ISAPNEWS

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Issue 65, October 2022

Editorial – Issue 65

We start and end this issue with our Honorary Member Albert Hesse, who sadly died on 2nd July 2022. His obituary shows his lasting contributions in research, teaching and training. Every time I met him I felt inspired to do more research in archaeological geophysics. The back page features a photo of his presentation in Bradford for the 80th birthday of the late Arnold Aspinall, another deceased Honorary Member.

We then have a survey article with a Roman theme, but focussing on some new research: the use of radiation detectors for the investigation of the Roman town of Silchester.

Many of you have contributed to the online poll on the role of archaeological geophysics. You will find a summary and evaluation of the results in this issue.

Our list of articles published in Archaeological Prospection is quite long this time as three issues were published since the release of ISAPNews 64. Fortunately, many articles are Open Access!

As always, I hope you will enjoy the collection of different articles and will feel inspired to send us something about your own work – some text, data plots and/or (funny) pictures.

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The Cover Photograph shows the SQUID magnetometer survey of the Leibniz-IPHT Jena, Germany, in Wroxeter, UK, 2006.

Table of Contents

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Obituary: Albert Hesse (1938- 2022)

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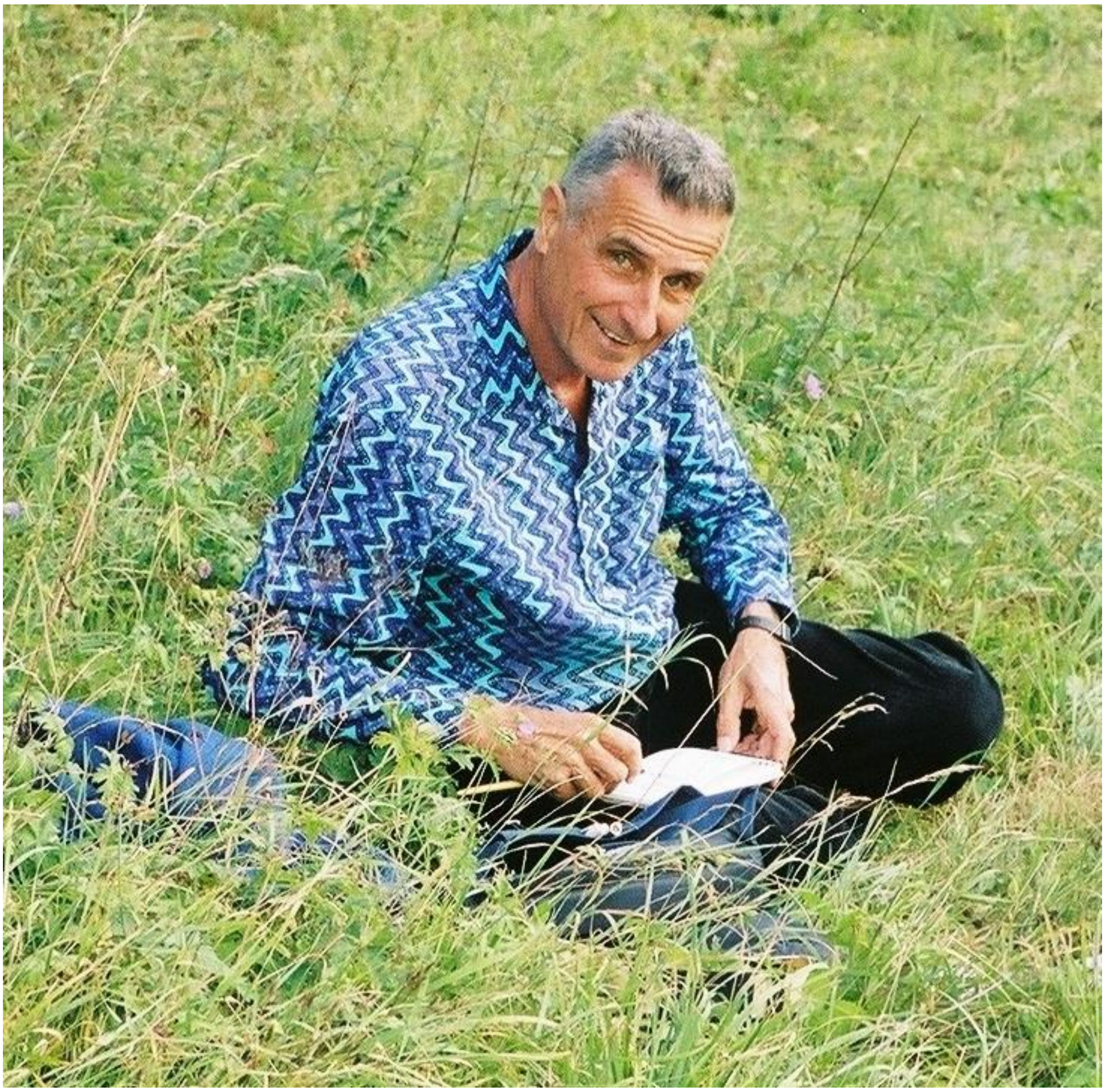

Albert Hesse in Igolomia during the excursion of ICAP2003, Cracow (Photo © T Herbich)

Albert Hesse was born in Casablanca and lived in Morocco during his childhood and adolescence. After his baccalaureate graduation (1956) he moved to his homeland to follow an engineering cursus at the ‘Arts et métiers’ higher education school from which he graduated in 1960. By the end of this cursus he met Professor André Leroi-Gourhan who guided him to archaeology. Following the teachings of Professor Louis Cagniard he chose near surface geophysics applied to archaeological prospection and was recruited by CNRS in October 1960. He became ‘Docteur-Ingénieur’ in 1964 and was the founder of the discipline of archaeological geophysics in France. He continued with this subject throughout his career in the CNRS, including at the ‘Centre de Recherche Géophysique’ in Garchy (Nièvre) where he was director of the laboratory from 1982 to 1988.

From October 1963 to March 1965 he did his military service in the Navy and followed this up as reserves officer in marine mines detection until the grade of Lieutenant commander.

His commitment in scientific organization was substantial and constant:

- Supervised ten PhD thesis and taught archaeological prospection methods at University Paris 1 from 1980 to 2000.
- Organised student exchanges between Garchy and the University of Bradford (UK) from 1977 to 1988.
- Founding member (1976), general secretary (1976-1980) and President (1980-1987) of the GMPCA (initially ‘Groupe des Méthodes Physiques et Chimiques de l’Archéologie’ and later ‘Groupe des Méthodes Pluri-disciplinaires Contribuant à l’Archéologie’).
- Member of the Standing Committee of the Archaeometry International Symposium from 1980 to 1999.
- Member and Secretary (1997) of the Pre and Proto-History section of the ‘Comité Technique des Travaux Historiques et Scientifiques’ (CTHS).
- Associate Editor of Archaeometry (1993-1998) and of Archaeological Prospection (1994-1999).
- Member of the editorial board of the French journals ‘Paléorient’, ‘Revue d’Archéométrie’ and ‘Histoire et Mesure’.
- Member of the scientific council of Mont Beuvray from 1985 to 1990.
- ISAP founding member (2003) and then honorary member (2004).

His scientific approaches covered archaeology and archaeometry and he always intended to introduce measurements to quantify observations wherever this is relevant and possible. For him archaeological prospection was a synthetic approach not limited to geophysical investigations (which provides information about the buried structures), but also using surface and aerial observations, statistical analysis of the spatial distribution of remains, document studies, ….all things now facilitated by the use of GIS.

As an exploration geophysicist he chose to work on a large variety of chrono-cultural areas, at first in the Eastern Mediterranean, Near and Middle East and Egypt, but also in India, Java, Mexico, Honduras, West Indies, Burundi,… and Europe. These projects were carried out within the framework of 'French abroad missions' and were of high scientific and human interest. However, his efforts to convince the metropolitan archaeology decision–maker to invest in prospecting methods were less fortunate. So that he wrote in 1998: "Who can believe that everything can be detected and is readable by shovel trenches, while there exist numerous examples of identification by measurements of features that were not evidenced by excavations?"

His major contributions to the development of geophysical techniques were related to earth resistance methods that are very simple in their principles and robust against the different sources of noise. He proposed solutions to overcome climate influences, to correct for anisotropy effects resulting from the orientation of current lines, and overall urged the development of designs and the use of continuous measurements while profiling. Beyond archaeology the resulting technical progress even met a fruitful application in precision agriculture.

The use of geophysical techniques in urban contexts was one of his major interests since the beginning of the 70's. First limited to the earth resistance technique it was later supplemented with two complementary methods, the electrostatic one which is an extension of the resistivity technique and Ground Penetrating Radar (GPR).

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- Prospection magnétique de la forteresse et détection de certains éléments du plan par un procédé de calcul du gradient horizontal du champ
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Radiation detectors could aid archaeological discoveries

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Gamma radiation detectors commonly used at nuclear power plants could be used to help archaeologists to detect buried features and could also be applied to discovering dinosaur bones, a new study has shown (Robinson *et al.* 2022).

A gamma-ray spectrometer – normally used to identify radioactive contamination on nuclear sites – was used for the first time in an archaeological setting at a University of Reading excavation in Roman Silchester, Hampshire (Figure 1). The trials found the devices were able to identify buried buildings or objects by detecting gamma radiation emitted during the natural decay of elements in these materials.

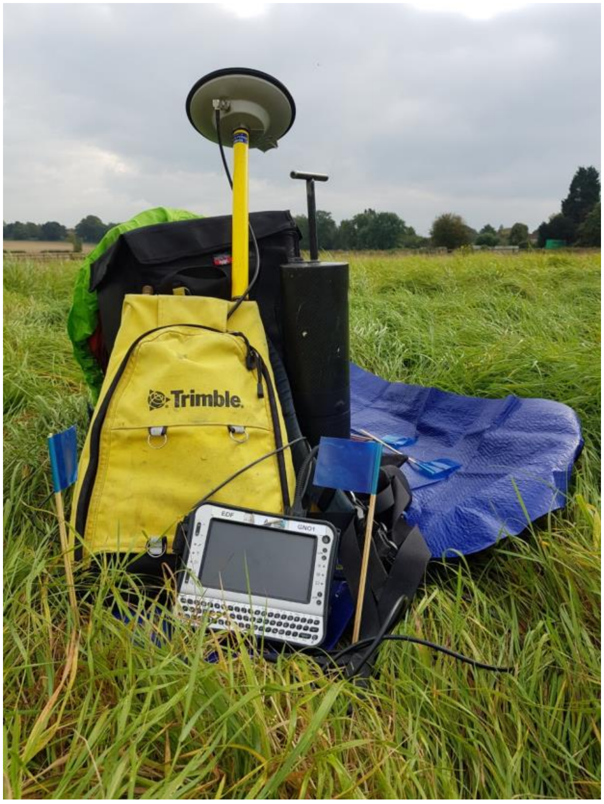

Figure 1: The Groundhog Fusion System gamma-ray detector as trialled at Roman Silchester

The detectors could therefore be a valuable addition to traditional geophysical surveys as they can reveal the composition of objects before they are excavated and provide clues as to how old objects are, where they came from, or even what a site was used for thousands of years earlier. It is clear that confirming other traditional surveys using a different technique is hugely valuable as it takes the guesswork out of archaeology. Until a site is fully investigated one can never be quite sure what lies under the ground. The more information is available to archaeologists, before any excavation starts, the better. Radiation detectors are not the first type of equipment one would think of to assist with excavations, but they could be a useful addition to the archaeological toolkit. They are portable and highly versatile, which also offers an advantage over the technology that is currently being used.

A Groundhog Portable Gamma-Ray Spectrometer was tested on four sites at Silchester in the summer of 2019 (Robinson *et al.* 2022). The detector was found to be most effective on the site of Silchester's Roman temple, where it confirmed geophysical surveys locating a buried boundary wall (Figure 2). The position of the wall was indicated by lower radioactivity readings, suggesting the wall was constructed from materials imported from a different geographical area with naturally depleted radioactivity.

The Groundhog detector's manufacturer was pleased that the use of their innovative technologies provided technological advances in fields outside of their initially intended use, opening up new possibilities.

Gamma-ray spectrometers pick up naturally occurring uranium under the ground. As materials and objects are weathered they release minerals containing uranium, which can then be absorbed by nearby objects such as bones over long periods of time. For this reason even dinosaur bones –usually only revealed by chance – could potentially also be identifiable.

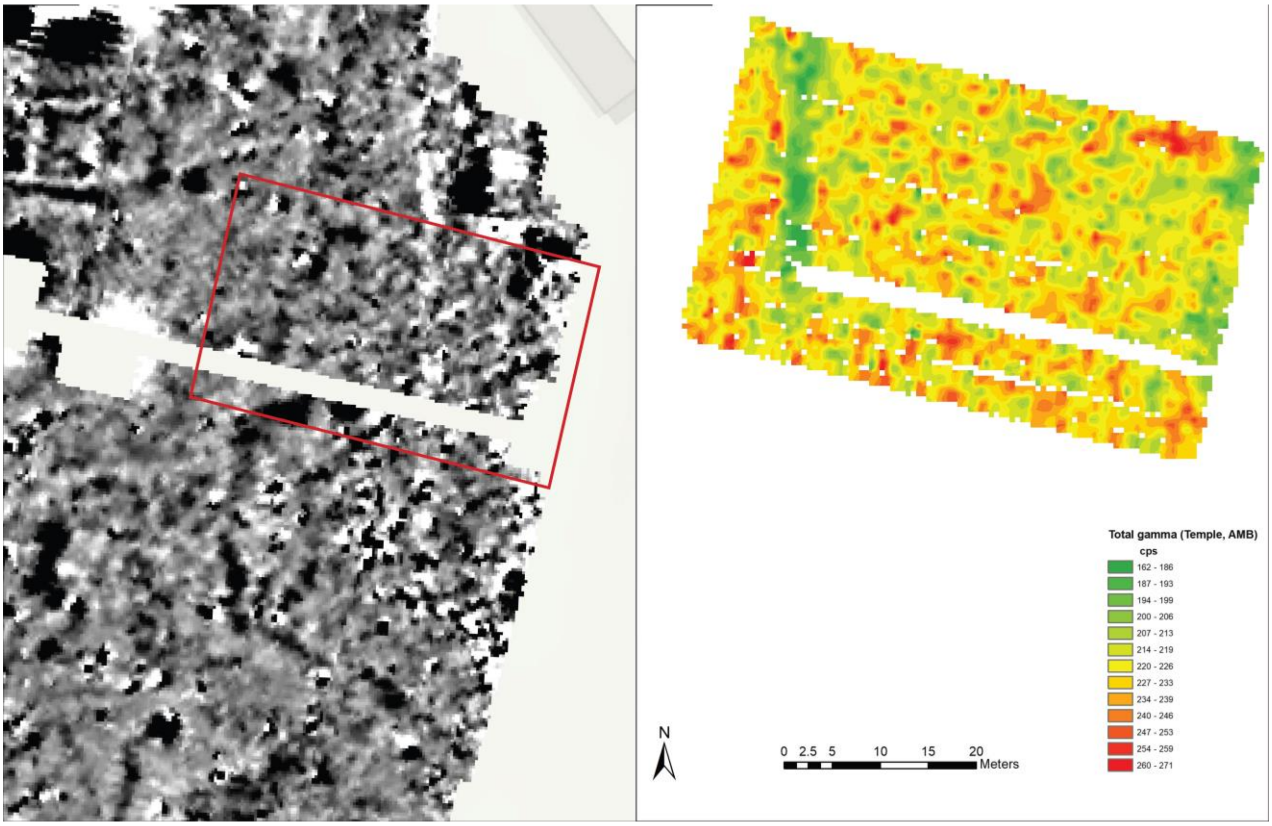

Figure 2: Geophysical survey image (left) and gamma-ray spectrometer survey image (right) at the Temple site in Silchester. The boundary wall (Temenos wall) is visible as a green shape, indicating low radiation relative to the surrounding soil. This could indicate that the materials used to build the wall were imported from a different location and could have been made from a material with lower concentrations of naturally occurring radioactivity, such as sandstone

The detectors penetrate up to a metre into the ground and gamma radiation readings are collected at regular intervals to build up a map. They are particularly good at identifying materials that did not originate in the location, as these usually have a different geochemical composition to the soil and objects surrounding them and therefore create contrasting radiation readings.

For example, the Welsh bluestone taken to Salisbury to build Stonehenge would be clearly distinguishable within the landscape. Firing clay bricks in a kiln also substantially changes their composition, making them easily detectable using a radiation detector. Places that hosted ancient industrial work often have similarly altered waste material deposited across them, providing a further indication as to what the site was used for.

Currently, there are three main geophysical surveying techniques commonly used on archaeological sites: magnetic, electrical and ground penetrating radar; each is best applied to different sites. The gamma radiation detectors are more portable than these other technologies, and so can be used for high-resolution surveys while walking or even mounted to vehicles to cover much larger areas.

Gamma ray spectrometers could be used alongside other techniques and further trials are planned, using denser readings to create a higher-resolution survey map, which could prove to be even clearer than those using other technologies.

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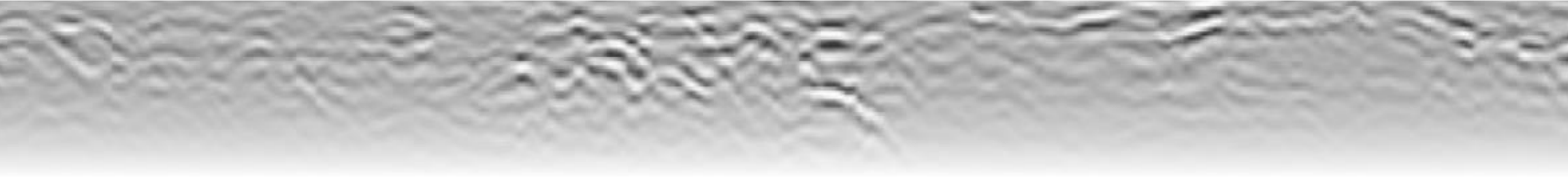

The Role of Archaeological Geophysics

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It all started when a colleague from the aerial archaeology community asked me a seemingly simple question: "I'd like … a sense of the proportion of archaeological geophysics carried out in development-led, heritage management, and academic research contexts in the UK. … Is this something ISAP has ever looked into?". My answer was "No we haven't, but yes it would be interesting". And that's when the complications began.

When trying to define the categories for an online poll of ISAP members discussions in the ISAP Management Committee quickly showed that this was a complex topic. Partly because some of the categories are poorly delineated and partly because people felt their work might not be included in the "good" categories. The initial differentiation into "development, research and community" immediately showed that research can be part of all these activities. Then the question arose whether the distinction relates to the source of funding for the project, whether the geophysicists are being paid and in fact what "community archaeology" is – it isn't a known phenomenon in all countries. As a compromise we adopted a reasonably broad definition and left it to the respondents to add their own comments about how they interpreted these categories. This means that the derived statistics are not entirely robust, but probably provide reasonable estimates.

a) Planning and development process (e.g. in advance of new building works).
b) University research projects (e.g. undertaken by museums, universities, funding agencies).
c) Community research projects.
d) Other.

Since respondents would only know reliable figures for the work they are familiar with we also asked to provide guesses for the national figures to see whether members think they do more than the national averages in certain categories.

In total there were 65 responses with 5137 reported projects. The largest number of projects (2616) came from the UK, followed by 1200 projects from a single user in the Czech Republic. Similarly, the majority of replies (23) came from the UK (Figure 1b).

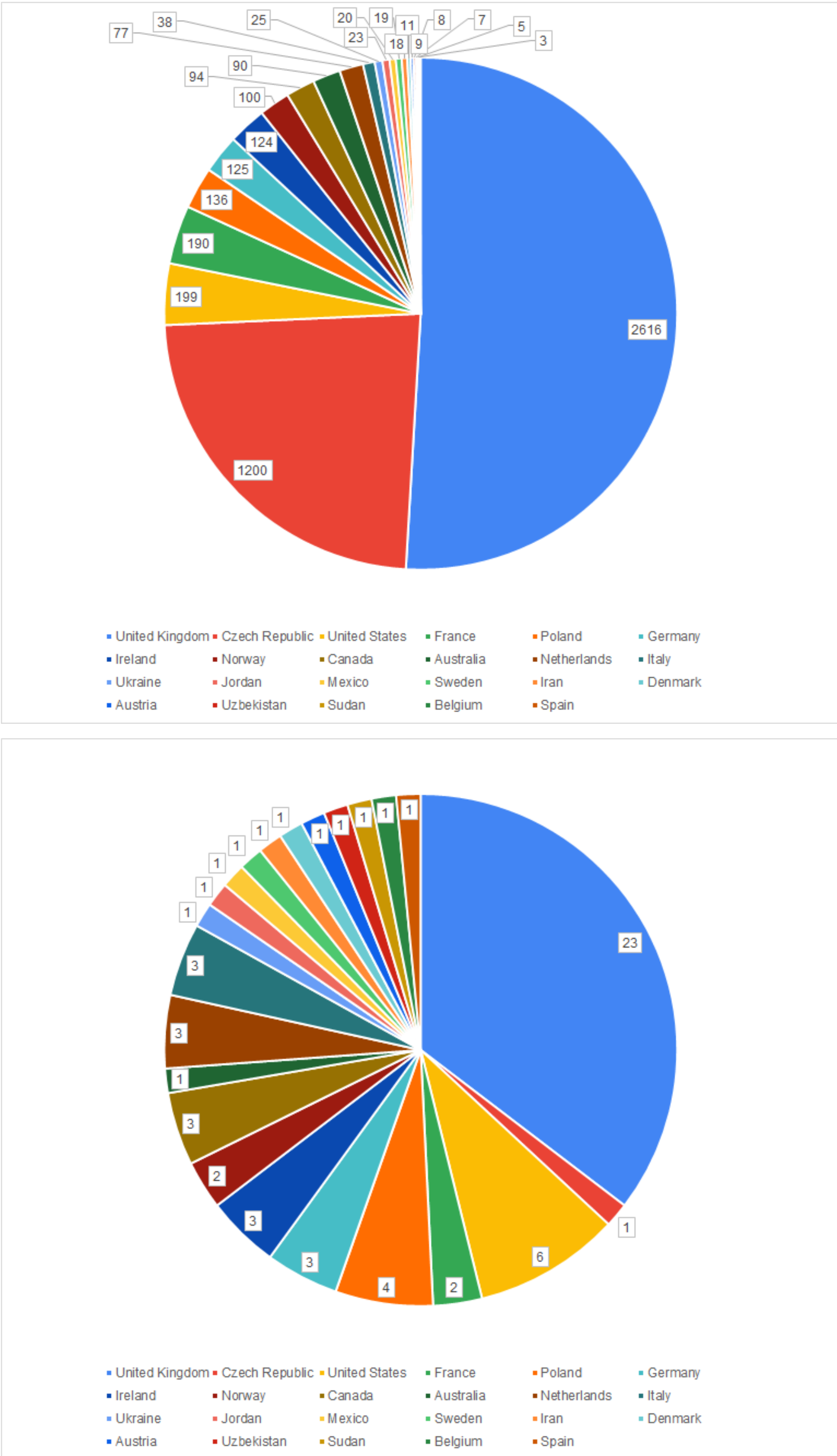

Figure 1: Responses to the poll: (a) number of replies by country and (b) number of surveys by country. Some colour scheme for both legends.

So what were the overall result? **59% of projects were linked to the planning and development process, 34% to research** (of which 19% from universities and 15% from community projects) and a fairly large proportion of 7% were outside of these categories. Rounding these figures broadly they can be summarised as **60/15/15**. However, these ratios varied considerably between countries (Figure 2). In the UK 89% of projects were related to planning, and only 6% and 3% to university and community research, respectively. By contrast of the 1200 projects in the Czech Republic the ratios were 13% (planning), 25% (university) and 42% (community). Several members reported very little (less than 5%) involvement with community projects: Austria, Belgium, Denmark, Iran, Jordan, Mexico, Netherlands, Poland, Sudan and Uzbekistan.

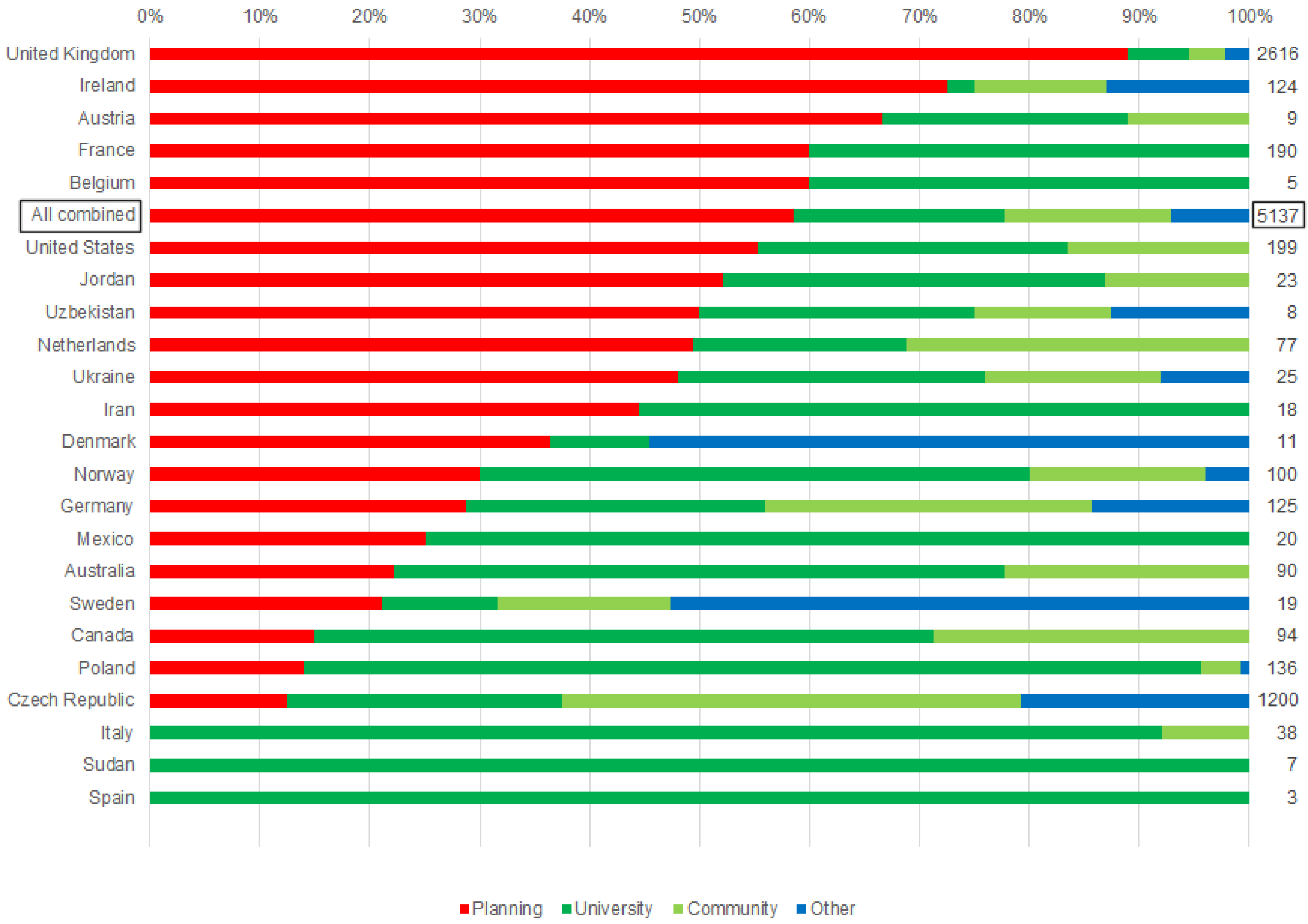

Figure 2: Proportion of different project types grouped by country and sorted in order of development-related projects. The numbers to the right are the total numbers of projects reported, with which the respondents were familiar with.

Interesting is also the difference between the numbers of projects the members are familiar with and those that they believe are nationally undertaken. For clarity's sake Figure 3 only provides these percentage points for planning related projects. In the UK (with 23 responses and hence a good statistical reliability) members worked to 89% on planning projects (Figure 2), but thought that nationally only 82% of projects were related to planning; hence members worked on 7%-points more projects than the national average was guessed. By contrast for Poland the members who replied worked on 20%-points fewer planning projects than the estimated national average. Simplistically this could indicate that in the UK practitioners who work on planning projects are slightly overrepresented in ISAP, whereas they are considerably underrepresented in Poland (how can we engage with those who undertake these additional planning projects but are not ISAP members?).

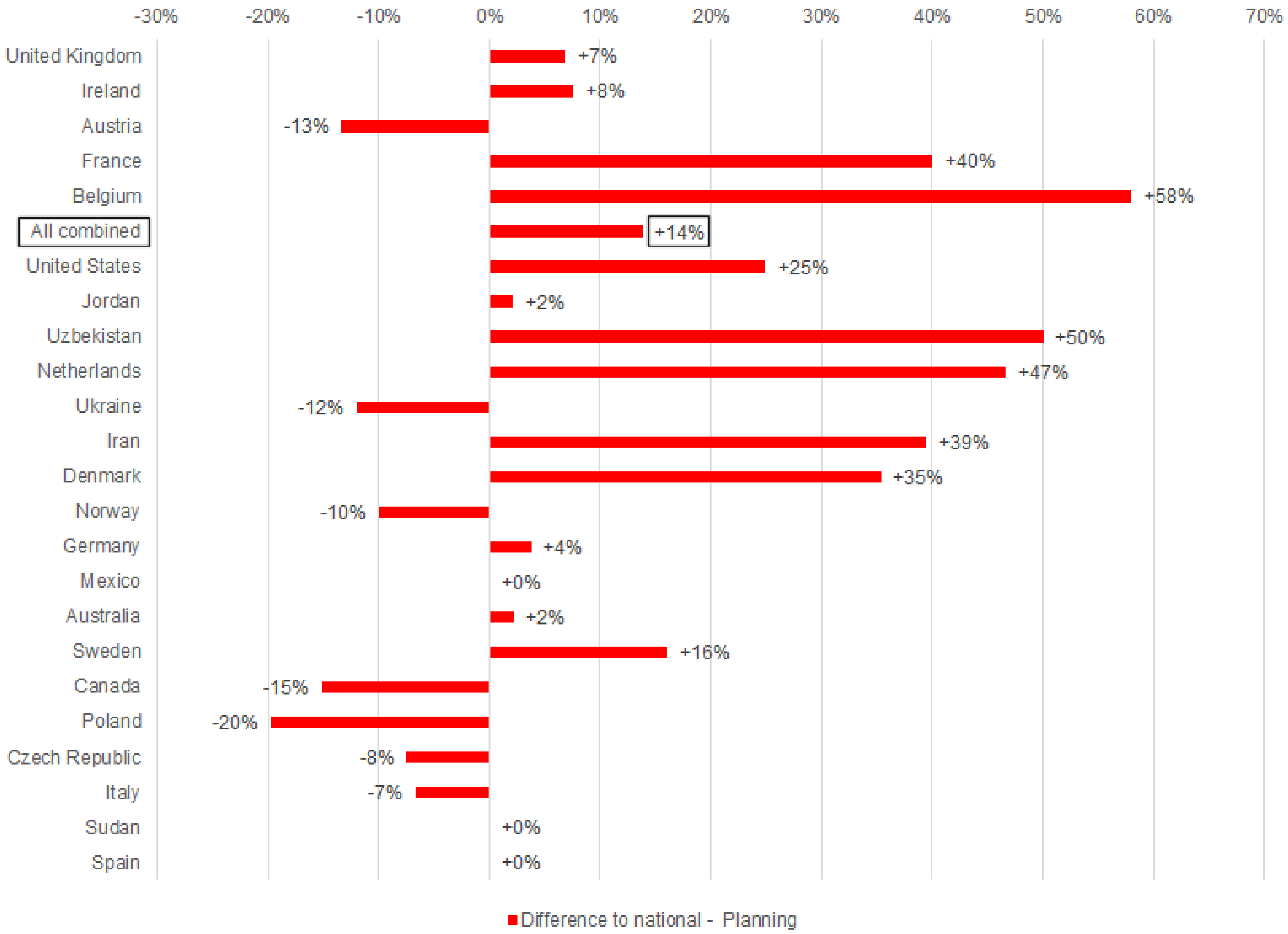

Figure 3: Percentage points by which the respondents did more development-related projects than the estimated national average (e.g. +7% for the UK means that respondents worked on 89% development projects (Figure 2) whereas the estimated national average was 82%)

Also instructive were the comments you provided about how you would view the specified categories; below is an edited extract that provides some interesting insights. I found it particularly intriguing that there were many respondents for the UK who provided lengthy comments/essays. I suppose a conclusion from that could be that although the planning process is seemingly well regulated in the UK there is still considerable need for a clearer definition, and that some people are concerned that development-led work might be seen as less valuable than university projects. The following text is structured such that the headlines indicate the relevant country and each paragraph represents an individual return from the survey – not all replies could be included here.

Australia

(c) more Indigenous communities are seeking the use of geophysics for mapping sacred sites.

Austria

(b) there would be more projects if labelled 'Institutional Academic research'.

Denmark

(a) developer-funded evaluation and preservation by record; (b) research commissioned by researchers, usually with some kind of research question; (c) citizen science / amateur archaeology groups; (d) curatorial / cultural heritage management is missing from these categories. For example, much of our work is undertaken for heritage bodies on eroding sites, or to characterise sites discovered by metal detecting or find scatters without being explicitly developer funded and without specific research aims.

France

(c) I do not understand what is 'community research'.

Germany

(a) near-surface investigations conducted before construction work (on- and offshore power plants, roads, buildings, railway lines) targeting hidden bombs and archaeological remains; (b) academic archaeological investigations and method development; (c) work commissioned by communities to investigate local cultural heritage for touristic and other purposes.

(a) being paid to do geophysical analysis before building construction; (b) research surveys prior to archaeological excavations; (c) interest by the community in a particular site (archaeological or architectural) that may or may not involve some payment.

Italy

(a) the geophysical work is the main topic of the project; (b) the geophysical work is part of a university project; (c) the geophysical work is financed from private funds.

Jordan

(a) use in daily practices; (b) opportunity to develop, learn and teach; (c) serving the communities.

Netherlands

(a) prior to construction; (b) as support of a university research project; (c) no construction work and no destruction of the site afterwards, initiated by locals, supported by locals.

Poland

(a) work prior to investment projects; (b) research for scientific or heritage protection purposes; (c) it is not entirely legal to perform pure "community" research of this kind in Poland, hence a researcher has to be involved, which then makes it "University research".

(a) … according to Polish law the results of non-invasive geophysical surveys are not sufficient to provide information on the archaeological heritage - they are rather a guide for archaeologists who are under a legal obligation to carry out rescue excavations … The inclusion of geophysical research is often the result of an arbitrary decision by an official … results often do not reach scientific circulation; (b) … Their main goal is to acquire scientific knowledge … As a rule, the results of these studies should be published; (c) … often initiated or supported by local communities … Sometimes this type of research is important for the difficult history of a particular place (e.g. mass burials of the victims of World War I and II), sometimes for cultural heritage. They have the potential to create a local identity. It also happens that this type of activity changes over time into more advanced and long-term research.

Ukraine

(a) contracts with commercial archaeological services, with ore mining enterprises; (b) projects funded by Ministry of Education and Science or by the Ministry of Culture; (c) funded by city administrations, NGO.

United Kingdom

(a) curators specifying a pre-condition prospection of archaeological potential of a development site to enhance the results of a historic environment search and to enable either more targeted further conditions or to provide data to determine the necessity of any further conditions at all; (b) an academic focus on a research question for which geophysical survey methods could either provide information which would contribute to further discussion about the hypothesis or, where combined results from different sources could evaluate the geophysical survey method in that context; (c) community projects where a multi layered and mixed ability/interest approach is taken to a research project. Where geophysical survey is conducted to enable a more focused and cost-effective targeting of archaeological potential and/or where geophysical survey is an appealing fieldwork method to the group for physical and practical reasons.

(a) any project commissioned ahead of (or to inform the design of) a development project. This can use the specific footprint of the development, but can also be part of the wider impact assessment; (b) surveys specifically geared towards answering research questions. These are normally funded through university projects, but can also include external funding e.g. ISAP Fund; (c) the survey is partially targeted towards a research question, but more broadly intended to widen participation and engagement with archaeological geophysics.

(b) university research comprises both informative surveys and technique development. The former is similar to those undertaken in planning, but possibly with less constraints in terms of time. Multiple techniques may be used to complement each other; (c) community research follows a similar pattern to university research and is also very useful in identifying sites and developing techniques that might otherwise be missed. The community engagement element is also very important for maintaining public engagement with archaeology.

(a) surveys for development make me a living, got me to where I am now and promote geophysics, they are the projects which are normally different and interesting.

(a) commercial work (short-term involvement, tick-box exercise, no follow-up), (b) project-based research and methods orientated (with greater involvement and inclusion throughout the overall process) (c) being inclusive.

(a) developer funded, carried out by professional contractors as part of the planning process; (b) carried out by university staff and students; (c) volunteer groups in their spare time.

(c) I don't know what community research is. Is it a single person interested in their field with no intention to develop? Is it the lottery giving Cotswold Archaeology about £4 million to research and work on property owned by the Society of Antiquaries?

(a) unfortunately, this is really badly devised; for a start, your premise is that planning/development archaeologists aren't professionals [NB: no such premise was made anywhere, explicitly or implicitly!]. Having been paid for my travails and qualifications, I can attest that I've been a professional and an academic and an amateur at parts of my career. None of the three categories are necessarily separate, as I have managed many projects that fall within all of those … This is impossible to measure until data filters through grey literature reporting, which is weak at best … Most commercial clients want confidentiality, until they decide to develop, as having archaeological assets on a site will harm its resale value; working in our clients' best interests results in the same fields being resurveyed many times ... Some of our projects make it to grey literature, but it's at our clients' whim … At what point does it start being archaeological if you're asked to review gravity or TDEM data collected by other companies? … I'd be happy to expand on my answers (at length).

(a) any survey undertaken as a requirement of the English statutory planning evaluation system. These surveys are well represented in English national statistics as there is as statutory requirement to make an OASIS entry as part of the process; (b) undertaken by or on behalf of any research and/or learning institution as part of an academic research project to increase knowledge and understanding. These surveys are underrepresented in English national statistics as there is no statutory obligation on universities to make OASIS entries and few of them do; (c) any survey undertaken by or on behalf of a community or local voluntary group where there is at least some participation in the survey by members of that group. Slightly underrepresented in English national statistics as while most amateur groups are likely to take and follow advice (including to make an OASIS entry to signpost their work), not all have the skills and wherewithal to do so.

(a) surveys carried out with the end of assessing and/or mitigating the impact of some development; (b) undertaken by universities with the aim to obtain data useful for research purposes or students' training; (c) organised by/for non-professionals individually or through associations, they normally obtain some funding and hire specialists to work with them.

(d) to cover work undertaken or commissioned for research purposes by professional non-university bodies (National Trust, Portable Antiquities Scheme, English Heritage, etc).

United States

(a) so called "cultural resource management" in the USA, which includes private sector, local, state, and national government work (including National Park Service). If size of surveys were factored in, it would be 99.5% Planning and Development in the USA, I suspect; (b) universities doing research or teaching; (c) non-academic professionals (very few avocationals are doing geophysics in the USA) doing their own research.

(a, c) planning and community often conflate.

(a) planning and development is helping a government agency or other group manage and interpret a site; (b) university research gives peer reviewed publications; (c) community research occurs when community members participate in the project, usually as volunteers.

Conclusion

There are some interesting comments and observations that would have been worth following up. However, we devised the poll so anonymously that I have no information who sent each individual reply. I would recommend for future polls to anonymise replies only at the very end.

As was to be expected there is no simple answer to defining the role of archaeological geophysics, especially as the practice varies considerably between countries. Even within one country practitioners have varied views on how exactly the projects should be labelled that they are working on. And to me that is a good thing, as it shows the many interlinked and interrelated topics for which archaeological geophysics is being used.

Last, but not least, we would like to thank all respondents for their input in this interesting poll!

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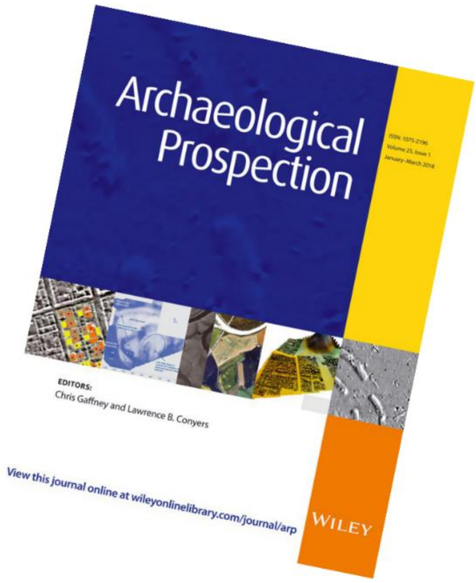

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