongside earlier suggestions this sand lens indicates that there was an eastward movement of desert sands at Giza, Saqqara and Lisht during the First Intermediate Period (Giddy and Jeffreys 1992). This sequence appears consistently throughout the Memphite region and is more indicative of a progressive accumulation rather than a large, single episode of sand deposition.

Beneath the sand is a horizon of silt, the depth of which corresponds with the Old Kingdom levels found elsewhere in the region. This silt strata indicates the presence of water, but not of standing water such as a lake. The archaeo-landscape interpretation is that of a perennially wet area subject to periodic flooding. The difference between the Ptolemaic lake deposit and this Old Kingdom flood deposit is the ratio of silt to clay found within the deposit. The variability of this ratio demonstrates two opposing types of depositional environments. The Old Kingdom landscape was more likely the result of overflow from the annual inundation, possibly forming perennial back swamps (Butzer 1976), and not a standing body of water. The convex flood plain topography means that the land closest to the desert edge is at a lower elevation than that closest to the river's edge (Lehner 1997, 12). Therefore, the area immediately in front of the pyramid complex may have been too low and wet for a large settlement.

Conclusion

In conclusion, the results from the Abusir Drill Core Survey have answered questions regarding the archaeo-landscape of Abusir. There is now geoarchaeological evidence to support the textual and historical accounts of a Ptolemaic lake. However, the drill core results indicate that the lake was a recent development and had not survived from the Dynastic Period. It can be concluded that the area at the foot of the Abusir pyramids was wet during the Old Kingdom, making the area unsuitable for a large habitation centre.

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