ISAP NEWS

The newsletter of the International Society for Archaeological Prospection

Issue 12, July 2007

Contents

Editor's Note

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Welcome to the 12th issue of ISAP News. This is the eighth that I have produced in this current stint as ISAP Editor. If someone else fancies taking over from me, or any other members of the ISAP management committee, you have until the 17th August to email nominations (seconded by a fellow member of ISAP) to our current chair, Armin Schmidt: A.Schmidt@Bradford.ac.uk.

Elections will take place at the Society's AGM, to be held on the 14th September, just after the close of the 7th International Conference on Archaeological Prospection in the Congress Center of the Slovak University of Agriculture, Nitra, Slovakia between 18:00-19:00 hours. For more information see http://www.bradford.ac.uk/archsci/archprospection/ArchPros07/

For any students wishing to attend the conference, don't forget about the ISAP bursaries (see page 7). The deadline for applications, 31st July, is fast approaching.

Blacklands, Frome, UK

John Oswin, Bath and Camerton Archaeological Society, UK JohnOswin@aol.com

The Bath and Camerton Archaeological Society (bacas) has been excavating Blacklands Field at Upper row Farm, Hemington, Frome, Somerset since 2001 and has also run an extensive geophysics campaign in the surrounding area. As an amateur society, its geophysics operations have a different, but complementary role to play to that of professional teams. Our aim is large area coverage with both twin-probe resistance (TR/CIA) and magnetometer (FM36 recently upgraded to FM256). We also have a Wild Herbrugge EDM to assemble contour data. We process data via INSITE v3, but we have provided our own download routines. Formal interim reports are sent annually to Somerset HER.

The site was the subject of a Time Team programme filmed May 2006 and shown January 2007, during which GSB Prospection contributed extra coverage. We are grateful for their input.

So far we have covered approximately 80 ha, of which some 60 is in the immediate vicinity of Blacklands, the rest at sites 'twixt Salisbury and Shetland. Our policy is to cover fields in entirety with both instruments (with magnetic limits of proximity to wire fences and machinery) at 0.5 m interval, 1 m traverse. We have the time.

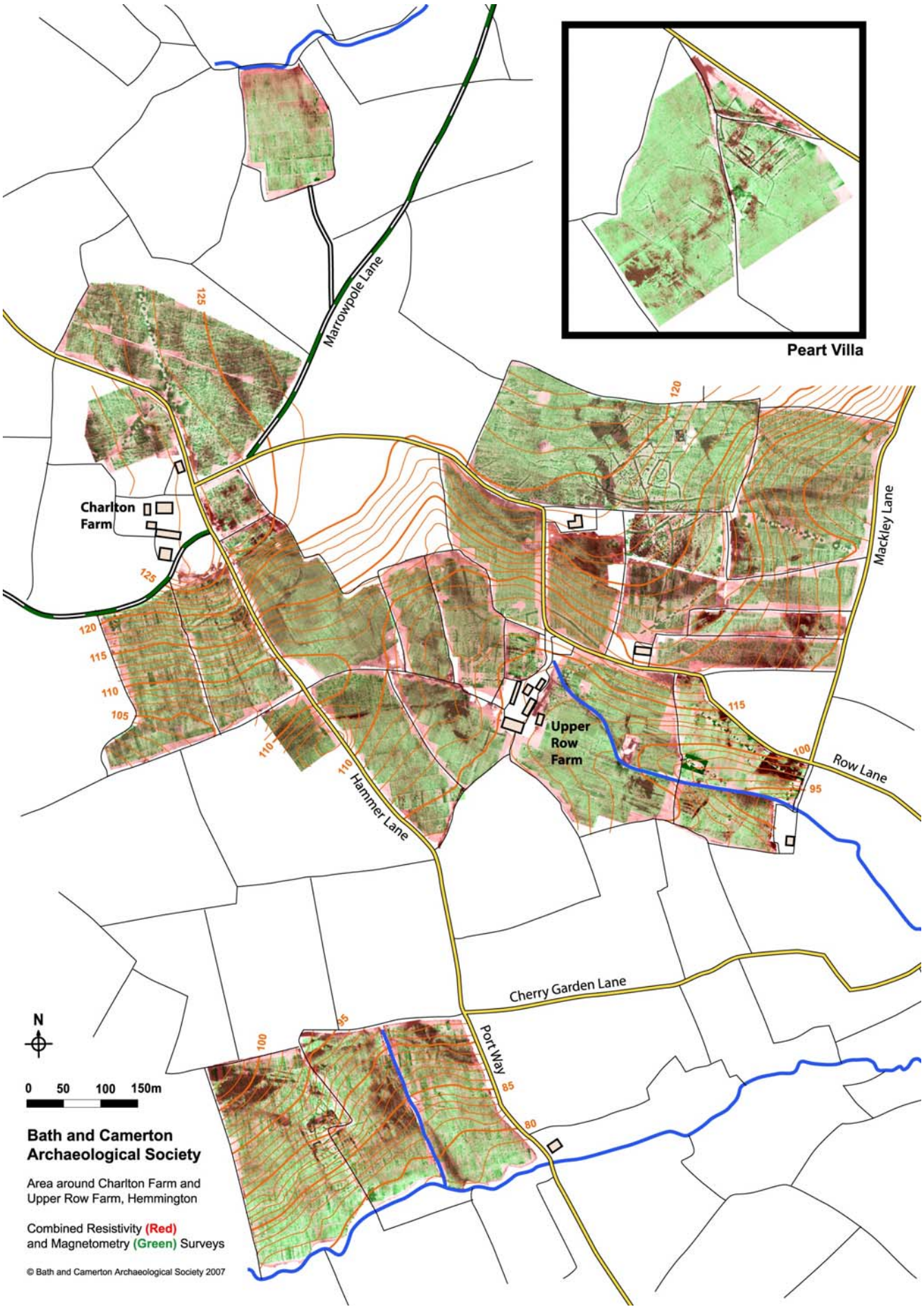
This is an area where building stone can be got from the ground easily, so although Blacklands provided spectacular magnetometry, most other discoveries have been through resistance. We are interested not just in discovering buildings but in understanding the historic landscapes. Our work so far has indicated some prehistoric to Roman continuity with Roman re-planning, a major Roman to Mediaeval transition and a major Mediaeval to post-mediaeval transition.

Below is a combined resistance and magnetometer plot of the main area, with contours added. The colour code is 'green for gradi, red for resi'. Our normal practice is to produce resistance and magnetometer plots individually in grey scale and then do a colour overlay. The colours mask a lot of fine detail, and individual plots are available on request. There are gaps to be filled before a formal report can be prepared, but these depend on availability. Their farming use must come first.

The inset at the top is a very large villa site some 2 km east of Blacklands. This has been reported in Britannia. The detached site in the far south-west is Lower Row Roman Villa (scheduled), a large villa built across the edge of an earlier enclosure, with a small building with a circular room some 120 m further to the south-west.

Blacklands is visible top centre of the main area with ring ditch and Roman farmstead spectacularly visible. Immediately to the south-east, a rectangular area lies diagonally under mediaeval strip fields, apparently Roman, with a farmstead at the western end and a villa at the eastern end near Mackley Lane. There is a Roman farmstead in the far south-east, but we believe most other features to be mediaeval, including the lost hamlet of Charlton (recorded in 1316) just east of Charlton Farm.

For more information go to: www.bacas.org.uk


Peart Villa
Marrowpole Lane
Charlton Farm
Upper Row Farm
Mackley Lane
Row Lane
Hammer Lane
Cherry Garden Lane
Port Way
125
120
115
110
105
100
95
85
80
N
0 50 100 150m
Bath and Camerton Archaeological Society
Area around Charlton Farm and Upper Row Farm, Hemmington
Combined Resistivity (Red) and Magnetometry (Green) Surveys
© Bath and Camerton Archaeological Society 2007

The Use of Magnetic and Electromagnetic Techniques in the Investigation of a World War II Aircraft Crash Site at Warton Marsh, Lancashire

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Warton Marsh lies some 15km west of Preston, Lancashire, UK, and 1km from Warton aerodrome, a former World War II airfield that was home to a squadron of *A26 Invader* bombers. The aerodrome has been used as a test facility for new and experimental aircraft for the last six decades and is currently operated by BAe Systems. Two of the *Invaders* crashed into the marsh adjacent to Warton in November 1944 for reasons unknown, whilst *en route* to a forward base near Paris, France. The bodies of the aircrew were recovered immediately after the incident, although the wreckage was left largely *in situ*.

The *A26 Invader* aircraft was a latecomer to the arsenal of the Allied air forces. It was heavily armed and armoured, with a range of cannon and machine-gun configurations employed according to the theatre into which it was to be deployed (Kirk 2004); the aircraft that crashed into the marsh were not carrying bomb payloads, as they were in transit to a forward base. Other aircraft of varying antiquity are known also to have crashed into Warton Marsh, although none are suspected to lie near the survey area.

The marsh is predominantly flat and is partially tidal, with large channels being inundated during storms and particularly high tides. Since the crash, some 2m of alluvium have accumulated above the former ground surface, thereby shielding the debris from removal by third parties. This is largely the result of the termination of dredging at the port of Preston (Kirk 2004). Warton Marsh now provides specialised habitats for flora and fauna; the immediate vicinity has been classified as a Site of Special Scientific Interest, amongst other protection measures. The survey areas were under long grass and sedge, with gullies ranging from centimetres to metres across dividing the ground into a series of closely spaced islands; this added to the challenge of data collection.

Geophysical Survey

The aim of the survey was to map the wreckage of the aircraft prior to partial excavation. It was intended that this staged approach would lead to a better understanding of the circumstances of the crash. Survey was carried out using a Bartington fluxgate gradiometer and a Geonics EM61 system. These were chosen for their complementary nature, speed and portability of the equipment, the latter being especially pertinent given the difficulty of the terrain for survey. The work was carried out as part of an investigation by Channel 4 television's popular archaeology series *Time Team*.

The Bartington Grad601-2 is a 1m separation dual sensor fluxgate system capable of 0.1nT resolution. The instrument has a greater theoretical depth response than a 0.5m gradiometer and at this site the large accretion of alluvium suggested the improved depth sensitivity to be essential especially for smaller targets. It is unnecessary to discuss the operation of the fluxgate gradiometer here, as many other easily available sources provide ample information e.g. Bartington & Chapman (2003), Scollar *et al* (1990). For the work at Warton Marsh, gradiometer data were collected within 20m grids at 4 samples per metre along traverses 1m apart.

Electromagnetic conductivity survey is perhaps not so familiar in British archaeological prospecting, although there is a long history of experimental work e.g. Howell (1966), Tite & Mullins (1970). The use of the technique is more widespread in the USA and mainland Europe, apparent from research by Bevan (1983), Clay (2003), Frohlich & Lancaster (1986) and Tabbagh (1986). Electromagnetic survey solely in the time-domain is less common and a brief précis may be useful therefore.

The instrument used during this survey was the Geonics EM61mk2, an active instrument that employs the principle of electromagnetic induction,

whereby magnetic fields induce corresponding electric currents in conducting bodies. The transmitter coil produces a strong pulsed magnetic field around the instrument, which induces the electric currents in conductive targets around the instrument. These currents in turn produce secondary magnetic fields, which generate secondary currents in the receiver coil of the instrument.

The strength of response at the receiver is proportional to the size and depth of the target below the surface. The decay of the induced field is sampled at a number of time intervals, leading to some indication of depth and size; fields produced by small and shallow anomalies decay faster than those from deeper and larger targets. Further discrimination against near-surface debris is achieved through a differential channel acquired from a second coil arranged above the first. The depth of penetration can be expected to be in the order of 3m for a target roughly 1m by 0.5m.

The complementary nature of the two data sets arises from the ability to discern between any metallic target as detected by the EM61, and purely ferrous targets detected by the fluxgate gradiometer. When considered alongside each other, anomalies appearing in both data sets are likely therefore to be ferrous in nature, whereas those appearing in the EM results alone are likely to be of some other metal or alloy. Further analysis of the response may reveal the composition and depth of the target.

The EM61 was used in conjunction with a palm-top computer for data capture, which also had a connection to a dGPS receiver; the GPS signal is decoded in real-time, thereby giving a geo-referenced location for each data point from the EM61. The dGPS receiver was fixed temporarily to the frame of the EM61 to maintain a constant offset relative to the instrument, with the palm-top computer and battery for the dGPS being carried by a second person to minimise noise in the data. Observations made in the field confirmed that the dGPS apparatus and palm-top computer did not influence the measurements made by the EM61 provided they were kept in excess of about 1m from the coils. The manufacturer of the dGPS receiver claims an accuracy of <5m under most circumstances, improving to c.1m in optimal scenarios. Due to the flat nature of the marshland around the coast, it was expected that a good 'open' sky would be available and the positional data would be close to 1m accuracy. The grid for the gradiometer survey was established using a Trimble real-time kinematic dGPS, thereby providing sub-metre accuracy.

Figure 1

The EM61 was tested in both the wheeled and harness configurations, although the latter was preferred under the circumstances (Figure 1). It was found that whilst it was possible to tow the instrument on its wheels, it was easier to carry the EM61 using the backpack provided, as this allowed the user to move more freely across the rough ground encountered during this survey. While data collection was along roughly parallel traverses, each measurement location was recorded by dGPS. The method for the EM differs from previously reported data collection strategies on crash sites; Gaffney and Gater (2003) report the use of 2 different metal detectors, Geonics EM61 and Whites TM808, with the former being towed and both instruments capturing data on a regular grid.

Survey Results – Figures 2 and 3

Area 1

A small channel separated the two halves of this area, with magnetic survey confined to a single 20m square on the eastern bank. Examination of the EM61 survey results shows a large 'hotspot'

that straddles the channel. The magnetic data show a strong ferrous response that broadly coincides with the eastern hotspot, although there is a definite offset to the south. This reflects a ferrous component of the aeroplane separate from the aluminium cockpit and wing. The ferrous response probably indicates the position of guns and/or armour plating.

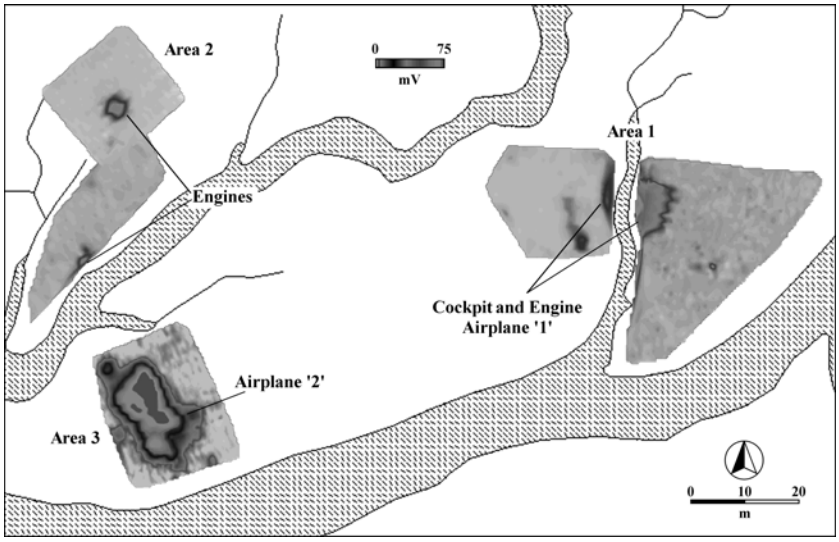

Figure 2

Area 2

The magnetic and electromagnetic data for Area 2 correspond almost exactly. The two anomalies are strong and well-defined, suggesting that they have been produced by discrete targets. The ferrous responses in the magnetic data suggest that the targets are likely to be two of the engines from the aircraft. Excavation of the 'southern' target confirmed this interpretation.

Area 3

The data from this area are dominated by strong responses, with both ferrous and non-ferrous components. The strongest hotspot in the EM61 data is again offset with regard to the ferrous anomalies, as in Area 1. Other, non-ferrous responses can be seen in the immediate vicinity of the main anomaly, suggesting that parts of the aluminium airframe were scattered over this area as the plane crashed and/or exploded. As the ferrous responses are relatively coherent, it seems likely that guns and armour plating lie towards the centre of the plot, with the remainder of the airframe and wings around them.

Conclusions

The dual approach to the survey was successful in identifying the main components of the aircraft and allowed discrimination between the different parts of the wreckage, that is the ferrous from the non-ferrous. The main advantage of the applied geophysical methods over conventional metal detector survey is the ability to produce high quality plans of the wreckage distribution together with information concerning its composition.

The offsets between the ferrous and non-ferrous anomalies are thought to be due largely to the relative positions of various parts of the aircraft. The guns, engines and armour plating comprised mostly steel and iron components, whereas the fuselage and airframe were constructed from aluminium. This would result in the majority of the anomalies being non-ferrous in nature, with discrete ferrous anomalies interspersed. Some separation between the different elements of the aircraft was expected due to their partial break-up upon crashing, known from contemporary photographic evidence. The interpretation of the various components of the aircraft was confirmed by limited invasive investigation (Figure 4).

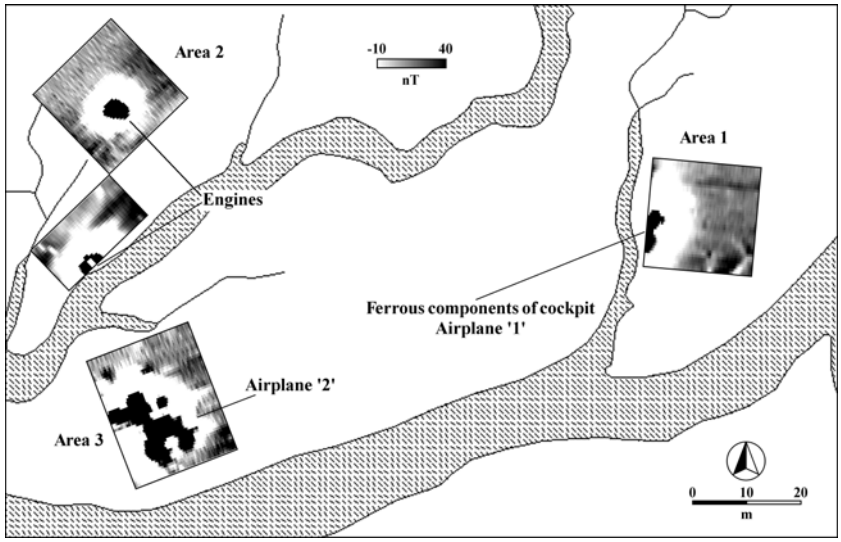

Figure 3

Figure 4

Acknowledgements

The project was carried out as a *Time Team* project funded by *Videotext Communications / Picture House* on behalf of *Channel 4* television.

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Conference, Seminar and Course Announcements

The 7th International Conference on Archaeological Prospection: Travel Bursaries

Nitra, Slovakia, 11th – 15th September 2007

ISAP
International Society for Archaeological Prospection

Application for Travel Bursary: 7th International Conference on Archaeological Prospection 2007, Nitra 11-15th September.

A feature of the last ISAP Archaeological Prospection conference in Rome was the introduction of a Student Bursary to facilitate attendance for those participating in the conference. Delegates at that conference contributed to a fund to ensure that ISAP can offer similar bursaries for the upcoming ISAP conference in Nitra (September 2007). The award will be 150 Euro for each successful applicant. The application form and other details can be found on the ISAP web site. Please note that the deadline for applications is 31st July 2007.

Chris Gaffney

Aerial Archaeology Research Group Conference

National Danish Agency for Cultural Heritage, Copenhagen, Denmark, 25th – 27th September 2007

The conference is to now take place at the National Danish Agency for Cultural Heritage, not the National Museum of Denmark, as originally announced in the call for papers.

Remember the last chance to register is 31st August!

More information, including a registration form and provisional programme can be found on the conference website: http://luftark.net/aarg2007/index.htm

Symposium on Geophysics and Remote Sensing in Determination of Near-Surface Structures (GARS 2008)

İzmir, Turkey, 30th April – 2nd May 2008

On behalf of the Executive Committee of *SYMPOSIUM ON GEOPHYSICS AND REMOTE SENSING IN DETERMINATION OF NEAR-SURFACE STRUCTURES* (*GARS 2008)*, I am pleased to invite you to be held in İzmir-Turkey between April 30 and May 2, 2008 for attending to this Symposium.

GARS 2008 will focus on applied geophysical and remote sensing methodologies applicable in the determination of near-surface structures. With a range of topical symposium sessions, GARS 2008 will have something for everyone who is interested in the present and future developments on the determination of near-surface structures. Since the 1990's, exploration geophysics and remote sensing applications have been coming up with an increasing number in the fields of archaeology, engineering, environmental, geology and hydrogeology, military and agriculture. Today, the extensive use of these techniques is supported by education and research at the many universities and research organizations. This Symposium is intended to be an open forum for archaeologists, geophysicists, geologists, engineers, physicists and environmental scientists as well as other interested experts and professionals to meet and discuss the actual practice and future developments of geophysical and remote sensing methods in near-surface applications. I would like to call all scientists and experts to participate such a nice occasion and to support this symposium. I will also present an unforgettable meeting not only with quality and scientific satisfaction but also the warm atmosphere of İzmir. Hope to meet you in the Symposium.

The symposium is arranged by the Center for Near Surface Geophysics and Archaeological Prospection (CNSGAP) of Dokuz Eylül University (DEÜ), the UCTEA Chambers of Geophysical Engineers, İzmir Branch and DEÜ Engineering Faculty Department of Geophysics.

Official languages of the symposium are Turkish and English. The symposium will be held in the Conference Hall (DESEM) of Dokuz Eylül University between April 30 and May 2, 2008.

Prof. Dr. Mahmut G. DRAHOR

SYMPOSIUM TOPICS
The program will include oral and poster sessions and an exhibition. The symposium will cover the entire spectrum of the main topics of geophysics *(magnetic, microgravity, resistivity, ground penetrating radar, electromagnetic, SP, IP)* and remote sensing *(GIS, GPS, radar, thermal etc.)* techniques in near surface applications. The general topics of the symposium are given as follows:

Geophysics and remote sensing in archaeological, agricultural, engineering, environmental, geological and UXO investigations,
In addition, a special topic named as “Combined geophysical and remote sensing assessment of near surface" will be performed within the symposium topics.

The organizers reached a mutual understanding with the peer-reviewed journal “Near Surface Geophysics” of EAGE to publish a Special Issue related to this special topic named as “Combined geophysical and remote sensing assessment of near surface” of the Symposium. In addition, the organizers reached a mutual understanding with the peer-reviewed journal “Yerbilimleri – an Earth Sciences Journal” to publish a special issue related to general topics of the Symposium.

For more and updated information see our official website:
http://web.deu.edu.tr/gars2008
gars2008@deu.edu.tr

GPR 2008

University of Birmingham, UK, 16th – 19th June 2008

Call for papers for the 12th biannual international Ground Penetrating Radar conference, to be held at the University of Birmingham, UK has been released

This is the first time this prestigious meeting has been held in the UK, and features a special focus industry day to tie together academic research and commercial practitioners

Papers for both oral and poster presentation across a wide variety of GPR themes are invited, including UXO and utility detection, mining and tunnelling, archaeology, pavement and engineering, environment and many more.
Deadline for submission of abstracts is 30th October 2007.
A technical exhibition of state of the art GPR hardware and software solutions will also run parallel with the technical sessions

Full details for submission of abstracts can be found at www.gpr2008.org.uk

Journal Notifications

Archaeological Prospection

Archaeological Prospection 2007 – Issue 3

As we turn our thoughts to the ISAP Archaeological Prospection Conference in Nitra, a set of papers from the previous meeting in Rome is about to be published in the journal *Archaeological Prospection*. The papers are a mix of interesting case studies, largely from Italy, and some additional quality submissions from elsewhere. As usual any member of ISAP can get a preferential rate from the publishers (see member benefit section at http://www.bradford.ac.uk/acad/archsci/archprospection.

The contributions include:

Integrated Technologies for Archaeological Investigation; the Celone Valley Project
Marcello Ciminale, Helmut Becker, Danilo Gallo

Multi-Temporal Geophysical Survey of a Roman Bath Complex in Montegrotto Terme (Padova, Northern Italy)
E. Finzi, N. Praticelli, L. Vettore, A. Zaja

Recent Results from the English Heritage Caesium Magnetometer System in Comparison to Recent Fluxgate Gradiometers
N. Linford, P. Linford, L. Martin and A. Payne

Archaeological Questions and Geophysical Solutions. GPR and IP Geoelectrics in Munigua (Spain)
Cornelius Meyer, Burkart Ullrich, Christophe DM Barlieb

Georadar Data Collection, Anomaly Shape and Archaeological Interpretation – A Case Study from Central Italy
Luciana Orlando

Integrated Geophysical and Topographical Investigations in The Territory of Ancient Tarquinia (Viterbo, Central Italy)
S. Piro, D. Peloso and R. Gabrielli

A SQUID System for Geomagnetic Archaeometry
Volkmar Schultze, Andreas Chwala, Ronny Stolz, Marco Schulz, Sven Linzen, Hans-Georg Meyer, Tim Schüler

For ISAP member discount on Archaeological Prospection please see the details on the society's website.

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