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„AIS-Mîn-Panos“

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Developing an Archaeological Information System for the  
Panopolite Nome (Akhmîm) in Upper Egypt

Rafed El-Sayed, Chrystina Häuber & Franz Xaver Schütz

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**Abstract:** The following is a preliminary report about the Mîn-Panos-Project, a fundamental goal of which is the development of an archaeological information system for the Panopolite Nome (Akhmîm) in Upper Egypt. The AIS contains primary data based on on-site surveys, remote sensing, and new in-depth research of museum stock, as well as secondary data like published and unpublished field reports, documentations plus records from archives, libraries, and museums. The AIS consists of a data base with GIS- and mapping functionalities and is planned to be available on the internet free access. Its objective is to support and sustain interdisciplinary research on the history of the Ninth Nome of Upper Egypt with its metropolis Panopolis, modern Akhmîm, a region which was of major historic importance, especially for the history of religion during the first millenium AD. Applying an archaeological information system to research into the sacred landscape of a defined region allows not only to improve the processing of huge amounts of data but also to visualize the changing topography of the region, and to identify ancient ritual sites that were hitherto only known from literary sources.

**Keywords:** Archaeological information system, Akhmim, Panopolis, Egypt, landscape archaeology, remote sensing, religious studies

## **‘AIS-Mîn-Panos’**

# **Developing an Archaeological Information System for the Panopolite Nome (Akhmîm) in Upper Egypt**

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The following is a preliminary report about the Mîn-Panos-Project, a fundamental goal of which is the development of an archaeological information system for the Panopolite Nome (Akhmîm) in Upper Egypt. The AIS contains primary data based on on-site surveys, remote sensing, and new in-depth research of museum stock, as well as secondary data like published and unpublished field reports, documentations plus records from archives, libraries, and museums. The AIS consists of a data base with GIS- and mapping functionalities and is planned to be available on the internet free access. Its objective is to support and sustain interdisciplinary research on the history of the Ninth Nome of Upper Egypt with its metropolis Panopolis, modern Akhmîm, a region which was of major historic importance, especially for the history of religion during the first millenium AD. Applying an archaeological information system to research into the sacred landscape of a defined region allows not only to improve the processing of huge amounts of data but also to visualize the changing topography of the region, and to identify ancient ritual sites that were hitherto only known from literary sources.

## **INTRODUCTION**

### **Project history and people involved**

In 2012 the Egyptologist Rafed El-Sayed initiated the multidisciplinary research project ‘*The Archaeology of Religious Change. The Cultic Topography of the Akhmîm District (Upper Egypt) in Late Antiquity*’ at Georg-August-Universität Göttingen (URL: <http://www.min-panos.uni-goettingen.de>). Participating researchers represent the following disciplines: Egyptology, History of Architecture, Classical Archaeology, Geography, GIScience and Geodesy. Close cooperation is sought with historians, art historians and archaeologists from universities, museums, and public institutions from different countries (see ‘acknowledgements’).

### **Research topic and objectives, an ‘archaeology of religious change’**

The main objective of the project is to sustainably support interdisciplinary research on the archaeology and history of the ancient Ninth Nome of Upper Egypt and its metropolis Panopolis, modern Akhmîm (fig. 1) with a focus on the ‘archaeology of religious change’.

The phenomenon of religious change characterised the history of the Mediterranean world in the first millenium AD (Brown, 1971; Barcelo, 2013). It originated in the eastern part of the Roman Empire where a multitude of beliefs and syncretisms coexisted at the beginning of the new millenium (Frankfurter, 1998). Our project focusses on the district of Akhmîm-Panopolis, a major provincial centre in northern Upper Egypt. As early as the fifth century BC this region was subject to strong influence by Greek culture. During the Ptolemaic, Roman, and early Byzantine periods (332 BC – ca AD 550) it was an important centre of ancient (Egyptian) religion and Hellenic culture (Egberts, Muhs & van der Vliet, 2002). In the early fourth century AD Akhmîm became of crucial importance for early Christianity because the region developed into a centre of monasticism (Gabra & Takla, 2008). Akhmîm-Panopolis is furthermore well known for its great wealth of relevant literary sources and archaeological finds from all periods of Egyptian history (Kuhlmann, 1983; Kuhlmann, 2012). It has, however, so far never been studied under the particular aspect described here.



**Figure 1:** Aerial view of the Akhmîm district with ancient toponyms based on @google.maps and sketch map of Egypt showing the location of the Ninth Nome (Nomos Panopolites) in northern Upper Egypt.

Previous studies of Akhmîm-Panopolis concerned themselves, among others, with the digital collection of meta-data on the funerary objects from the Graeco-Roman period now spread over collections all over the world (Depauw, 2002), photogrammetric documentations of single monuments and comprehensive recording of cemeteries from the pharaonic and Graeco-Roman periods remaining *in situ* (Kuhlmann, 1979; Kanawati, 1980–2010), maps of the archaeological zone based on aerial photography (Kuhlmann, 1982), as well as databases of artefacts from residential sites (McNally & Walsh, 1984; McNally & Dvorzak Schrunk, 1996). Part of this material we were generously allowed to incorporate into the ‘AIS Mîn-Panos’ (see ‘acknowledgements’).

In order to study the archaeology of religious change in a holistic manner archaeological finds needed first to be traced to their present location in order to be recorded and studied. Most of these finds (amounting to thousands) lack a detailed description of provenance mainly because early archaeological exploration in the Akhmîm district during the 19th century was not conducted according to modern scientific standards of documentation (Kuhlmann, 1983; Depauw, 2002). However, in many cases the lack of information is due to the fact that outdated publications, archival material, published and unpublished excavation reports and other pertinent documents contained in disparate archives, had previously not been exhaustively exploited (El-Sayed, in preparation). In a comprehensive way this was only started by the project presented here, in the framework of which the creation of an AIS was the fundamental decision.

In the beginning the research focused on the religious change during the first millenium AD and the changing sacred landscape of the Panopolite Nome. During this

period the entire Mediterranean World underwent major changes, in particular two major religious shifts, both characterized by a multitude of minor changes (Brown, 1971; Cameron, 1993; Bowersock, Brown & Grabar, 1999). One of our principal aims, therefore, was to understand the chief agents of change, or rather the diverse processes responsible for such transformations by taking a diachronic look at the sacred landscape and material culture of a particular region.

## METHODS

### Methodologies and state of the art: Egyptian Archaeology, Religious Studies, and GIScience

Systematic studies of ancient Egyptian and late antique archaeology and history have been conducted since the end of the 19th century (Bard, 2008; Hornung, 2010; Wilkinson, 2008; Verbovsek, Backes & Jones, 2011). New technologies were introduced to such studies not before the late twentieth century, especially in research dealing with the spatio-temporal changes of landscapes (Fabrizio, Bresciani & Giammarusti, 2003; Parcak, 2007; Tronchère, 2009; Ghillardi & Tristant, 2012a; Claes & Van Keer, 2014).

Religious studies, on the other hand – especially those concerned with late antique Egypt – rely to this day heavily on texts, and are usually not principally concerned with topographical context or with the material culture of the specific areas (Frankfurter, 1998; Hahn, 2004; Hahn, Emmel & Gotter, 2008). According to our understanding of religious studies, however, including the material culture and the changing sacred landscape is indispensable since materiality and space are major aspects of ‘the religious’ (Török, 2005a; Quirke, 2015).

The term GIS (denominating a software) stands for ‘geographic information system’ (Tomlinson, 1976). The methodological approach exists since at least the 1970s (being at that time called ‘GIS’ as well). Today this field of studies is called ‘GIScience’ and has developed into a discipline in its own right (Goodchild, 2010). The term ‘AIS’ was coined in the 1990s within the context of “a European Archaeological Information System (AIS)” (Arroyo-Bishop, Lantada Zarzosa, 1995: 43). For the history and definition of AIS, see Häuber and Schütz (2004: 16). As a matter of fact, GIS and AIS are closely related systems because information systems called AIS usually contain GIS software. The latter is also true for the project presented here.

In Archaeology ‘air survey’ has been used since 1924, at least (Crawford, 1924). In combination with GIS techno-



logies remote sensing found practical implementation in archaeology more than 25 years ago (Allen, Green & Zubrow, 1990; Schütz & Häuber, 2003; Schütz, 2014), because these methodologies allow the survey, analysis, and monitoring of large areas and support research projects that deal with large amounts of data. In Egyptian archaeology the methodologies were introduced more recently (Freeman, Nicoll, & Holliday, 2001; Saleh & Bahgat 2002; Fabrizio, Bresciani & Giammarusti, 2003; Mueller, 2004; Parcak, 2004). In studies focusing on Egyptian religion GIS technologies have so far not yet been applied (cf. Raja & Rüpke, 2015).

Combining all the above mentioned disciplines in one research project based on the approaches and methods described below is new; this is why it features as a contribution to this paper. In addition, the development of the 'AIS Mîn-Panos' provides even more potential. It is used to allow the storage and retrieval of a huge amount of data their analysis and the visualisation of the research results especially as (diachronic interactive) maps.

## Approaches

### *Developing the 'AIS Mîn-Panos'*

Today, professional development of software and information systems follows international standards (Häuber & Schütz, 2004: 49–54). Initially it is essential to define what is being required of the information system. Basic requirements concerning our project were (1.) simple structure and (2.) ease of use. As a matter of fact, any information system designed for similar purposes should provide the following functions: (1.) integrating (importing) existing data sources of a very heterogeneous kind, (2.) storing such data as they are, (3.) changing the data, and (4.) performing spatio-temporal analyses and visualizations. In short, input, storage, manipulation, and output of spatio-temporal data are the essential points.

The data which the future 'AIS Mîn-Panos' will contain and provide the user with are the following:

- (1.) archaeological finds (together with the pertinent metadata) documented in analogue and digital photographs as well as drawings and restitutional drawings; if possible, the coordinates of the findspots will be provided
- (2.) maps, images, digital elevation models and „3D“-models of an entire area and/or single site as well as of architectural and landscape features
- (3.) ancient and post-antique texts written in their original language, including reports, travellogues, etc.

- (4.) published and unpublished archive material relating to people, collections, landscapes as well as archaeological sites, missions and finds.

Due to this wide range of data the 'AIS Mîn-Panos' is meant to comprise, the AIS was designed according to the following requirements and functionalities: storage, retrieval, analysis/statistics, change and output of text-, raster- and vectordata in different modes of visualization.

### *Reconstructing the 'archaeology of religious change'*

To date, the project has focused on just a few select aspects within the framework of in-depth studies concerned with the material culture and landscapes of particular periods (cf. below). Because of the complexity of the matter, the length of the historic period (300 BC – 900 AD) as well as the size of the area under investigation it was decided from the very beginning to support the research by an appropriately designed information system, the 'AIS Mîn-Panos'.

Because of this fundamental decision regarding the recording of the relevant data which the AIS must contain the following initial steps were decided upon and implemented since 2012:

- (1.) data collection and processing (**site** surveying, remote sensing as well as mapping; **object** search, recording and processing; evaluation of published and unpublished primary and secondary sources on site, in archives, collections and libraries)
- (2.) conception and development of the databases' structure, as well as entering the collected data into the databases
- (3.) investigation of select aspects within in-depth studies

## RESULTS AND DISCUSSION

### *Data collection, spatio-temporal contextualization of finds, and synthesis of religious changes*

Since 2012 the project's collaborators have conducted in-depth studies on the following topics:

- (1.) "Sacred Landscapes and Material Culture of Akhmîm-Panopolis from Late Antiquity to the early Middle Ages" (El-Sayed, in preparation)
- (2.) "Graeco-Roman Material Culture at Panopolis 300 BC to 300 AD" (Wegener, in preparation)
- (3.) "Late Egyptian Funerary Traditions at Panopolis 300 BC–300 AD" (Hussien-Yosef, in preparation)

All in-depth studies aim to give a comprehensive description of the historic processes of change through synchronic and diachronic reconstructions of the sacred landscape that includes all types of sacred places inside and outside of settlements as well as necropoleis. In addition, a thorough analysis of the material culture of the region under scrutiny including cultic objects and those being part of the material culture of daily life (cf Török, 2005a; Török, 2005b) has been undertaken.

Sites and toponyms may be located respectively identified through artefacts which in their iconography very often represent the topography they were originally associated with (cf. Häuber, 2014:1, 9–10, 807–811). Most of the objects included in the investigated material lack information about their exact provenance and archaeological context. Consequently, one common aspect of all studies is a background research into the history of collections and the establishment of a typological framework (El-Sayed & Lakomy, forthcoming). A similar approach is described by Quirke (2013). Through this holistic approach we were able, e.g., to locate the site of a late antique cemetery at Akhmîm as well as the find spots of some artefacts said to originate from this cemetery, that had been ‘lost’ for 100 years (El-Sayed, in preparation).



**Figure 2:** Detail from map File. 11 „Tahta“ from the Description. Source: <http://digi.ub.uni-heidelberg.de/diglit/jomard1828bd6/0020>.

### A diachronic map to analyse the changing sacred landscape of the Akhmîm district

In 2012 the development of the ‘AIS Mîn-Panos’ was started. When finished, it will constitute an effective research tool for archaeologists, papyrologists, historians, art historians and other scientists dealing with the Akhmîm district. As one essential element of the system we used ArcGIS 10.3. For the required precise spatial data referencing we used the official Survey of Egypt maps drawn to the scale 1:50.000 available in print at the

local cadastral and antiquities authorities. These maps were scanned at high resolution at the GWDG digitization centre at University of Göttingen. The scanned maps were georeferenced using ArcGIS. Testing our georeferenced data the latter proved to be highly accurate (Root-Mean-Square-Error (RMS) very close to 0). We also used aerial photographs with a resolution of 2 to 10 cm for chosen areas (provided by Hochschule Bochum), satellite images from WorldView-2 (DigitalGlobe 2015) for a selected area with a resolution of 50 cm, SRTM-data (Shuttle Radar Topography Mission, Jarvis et al. 2008) for the creation of a Digital Elevation Model (DEM, fig. 3), and free access scanned historical maps and plans of the area (fig. 2).

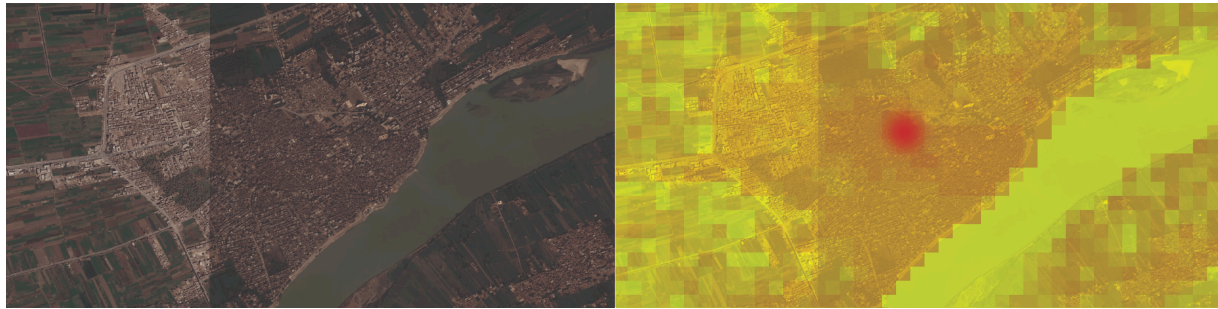
Overlaying and analyzing the aforementioned data resulted in important findings concerning the change of the landscape. Using satellite images in overlay with a digital elevation model derived from SRTM data, we detected spatial patterns which could be identified in many cases as cores of ancient settlements. These patterns have specific radial shapes and appear only in certain elevations above slm. As a preliminary hypothesis we suggest that these are ancient ‘tells’ (El-Sayed, in preparation). Especially in Egypt those ‘tells’ or ‘kôms’ (mounds) emerge from constant use of settlement sites and usually mark ancient sites (Parcak, 2005; Hansen, 2010). These findings mean nothing less than the potential to (a) identify ancient settlements by looking for these spatial patterns supported by the AIS, and (b) to locate firmly on the ground (religious) toponyms known from ancient and post antique texts and/or artefacts which have so far not been identified with known sites (El-Sayed, in preparation).

Superimposing two or more cartographic layers of historic raster maps with the current situation one can visualize the change of the (sacred) landscape over time. By adding a series of recent satellite images, moreover, the diachronic development of landscape features (for example low desert burial grounds), (potential) archaeological sites and single architectural structures/monuments becomes apparent.

## CONCLUSIONS

### Broader implications

Based on the results achieved so far it can be said that the potential of research on collections and archives in combination with remote sensing and site surveys is far from exhausted for the research goals outlined in this contribution.



**Figure 3:** Left: Satellite image of Akhmîm. Source of this image: ArcGIS Online "Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community". Right: Overlay with an analysed SRTM Radar image. The orange/red areas indicate surfaces with a higher elevation. We can clearly see the area around the red dot, it is the core of an ancient settlement. Source of the raw SRTM data: Jarvis, Reuter, Nelson, Guevara 2008.

If approached appropriately and supported by an adapted archaeological information system such research will greatly add to our understanding of the underlying processes of major changes in cultural and religious history of ancient landscapes.

### Tasks to be accomplished until the end of the project

The tasks that we hope to accomplish until the end of the current project are: Firstly, to implement step by step the to-do list described above, especially to complete and prepare the aforementioned in-depth studies for publication. Secondly, to complete and prepare the data entries included into the AIS potentially for publication on the internet. Finally, to integrate further maps and plans into the AIS and to create a diachronic general map available maybe also on the internet.

### Future work

We hope to be able to publish our results (including the databases and maps) in an appropriate manner on the internet in the near future. Since the development of an AIS does automatically open prospect for future research the initiator of the project plans to utilize the ,AIS Mîn-Panos' to study selected aspects of the archaeology, topography, and religious history of an area that counts among the historically most promising regions in Egypt regardless of its sometimes problematic history of exploration and the ongoing destruction of its archaeological potential by looting as well as urban and agrarian expansion.

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