ISAP News

the newsletter of the International Society for Archaeological Prospection

Issue No. 1, May 2004

Welcome to the ISAP and the first issue of **ISAP News**. I hope that you will enjoy reading it and find it informative – there hasn't been anything quite like it available before in our discipline. This first issue has taken a while to get finished but the next one is planned to follow in August. Thanks to all those who contributed and supported getting this newsletter started: I was pleased to receive such a variety of input.

The broad purpose of **ISAP News** is to keep the membership up to date with what's going on in archaeological prospection around the world and the current plan is to have four issues a year. Don't forget, it's your newsletter, so tell me what you'd like to see here and, even better, send me articles, news items, pictures, etc., about what you're all doing and what's important to you.

Anne Roseveare, Editor ISAP

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Who's who on the Management Committee

Chairman

Joerg Fassbinder

Joerg Fassbinder graduated from the Department of Geophysics at the Ludwig-Maximilians Universitaet Munich. He joined Helmut Becker at the Landesamt fuer Denkmalpflege in Munich and in 1994 submitted his PhD thesis on "Magnetic Properties and Genesis of Ferrimagnetic Minerals in Soils". In particular, he has pioneered work on magnetotactic bacteria in archaeological soils. Using high-sensitivity caesium magnetometers he has carried out extensive surveys in Germany and overseas, notably China and Iraq.

Armin Schmidt

Vice Chairman

Chris Gaffney

My first geophysical survey was conducted 20 years ago and I worked as a freelance archaeological geophysicist between first and second degrees. My research, conducted under Arnold Aspinall at Bradford, was on the Schlumberger resistance array. Since leaving academia I have worked in the commercial sector. With John Gater I started the first successful independent 'archaeogeophysical' company in Britain, Geophysical Surveys of Bradford, which now trades under the name GSB Prospection.

The geographical location of my surveys has stretched from America through to Zimbabwe and my interests in archaeological geophysics are equally broad. I have been an Associate Editor, since the first issue in 1994, of *Archaeological Prospection*. I was part of the CBA Advisory Committee on Archaeological Science and I am currently a member of the steering committee for NERC's Geophysical Equipment Facility.

Although committed to being an applied geophysicist I have taught field courses to diploma, degree, continuing and professional education groups at a number of universities. I still have strong links with Bradford University where I am a Visiting Lecturer.

In my spare time I look at bridges and old postcards of bridges. I try and justify my behaviour by saying 'someone has to do it', but that is untrue! At least it stops me from thinking too much about football…. next year is going to be Newcastle's year. As an alternative to life in general I cycle. All in all I would rather be cycling.

Chris Gaffney

Honorary Secretary

Armin Schmidt

Although my earliest aspirations were to become an 'inventor' (a suitably broad job description), my fascination was always with history and ancient civilisations. Imagine a child being excited about the illustrated companion volume to C.W. Ceram's 'Gods, Graves and Scholars'. Well, that was me. The rather fearsome looking bog bodies were a bit worrying, but that did not restrain my interest. However, in the end the natural sciences got the better of me and in 1982 I began to study Physics in Munich (*Technische Universität München*). One of the key events for me during that time was a seminar given by Helmut Becker in which he described the amazing advances in

archaeological prospection using Caesium magnetometers. I was hooked. The lecture series on archaeometry had, for my taste, far too little geophysics in it and in the end I decided to do the one-year master's dissertation on electron mobility in liquid Argon at the *Max-Planck-Institut für Physik* (Heisenberg Institute). Thereby, I had entered the path of low temperature physics and continued with a PhD at the *Rheinisch Westfälische Technische Hochschule (RWTH)* in Aachen on the subject of magnetostriction on high-temperature superconductors. Very interesting (I still wish I had a cryostat at home for some minor experiments), but time had come for archaeological prospection.

When I looked round for the best place to go it became very clear that Bradford was the lead institution for archaeological geophysics. Initially I went for a year, but after a two-year Research Fellowship I was 'trapped' with a permanent Lectureship (now Senior Lectureship). Archaeological geophysics had been built up in Bradford by Arnold Aspinall and for me, like for many others, he was (and still is) a constant source of inspiration. Although retired, he is very active in undertaking experiments with different array geometries in our water tank and editing the journal *Archaeological Prospection*.

I have been involved in our *MSc in Archaeological Prospection* since its beginning in 1994 and the training of highly motivated students in this area has been very rewarding. Some have gone on to do PhDs and meeting one's 'academic off-spring' at international conferences is rather pleasant.

I have been involved with various research projects over the years. From the surveys of a twice-deserted Medieval Village in Yorkshire, England to the investigation of pre-Hispanic shaft graves along the Ecuadorian coast, they all have been exciting. But my favourite site is Lumbini in Nepal where we investigated the birthplace and childhood palace of The Lord Buddha during several UNESCO missions. A truly magical place and a wonderful country. In all these projects the interaction between archaeologist and geophysicist was crucial for the final interpretation of results and it is the challenge of working at an interdisciplinary level that makes these missions so rewarding. There has to be a willingness to listen to each other and accept that people have different expertise and research culture (think: 'developing a new type of magnetometer' *vs.* 'the investigation of 100 Roman villas'). My more geophysics-orientated research has concentrated on the development of new magnetometer techniques, and more recently on GPR. Masters dissertations are always a good way to undertake pilot studies for various topics, for example our recent investigation of the multi-frequency system GEM-300.

Archaeological prospection is a rich subject and it has never bored me (which isn't easy …). Joining this Society of like-minded researchers and practitioners is a good way of connecting the different strands and ideas. I am looking forward to seeing the discipline and ISAP flourish.

Armin Schmidt

Conference Secretary

Salvatore Piro

Salvatore Piro is Senior Scientist in the Institute of Technologies Applied to Cultural Heritages of the C.N.R. (National Research Council of Italy). His specialisations are development of acquisition, elaboration and interpretation techniques for archaeological and environmental prospection, using magnetic, geoelectric and ground penetrating radar (GPR) methods.

He has been a Senior Researcher at the ITABC (CNR) since 1995, where he has also been a Member of the Institute Committee since 2002. From 1992 to 2002 he was a Member of the Scientific Council of ITABC. Salvatore Piro is a member of the European Session of the EEGS, EGS, EAEG, Near Surface Geophysics Section of the SEG and now also the ISAP.

Some of the innovations obtained with his projects include:

- Location of archaeological structures using focused geoelectric arrays, gradiometric and GPR methods
- Improvement of S/N ratio using filtering methods
- Development of bidimensional cross-correlation techniques for geoelectric and magnetic methods
- Experimental tests for the characterisation of GPR antenna patterns
- Improvement of S/N ratio of GPR using seismic reflection acquisition techniques and data processing

- Development of integrated acquisition methodology using magnetic, GPR and geoelectric methods to locate archaeological structures
- Calculation of synthetic anomalies due to different bodies for geoelectric and magnetic methods.

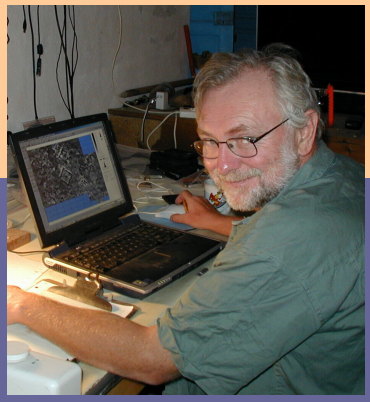
Salvatore Piro's ongoing research projects are:

- "Geophysical Integrated Investigation in the Archaeological Park of Maalga – Carthago (Tunisia) " supported by Italian Minister for Foreign Affairs
- "Integration of high-resolution prospection techniques to study archaeological sites and historical buildings" supported by ITABC
- "Integrated investigation to reconstruct the coupling between Ancient Tarquinia and its territory " supported by University of Milano.

Salvatore Piro has published and presented one hundred research papers in the national and international journals and conferences. In addition, he has organised workshops and conferences with the ITABC-CNR and convened sessions at EGS conferences. The 2005 Archaeological Prospection conference is being organised by him and his team.

Salvatore Piro

Vice Conference Secretary



Tomasz Herbich

Immediately after obtaining a Master's degree in Mediterranean Archaeology from Warsaw University (in the late 1970s) Tomasz Herbich joined the staff of the Department of Applied Sciences, Institute of Archaeology and Ethnology, Polish Academy of Sciences.

In the 1980s he worked mainly in central Poland (Holy Cross Mountains area), specializing in the application of resistivity methods to the study of Neolithic and Bronze Age flint mines. This work was published in a series of papers and presented during geophysical and archaeological conferences.

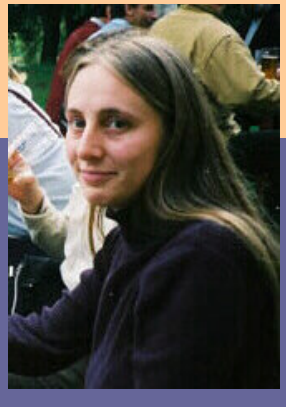
Throughout this period he carried out surveys at sites of different types and epochs, e.g. mediaeval cities in southern Poland (Sławków, Olkusz and others), Torcello Island (Italy). In the mid 1980s, he extended the scope of his experience to include work in Egypt, where he conducted geophysical surveys and took part in excavation work in Saqqara, Tell Atrib and in the Fayum Oasis. In the late 1980s, his department started a joint project with the Office for Preservation of Historical Monuments of the Baden-Wuerttemberg land in Germany. This required him to work on a series of surveys of Roman and Mediaeval sites in different areas of the country (Rottwiel, Constanz, Sontheim am Brenz, Ladenburg and others). The results of this prospection prompted the Office authorities to establish their own geophysical laboratory in Stuttgart (directed by Harald von der Osten).

In 1994 Tomasz Herbich received a rather unexpected offer to take up the position of Secretary General of the Polish Center of Mediterranean Archaeology in Cairo. This caused his temporary transfer to Warsaw University – and to Cairo, since his job was to coordinate the activities of Polish expeditions excavating in Egypt. After two years, having become sick of administrative work alone, he began persuading Egyptologists of the benefits geophysical prospection could bring to the study of the sites they were digging. This was no easy job, but after the first successes (prospection in Dakhleh Oasis and the sensational finds that Joerg Fassbinder and Helmut Becker had at Qantir) he was able to join forces with a number of expeditions. The results of these surveys, which were conducted in practically all the regions of Egypt and on sites representing the entire chronological spectrum in Egyptian millennia-long history, can be read in the opening article of the most recent issue of *Archaeologia Polona* 41 (2003).

In 2000, Herbich returned to Warsaw, back to his job at the Institute of Archaeology and Ethnology, but 90% of his surveying fieldwork continues to be in Egypt and recently also in other countries of the Middle East. Last year was the only exception, as he spent most of the year organizing the Fifth International Conference of Archaeological Prospection.

Tomasz Herbich

Editor



Anne Roseveare

My introduction to the discipline came in 1995, while I was still a Chemical Engineering student at Bradford University. Following two periods in industry, as a research engineer at Hoechst AG and in manufacturing for BP, I was intending to go into environmental work, such as assessing and cleaning up industrial sites. However, I discovered something fascinating in the Archaeological Sciences department next door: geophysical prospecting. Whilst I looked after the exhibitors' stands during a session of the 1995 Archaeological Prospection conference I had a good opportunity to find out more and my interest grew. I joined with Martin Roseveare and others in starting a survey company, ArchaeoPhysica, which was launched in 1998.

From the start, we have tried to make time for research alongside the survey work but it can be difficult! Areas I have a particular interest in include: total field magnetometry – methods and analysis; landscape development through medieval times to the eighteenth century; early industries; and where the best fish and chips can be found! I have been involved in developing the use of caesium magnetometers for routine commercial survey for five years. Also DGPS tracking for electromagnetic and magnetic data collection; designing and building chariots and sledges for equipment and testing of new equipment such as the GSSI GEM-300 electromagnetic meter and the Searchwell MPR50 radar. One of my current research themes is the analysis of "texture" in magnetic survey results: what happens in the background could tell us more about zoning and land use.

When I'm not looking for lost castles and chapels or mapping miscellaneous pits and ditches, I like to relax by heading for the Welsh hills. (That is, when I'm not putting together newsletter items ...)

Anne Roseveare

Auditor

Rob Vernon

Rob Vernon was born in Liverpool in 1945. He graduated in 1969 with a BSc (Hons) in geology from London University. Between 1969 and 1993 he held a variety of senior posts as a geologist in the British coal industry (deep mines), where he became familiar with downhole geophysical logging and seismic surveying. After leaving the coal industry, Rob gained an MSc in Archaeological Prospection from the Department of Archaeological Sciences, University of Bradford where he is currently conducting research on the geophysical responses produced by British smelting sites, for a PhD. He has published various papers on his PhD topic and recently edited an archaeological summary of the work conducted on the Myers Wood iron-smelting site, the theme of his last AP oral paper at Krakow.

Rob' s other interest is mining history. He has co-written a series of books on the lead mining history of the Conway Valley and the Llanengan area in North Wales. He was until recently the Deputy Chairman of the National Association of Mining History Organisations and has edited two editions of their handbook.

Rob Vernon

A Treasurer has been appointed (see the Noticeboard)

Ghost features
– A proposal for appropriate management and a forum for discussion

Norbert Schleifer Department of Earth Sciences, Institute of Geophysics, Palaeomagnetics and Petrophysics Working Group, Montanuniversität Leoben, Austria

The Archaeological Prospection Conference last year in Cracow (Poland) was something like the key-event for tabling the topic of "ghost features" in the International Society of Archaeological Prospection (ISAP).

Although there are already local publications and conference contributions about that topic (Fassbinder et al., 1998; Leckebusch et al., 2000; Linford, 2002; Fröhlich et al., 2003) the phenomenon itself is not very well known among archaeologists and geophysicists working in the field of archaeological prospection.

The analogy of *Albert Hesse*, that physics is able to distinguish between the liquids water and alcohol but the human eye is not, perfectly described the discrepancy that exists in the way archaeologists and natural scientists interpret their results. Archaeologists believe in what they reveal during excavation, natural scientists in what they can detect with their instruments.

Magnetic ghosts are archaeological features, e.g., ditches, pits and graves, which are detectable by magnetic prospection whereas they are optically not visible in the subsequent excavation.

Of course there are variations of this phenomenon as there are magnetically visible features that finally appear due to a change of soil moisture content (Fassbinder et al., 1998) but a conventional ghost feature will stay invisible (Leckebusch et al, 2000; Breitwieser et al., 2001).

The soil conditions that lead to an appearance of ghost features have not been completely understood yet and additional investigation of the interaction between the magnetic properties and the colour of the soil is needed.

One conclusion of the known case studies is that the decomposition of organic matter plays the key role. Whether we talk of organic artefacts or filling material in both cases the iron minerals stay whereas the organic matter disappears. In the case of Linford (2002) bones were dissolved in acidic sandy soils and it was hardly possible to recognise the graves structure due to an almost insensible contrast in soil colour. In the case of Breitwieser et al. (2001) the ditch of an Early Neolithic house disappeared within meters which concludes that also small scale variations of subsoil conditions can have a major effect on archaeological remains (Cook & Carts, 1962). A detailed investigation of the soil samples has been going on.

The decomposition of organic matter content is a complex process that is governed by several parameters like pH value, water content and/or aeration. Of course agricultural activity has an additional effect. As a result a complete understanding of magnetic ghosts requires the investigation of all these parameters.

Soil colour is mainly influenced by organic matter content and iron minerals (Bigham et al., 1991; Schwertmann, 1993). Whereas the presence of iron minerals has a direct influence on the magnetic properties, it is known from soil magnetic investigations (Thompson & Oldfield, 1986; Evans & Heller, 2003) that the organic matter content influences the occurrence of different iron minerals. A variation of the organic matter content between the structure and the undisturbed soil consequently leads to a measurable contrast in the magnetic properties. As a result the feature will be detectable by a magnetic survey.

As the brightness of the soil is also influenced by the organic matter content the archaeological feature will be easily recognisable in the subsequent excavation. This correlation between soil colour and magnetic property is one major reason for the great acceptance of this method among archaeologists. The aim of this article is to focus the attention of the ISAP on this topic.

Beside the fact that the knowledge of physical properties of archaeological features should be an essential concern of a geophysicist working in the field of archaeological prospection the necessity of an understanding of this phenomena is of further relevance because of the following reasons.

The archaeological background and/or pedological processes that result in an optical disappearance and mere "magnetic existence" yields additional information

about landscape changes, the isochronical appearance and the circumstances of the built up of archaeological remains. This has been proven in cases concerning the interpretation of unexpected magnetic behaviour of ditches (Fassbinder et al., 1998; Schleifer et al., 2001).

Without a proper understanding of the appearance of ghost features it will be impossible to convince archaeologists about the importance of a magnetometer survey concerning the evaluation of an archaeological site. The state of the art demands the proof of magnetic anomalies by excavation and thus by the archaeologist.

One possibility to convince archaeologists about the real existence of a ghost feature is to carry out a small-scale survey within a trench at the location where the feature is expected to be. Modern susceptibility meters are able to resolve sub-centimetre structures. Another way is to investigate soil samples out of the "invisible" feature and the surrounding undisturbed soil.

The advantage of both methods is that methodical errors due to the geodetic survey are eliminated and the shape of the sought feature can be determined more precisely.

Altogether the verification of the ghost feature should include six major steps:

1. Proof of geodetic survey.
2. Consultation of a soil scientist and/or geophysicist.
3. Verification of the existence of the feature within a trench using a susceptibility meter or by collecting soil samples that are later investigated in a magnetic laboratory.
4. Soil colour determination in the field and the laboratory (wet and dry samples).
5. Investigation and reconstruction of the pedological processes influencing the archaeological site, especially in the ambience of the ghost feature.
6. Combined interpretation of the results.

The steps 1 up to 4 can be alternatively carried out by an experienced archaeologist in case there is no specialist available. For example, a case study from the multiperiod site at Bad Homburg, Germany showed (Breitwieser et al., 2001) that it is important that the sampling for the soil magnetic and pedological investigations is carried out simultaneously.

An appropriate management of ghost features assumes that archaeologists are aware of the existence of magnetic ghosts and that they accept magnetic prospection as an independent and equal method to excavation. The importance of the evaluation of this additional information sometimes might be the only possibility to reveal features who otherwise never will have been recognised.

The author recommends that the ISAP should be used as a forum for the definition of guidelines handed over to archaeologists. Perhaps the English Heritage Research & Professional Services Guidelines No.1 "Geophysical survey in archaeological field evaluation" can provide a basis for that. At the moment these guidelines are being updated.

As the appearance and investigation of ghost features can not be planned like a conventional research project I propose an ISAP forum called "magnetic ghosts" where case studies can be discussed. This forum can also be used to discuss archaeological features showing an unexpected physical behaviour.

A collection of case studies, or as one can say an exchange of our experiences, within the ISAP would be worthwhile and would lead to a better understanding and interpretation of our results.

References:

Bigham, J. M., Heckendorn, S. E., Jaynes, W. F. and Smeck, N. E. (1991): Stability of iron oxides in soils with contrasting colours. Soil Sci. Soc. Am. J. 55: 1485-1492.

Breitwieser, C., Fröhlich, N., Lehmann, J. and Posselt, M. (2001): Archäologische Untersuchungen auf der Trasse der Umgehungsstrasse Bad Homburg-Ober-Eschbach/Ober-Erlenbach. Die vorgeschichtlichen Fundstellen. Hessen Archäologie 2001.

Cook, J. C. and Carts, L. S. (1962): Magnetic effects and properties of typical topsoils. Geophysical Research Letters 67, 815-828.

David, A. (1984): Research & Professional Services Guidelines No. 1 "Geophysical survey in archaeological field evaluation". English Heritage.

Evans, M. E. and Heller, F. (2003): Environmental Magnetism. Elsevier Science, London, U.K. 382 pages.

Fassbinder, J. W.; Irlinger, W.; Schleifer, N. and Stanjek, H. (1998): Methodische Untersuchungen zur Magnetometer-prospektion. Das frühmittelalterliche Gräberfeld von Alburg. Das Archäologische Jahr in Bayern 1998.

Fröhlich, N., Posselt, M. and Schleifer, N. (2003): Excavating in "blind mode". Magnetometer survey, excavation and magnetic susceptibility measurements of a multiperiod site at Bad Homburg, Germany. Conference paper, Archaeological Prospection Conference in Cracow.

Leckebusch, J., Nagy, P. and Matter, A. (2000): Ein Prospektionsobjekt in der Wüstung Unterstammheim ZH. Jahrbuch der Schweizerischen Gesellschaft für Ur- und Frühgeschichte 83. 149-176.

Linford, N. (2002): Magnetic Ghosts: Mineral magnetic measurements on Roman and Anglo-Saxon graves. Abstract. Meeting of the European Geophysical Society (EGS) in Nice.

Schwertmann, U. (1993): Relations between iron oxides, soil color and soil formation. In: Bigham, J. M. and Ciolkosz, E. J. (eds.). Soil color. Soil Sci. Soc. Am. Spec. Publ. 31: 51-69.

Schleifer, N., Fassbinder, J. W., Irlinger, W. and Stanjek, H. (2001): Investigation of a Neolithic Chamer-group ditchsystem near Riekofen (Bavaria) with archaeological, geophysical and pedological methods. Proceedings of the 1st International Conference on Soils and Archaeology. Szazhalombatta, Hungary.

Thompson, R. and Oldfield, F. (1986): Environmental Magnetism. Allen & Unwin, London, U.K.

aarg Aerial Archaeology Research Group

NEOLITHIC STUDIES GROUP

BAYERISCHES LANDESAMT FÜR DENKMALPFLEGE

International aerial archaeology conference, Munich, Germany,

'**Aerial Archaeology – European Advances**' *A decade on from Kleinmachnow*

Sunday 5th to Wednesday 8th September 2004

To be held at:

Bayerisches Landesamt für Denkmalpflege, München, Deutschland
Bavarian State Department for Historical Monuments, Munich, Germany

The Aerial Archaeology Research Group is proud to welcome you to its 2004 annual meeting in Munich, Germany. In September 1994 the historic *Symposium zur Luftbildarchaology in Ostmitteleuropa*, '*Aerial Archaeology in Central and Eastern Europe'*, was held at Kleinmachnow, Brandenburg, drawing together aerial archaeology and remote sensing practitioners from across Europe following the fall of the Iron Curtain. Ten years on, the Munich conference will celebrate and investigate the progress of aerial and ground remote sensing in Europe and surrounding countries, addressing a number of key academic, technical, management, survey and archive issues over three main conference days. The conference will feature a special one-day session Revealing Neolithic Europe, to be followed on the third day by Aerial Archaeology and Remote Sensing – European Advances.

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