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Geophysical survey at ancient Naukratis, Egypt

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In May 2014 the third season of geophysical survey, core survey and excavation was conducted by the British Museum at the ancient site of Naukratis, the modern village of Kom Ge'if, located near Damanhour in the Governorate of Beheira, between Cairo and Alexandria, Egypt. The Naukratis fieldwork project, directed by Ross Thomas of the British Museum, seeks to assess the surviving archaeology of this important ancient entrepôt using a range of complementary methods including topographic and geophysical survey, in addition to borehole survey and excavation. This is part of a larger project, directed by Alexandra Villing of the Greek and Roman department of the British Museum called 'Naukratis: Greeks in Egypt' that is cataloguing, re-contextualising and publishing freely online all artefacts discovered at this ancient site since its discovery in 1883 by the pioneering Egyptologist Flinders Petrie.

The latest season of work added to the existing dataset from the first two seasons in 2013, mapping the extent of the ancient settlement and its association with the Canopic Branch of the River Nile. The 2014 team comprised staff from the British Museum, Bryn Mawr College and the University of Southampton, with inspectors from the Ministry of State for Antiquities (MSA) heavily involved in the day to day survey work. The 2014 fieldwork was largely funded by the Honor Frost Foundation and the Institute of Classical Studies

The port of Naukratis was the earliest Greek port in Egypt, established in the late 7th century BC as a base for Greek

(and Cypriot) traders and the port of the royal Pharaonic city of Sais. It was an important hub for trade and cross-cultural exchange long before the foundation of Alexandria and continued to be significant through the subsequent Ptolemaic, Roman and Byzantine periods. Previous fieldwork was conducted by Flinders Petrie amongst others, and concentrated on excavation of the central areas of the ancient town. Further research was required to fully understand this very important archaeological site. Techniques used in the three seasons to date have encompassed geophysical prospection, the creation of a topographic survey map using GPS technology, integrating and georeferencing archived survey plans and sketches, aerial photography and satellite images, surface pottery collection, excavation and geological work with a hand auger.

Survey Methods

For the magnetometer survey a Bartington Grad601-2 Dual Array Twin Fluxgate Gradiometer was used (**Fig. 1**). Readings were taken at 0.25m intervals along traverses every 0.5m within 30 x 30m grids, with all traverses walked in a zig-zag fashion. MSA inspectors were shown how to set up and use the equipment as part of a programme of training of Egyptian colleagues. They were also shown preliminary results and had the principals of the instrumentation explained to them.

Two ERT profiles were also undertaken using an Allied Associates Tigre ERT (**Fig. 2**). The first of the profiles ran from a point some 400m to the west of the site, over the



Figure 1 Magnetometer survey being conducted by MSA inspector Mohamed Roshdy Gomaa Soliman, with tuition from Kris Strutt, to the east of the kom.

kom or mound, to a point 400m to the east of the site, incorporating the line of the Canopic Branch of the Nile and Naukratis. This provided a section 15m deep running west-east across the southern part of the site. The main aim was to better understand the geological relationship between the river and the settlement, and to tie the profile in with the series of borehole surveys conducted along the same traverse. The results may also identify walls and other structures within the main area of the ancient settlement.

All magnetometry grids, ERT profiles, excavation trenches, structures, features, auger holes and spot finds were located in real-world coordinates using a Real Time Kinematic (RTK) Global Positioning System (GPS). This has ensured that survey data are fully geo-referenced, and facilitates the incorporation of the other survey methodologies into a real-world co-ordinate system.

Preliminary Survey Results

The survey work at Naukratis has produced significant new data on the layout of the ancient town, its local environment and hinterland, including the location of the Greek sanctuary complex, the Hellenion, and the Temenos or temple enclosure at the site. The magnetometer results located a large number of mud brick and stone structures in the fields around Kom Ge'if (**Fig. 3:** overleaf), particularly in the north and east of the site, with negative linear anomalies showing the potential location of substantial stone foundations of tower houses and other structures. We now know that the settlement exceeded 60 hectares at its peak, significantly larger than the 32 hectare settlement revealed by the previous excavations. The positive linear anomalies associated with the mud brick structures, and the internal units of construction of larger structures such as the Temenos enclosure wall, also show up clearly.

In addition to the plan of the ancient town, the magnetometer results also give us a much better idea of the extent of the ancient site in relation to the location and development of the Canopic branch of the Nile, which ran to the west of the ancient settlement. The magnetometry



Figure 2 MSA inspector Ashraf Salah El din Mohamed and workman Saad Mohamed Awad with the ERT set up to the west of Kom Ge'if, across the location of the Canopic Branch of the Nile.

clearly shows the change from settlement to canal infilling, with structures positioned along the edge of the canal. This data is reinforced by the results of the ERT survey (**Fig. 4**) which indicates coarse grained sediments giving high resistivity in the area of the Canopic Branch of the Nile, and smaller sediment grain size in the area of the kom.

The survey results highlight the need for, and the great potential of, further research in future fieldwork seasons. Many of the areas of the ancient settlement still require surveying using magnetometry, and a combined strategy of ERT survey with drilling of boreholes will provide useful comparative data for particular parts of the site and its hinterland.

Figure 4 Preliminary image of the ERT profile, showing the contrast between the sediments of the Canopic Branch of the Nile (high resistivity, left) and the finer sediment of the kom (low resistivity, right).

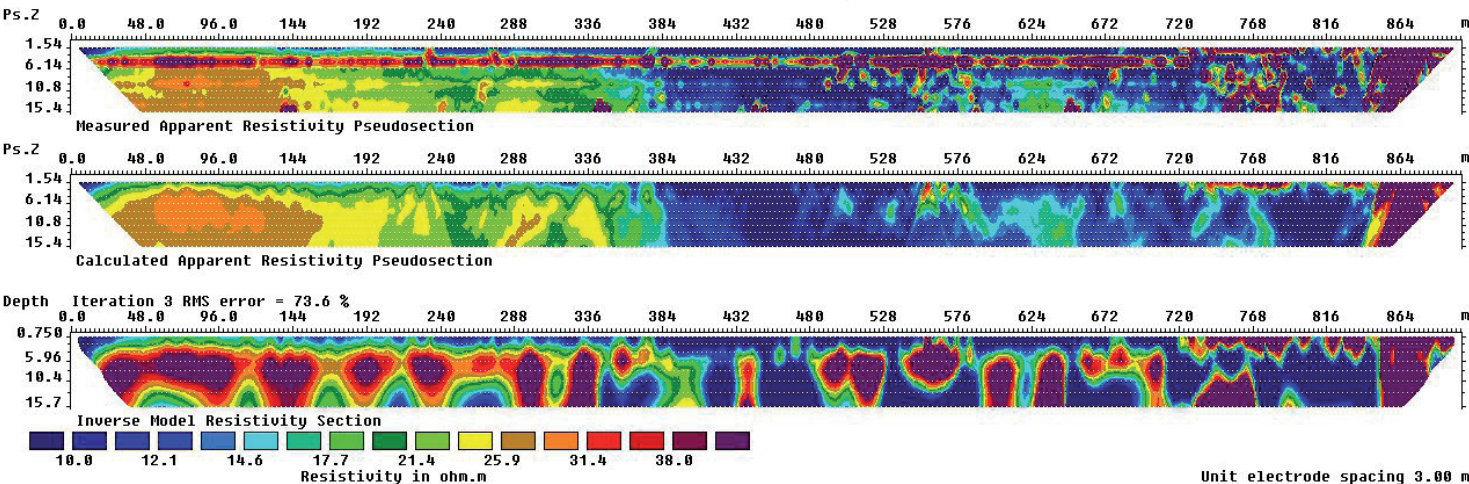




Figure 3 Detail of the magnetometer survey results showing some of the anomalies representing structural remains.

For more information on the fieldwork at Naukratis please visit the project website at:
www.britishmuseum.org/research/research_projects/all_current_projects/naukratis_the_greeks_in_egypt.aspx

To discover more about the artefacts recovered from Naukratis visit the Online Research Catalogue at:
www.britishmuseum.org/research/online_research_catalogues/ng/naukratis_greeks_in_egypt.aspx