7 ARCFIELDLAB – STIMULATING NETWORKS, KNOWLEDGE EXCHANGE, AND EXPERIMENTATION IN APPLIED SENSOR ARCHAEOLOGY FOR DUTCH FIELD RESEARCH

Scholte, Mason (4D Research Lab, Universiteit van Amsterdam) - Waagen, Jitte (Amsterdam Centre for Ancient Studies and Archaeology / 4D Research Lab, Universiteit van Amsterdam)

In Dutch archaeological fieldwork there are increasingly innovative applications of new technology, ranging from drones with various sensors, new geophysical instruments, automated auguring tools and so on and so forth. Funded by the European E-RIHS initiative, the 4D Research Lab leads the ARCfieldLAB project consortium in The Netherlands to provide archaeological professionals with insights into the possibilities and limitations of these novel techniques.

The aims of ARCfieldLAB are to stimulate networks of archaeologists and specialists, facilitate knowledge exchange and promote experimentation with cutting-edge technology, all in the field of sensor archaeology for terrestrial and maritime contexts. These are addressed by organizing expert meetings, creating a central website to share community-generated knowledge on the applicability of the various techniques, funding case studies, and creating and sharing best practices. One of the additional aims that has been formulated in the course of the first expert meeting is to establish so-called 'benchmark sites' – a series of sites on different soils and with different types of archaeological contexts that should be researched using different sensors in a comparative and integrative multitemporal approach.

This presentation aims to share the progress so far, discuss the potential of benchmark sites, and explore the possibility to do this in an international context.

8 IDENTIFICATION OF ARCHAEOLOGICAL ELEMENTS WITH GROUND-PENETRATING RADAR (GPR): LABORATORY PRACTICES AND COMPARISON WITH REALITY

Oliveira, Rui (Instituto de Ciências da Terra, Universidade de Évora, Évora, Portugal; Departamento de Física, Universidade de Évora, Évora, Portugal; Earslab - Earth Remote Sensing Laboratory, Universidade de Évora, Évora, Portugal) - Trapero, Pedro (Área de Historia Antigua, Departamento de Historia, Geografía y Filosofía, Universidad de Cádiz, Spain; Earth Remote Sensing Laboratory (EaRSLab), Universidade de Évora, Portugal; Centro de História de Arte e Investigação Artística (CHAIA), Universidade de Évora, Portugal) - Caldeira, Bento (Instituto de Ciências da Terra, Universidade de Évora, Évora, Portugal; Departamento de Física, Universidade de Évora, Évora, Portugal; Earslab - Earth Remote Sensing Laboratory, Universidade de Évora, Évora, Portugal)

The application of non-invasive and non-destructive techniques in geophysical prospection, has become a common practice in the search for archaeological elements without resorting to excavation. The interaction between archaeologists and geophysicists has not always been ideal, with archaeologists possessing the tools to process and understand the data, while geophysicists face their own set of challenges. The complexity of the process increases further when seeking a historical interpretation, such as the reconstruction of a site's layout or the interpretation of its elements. Recognizing the need for improved collaboration, we present a series of experimental case studies wherein various scenarios that may arise in an archaeological context are reproduced using idealized laboratory conditions. The study involves a comparative analysis between archaeological remains on a small scale, buried within a uniform medium composed by coarse sand, and data obtained by ground-penetrating radar (GPR) using a 1600 MHz antenna. The obtained results are then compared with the geometry of the buried objects, and a discussion ensues regarding the feasibility of addressing typical historical and archaeological questions based on this analysis.

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9 THE GOOD, THE BAD AND THE UGLY- DUTCH DESK-BASED ARCHAEOLOGICAL RESEARCH AN EXAMPLE OF MULTIDISCIPLINARY APPROACH. CHANCE OR WASTED RESOURCE?

Durczak, Kinga (Antea Group)

In Dutch commercial archaeology, desk-based research initiates a multi-step process to assess archaeological potential, including survey drilling, trial trenching, and definitive excavation. In most cases, the desk- based research leads directly to or is combined with survey drilling. Researchers investigate various aspects such as geology, geomorphology, LIDAR, aerial images and additional data like paleogeography and groundwater levels in GIS environment. Integrating archaeological and historical information theoretically aids in identifying potential of the site.

However, discrepancies between intended outcomes and data quality persist. The requirements for the use of data (lidar, aerial photos, geological, legacy data etc. usually an open-source) do not always leads to the correct conclusions and understanding of the potential of the landscape. The Dutch archaeological expectation model primarily employs an inductive approach, with occasional instances of a deductive system, resulting in data incompleteness and inconsistencies. Furthermore, challenges arise from the diverse landscapes and their archaeological potential, while varying models across municipalities exacerbate gaps and weak links between data, modelling, and assessment outcomes.

Archaeological prospection ideally serves as a robust cornerstone for subsequent research endeavours. However, its efficacy significantly depends on the proficiency of researchers, the experience of reviewers, and the accessibility of relevant data. Unfortunately, there is often a lack of comprehensive resources explaining the models used to assess archaeological potential and establish connections with geomorphological data. Moreover, there is currently no push from the archaeological companies, municipalities, and government to create an appropriate resource. This shortage of explanatory materials poses challenges and impedes the seamless integration of diverse datasets crucial for informed decision-making in archaeological investigations.

Despite the potential of desk-based research, it is frequently underutilized. Addressing systemic errors and theoretical gaps requires collective effort, yet responsibility allocation remains unclear. These challenges must be tackled to maximize archaeological data usage and prevent resource waste.

10 COMPARATIVE NON-DESTRUCTIVE SURVEYS ON CENTURIATED ROMAN LANDSCAPE

Bödöcs, András (Eötvös Loránd Tudományegyetem) - Márkus, Gábor (Archaeodata 1998 Ltd.)

To understand the former territory and Roman land use of Savaria, the first Roman colony of Pannonia, a research programme was launched in 2022. The main objective was to identify the land allotted to the veterans settled on the land of the former colonia, to map the land use traces and the relationship between the veteran estates. Traces of land distribution previously we reconstructed using a GIS predictive model and then identified from aerial photographs. Although we have been able previously to identify concrete traces of this, we still do not know exactly the main aspects of the land allocation. We would like to understand and identify features that can be compared with the texts of ancient sources. For example, how many veterans shared a centuria, a Roman centuria unit (ca. 710×710m).

Therefore, we aimed at surveying large areas with non-destructive methods. So we arrived to the other main objective of our project: to investigate the potential of using multispectral drones in archaeological research, especially in landscape archaeology. We therefore started to survey the elements of the Roman centuriatio allocation. For this work we acquired a DJI P4 MultiSpectral drone, with which we started monitoring several pre-selected areas. These areas were assumed to be complete Roman centuria units (>50ha). We tried to compare the data obtained from these flights with the results of 16 channel fulxgate magnetometer surveys of the same areas. In our presentation we would like to illustrate with examples the pitfalls, possibilities, positive and negative aspects of the surveys and the comparison of the results.

11 COMPARISON OF LARGE-SCALE MAGNETOMETRY MEASUREMENTS WITH EXCAVATION DATASETS IN EASTERN HUNGARY. FEATURE DETECTABILITY AND IDENTIFICATION POSSIBILITIES

Mesterházy, Gábor (Hungarian National Museum - National Institute of Archaeology) - Pethe, Mihály (Hungarian National Museum - National Institute of Archaeology)

In 2009, David Jordan highlighted the half-century track record of archaeological geophysics' effectiveness. Since then, the adoption of non-invasive geophysical methods in scientific and development-led archaeological research in Europe has gradually increased. Despite the widespread use of geophysical measurements for various archaeological objectives. Many studies often focus solely on processing and interpreting data without adequately addressing feature detection probabilities, identifiable feature types, and undetectable archaeological features.

This study examines two sections of motorway in Jász-Nagykun-Szolnok county, Eastern Hungary: the 19 km M4 section between Abony and Fegyvernek, and the 33 km M44 section between Tiszaug and Szarvas. Geophysical surveys, conducted in 2013 and 2014 across 67 hectares using magnetometry, were complemented by trial trenching and full-scale excavations in subsequent years, yielding a significant dataset for comparison. The presentation aims to analyze the physical and cultural properties of archaeological phenomena by comparing features from magnetometry, survey interpretation, and excavation. Each method has its limitations and biases: magnetometer surveys are influenced by measurement settings and soil properties; survey interpretation depends on the expertise of the interpreter; and the success of excavations is impacted by the archaeologists' skills.

Our approach not only offers an overview of detection rates but also delves into the analysis of detection and misinterpretation rates by feature type, chronological categories, and properties (size, depth, topsoil depth). Through this comprehensive examination of large-scale datasets, we have enhanced our understanding of regional feature detection capabilities.