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What you see is what you get: some reflections on the impact of geophysical data on the strategies of archaeological fieldwork, based on case studies from Iran and Azerbaijan

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This paper aims to provide a reflection on some fifteen years of collaboration between archaeologists and geophysicists and the ways how these two disciplines have interacted, but also influ-

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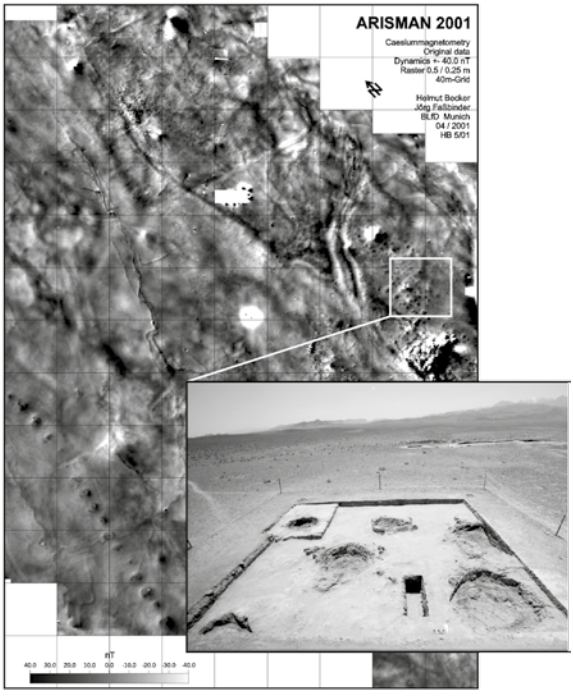

Fig. 1. Arisman, Central Iran. Magnetic map of the site, with a concentration of anomalies in the eastern part; view of excavation in that area, where anomalies turned out to be fired pits (measurments J. Fassbinder and H. Becker, 2001. Photo B. Helwing)

enced each other. It is maintained that geophysical surveying has become an indispensable tool in archaeological inquiry, in particular under time constraints in rescue and preventive archaeology but also in problem-oriented research, allowing to focus on neuralgic points of investigation. This same strategy, however, also bears the risk that archaeologists may let themselves be guided so closely by the results of geophysical prospection as to narrow their own perspectives onto features made visible in these maps. These risks can be outbalanced by continuous communication and the application of additional means of field exploration. This paper examines some case studies of firsthand experience from projects in Iran and Azerbaijan with the aim to point out possible future directions.

CASE STUDIES

Throughout the last fifteen years, geophysicists from various institutes have collaborated with us on fieldwork in Iran and Azerbaijan. One common parameter in all these works is the situation of working in a foreign research environment together with local colleagues, meaning that all necessary equipment has to be transported back and forth. Our geophysicists therefore always chose to work with portable instruments, which also enable them to be flexible in the often rugged terrain.

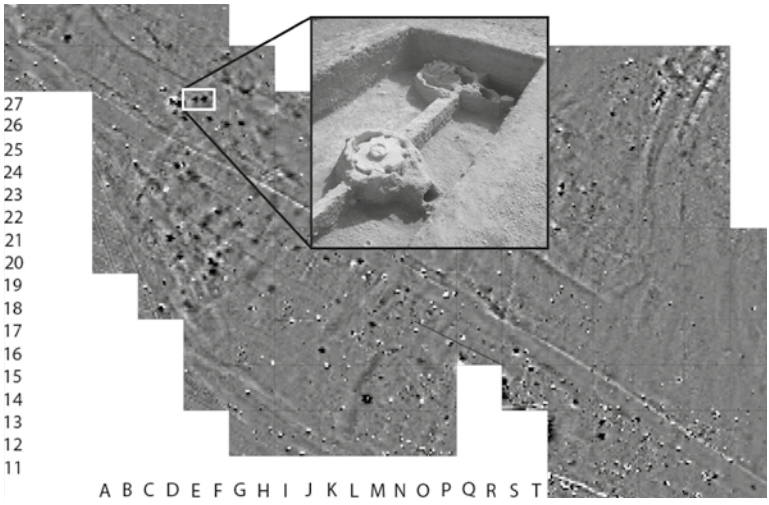

Fig. 2. Site TB 73, Bolaghi Valley, Fars Province, Iran. Magnetic map of the site and excavated pottery kilns in square E27. White square indicates location of excavation; seven other pottery kilns are discernible in the map (magnetometry Baoquan Song, 2006. Photo B. Helwing)

Case study 1: Arisman, Central Iran, work in 2001

At Arisman, an extended metal-producing site of the 4th to early 3rd millennium BC, Jörg W.E. Fassbinder and Helmut Becker conducted intensive magnetic prospection over a larger part of the site (Becker *et al.* 2011). The site is located on gypsum soil and contained enormous amounts of copper slag. The results of the prospection showed practically no traces of the ancient architecture that was constructed of local mud brick. Several larger anomalies appeared in isolated zones, and in the eastern part of the site there was a concentration of roundish anomalies that were interpreted as possible furnaces for copper smelting. Subsequent excavations focused on that zone and resulted in the discovery of burnt pits, no doubt somehow used in the metallurgical processing, but no furnaces. Other isolated anomalies were investigated as well and resulted in the discovery of single features with strong signal, like a pot burial wedged into its pit with fragments of a crucible. Had the focus of the excavation been solely on the magnetometry mapping, emphasis would have certainly been placed on the zone with the burnt pits, and the discoveries found in the extended proto-Elamite architecture would have been missed, as none of this was visible in the magnetometry.

Case study 2: Bolaghi Valley, South Iran, work in 2006

Archaeological fieldwork in the Bolaghi Valley in 2005 and 2006 took place under rescue work conditions as the valley was scheduled to be flooded by a dam (Helwing *et al.* 2010). Our group was responsible for the documentation of four sites with 5th millennium BC material, which were all also covered with historical stone architecture. In the second year, Baoquan Song undertook systematic magnetic prospection on two sites: TB 73 was investigated before

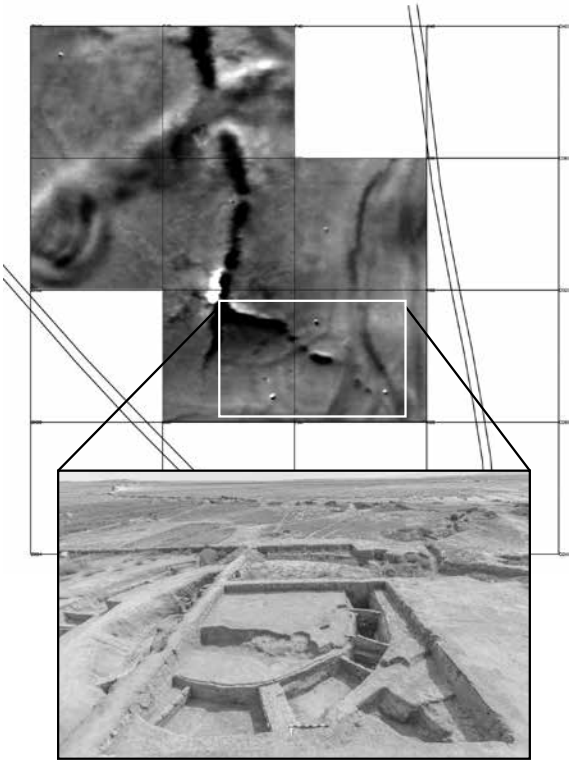

Fig. 3. Site MPS 4, Mil Steppe, Azerbaijan, magnetic map; white square indicates location of concentric ditch system, view shows ditch system in 2014, partly excavated and seen from the North (measurments by J. Fassbinder 2011. Photo J. Krumnow)

excavation, TB 91 had already been excavated the year before, and site TB 131 was discovered only later and was surveyed by Babak Aminpour.

The magnetometry allowed an extensive documentation of historical architecture. It also revealed underlying geomorphological features, like a landslide, and water channels that seem to have supplied the historical settlements in the valley. But the most obvious features were strong punctual anomalies, which imaged prehistoric pottery kilns. At site TB 91, where a prehistoric pottery kiln had already been found in the earlier excavations, another kiln was documented under a wall of historical date that had shaved the largest part of the kiln. At TB 73, where the anomalies were a major feature, five kilns were excavated and another four were inaccessible under a modern road. When the excavated kilns were selected for block recovery, the trenches had to be considerably enlarged, and this led to the discovery of a human skeleton and of traces of house structures preceding the kiln phase. In retrospect, the excavation process was significantly guided by the magnetometry results, which most probably caused other prehistoric features to be missed.

The late discovery of site TB 131, once a mounded site visible in the valley and later-on leveled by the local farmers, only allowed short-term prospection. No architectural features were visible on the magnetometry map, but a few larger anomalies of unclear contours looked worth investigating and turned out to be rather geological than anthropogenic features. The most significant discoveries at this site were a number of prehistoric burials that were not visible on the magnetic map.

Case study 3: Mil Plain site, Republic of Azerbaijan, work since 2010

Ongoing research in the Mil Plain focuses on the documentation of prehistoric settlement patterns, with intensive fieldwalking and related excavations and testing on various sites in a region with still excellent conditions of preservation that are today, however, threatened by rapid land development schemes (Helwing *et al.* 2012). Jörg W.E. Fassbinder regularly participates in the field seasons with the aim to identify sites previously recorded in surveying and to identify types of sites and buried features (Fassbinder, in Lyonnet *et al.* 2012). This allows sites to be preselected for investigation by auguring and excavation. However, the discovery of the first concentric ditch monument in the Southern Caucasus happened by accident, and was only subsequently confirmed in the magnetometry, where a faint anomaly had been overlaid by other, more obvious features. The adopted work flow of survey – magnetometry – auguring, followed by excavation, allows the results of the geophysical survey to be checked, whereas the magnetometry data also helps in identifying features that are sometimes barely visible to the naked eye.

RESULTS

The continuous collaboration with geophysicists has greatly changed the approach to archaeological fieldwork and has led to significant discoveries, which may have otherwise gone unnoticed. For geophysics, the "ground-truthing" provided by subsequent excavation serves as an important corrective of preliminary interpretations. From the archaeological perspective, the danger of being seduced to plan excavation strategies by obvious and visible features in the magnetometry map is imminent. A larger scheme of excavation remains a desirable scheme in order to avoid seeing only what one wants to see. A regular check-back and communication from both sides remains an important and necessary approach to this type of successful interdisciplinary inquiry.

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