

Successfully falsified... On epistemological problems of archaeological excavations and geophysical surveys

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PROBLEM

Archaeological prospectors using geophysical methods sometimes can get rather frustrated by the feedback they receive from archaeologists based on the results of follow-up excavations. Usually, when the prospection results and in particular their interpretation as provided by the prospector agree with the results of the corresponding archaeological excavation, then no further problem seems to arise, as it is considered that the excavation appears to “verify” the results of the geophysical survey.

But if the excavation unearths archaeological stratification or part of a stratification that had not been detected by the earlier use of geophysical prospection methods, or — even worse — which had not been interpreted correctly, archaeologists tend to question the integrity of the method of geophysical archaeological prospection as a whole. On the other hand, the employed methods of excavation and the interpretation results of the unearthed features and archaeological stratification derived at least to some degree subjectively, are seldom questioned as a rule. It seems as if the archaeological excavation — no matter what methods are used or how well documented they are — forms an absolute source of knowledge about an archaeological site or part of it, in contrast to archaeological prospection, the credibility of which is often described as relying on verification through archaeological excavation. We are convinced that this approach and position is based on basic methodological and epistemological errors, which have profound implications on our profession and the uses and potential of non-invasive archaeological prospection. Furthermore, we believe that we can provide a simple and effective solution to the described problem.

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ARCHAEOLOGICAL EXCAVATION AS A SOURCE OF KNOWLEDGE

Archaeologists usually impose high demands on the quality of their excavations. Nowadays, it is widely accepted that excavation methods that are regarded as more scientific, especially the stratigraphic method, lead to a better understanding of a site's archaeological stratification, compared to inferior methods, such as for instance arbitrary excavation methods or hybrid forms of those two (Harris 1989; Gersbach 1998). All used methods result in a corpus of documentation that should represent the original, meaning the actual discrete form of the archaeological stratification prior to excavation. This would not be a problem, if we could look at excavations as reproducible processes that guarantee the repeatability of the scientific outcome. But as the very process of excavation implies a generally irreversible destruction of the object that is being investigated, all knowledge gained during an excavation later exists only in form of the respective documentation, as the process of excavating is not reproducible at all. This differentiates excavation methods from all non-invasive geophysical prospection methods.

Furthermore, there exists another fundamental methodological problem with excavations: all excavation work in archaeology is by definition interpretative (Tilley 1989). It is impossible to excavate and thus document the original form of the archaeological stratification sought after, because even the best methods used can lead only to an approximation of the original form.

GEOPHYSICAL PROSPECTION AS A SOURCE OF KNOWLEDGE

From the point of view of archaeological stratification, geophysical prospection methods show major advantages over excavations: they will not destroy the stratification, they are all repeatable and they will result in the same data after every single repetition, within given methodological errors. Repeatability and reproducibility of an experiment are basic requirements for qualification of an experiment or method as scientific.

The results of a geophysical survey in form of data or data images are *per se* not interpretative, but actually are a representation of the original form of the archaeological stratification of the surveyed site, limited to the material-dependent physical parameters and the limits of detectability and imaging resolution of the method(s) used. This means that an archaeological-geophysical survey conducted by an experienced surveyor, who uses geophysical methods appropriate for present soil conditions and geological as well as archaeological circumstances, will result in a scientifically documented data set that can subsequently be used for further discussion and interpretation.

ARCHAEOLOGICAL INTERPRETATION OF GEOPHYSICAL DATA

New problems arise when interpreting geophysical data. Just as the excavator interprets the physical data set of the archaeological stratification during excavation and documentation, the geophysical surveyor should interpret the geophysical data set into something archaeologists, who are inexperienced with the analysis of geophysical prospection data or images thereof, should at best be able to understand and work with. The quality of this interpretation is limited by the experience and knowledge of the person interpreting, again similar to the excavating persons. Therefore these interpretations will always be just as flawed and subjective representations of

the real archaeological stratification as those derived from excavation. In any case, increasing experience and professional training will lead to better interpretations.

SOLUTION

As stated above, the solution to the problem is as simple as effective and will stop any unpleasant quarrels while improving the quality of the discourse. Whenever there is a mismatch between the documentation of an excavated site and the interpretation of geophysical data representing the same site, the basis of any further discussion must be the geophysical data set. Of course both methods can represent only an aspect of the original stratification, because by definition they are incomplete. But as described above, geophysical data are produced through scientific experiment and therefore show a more scientific representation of the original form of the archaeological stratification before excavating, than any documentation of the interpretative act of excavating ever could provide.

The key to the understanding of possible problems and to dissolving any mismatches in the interpretation is to sit down together and to discuss the results of either methods and to understand and accept their inherent limitations. It is not accusing each other of using insufficient or unsuited methods or questioning the integrity of an entire scientific discipline. Archaeological excavation is certainly not able to either verify or falsify the results of a geophysical survey; it is only able to question the quality of the archaeological interpretation derived from geophysical data.

REFERENCES

- Gersbach, E. 1998. *Ausgrabung heute. Methoden und Techniken der Feldgrabung*. Stuttgart.
- Harris, E. C. 1989. *Principles of Archaeological Stratigraphy*. London - New York.
- Tilley, C. 1989. Excavation as theatre. *Antiquity* 63: 275-280.