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Comprehensive field survey at Gebelein: preliminary results of a new method in processing data for archaeological site analysis

Wojciech Ejsmond[a], Julia M. Chyla[a], Piotr Witkowski[d], Dawid F. Wieczorek[b], Daniel Takács[a], Marzena Ożarek-Szilke[a] and Jakub Ordutowski[b, c]

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GEBELEIN ARCHAEOLOGICAL SITE COMPLEX

The Gebelein archaeological site complex is located 28 km southwest of Luxor, on the western bank of the Nile in the Qena Governorate in Egypt. Practically all kinds of archaeological sites known in Egypt are represented in the site complex, dating from the Paleolithic through the Islamic Period (Marochetti 2013; Ejsmond 2013). The area has been visited by scholars from the 18th century on and the first excavations were conducted in 1885 (Marochetti 2013). Modern expansion of the cultivation zone and settlement development is threatening the survival of many of the sites, hence the project, which is carried out under the auspices of the Polish Centre of Mediterranean Archaeology of the University of Warsaw, proposes to investigate the site complex with a new form of comprehensive field survey.

The novelty of the method depends on combining the results of gathering, managing, storing, post-processing and interpreting different types of individual data from the field. The team has carried out a magnetic prospection of selected parts of the site and combined the results with an analysis of data coming from a number of other research and survey methods, including most recently an anthropological and ceramological survey.

RESEARCH METHODS AND RESULTS

A fast and effective way of collecting field data needed to be developed owing to the size of the area, which measured approximately 3 km by 4 km, and the extensive number of archaeological sites recorded in the complex. Mobile GIS together with remote sensing analysis (four spectral band satellite images from which one was near infrared [NIR]) gave the opportunity to prospect and examine sites, as well as to document archeological remains (see Chyla 2012). Mobile GNSS tools with GIS applications were used to document both position and information about archaeological features. Trimble Juno and MobileMapper 20 and ArcPad – ArcGIS applications were used to create a features database concurrently with the fieldwork. The objective was to connect features with positions and with information regarding the state

[a] University of Warsaw, Warsaw, Poland
[b] Polish Centre of Mediterranean Archaeology, University of Warsaw, Warsaw, Poland
[c] Maria Curie-Skłodowska University, Lublin, Poland
[d] Independent researcher

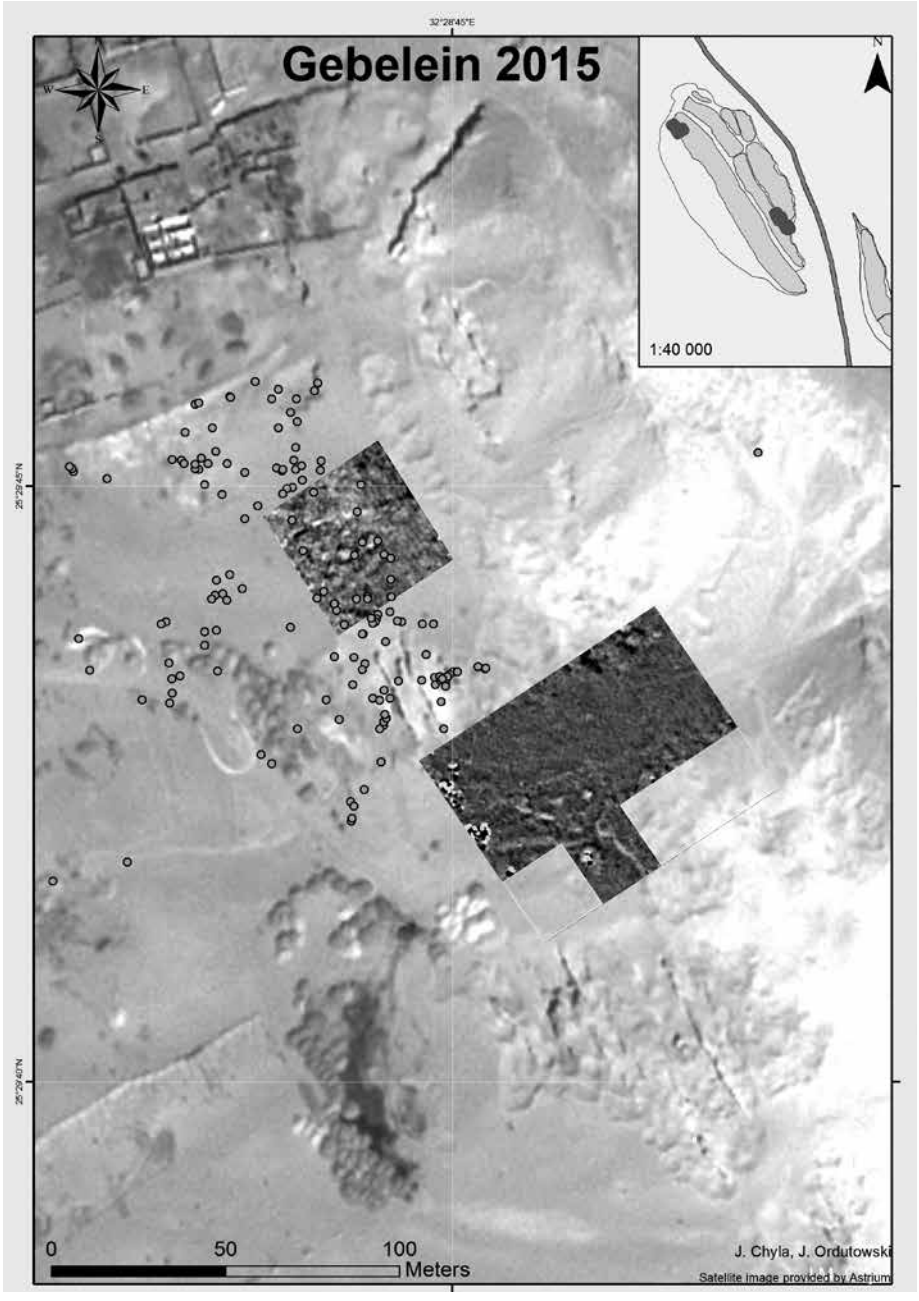

Fig. 1. Combined results of geophysical prospection and ceramological survey (processing J. Chyla, J. Ordutowski)

of preservation and recognized threats, archaeological finds, if present, basic description and photographic documentation (Chyla 2012).

Prior to the fieldwork, archival maps (of which Pierre Jacotin's [1826] map from the time of Napoleon's expedition to Egypt was the most useful) and contemporary satellite imagery (Corona, Landstat and Google from 1969, 1974/2013 and 2009–2014, respectively) were correlated and analyzed in GIS. A comparison of archival information and the situation today confirmed the expected expansion of agriculture into archaeological sites and beyond. Results and documentation from previous research (Chyla, Ejsmond 2013) were imported into the GIS, subsequently into a mobile GIS application and then used during fieldwork. The information helped in understanding the partly published research results from the beginning of the 20th century (Chyla 2012; Ejsmond, Chyla, Baka in press). Additionally, it proved possible to locate presumed ancient waterways by analyzing contemporary NIR and archival satellite images and archival maps, which reveal possible traces of an old riverbed and channels, as well as by reading ancient written sources from the Late and Greco-Roman periods, which describe numerous waterways in the Pathyrite district, the Greek name of the area administered from Gebelein (Andrews 1994).

One of the goals of the survey carried out in 2015 was to gather anthropological and pottery data with mobile GIS, which allowed all the human bone and pottery finds within the test areas to be positioned in the field. The pottery database included information on localisation, material, surface finish, diagnostic form (e.g., base, body or rim) and dating. It is an open database, in the process of being developed for the purpose of conducting a spatial analysis of the distribution of different kinds of pottery. This information was paired with the results of geophysical prospection (Fig. 1), in effect providing easy access to more precise information on the archaeological sites, as well as the dating and interpretation of structures traced on the magnetic map. The proposed method of gathering data, managing, post-processing and combining the information together with the results of other surveys, such as the pottery and anthropological collections, turns out to be a new approach to fieldwork methodology.

The magnetic prospection carried out on 22–28 February 2015 used a Geoscan Research fluxgate gradiometer FM 256 with 0.1 nT resolution. The sampling grid was 0.5 m by 0.25 m, giving eight readings per each square meter collected in both parallel and zigzag modes. Measurements were taken in squares 20 m by 20 m and covered approximately 1.5 ha. The method was chosen based on the presumption that mud brick (used in the region for tomb construction in antiquity) would be traced easily in the mostly sand and limestone bedrock geology of the site. Nile silt has been proved to be a highly magnetic material (Herbich 2003: 16).

The survey covered areas estimated to be under the greatest threat from modern expansion of arable land and which were researched in the ceramological survey. In the southern part of the valley (Area 1), no evidence of tombs was discovered over most of the valley floor, the sole exceptions being a few highly magnetic anomalies in the southwestern part of the map, corresponding with remains of mud-brick tombs explored in 1996 (Bergamini 2005: 33). In the second area located in the western part of Gebelein (Areas 2A and 2B), modern rubbish encroaching into the surveyed ground on the west caused a strong anomaly. Another highly magnetic anomaly in the northeastern part of Area 2A corresponded to an archaeological feature that could well be constructed of mud brick. A rectangular feature exhibiting fairly high

Fig. 2. Geophysical prospection of Eleventh–Twelfth Dynasty structures in Area 3 (processing J. Ordutowski)

magnetic values, measuring some 2 m by 5 m, was observed on the magnetic map of Area 2B. Finally, in Area 3, the magnetic survey discovered some new features around a tomb partly excavated in 1996 (Fig. 2), dated to the Eleventh and Twelfth Dynasties (Bergamini 2005: 33–36). Mud bricks were noted scattered over the surface of the site to the south of the tomb already during remote sensing analysis and confirmed during the survey in 2014. The geophysical anomalies recorded this year gave additional argument for the presence of yet another mud-brick tomb of similar construction and dimensions. Evidence of another rectangular feature, possibly a mastaba-type tomb, was observed as an anomaly with high magnetic values situated to the north-west of the tomb mentioned by Bergamini. West of this feature was a linear structure of low magnetic values, probably the remains of a boundary wall. Several anomalies over the entire northern part of the map may correspond to remains of brick-cased pit-graves, some of which were recently destroyed. This area was researched also in the anthropological survey. All human remains visible on the disturbed surface were individually documented, including data, such as type of bone, size, preservation and, if possible, interpretation. A comparison of the results from different survey methods (anthropological, geophysical and remote sensing) attested to the presence of at least four features and a minimum of five individuals buried in the area.

Overall, the results of the magnetic survey, despite disturbances caused by encroaching vegetation and earlier archaeological excavations, have proved satisfactory in providing data for the interpretation of the surveyed areas and determining places for future excavations that could provide archaeological feedback for the observed anomalies.

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