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Archaeological and geophysical survey of Tell el-Dab^a, an ancient town in the Nile Delta

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Tell el-Dab^a, a site located in the eastern part of the Nile Delta in Egypt, has been known to Egyptologists since 1885 thanks to Edouard Naville's excavation. The site was investigated later by Mohamed Hamza in 1928, Labib Habachi in 1941–42 and Shehata Adam in 1951–54. The Austrian Archaeological Institute in Cairo has been investigating the site since 1966, first under the direction of Manfred Bietak (1966–2009) and now Irene Forstner-Müller (since 2009).

The site can be identified with Avaris, capital of the Hyksos in the Second Intermediate Period (15th Dynasty,) and with the southern part of Piramesse, the Delta residence of the Ramesses. By the middle of the second millennium BC, Avaris was not only the capital of the Hyksos rulers, but also one of the largest and most important cities in Egypt and the Ancient Near East. It occupied around 260 ha and had an estimated population of between 29,000 and 34,500 persons. Its strategic position on the route out of Egypt to the east gave it the status of a hub and gateway between the Nile Valley proper and the Mediterranean and the Ancient Near East.

The town was founded on now buried sand mounds (*geziras*) on the southeastern bank of the ancient Pelusiac branch of the Nile. The *geziras* were preferred for settlement for they remained unflooded during annual Nile inundations. At present the whole area is cultivated and remains of ancient settlement mounds survive in only a few places. From the late 1980s to the beginning of the 1990s, the ancient landscape of Tell el-Dab^a/Qantir was reconstructed over an area of 12 km², based on about 800 core drillings (Dorner 1994). His map of the reconstructed historical landscape with the old Pelusiac branch, the river system and turtlebacks sets the framework for all prospective work in Tell el-Dab^a.

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Fig. 1. General magnetic map of Avaris. © Austrian Archaeological Institute

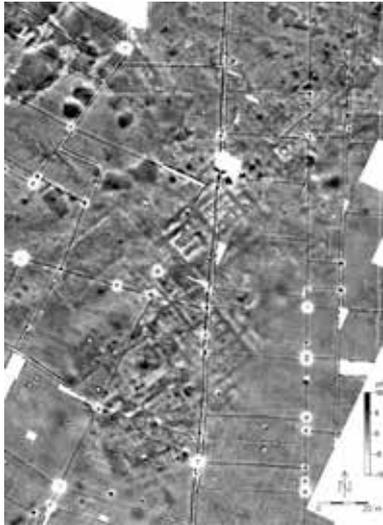


Fig. 2. Magnetic map of the Hyksos palace. © Austrian Archaeological Institute

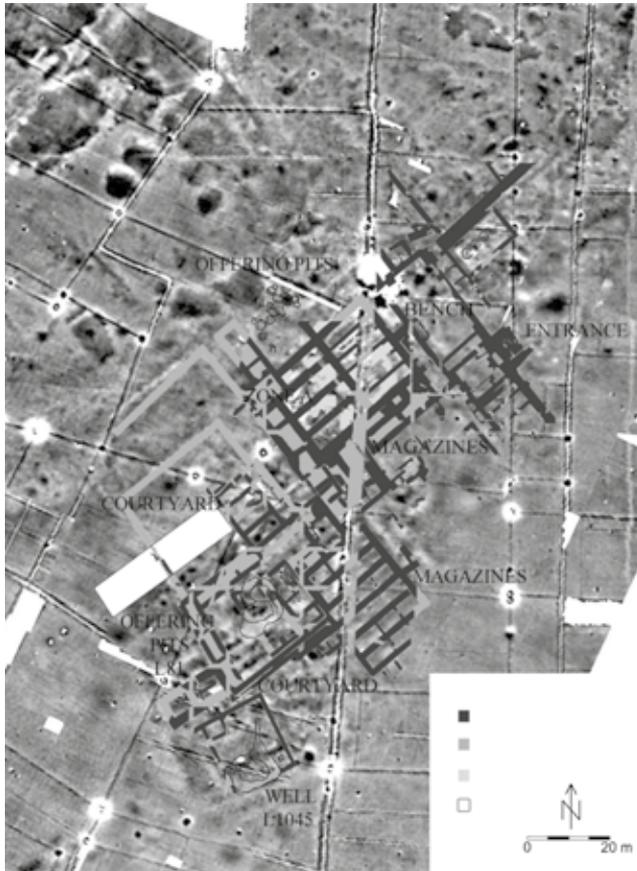


Fig. 3. Archaeological map of excavated structures superimposed on magnetic map. © Austrian Archaeological Institute

Taking into account the size of the site, classical archaeological excavation methods were of no use for the reconstruction of the urban plan, necessitating the use of other surveying methods. The survey carried out by Helmut Becker and Jörg W.E. Fassbinder in neighbouring Qantir showed the efficiency of the magnetometer prospection method applied to this kind of research (Pusch *et al.* 2000). In 1999, Tomasz Herbich began a magnetic survey of Tell el-Dab'a using a fluxgate gradiometer (Herbich 2001). Since 2002, the survey has been continued with two different magnetometers: fluxgate and caesium (by Christian Schweitzer) with two sensors set in parallel mode measuring the total value of the Earth's magnetic field intensity. Starting from 2010, a resistivity survey has been carried out in VES version.

The area surveyed with the magnetic method covers 150 ha and is bounded to the west by the longitudinal section of the ancient Pelusiac Nile branch and to the south by the latitudinal stretch (Fig. 1). To the east, the survey encompassed an area east of 'Ezbet Rushdi, reaching at 'Ezbet Machali almost to the southwestern edge of the area surveyed by H. Becker and J.W.E. Fassbinder in Qantir.

In the northwestern part of the old town of Avaris (‘Ezbet Helmi), the survey revealed remains of the Tuthmoside palatial platform (palace G), remains of a Hyksos wall (section of buttressed wall, Bietak *et al.* 2001; Herbich 2003; perhaps part of a late 15th Dynasty city wall, Forstner-Müller 2013) as well as remains of a large wall from the Late 18th to Early 19th Dynasty. The magnetic survey east of ‘Ezbet Rushdi revealed an Early Middle Kingdom settlement with orthogonal layout (Forstner-Müller *et al.* 2005). To the south, remains of the town from the 15th Dynasty have been mapped. In area F/II (between ‘Ezbet Helmi and Tell el-Dab’a), a palatial complex from the Hyksos period was discovered (first published in Bietak *et al.* 2007). The dating of these structures is known from earlier excavations (orthogonal settlement at ‘Ezbet Rushdi) or verifying testing following the magnetic survey (palatial complex in F/II). The survey on the mound of Tell el-Dab’a revealed remains of large buildings dating to the Late and Ptolemaic periods (Forstner-Müller and Müller 2007). In the area neighbouring with the earlier excavation in F/I, remains of tombs of the Late Middle Kingdom and Second Intermediate period were registered.

Recently, an electrical resistivity survey (VES) undertaken to trace the fluvial system and Nile branches has brought interesting results (recently Forstner-Müller *et al.* 2010). Combined with the magnetic survey, it has allowed structures registered along the Nile edge to be interpreted as reinforced banks and harbours (Herbich and Forstner-Müller 2013).

The survey with caesium magnetometers has provided a clear picture of the paleomorphology of the Nile Delta showing the Pelusiac main branch with river banks and deep water sediments, less rapid flowing side branches and lagoon areas with limnic sedimentation. Combination of these and VES results gave a precise estimate of the extent of the areas that were above water level during the annual Nile inundation (giving a picture slightly different than that obtained from the corings).

These survey methods, especially the magnetic research, have not only provided an overview map of ancient Avaris, but have been a breakthrough in understanding the spatial structure and organisation of the town.

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