ISAP NEWS

The newsletter of the International Society for Archaeological Prospection

Issue 44
October 2015

New Surveys at Verulamium

Magnitude Surveys' Big Day Out

Combined Survey at Ostia Antica

Welcome to the 44th issue of ISAP News! And welcome to Paul Johnson as ISAP News co-editor. It was nice to catch up with familiar and new faces at the ICAP conference in Warsaw in September, and, of course, we hope you are feeling suitably inspired to write up your current projects for the next issue of ISAP News!

This issue has a slight community geophysics bias: firstly, we have an account of Magnitude Surveys' experience hosting a community geophysics day; secondly, we have some preliminary results of magnetic and radar surveys conducted at Verulamium by the Community Archaeology Geophysics Group there. Meanwhile, we also have details of intensive survey conducted using a combination of techniques at Ostia Antica, Italy.

Please send any contributions, notifications, and cover images for the next newsletter (ISAP News 45) to the email address below by the 31st December 2015. All entries are gratefully received!

Hannah Brown & Paul Johnson

editor@archprospection.org

The Cover Photograph shows children of various ages using a multimeter to investigate the electrical properties of conducting clay during a geophysics open day run by Big Heritage and Magnitude Surveys. (Photo: Magnitude Surveys)

Below: delegates at the recent ICAP conference in Warsaw. (Photo: Robert Ryndziewicz)

Organizers of the AP2015 Conference would like to inform readers that the blank pages of the conference website (http://www.iaepan.vot.pl/ap2015/) (i.e. list of participants, list of authors and photographs) are currently being completed and will be activated by the end of October.

Membership renewal
£7 or €10 for the whole year. Please visit:
http://www.archprospection.org/renew

Archaeological Prospection Journal
Take advantage of the great deal offered to ISAP members by Wiley-Blackwell for this journal:
http://www.archprospection.org/wiley

Our Big Day Out: #digblacon with Big Heritage

Chrys Harris, Graeme Attwood & Finnegan Pope-Carter
Magnitude Surveys
c.harris@magnitudesurveys.co.uk

In mid September, we (the Magnitude Surveys team) had the wonderful opportunity of hosting a geophysics open day with **Big Heritage** as part of their **#digblacon** community archaeology project.

Big Heritage's Blacon project encourages community engagement and active lifestyles through archaeological investigations over one of the oldest parts of Blacon, just outside Chester in the northwest of England. Our survey area was a communal green adjacent to the site of the (now buried) 18th century Blacon Hall. There was a great turnout with a nice balance of adult volunteers and eager children. We believe it is never too early or too late to become engaged with heritage and science; so we were excited to develop activities for both children and adult participants.

Chrys managed the hands-on children's activity for understanding earth resistance:

"We wanted to simplify the concept of current flowing through the earth with an activity that was both visual and hands-on. We explored electric current by first making simple circuits with light bulbs and batteries. The higher-level concept of how electric current moves through the earth was understood by making circuits using conducting clay (recipe from Squishy Circuits). We used a multi-meter to measure the potential difference, watching how it differed between the different shapes of clay. The kids had a blast playing with the clay! It was great because they could shape the clay into whatever they wanted and had fun using the multimeter, testing their clay. They really seemed to grasp the concept that the electric current flows through the clay, and how it flows depends on the shape and volume of the clay used. We had some other higher-level activities for simulating earth resistance survey, but this activity just clicked so well and they were all really engaged with it!"

Graeme and Finn managed the geophysical equipment with both adult and children participants. The systems we utilised were all cart-based. Using cart-based magnetometer systems helps to reduce some of the issues you can have when using a number of different operators with manual instruments. Graeme explains this further:

“For example, typically one of the biggest issues is the operator being very magnetic. Using handheld magnetometers can often restrict the number of people who could take an active role in survey, but using a cart system reduces the problem of volunteers being magnetic because of the greater distance between the operator and the instrument. I demonstrated the mag and EM cart, which positions data using a real time GPS stream. The GPS positioning was also beneficial when working with different operators. We were able to collect data on long traverses down the full length of the playing field, which means we didn't have to worry about the participants walking down specific lines with an even pacing.

What I did not expect was that by using the cart we turned data collection into a more social event. It was a great pleasure seeing people help each other pull the cart whilst passing on what they had just learnt, or even simply walking alongside each other, talking about the site, the history and the area in general. It really gave the participants an opportunity to make new connections within their own community. What's more it allowed the younger members of the group to contribute; those who would normally be a bit too small to carry a magnetometer were very much enjoying pulling the cart even if they were unaware that they were being helped!”

Finn demonstrated how earth resistance and magnetometry can be collected simultaneously using Geoscan Research's MSP25 hand pulled cart system:

“We explored the sensitivity of magnetometers by operating the instrument in scan mode to see how it picks up on magnetic clothing items and accessories. We also explored how earth resistance measurements can be collected using towed systems, positioned using the optical encoder wheel system. As with the GPS positioned cart, the encoder wheel positioning helps when using different operators. Demonstrating with different types of kit and non-standard kit was able to get more participants involved. For a particular example, one of the participants really liked the cart system because he was able to get involved collecting data; he said the cart system was much

easier and more comfortable than using a traditional earth resistance system where the electrodes are inserted and removed manually.”

Big Heritage's excavation component of the project has been ongoing. Community participants of all ages and various school groups have been involved in test-pitting, finds washing and sorting, recovering all sorts of artefacts, including coins and medieval pottery. Test pits over anomalies mapped in the geophysical data confirm medieval field boundaries.

Thanks to Big Heritage, Geoscan Research, GNSS Solutions, University of Bradford Archaeological Sciences, and the Centre for Applied Archaeology for assistance with this project.

The whole story of the incredible project has been documented on twitter with hashtag **#digblacon** and can also be found on Big Heritage's website:

http://bigheritage.co.uk/digblacon/

New Surveys at Verulamium

Kris Lockyear
University College London, UK
noviodunum@hotmail.com

Verulamium (St Albans, Hertfordshire, UK) is the third largest Roman town in the province of Britannia. Of the four 'public' towns in Britain which are not built over by modern cities (Verulamium, Wroxeter, Silchester and Caistor-by-Norwich), it is the only one for which the entire available area has not been subject to a geophysical survey. Martin Aitkin, in 1959–60, successfully traced the line of the so-called '1955 ditch' using magnetometry (Aitkin 1960, 1961) and English Heritage conducted surveys of parts of the town in 1994 and 2000 (Cole 1994, Linford 2000). In 2013–14 the newly-formed Community Archaeology Geophysics Group undertook a magnetometry survey of that half of the town which lies under Verulamium Park using a Foerster Ferex cart-system purchased for the Sensing the Iron Age and Roman Past project by the AHRC (Fig. 1). The results of this survey were reported at the NSGG conference in 2014, and are in press (Lockyear and Shlasko forthcoming).

The Group were able to obtain permission from the Earl of Verulam to survey the part of the Roman town that lies within the Gorhambury Estate in August 2015. We were able to complete 17½ survey days, losing 4½ days to bad weather. Some 17.3ha were surveyed using the Foerster Ferex system. In addition, the group were also able to access a Malå GPR system belonging to SEAHA (Fig. 2), a doctoral training school run jointly between UCL, Oxford and Brighton. Four hectares of GPR data were collected using a 450MHz antenna with transects at 0.5m spacing. It will take another two seasons to complete the magnetometry survey of the area inside the 3rd century town walls.

Here we would like to discuss some of the highlights of the survey. We must emphasise that the analysis of the data, especially the GPR surveys, is at a very early stage.

Fig. 3 (overleaf) is the magnetometry survey from this season overlain on satellite imagery from Google Earth. The '1955 ditch' — so-called because Sheppard Frere excavated a section of it in 1955 — shows clearly on the southern side of the survey area, and can be

Figure 1 *Peter Alley (South-West Herts Archaeological and Historical Society) operates the Foerster magnetometer.*
Figure 2 *John Dent (St Albans and Hertfordshire Architectural and Archaeological Society) operates the Malå GPR.*

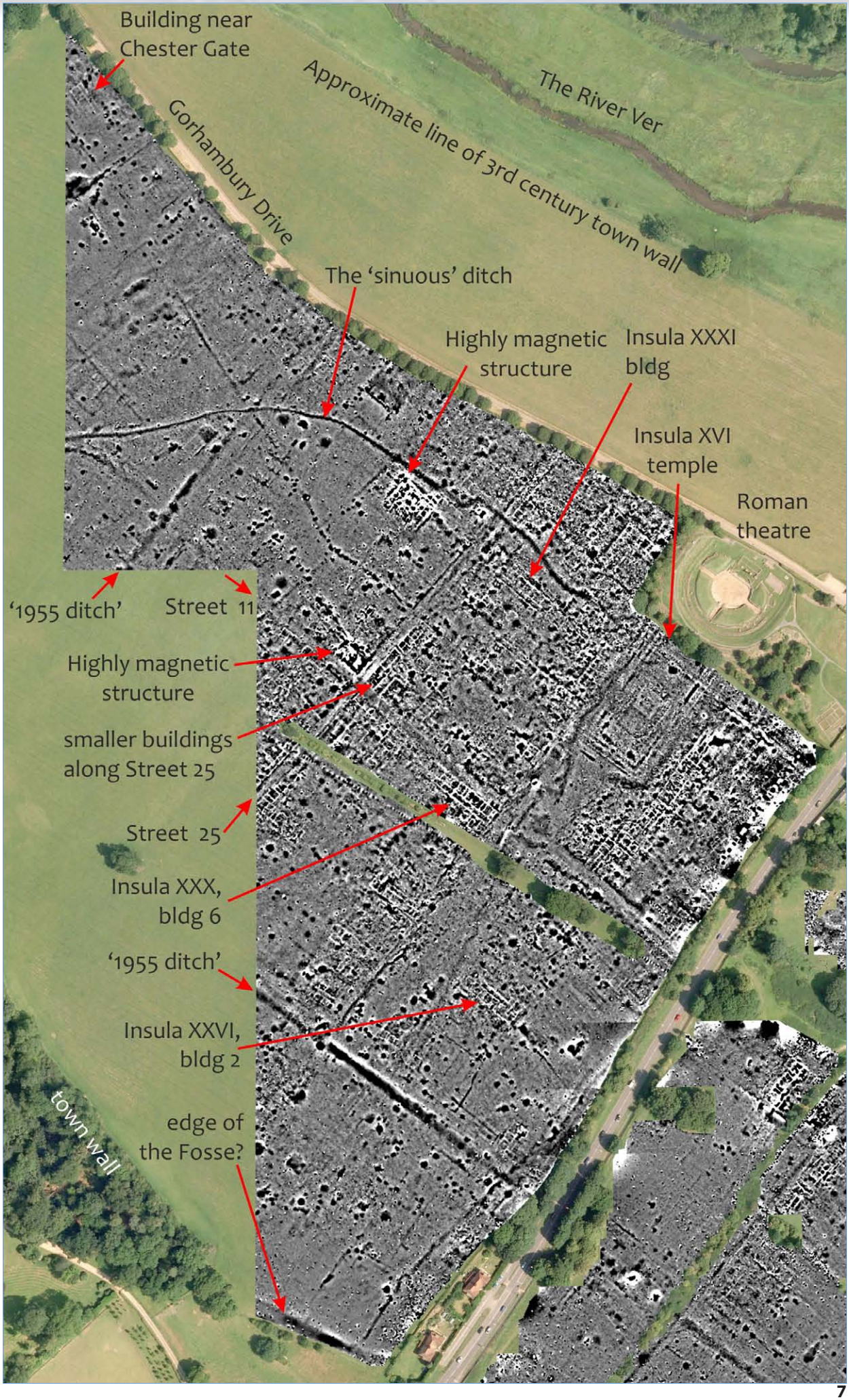


Figure 3 *The 2015 magnetometer survey of the "Theatre Field" at Gorhambury overlain on satellite imagery from Google Earth. The mag data has been clipped to ±7.5nT.*

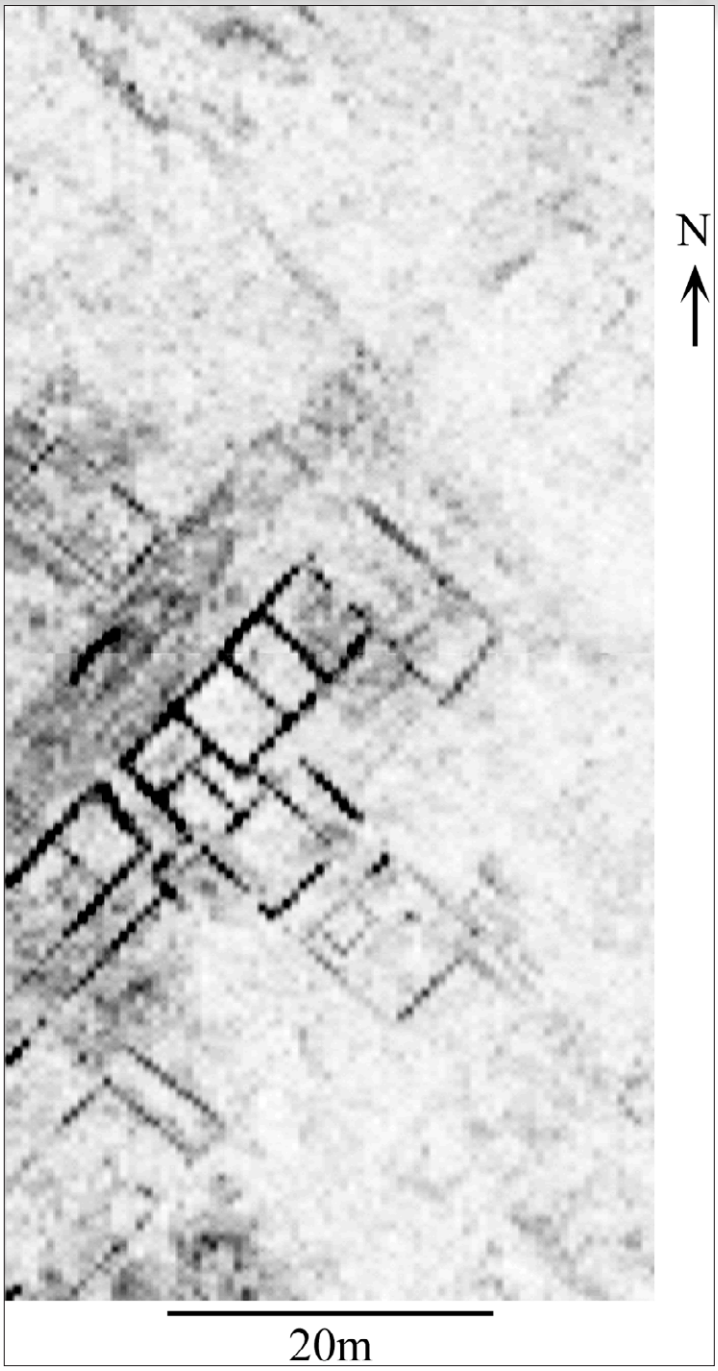


Figure 4 *The 11–16nS time-slice of the GPR data over the range of small buildings alongside Street 25. Data processed by Mike Langton (Malå Geoscience AB) using Reflex-W.*

discerned to the west although it becomes quite indistinct as it approaches the Gorhambury Drive. This feature, which dates to about AD 80, was the boundary of the town until its expansion out to the line of the walls at some point in the third century. The ditch appears to have gone out of use as a boundary in the first half of the second century, but in places was not entirely backfilled until the early third century. The variable response must be a result of differing episodes of backfilling, and the nature of the material used in that backfill.

The 'sinuous ditch' was identified in two transects in the EH survey of 2000 but at that time it was not obvious that they were part of the same feature. It clearly post-dates the 1955 ditch, but is it associated with the Roman town? The western section comes down a dry valley towards the centre of the town, and then as the ditch turns to the SE it follows the contours of the slope, dog-legging around a highly magnetic feature before seemingly coming to an end close to the theatre. Our highly speculative preliminary interpretation is that this might be an aqueduct. Aqueducts in Roman Britain were less Pont du Gard and more muddy ditch!

Some of the streets show very clearly, especially Streets 25 and 11 which also show a series of buildings along their length. Others, such as Street 24, which is supposed to run parallel to Street 25 along the NW side of the Roman temple, are barely discernible in the data. In fact, there appears to be a broad open area in front of the SW face of the Insula XVI temple leading all the way up the hill to the edge of the town.

A number of buildings show clearly as negative features. Flint, the local building material, is non-magnetic and what we are seeing are foundations, or foundation trenches, cut through more magnetic material. Insula XXVI, building 2 was previously seen in an aerial photograph, and GPR survey has picked up the building very nicely. The high magnetic responses within Insula XXX, building 6 may represent a tile floor, or perhaps a room with hypocaust heating. There are a series of smaller buildings along the streets, especially along Street 25. There are two highly magnetic buildings. The northern building was also subjected to GPR survey, but very little shows suggesting this is a timber framed building which has burnt down.

The GPR surveys were highly successful. Data was collected in the same 40m blocks as the magnetometry at 0.5m transect intervals. Fig. 4. Shows just one small part of the GPR data over the line of smaller buildings and Street 25 referred to above. The GPR data when compared to the magnetometry is allowing us to identify robbed v. unrobbed structures.

While we wait for next season, the group is expanding the area surveyed with GPR within Verulamium Park, currently concentrating on Insula XXIV using a 25cm transect spacing.

The results are regularly posted to the project blog which can be found at

hertsgeosurvey.wordpress.com

Using Technical Expertise at Ostia Antica (Leiden University & TU Delft)

Till F. Sonnemann[1], Hanna Stöger[1,2], & Dominique Ngan-Tillard[3]

[1] Universiteit Leiden, [2] Universität Augsburg, [3] TU Delft t.f.sonnemann@arch.leidenuniv.nl

Figure 1 *Photogrammetric model of Insula IV. Parts of the extant structures are partially overgrown.*

A combination of prospection techniques was applied in an intensive geophysical and archaeological fieldwork experience at Ostia Antica, Italy, to link vacant and unexcavated areas to excavated quarters of the principal port-town of the Roman Empire. These techniques included ground-penetrating radar to expose the subsurface features, topographic studies and micro-UAS (commonly known as drones) for photogrammetric analysis.

Ostia Antica

Numerous studies of the archaeological site of Ostia Antica revealed the many faces of the once important port city of the Roman Empire (Meiggs 1973, Pavolini 1986, Descœudres 2001). Scholarly publications range from the city's early beginnings as Rome's gate to the Mediterranean (Belotti et al. 2011, Vittori et al. 2015), to becoming an economic powerhouse, and, after the regression of the sea and siltation (Goiran, 2011), losing its significance to the neighbouring Portus (Ogden et al., 2009, Keay et al., 2014), and finally leading to the abandonment in the 8th century.

The study

The surveys form part of the 'Neighbourhoods of Roman Ostia' study conducted by Hanna Stöger (Stöger 2011, 2014). The project is committed to non-invasive methods in archaeology and aims to reconstruct urban neighbourhoods from a long-term perspective. The Leiden-Delft collaboration is part of a larger co-operation agreement between the Universities sharing expertise centres and facilities. The collaboration provided students from Leiden, Delft and Augsburg with the opportunity

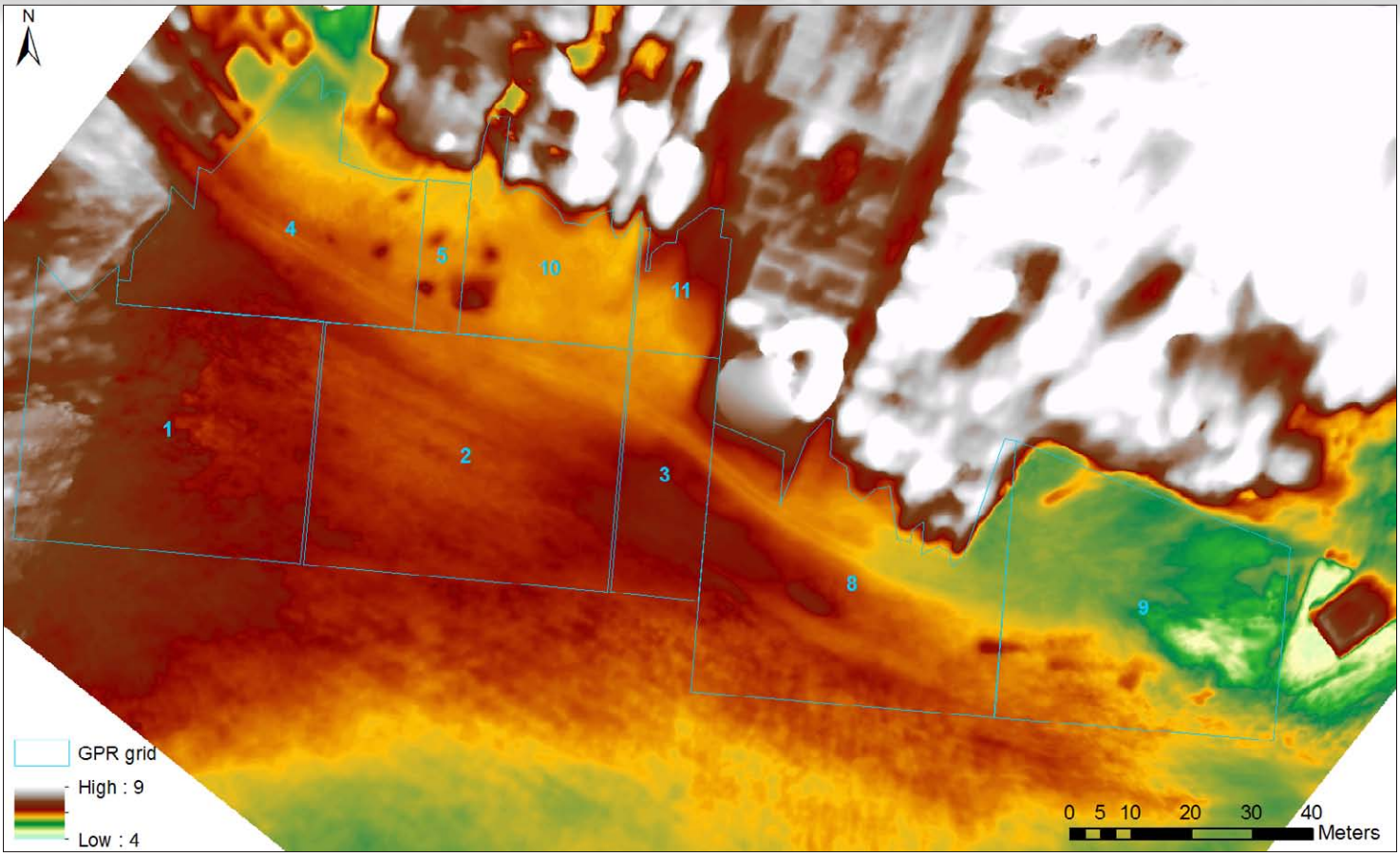


Figure 2 (above) *Photogrammetric DEM of the area, highlighting slight topographic changes.*
Figure 3 (below) *GPR survey results (depth ~70-100cn), overlaying the UAS orthophotographs; highlighted in red are the structures identified so far.*

to get hands-on experience in different field techniques, and to collect data for theses on topics ranging from geosciences to civil engineering and architecture.

The goal was to analyse the connection of the built-up insula IV, a set of city blocks in the southeast part of Ostia Antica, with the adjacent vacant, lower lying plots to the south that are now covered by grass. Under strict time constraints it was decided to survey about one hectare using the towing system of an S&S 250MHz antenna. The grid was set up in an angle to the orientation of the buildings. Starting from approximately 50 meters distance to the insula, using 50 cm row spacing over a 250 meters width, the survey terminated in front of the remaining structures. In addition, UAS flights for photogrammetry, processed using Agisoft Photoscan software, and DGPS surveys were conducted to create detailed topographic maps and orthophotographs of the area.

The 250MHz antenna received data to about 120cm, possibly caused either by a cover of rubble remaining from the once spread out city, or diffused by salt intrusion of the close sea. Data processing, using ReflexW software, included start time fix, max. phase correction, background removal and applying median filters and gain. Deep plowing has significantly affected the top soil, nevertheless the collected GPR data shows a number of significant features. Below an elevated area in the west (grids 1 & 2 - fig. 2), linear features give evidence of remains of built structures. To the east (particularly in grids 8 & 9) there is additional evidence of human landscape modifications; linear features speaking for masonry walls, and rectangular features indicating potential floors or cisterns. Further research is required to clarify whether the missing evidence is due to the environmental circumstances or the actual lack of built structures in this area.

The results of the surveys were processed as part of two jointly supervised bachelor theses at TU Delft and serve as the base for a master thesis at the University of Leiden. This multi-disciplinary research will hopefully lead to further successful collaborations in the near future.

Acknowledgements

The fieldschool in Ostia was organized within the EU-funded ArchaeoLandscape project. The Authors would like to thank Eraldo Brandimarte and Eric Dullart for providing their expertise. Members of the survey team were Tim Beerens, Thomas Dworschak, Alexander Jansen, Lars Schaarman, Martijn Warnaar and Thierry van 't Westenende. Our gratitude goes to the Soprintendenza of Rome (Sede Ostia) and the staff at Ostia Antica, and particularly to Dean Goodman (gpr-survey.com) for allowing the Delft students to work with his software.

References

Belotti, P., Calderoni, G., Di Rita, F., D'Orefice, M., D'Amico, C., Esu, D., Magri, D., Preite Martinez, M., Tortora, P., and P. Valeri. 2011. "The Tiber River delta plain (central Italy): Coastal evolution and implications for the ancient Ostia Roman settlement." The Holocene 21, 7: 1105-1116.

Descoeudres, J.-P. (Ed.). 2001. Ostia: port et porte de la Rome antique. Geneve: Ville de Geneve, Department des affaires culturelles.

Goiran, J., Salomon, F., Mazzini, I., Bravard, J., Pleuger, E., Vitorri, C., Boetto, G., Christiansen, J., Arnaud, P., Pellegrimo, A., Pepe C., and L. Sadori. 2014. "Geoarchaeology confirms location of the ancient harbour basin of Ostia (Italy)." J. Archaeol. Sci. 41: 389-398.

Keay, S., Parcak, S., and K. Strutt. 2014. "High resolution space and ground-based remote sensing and implications for landscape archaeology: the case from Portus, Italy." J. of Archaeol. Sci. 52: 277–292

Meiggs, R. (1973, 1st edition 1960). Roman Ostia. Oxford: Clarendon Press.

Ogden, J., Keay, S., Earl, G., Strutt, K., and S. Kay 2009. "Geophysical Prospection at Portus: An Evaluation of an integrated Approach to the interpretation of Subsurface Archaeological Features." In: Frischer, B., J. Webb Crawford and D. Koller (eds.): Making History Interactive. BAR International Series S2079: 273-284.

Stephani, M., Becker, H., Brand, R., and J. Fassbinder. 2000. "Fusion of aerial images and magnetic prospection for archaeology." International Archives of Photogrammetry and Remote Sensing. Vol XXXIII, Part B5, Amsterdam: 764-771.

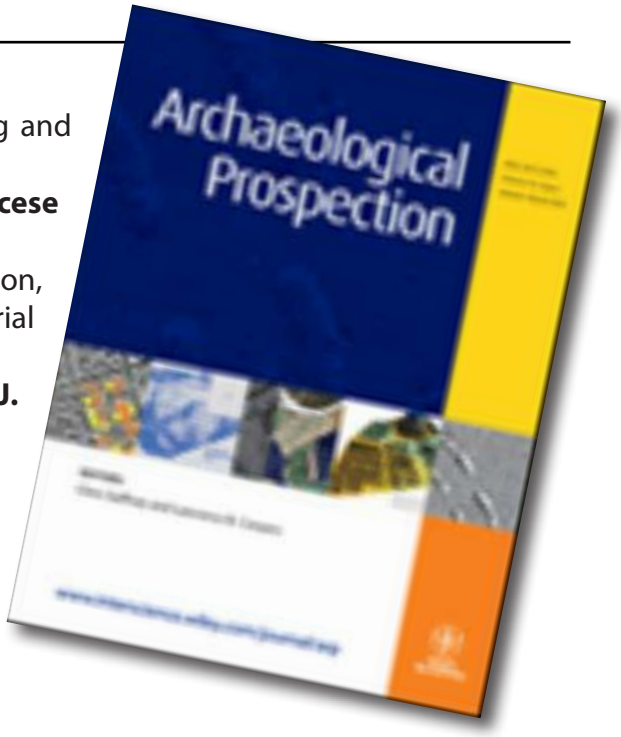
Stöger, H. 2011. Rethinking Ostia: A spatial enquiry into the urban society of Rome's imperial Port-Town. Leiden: Leiden University Press.

Stöger, H. 2014. The spatial signature of an Insula neighbourhood of Roman Ostia. In: Paliou Elefteria, Lieberwirth Undine, Polla Silvia (Eds.) Spatial analysis and social spaces: Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environments. no. 18. Berlin and Boston: De Gruyter: 297-316.

Vitorri, C., Mazzini, I., Salomon, F., Goiran, J., Panuzzi, S., Rosa C., and A. Pellegrimo. 2015. "Palaeonenvironmental evolution of the ancient lagoon of Ostia Antica (Tiber delta, Italy)." J. Archaeol. Sci. 54: 374–384.

Journal Notification

Archaeological Prospection 22 (3)



The Roman City of Altinum, Venice Lagoon, from Remote Sensing and Geophysical Prospection
P. Mozzi, A. Fontana, F. Ferrarese, A. Ninfo, S. Campana & R. Francese

The Investigation of the Ardales Cave, Spain – 3D Documentation, Topographic Analyses, and Lighting Simulations based on Terrestrial Laser Scanning
D. Hoffmeister, S. Zellmann, A. Pastoors, M. Kehl, P. Cantalejo, J. Ramos, G. C. Weniger & G. Bareth

A Multidimensional Research Strategy for the Evaluation of Settlement Pits: 3D Electrical Resistivity Tomography, Magnetic Prospection and Soil Chemistry
E. Nowaczinski, G. Schukraft, K. Rassmann, S. Reiter, N. Müller-Scheeßel, S. Hecht, B. Eitel, O. Bubenzer & J.Bátora

The Discovery of an Ancient Greek Vineyard
T. N. Smekalova, B. W. Bevan, A. V. Chudin & A. S. Garipov

3D Reconstruction of Buried Structures from Magnetic, Electromagnetic and ERT Data: Example from the Archaeological Site of Phaistos (Crete, Greece)
R. Di Maio, M. La Manna & E. Piegari

UNIVERSITY of BRADFORD

MSc Archaeological Prospection
Shallow Geophysics
At The University of Bradford, UK

The course is a highly focused postgraduate degree programme which develops specialist skills in the theory and practice of archaeological prospection, in particular in near-surface geophysics.

It provides students with knowledge and experience of the principal geophysical and geochemical techniques currently available for the detection of buried archaeological features and other near-surface targets. The course provides appropriate background to materials and soil science, together with the relevant mathematical principles.

Other methods of detection such as remote sensing, topographical survey and field-walking are introduced as essential components of an integrated approach to landscape assessment. Sampling procedures and the computer treatment and display of field data from all methods are critically examined with the aid of case studies based on field experience. Skills and knowledge are developed through lectures, seminars, laboratory and fieldwork classes and a substantial individual research dissertation.

Course Syllabus:
- Electrical Methods of Survey
- Magnetic and Electromagnetic Methods of Survey
- Site Evaluation Strategies
- GIS for Practitioners
- The Nature of Matter
- Treatment, Display and Interpretation of Field Data
- Soils and Chemical Prospection
- Dissertation (MSc)

Special Features:
- In-depth specialist training, including hands-on experience in the Division's geophysics and computer laboratories and in the field
- First destination figures indicate that about 85% of postgraduates in Archaeological Sciences achieve work or further studies in the discipline or cognate areas

For more information visit:
http://www.bradford.ac.uk/study/courses/view/?c=archaeological-prospection-shallow-geophysics-msc-full-time
or contact Dr Chris Gaffney: c.gaffney@bradford.ac.uk