ISAP NEWS

***The** newsletter of the **I**nternational **S**ociety for **A**rchaeological **P**rospection*

Contents

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Editor's Note

Robert Fry R.J.Fry@student.bradford.ac.uk

Over the past few months, I received some sad news and regretfully announce the passing of Dr. John W. Weymouth last December. This issue of ISAP News is therefore dedicated to the memory of John, who will undoubtedly be missed by all who knew him. The first half of the Newsletter covers an Obituary of John and his work, with two further articles based on his lasting legacy within the National Park Service, USA.

*A huge thank you to all who have found the time to contribute to the newsletter, it is always fascinating to hear about the work you are involved with. Please send any contributions or queries for the next newsletter (ISAP News 35) to the address above by the **30th April 2013**. All entries are gratefully received; I will always try to respond to emails in the same day if possible.*

I would like to remind all those who have not yet renewed their membership that is it now due for 2013 (see link below).

Important Notices

Membership renewal
£7 or €10 for the whole year. Please visit:
http://www.bradford.ac.uk/acad/archsci/archprospection/renew.php

Archaeological Prospection Journal
Take advantage of the great deal offered to ISAP members by Wiley-Blackwell for this journal
http://www.bradford.ac.uk/archsci/archprospection/menu.php?2

Obituary for Dr. John W. Weymouth

Rinita Dalan
Mark Lynott
Chris Gaffney

I first met Professor John Weymouth at the Society for American Archaeology conference in 1997 at a session to celebrate the Fryxell Award that the SAA bestowed upon him. At the end of the conference I was struck by two things. Firstly, John was a gentle person who listened intently before giving careful and thoughtful advice. Subsequent meetings confirmed that initial impression. Secondly, his colleagues and students appeared to be as dedicated to him as he was to them. That, surely, is a sign of a great educator. As a PhD student in the 1980s I 'hoovered up' his articles as I found them both inspiring and a little bit exotic – so that was how you interpreted sites without stone walls! When I told him that I had eagerly read his articles he simply grinned and expressed astonishment that anyone from the European 'hotbed' of archaeological geophysics would have been interested. In the obituary below Mark and Rinita describe John as humble, which is so apt. John was a natural candidate for the first esteemed individuals to be awarded Honorary Membership of ISAP. He like all the others has represented the Society with great dignity. He will be missed by colleagues and friends alike. The ISAP community is reduced by his loss, but strengthened by the legacy of his influence on former colleagues and students.

Dr. Chris Gaffney, Chairman ISAP.

Obituary

John Walter Weymouth died at his home in Lincoln, Nebraska on December 20, 2012. He is widely recognized for his work in the development of geophysical methods in archaeology, for which he received numerous awards including those from the Nebraska State Historical Society (A.T. Hill Award 1995), the Society for American Archaeology (Fryxell Award 1997), the International Society for Archaeological Prospection (Honorary Membership 2004), and the Geological Society of America (Rip Rapp Award for archaeological geology 2012).

John was born January 14, 1922 in Palo Alto, California on the campus of Stanford University where his father and grandfather were professors. He studied physics at Stanford and the University of California-Berkeley (Ph.D. 1951). John taught and did research in physics at the University of California, Clarkson University, and Vassar College before joining the University of Nebraska-Lincoln (UNL) in 1956. While conducting research on x-ray diffraction, he became acquainted with archaeology and explored the application of this technique to the study of ceramic composition.

As John's interest in archaeology grew, he began investigating the use of magnetometers and other geophysical instruments as survey tools for the subsurface mapping of archaeological features. In the 1970s he evaluated the use of magnetometers at earth-lodge village sites along the Missouri River, and his success in this early work precipitated projects throughout North America and Europe. Much of his work was conducted in assistance to the National Park Service at nearly twenty parks ranging from Fort Clatsop and Chaco Canyon to Abraham Lincoln's Home and Hopewell Culture National Historical Park. His research interests also led him to St. Catherine's Island in South Carolina, Cahokia and Fort des Chartes in Illinois, Spiro, Deer Creek and Edwards in Oklahoma and the Cowen site in Iowa. John worked on historic forts, pioneer farmsteads, a pony express station, and conducted NATO sponsored work in Greece.

Although John officially retired from UNL in 1989, that by no means put an end to his professional contributions. His most recent work has been the mapping of a major Hopewell earthwork site in Ohio using a cesium gradiometer. John was actively involved in fieldwork at the Hopeton Earthworks until 1995. After that time he continued research and writing, with his latest publication in 2009. His work at Hopeton

demonstrated the importance of geophysical methods for mapping and relocating prehistoric earthwork sites that have been severely degraded by two centuries of agriculture.

John's work paved the way for geophysical applications in archaeology, transforming the use of these methods in North America from a type of special analysis to an invaluable and standard component of contemporary archaeology. He served as an important bridge between the geophysical community and archaeologists, establishing and encouraging connections with archaeological practitioners on a national and international level. John presented his findings at archaeological, geological and geophysical conferences, and through publications and technical reports produced an unparalleled body of work spanning four decades. His meticulous and prolific research has inspired several generations of scholars to follow in his footsteps. His collaboration with the National Park Service helped establish their critical role in research, development, and training in the use of geophysical methods in archaeology.

John was both a scholar and a teacher. One of the students in his first Physics in Archaeology class (1971) recalls that to assist the more science-challenged students, John provided mimeographed notes at all of his lectures and encouraged them to listen rather than write notes themselves. He was a frequent participant in National Park Service sponsored training workshops on archaeological prospection, and he mentored and assisted numerous students and colleagues who sought to include geophysics in their research.

His family, friends and colleagues knew John as a humble, thoughtful and caring man with a great love of music. John was thoroughly devoted to the dogs in his life, who occasionally accompanied him on field trips. He was a strong-minded and disciplined scholar, a great colleague and mentor, who loved the intellectual exchange associated with interdisciplinary science. John helped lead archaeology into the future, and those of us that had the privilege to know him and work with him understand how much he will be missed.

Mark Lynott and Rinita Dalan

A collection of photographs in Memory of John Weymouth is available from the Midwest Archaeology Center's Facebook page. A direct link can be found here:
http://www.facebook.com/media/set/?set=a.450575631674660.102698.126968464035380&type=1

Magnetic Surveys at the Knife River Indian Villages National Historic Site, North Dakota, U.S.A.: A Memorial to Dr. John W. Weymouth

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National Park Service – Midwest Archaeological Center

Knife River Indian Villages National Historic Site (KNRI), located in Mercer County, North Dakota, was established in 1974 to preserve certain historic and archaeological remnants of the cultural and agricultural lifestyle of the Plains Indians particularly the Hidatsa Indians (Figure 1). Three major Hidatsa village sites are located within the park boundary, including the Lower Hidatsa site (32ME10), the Sakakawea Village site (32ME11), and the Big Hidatsa site (32ME12). Archaeological research was also identified as a key element in the park's management. Numerous archaeological research projects have been conducted at the park since its founding including geophysical investigations of the archaeological sites (Nickel 1993:177-186).

Beginning in 1976, magnetic survey techniques were incorporated into the archaeological investigations at KNRI. Dr. John Weymouth of the Department of Physics and Astronomy at the University of Nebraska-Lincoln (UNL) began long term collaboration with the National Park Service's (NPS) Midwest Archeological Center (MWAC) in the application of geophysical prospection techniques at National Park Service units across the nation. Dr. Weymouth's innovative application of magnetic surveys on archaeological sites made him one of the founding fathers of geophysical prospection in the U.S.A. along with his MWAC field supervisor Robert Nickel.

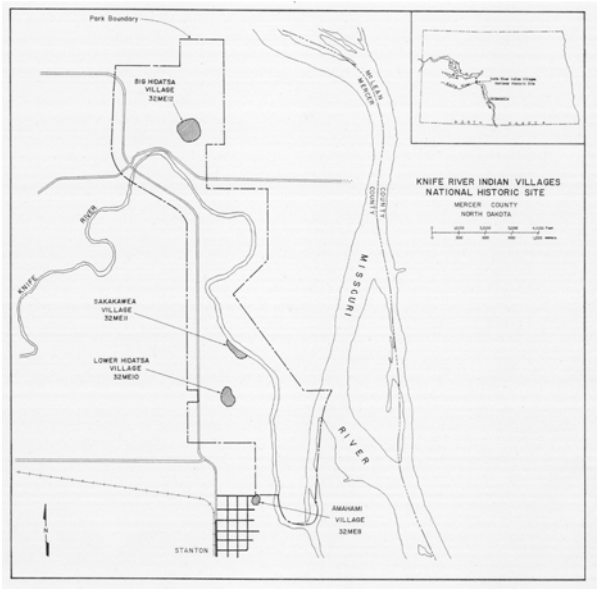

Figure 1. Location of major village sites at KNRI.

Their work at KNRI began with the magnetic survey of the Sakakawea Village site (Weymouth 1979a; Weymouth and Nickel 1977:104-118). Over the course of six field seasons from 1976 and 1981, Weymouth and Nickel conducted the magnetic survey of the Sakakawea Village site with two proton magnetometers using the difference mode: one operating as a base reference unit and one operating as the moving rover unit (Figure 2). In addition to the magnetic surveys at the

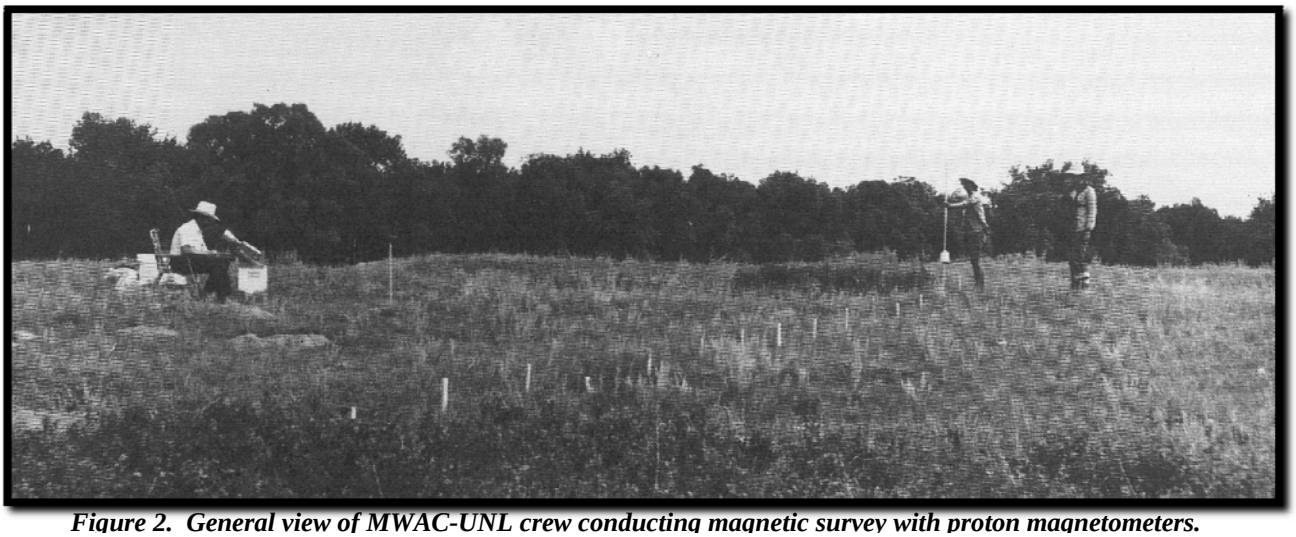

Figure 2. General view of MWAC-UNL crew conducting magnetic survey with proton magnetometers.

Sakakawea Village site, the MWAC-UNL team surveyed eleven other sites at KNRI (Weymouth 1978,1979a,1979b,1986,1988).

The total field magnetic data were collected at one gamma (one nanotesla - nT) sensitivity between 1976 and 1979. In 1980, the magnetometer sensitivity was upgraded to 0.25 nT. Initially, the data were hand recorded but later the data collection was automated. Over the course of the magnetic survey efforts, the MWAC-UNL crews averaged 2.9 20-meter by 20-meter grid units per day. The magnetic data were collected at one sample per meter along one meter traverses with the collection of 441 data points per grid unit. Data were entered onto a mainframe computer where the data were processed by software programs developed by the Nebraska Center for Archaeophysical Research (NEBCAR) that could produce level maps, profiles, and three-dimensional views (Weymouth 1988:6-7; Weymouth and Nickel 1979:109-110). Figure 3 is a level map produced by NEBCAR. The data were also brought into SYMAP (Dougenik and Sheehan 1975) for printing contour, trend surface, and residual maps.

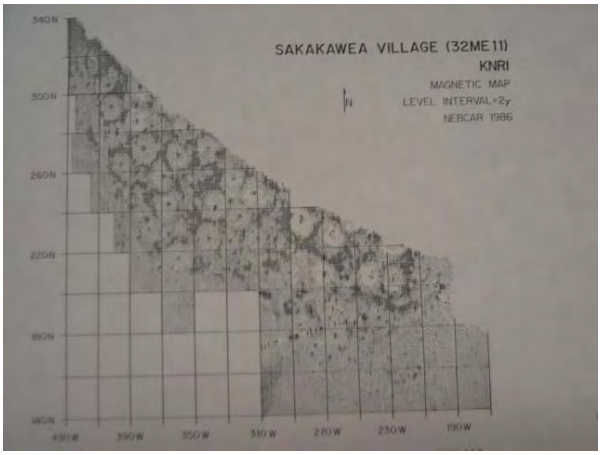

Figure 3. NEBCAR level map of magnetic data from Sakakawea Village.

It is fitting that we remember Dr. John Weymouth and his contributions to North American geophysical prospection that began MWAC on a course of incorporating these techniques into the standard archaeological investigative tool kit. This innovative approach to archeological investigations in the NPS started with the intensive magnetic surveys at KNRI. A second paper is devoted to a re-processing of Dr. Weymouth's magnetic data with modern computer processing and the 2012 dual fluxgate gradiometer survey.

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Weymouth, John W., and Robert Nickel. 1977. A Magnetometer Survey of the Knife River Indian Villages. Memoir 13. *Plains Anthropologist* 22(78): 104-118. The site was occupied between A.D. 1795 to 1834 or 1837.

Magnetic Survey Data from the Sakakawea Village Site at Knife River Indian Villages National Historic Site, North Dakota, U.S.A.

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In 2012, Midwest Archeological Center (MWAC) archaeologists returned to the Knife River Indian Villages National Historic Site to supplement Dr. John Weymouth and Robert Nickel's (MWAC-UNL) initial magnetic survey efforts at the Sakakawea Village (32ME11), the Lower Hidatsa (32ME10), and the Big Hidatsa (32ME12) sites with the more rapid dual fluxgate gradiometer system and vastly improved computer processing capabilities, as well as additional geophysical prospection methods, including ground penetrating radar, conductivity, and resistance survey techniques.

The 2012 geophysical prospection project was the initial phase of a multi-year geophysical project at the park to re-examine the three main village sites with multiple instruments. Magnetic data were collected at the three major village sites along with limited ground penetrating radar, conductivity, and resistance survey data at the sites. In addition to the collection of geophysical data at the three major village sites, the National Park Service (NPS) also converted text files containing the geophysical data from the MWAC-UNL KNRI magnetic surveys into digital format for processing with modern geophysical software processing programs on desktop personal computers. The computing power of the modern desktop personal computers was far greater than the mainframe computers of the late 1970s and early 1980s used by Dr. John Weymouth during his early magnetic surveys at KNRI. The following is a presentation of the 2012 dual fluxgate gradiometer data and the re-processed Weymouth data from the Sakakawea Village site at KNRI.

The Sakakawea Village site (Figure 1) represented a historic Hidatsa village along the Knife River in central North Dakota, which was occupied by the Awatixa subgroup of the Hidatsa Tribe (Ahler and Benz 1980:7-10; Ahler et al. 1980:7-16). The site was occupied from ca. A.D. 1795 to 1834 or 1837. The village was burned out by the Dakota in 1834 and ultimately abandoned during the 1837 small pox epidemic. The village site was believed to be the village where French-Canadian fur trapper Toussiant Charboneau and his Shoshone wife Sakakawea jointed the Corps of Discovery expedition under the joint command of Captains Meriwether Lewis and William Clark during the winter of 1804-1805. The site was first documented by T. H. Lewis in 1883 (Ahler et al. 1980:17-20). In 1906, F. J. V. Kiebert made the first map of the site (Bowers 1965:20).

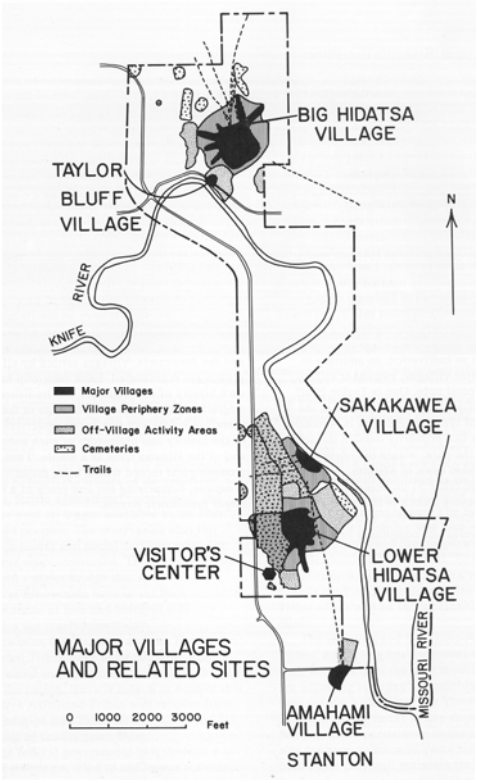

Figure 1. Location of the Sakakawea Village site at KNRI (from Ahler et al. 1991:84)

A second drawing of the site, made in 1911 by H. J. Spinden and George F. Will (Will 1924:324), indicated the presence of at least 46 earthlodge depressions. Sporadic archaeological investigations occurred in the mid-1900s (Bowers 1992; Lehmer et al. 1978; Strong 1940; Will and Hecker 1944; Wood 1980). Following the purchase of the site in 1976 as part of the Knife River Indian Villages National Historic Site, the National Park Service began systematic archaeological investigations of the site and other archaeological sites within the park, which continue to the present time, including the early application of magnetic survey techniques to archeological investigations (De Vore 2008,2010; Thiessen 1993; Volf 2002). During the 1976 magnetic survey of the Sakakawea Village site, 31 earthlodge depressions were noted by the investigators (Weymouth 1988:8). The surface manifestations of ten more lodges were obliterated in the cultivated field on the south side of the site. Six earthlodges were lost to bank erosion along the Knife River. Today, a major portion of the site is maintained by mowing the grass in order to present the visitors with an interpretative view of the archeological resources (Figure 2)

Figure 2. General view of the Sakakawea Village site facing south.

Figure 3. Collecting magnetic data with the dual fluxgate gradiometer.

During the 2012 geophysical investigations at KNRI, the magnetic survey at Sakakawea was conducted with a Bartington Instruments Grad601-2 dual fluxgate gradiometer (Figure 3). The site was divided into 20-meter by 20-meter grid units oriented on magnetic north. Thirty-seven complete and partial grid units were staked out with a robotic total station and mapped with a global positioning system unit and external antenna (Figure 4). The magnetic data were collected at eight samples per meter along one-meter traverses in a zigzag fashion. A total of 3,200 data points were collected for each complete grid unit. It took approximately seven minutes to survey a complete grid unit. The data were processed in the DW Consulting's ArchaeoSurveyor software package designed to process the geophysical data. The individual grid data were incorporated into a composite file and processed. The processing included a destriping function, interpolation, and a low pass filter. The data were then exported to an image and contouring program for the final display of the data (Figure 5). The collapsed walls of the earthlodges were identified by circular magnetic highs surrounding a strong dipole, which was identified as the central hearth of the earthlodge. Magnetic dipoles inside and outside the earthlodges appeared to represent cache or refuse pits. Other extremely strong dipoles appeared to represent historic or recent ferrous objects, including the location of the historic fence line along the southern portion of the project area.

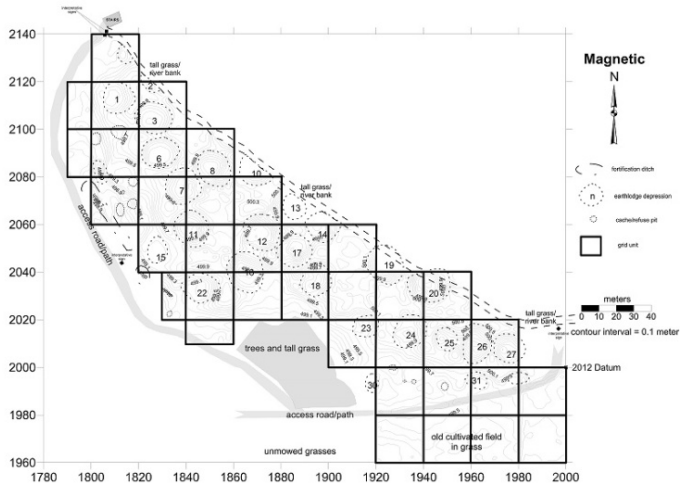

Figure 4. Site map for Sakakawea Village site.

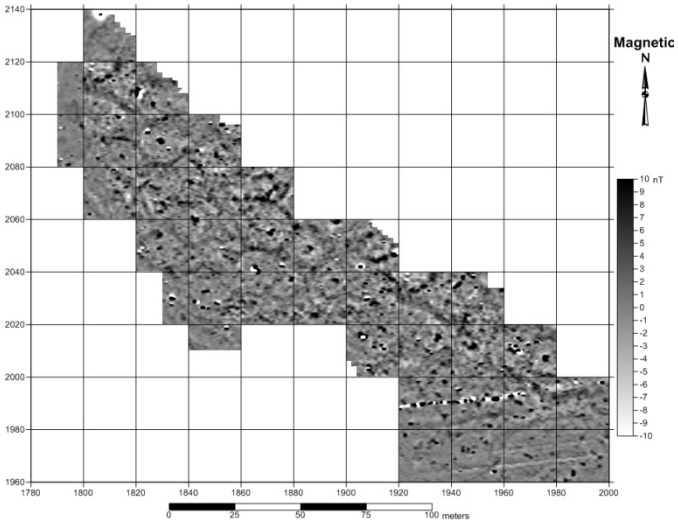

Figure 5. Image plot of the 2012 magnetic data.

Using Geoscan Research's Geoplot software package for processing geophysical data, the MWAC-UNL data were processed with the same methodology applied to the 2012 magnetic data for comparison of the Weymouth data and the 2012 MWAC magnetic data (Figure 6). The original 1976-1981 MWAC-UNL was collected at one sample per meter along one-meter traverses in a parallel direction. The data was first transformed from the MWAC-UNL text file to an XYZ spreadsheet using a script written in Math Lab. The data was then processed and an image map produced of the 1976-1981 magnetic data

from the Sakakawea Village site (Figure 7). The two data sets have a high correlation between them. The major differences result from the higher density of data collected per unit area in 2012.

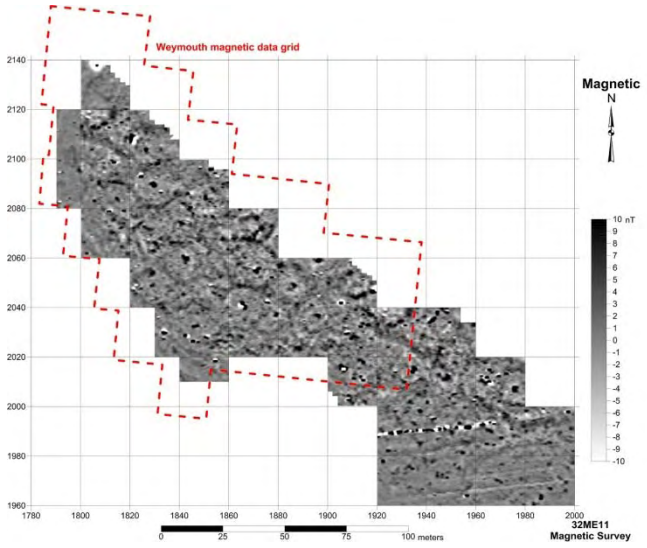

Figure 6. Location of the MWAC-UNL magnetic data in comparison with the 2012 geophysical project area.

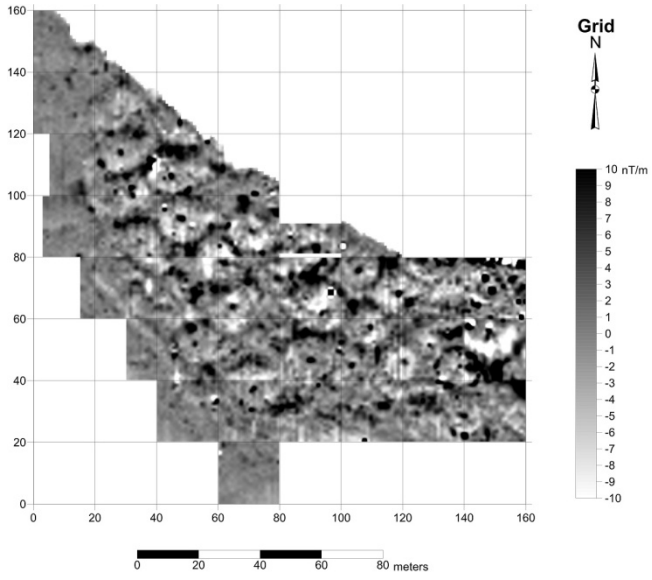

Figure 7. Image plot of the MWAC-UNL (1976-1981) magnetic data.

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Bodiam Castle, East Sussex. Geophysical and Topographic Survey of an Archaeological Landscape

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Since March 2010 a geophysical and topographic archaeological survey, combined with a new building survey, of Bodiam Castle and its environs has been conducted by staff, undergraduate and postgraduate students from the University of Southampton in the UK and North Western University in the USA. The project is being conducted to investigate the nature and extent of buried archaeological material at the site, and to provide the National Trust with a new plan of the archaeological features located during the survey.

Bodiam Castle is located on the south-facing slope of the north side of the River Rother, in the parish of Bodiam, East Sussex. The castle occupies a site on the edge of the Rother valley, with associated features located along a higher ridge to the north. The underlying geology comprises Ashdown beds of Cretaceous sandstone to the north, corresponding to the higher ground of the National Trust property, and alluvial deposits with peat corresponding to the Rother valley bottom and the southern portion of the National Trust property.

The castle is situated in an area of high archaeological potential at the junction of the High Weald and the floodplain of the Rother, with a wealth of archaeological material from the Palaeolithic through to Roman, medieval and post-medieval periods. While the main focus of the current project is concerned with the medieval and post-medieval aspects of the landscape around Bodiam castle, a number of other sites and monuments dating to various periods are reflected in the landscape and the results of the topographic and geophysical surveys that have been conducted to date.

Figure 1 Staff and students working in the vicinity of Bodiam Castle (top) using total stations on the topographic survey, (middle) conducting magnetometry and (bottom) undertaking ERT survey across the Rother valley.

Survey Methodology

The geology of the High Weald and the presence of masonry structures suggested that use of resistivity would be the most useful technique in recording the remains of sub-surface archaeological structures, particularly in terms of medieval features. A complete survey of the landscape to the north of the river Rother has been conducted using Geoscan Research RM15

resistance meters with 0.5m twin probe array configuration. Measurements were taken at 1m interval along traverses spaced 1m apart. Magnetometer survey (Fig. 1) was also conducted to provide comparative survey data across the site. This technique was chosen as a relatively efficient survey technique, especially useful for locating potential Iron Age and Romano-British features in the landscape. The presence of a possible Roman road surfaced in iron slag running to the west of the castle, and possible later prehistoric enclosures were of particular interest. Survey was conducted using Bartington Instruments Grad 601 fluxgate gradiometers, with measurements taken at 0.25m intervals along 0.5m traverses.

In addition Ground Penetrating Radar (GPR) was conducted over parts of the site, particularly the interiors of rooms associated with the extant remains of the castle, and over features located in the resistivity survey, including a possible mill building. Data was collected along traverses at 0.5m spacing using a Sensors and Software Noggin Plus with Smartcart and a 500Mhz antenna. An Electrical Resistivity Tomography (ERT) survey was also conducted across the Rother valley using Allied Associates Tigre equipment, to assess the nature and depth of deposits in the floodplain.

A new survey of the extant remains of the castle has also been conducted, mapping the structure in plan, and the main elevations of the monument, utilising red laser total stations with TheoLT software.

Preliminary Survey Results

Results of the topographic and geophysical surveys (Figs 2 - 4) in the immediate environs of the castle indicate a substantial quantity of archaeological material and features relating to the development of the estate. To the west of the castle the topography, resistivity and magnetometry all show the presence of a substantial bank and ditch feature, running as a so-called cascade to the north then cutting off the eastern part of the low ridge. A significant concentration of anomalies is visible in the resistivity results to the south east of the castle, suggesting the presence of stone-built structures, and two revetted channels, one running from west-east, the other from north-south. The presence of the pond to the east of the castle, and the fall in the terrain as one proceeds south, would suggest that the anomalies mark the presence of a possible mill and mill race associated with the ponds at Bodiam.

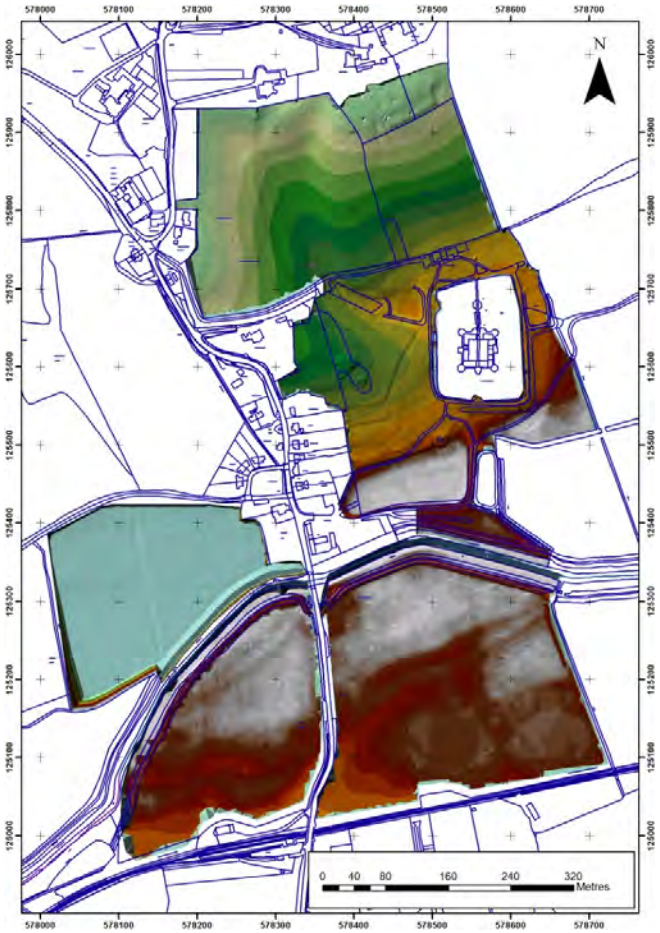

Figure 2. Results of the topographic survey of the landscape of Bodiam Castle.

Results of the magnetometry indicate a significant concentration of ferri-magnetic and burnt features to the west of the castle. Some of these suggest very distinctive kiln features, and in one instance a rectilinear structure associated with a kiln. Others are more suggestive of slag heaps of residue from firing and the remnants of other industrial activity.

The location of these features seem to respect the presence of the tenement boundaries immediately to the west, and this may indicate that the industrial workings post-date the village tenements. If so, these may relate to the phase of construction for the castle at Bodiam, for the preparation of materials such as lime. Alternatively they may relate to later development of the estate and castle by individuals such as Curzon. Other dipolar anomalies in the magnetometry, especially those located on the low ridge to the west of the castle, may be

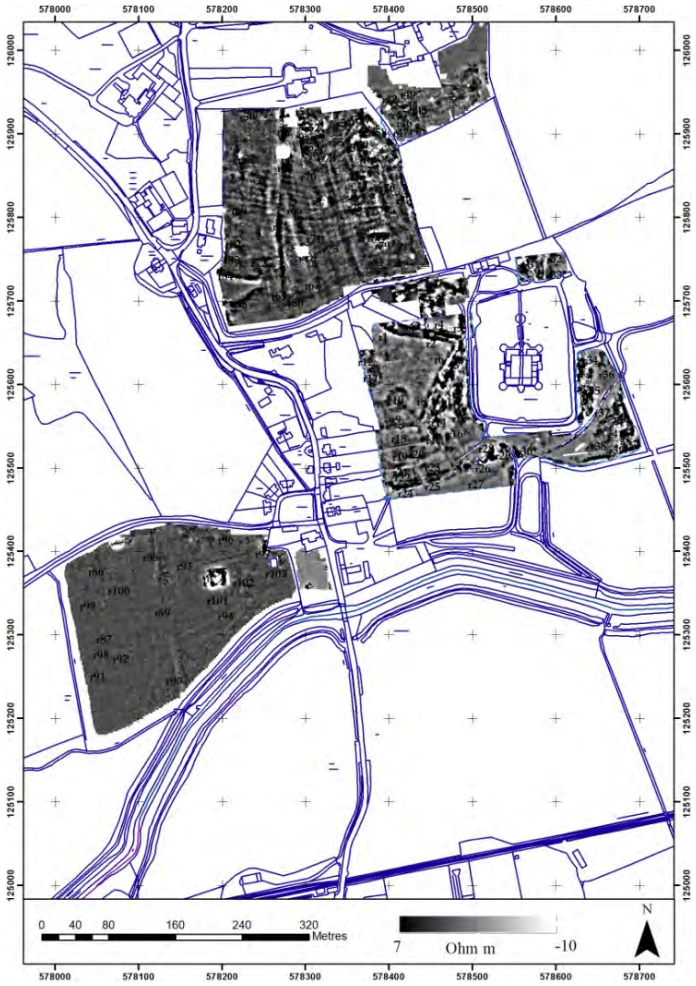

Figure 3. Results of the resistivity survey in the landscape at Bodiam Castle.

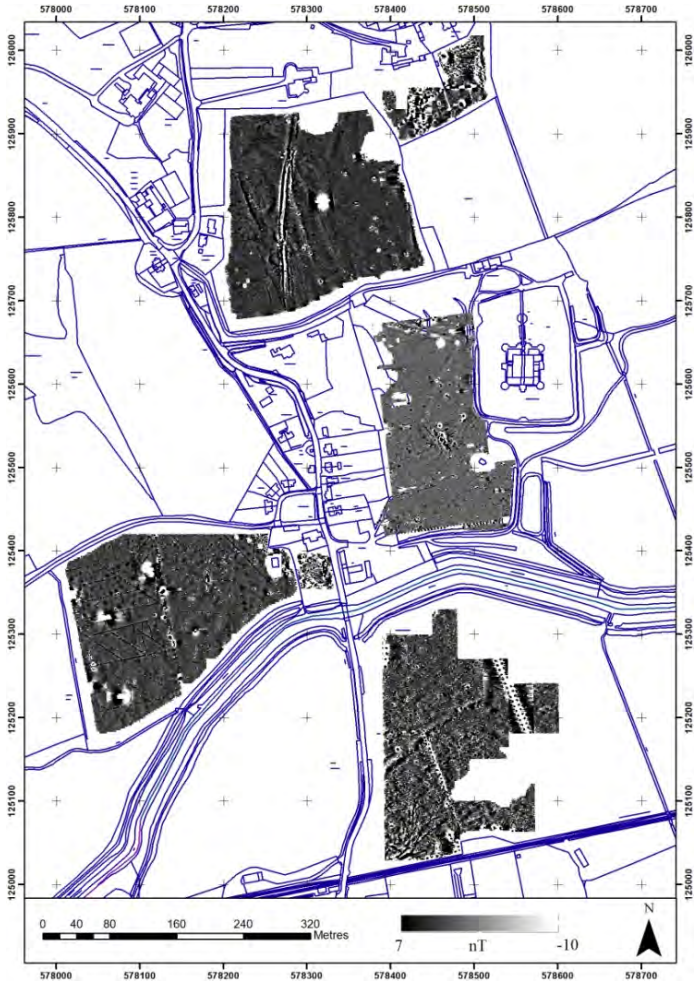

Figure 4. Results of the magnetometer survey in the landscape at Bodiam Castle.

associated with other kilns or firing of material, or alternatively dump deposits of iron ore. One possibility is that they relate to iron smelting from the Iron Age and Romano-British period, located on the valley sides above the settlement. Similar features are reported on the south side of the Rother and elsewhere in the Weald.

In terms of the building survey, the results show that some features on the plan are not represented by those drawn by Taverner Perry, commissioned by Cubitt, Baron Ashdowne, such as the doorway adjoining one of the large fireplaces blocked at an early period; but that plan does show an opening in the oven which has long been closed off.

However, the general layout and geometry of the castle plan as a whole respects that of the Ordnance Survey and other plans, with a change in the line of the causeway and the relative position of the walls and towers in places. A detailed analysis of the castle building from the extensive survey undertaken is in preparation for publication.

The area of Doke's Field to the north west of the castle did provide some new and very interesting features. A significant road, probably Roman in date, does cut through the field. A second and probably later road also deviates from this original line heading to the south-east. The former road seems to lie on an alignment which would carry it through to the bridge crossing the Rother, some 500m to the south. In addition to the road a number of terraces, pits and an enclosure are visible on the western side of the field, on the edge of the ridge located to the west of Doke's Field. Some of these anomalies may indicate Iron Age or Romano-British features, possibly associated with cemetery activity close to the line of the possible Roman road. The entire field is also covered by broad low resistance anomalies suggesting ploughed terraces. They appear to be later than the main road feature, and may

represent cultivation of Doke's Field in the medieval period.

Results of the topographic survey, resistivity, ERT and magnetometry to the north and south of the Rother indicate a number of features which may require further investigation. The previous courses of the Rother are clearly indicated in the results of the topographic survey and in the magnetometry and a number of large waterlogged features are also located along the southern edge of the floodplain. The three broad low-lying areas may represent the presence of medieval ponds, but their size (in the region of 110m across) suggests that they may be associated with a harbour area or other feature to the south of the Rother. The presence of possible kiln features, and linear anomalies in the magnetometry and suggest the presence of an extensive settlement of Romano-British date along the low sand terrace to the south of the river. The results of the 2012 survey show runoff of ferrous material from the terrace overlooking the valley, and a number of rectilinear features, and possible industrial working on the plain.

In the cricket field to the north of the Rother a number of discrete positive anomalies at first suggested pit or kiln features along the edge of the floodplain. However evidence from hand augering samples, four of which were conducted in 2012, indicated alluvial deposits to a depth of 1.5-2.0m, overlying protrusions of humic peaty material in the locations of these anomalies. Two linear features in the cricket field may suggest the presence of a leat or drainage feature running upstream of Bodiam Castle towards the mill ponds near the castle.

The survey work at Bodiam is part of an ongoing project looking at medieval sites in the south-east of England. Futher work is planned at Bodiam, with the focus of the project then shifting to other medieval sites in East Sussex and Kent, including Ightham and Knole.

Acknowledgements
Considerable advice and assistance was received from a number of sources in the completion of this survey. Permission for work in the immediate vicinity of the ruins was kindly granted by the National Trust. Our thanks go to George Bailey at the National Trust for commissioning the survey, to Caroline Thackray and Nathalie Cohen, and to staff at Bodiam for assistance during the organization of the survey. Warm thanks are also extended to the English Heritage inspector for East Sussex for permission to undertake the survey and for advice on the nature of the site, and to the county archaeologist Casper Johnson. In the field the hard and conscientious work of Kathryn Catlin is also gratefully acknowledged. Finally the survey work in the 2010-12 seasons could not have been completed without the hard work of the second, third year and postgraduate students from the Universities of Southampton and North Western.

Current research at Sant'Ivo alla Sapienza, Rome

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A pilot survey was conducted at Sant'Ivo alla Sapienza in December 2012 by the British School at Rome (BSR) and the Archaeological Prospection Service of Southampton (APSS). This survey is the initial phase of a larger project, which is aimed at investigating potential archaeological remains under Baroque churches in Rome, and is led by Prof. Andrew Hopkins.

As part of an expansion programme in the 15th century, the University of Rome La Sapienza transformed much of the land between Piazza Navona and the Pantheon. This resulted in the reconstruction and renovation of many medieval buildings, including Sant'Ivo alla Sapienza (Smyth-Pinney 2000: 315; Tuzi, 2005: 1; Wassermann, 1964: 501). Sant'Ivo alla Sapienza is famed as being an archetype of Roman High Baroque architecture (Scott, 1982: 294), and the design is a consequence of several phases of construction during the 16th and 17th centuries (Connors, 1996: 38). Unfortunately, documentary evidence for earlier structural remains is minimal, with only a few sources such as Bufalini's map dating to 1551 (Thelen, 1961: 289).

Figure 1: GPR survey data collection at Sant'Ivo alla Sapienza.

Ground-penetrating radar (GPR) survey has been successfully applied to a range of urban sites (Linford, 2004: 237; David et al, 2008: 28) and so was selected as the most appropriate technique for detected sub-surface remains in the courtyard and portico of Sant'Ivo alla Sapienza. For this survey a GSSI SIR-3000 was employed using a 400 MHz antenna mounted on a cart system with an odometer (Figure 1). Data was collected using zig-zag traverses with a separation of 0.25m.

An initial examination of the survey results as time-slices, suggested a high level of modern disturbance as many anomalies appeared to denote modern features, such as service pipes. This was confirmed when the geophysical data sets were overlaid with the topographic survey that indicated the location of drains and other services visible on the ground surface (Figure 2). A thorough examination of these times-slices suggested that a series of linear anomalies deviated from the alignment of the modern drainage system; and did not correspond to the position of services recorded in the topographical survey. In particular, two linear anomalies were identified as potentially representing archaeological features (labelled in Figure 2: A and B). However, this evidence was inconclusive and further investigation was required to formulate a full interpretation of these potential archaeological remains.

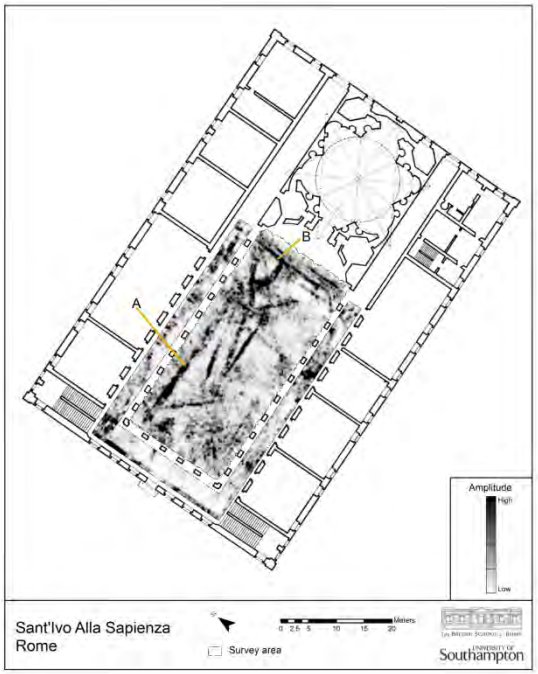

Figure 2: GPR survey results (depth approximation 15 17ns:79-90cm). Two linear anomalies (A and B) have been identified as potentially having an archaeological significance.

One advantage of GPR surveys is that data sets can be displayed either as time-slices, radar-grams or as iso-surface rendered images. Time-slices are an effective way to view data plots as horizontal plans; whereas radargrams can be useful for

examining features vertically, enabling a greater investigation of hyperbola signatures; and iso-surface rendered images can be a useful way to examine the form of features, as features appear as three-dimensional images. At Sant'Ivo alla Sapienza examining radargrams and iso-surface rendered images in conjunction with time-slices was crucial for the accurate recognition and interpretation of anomalies. The two linear features highlighted as A and B in Figure 2 are also labelled A and B in Figures 3 and 4.

Figure 3 labels the two features A and B and their associated hyperbola A1 and B1. These hyperbolas appear to have different characteristics in comparison to hyperbolas that denote modern features. The hyperbolas of features A1 and B1 have a similar broad form and begin deep in the stratigraphy (approximately 3ns or 16 cm); whereas features, identified as representing the drainage network, are generally found much higher in the stratigraphy (often starting at 0ns) and are characterised by narrow and discreet hyperbolas.

Displaying the same potential archaeological features, A and B (Figure 4), as volumetric image, provides an understanding of the shape and extent of these features using both a vertical and horizontal perspective. Figure 4 demonstrates that when viewed as an iso-surface, A and B, appear more substantial than the small, discreet signature of features identified as relating to the drainage network. A and B have a continuous presence throughout the time-slices indicating the possible presence of structures with a height of about 3m (depth approximation of 3-56ns: 16-296cm).

The portico at Sant'Ivo alla Sapienza is heavily disturbed by modern activity. As a consequence, initially, the accurate identification of potential archaeological remains presented some problems. Although a tentative interpretation could be applied, a more confident and accurate interpretation including distinguishing between modern and archaeological remains, was achieved by comparing the three different visualisations of data set. By interrogating the data in the form of time-slices, radargrams and iso-surface rendered

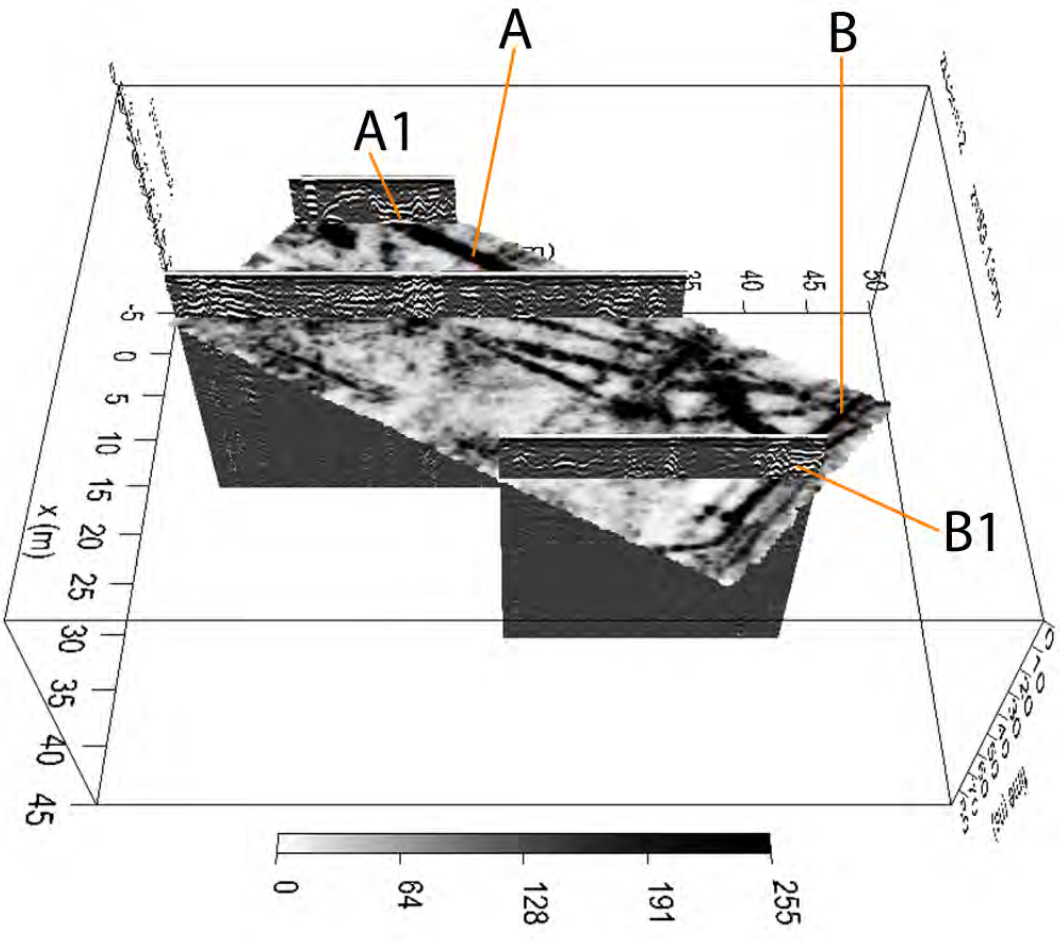

Figure 3: Visualisation showing unprocessed radargrams (traverses 20, 60 and 120) and a processed time-slice with a depth approximation of 16.82ns or 89.13cm. Features labelled 'A and B' their corresponding hyperbole marked 'A1 and B1' are suggested to indicate the presence of structural remains.

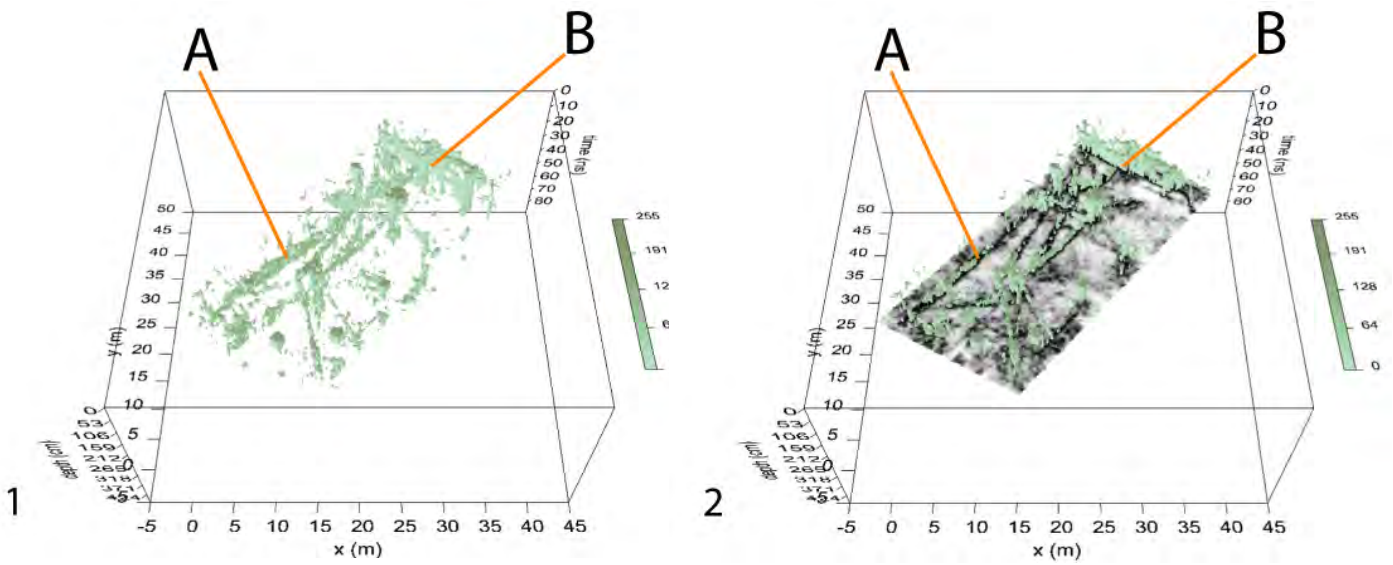

Figure 4: Volumetric visualisation the GPR survey results at Sant'Ivo alla sapienza: 1, Isosurface rendered image using amplitude values above 99.9% of maximum amplitudes; 2, Isosurface image combined with horizontal time-slice of an approximate depth of 10.7ns or 56.72cm.

images, it has been possible to distinguish the archaeological remains from the modern activity and therefore suggest a layout of structural remains predating the extant buildings at Sant'Ivo alla Sapienza.

The survey was completed at the request of Andrew Hopkins of the Università degli Studi dell'Aquila as part of on-going research of Baroque churches in Rome. This survey was only possible with the support of the Soprintendenza per i Beni Architettonici e per il Paesaggio per il Comune di Roma in particular the Superintendent Arch. Maria Costanza Pierdominici and Ing. Franco Formosa, The geophysical survey was conducted by APSS the BSR (Sophie Hay, Alice James and Stephen Kay). We would like to thank Prof Christopher Smith, Director of The British School at Rome, and Prof. Simon Keay, University of Southampton, for their support and constant encouragement.

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NSGG Day Meeting: Recent work in Archaeological Geophysics, Dec 2012

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The University of Bradford, England

Building on the success of recent years, the Near Surface Geophysics Group held its tenth conference; "Recent Work in Archaeological Geophysics" in December 2012 at The Geological Society's home at Burlington House, London. The conference played host to 122 delegates in total, with visitors from as far afield as Austria, Canada, Denmark, France, the Netherlands, Germany, Poland and Sweden.

Enabled by excellent organisation on the day, a tremendous amount and variety of information about recent and ongoing projects was shared and discussed. Although there was a full programme of 14 presentations, ample time was built into the day to allow attendees to view the accompanying poster display, which encapsulated the breadth of geophysical work being undertaken in archaeology; both as a stand-alone approach and as part of wider archaeological investigations. Commercial exhibitors including Allied Associates Geophysical Ltd, Bartington Instruments Ltd, DW Consulting, Geomatrix Ltd, Geoscan Research and Utsi Electronics, provided another dimension to the day all willingly adding their own knowledge and experience.

The presentations followed the format of previous conferences; a 15 minute presentation with a five minute question and answer session. Although diverse in aims location, scope and approach taken, they were linked together in each session by a distinct theme. Following a short welcome and introduction the day's first presentation session focused on work to evaluate emerging geophysical instruments and techniques for archaeology including the use of single multi-depth electromagnetic systems for prospection in comparison to multiple instrument surveys, use of multi-channel, free configuration systems to rapidly collect geophysical data to support advanced electrical resistivity imaging techniques, composite multiple frequency GPR radargrams to better investigate voids in an urban site and high resolution GPR survey data to not only locate but categorize distinct burial types.

Session two brought together new data generated from geophysical work conducted across large areas notably around the Stonehenge site in England and the Brú na Bóinne in Ireland; both are UNESCO World Heritage sites which have been the focus of archaeological investigations over hundreds of years. The presentations showed how both rapid data collection with towed cart/sledge based multi-instrument systems and targeted single hand held systems can be used in combination and to complement each other to confirm and refine previous investigations and interpretations and instigate new questions and research.

In the afternoon, consideration of current practices in archaeological prospection sparked lively debate. Research undertaken in Ireland analysed ground-truthed magnetometer data to identify in which areas (based on their underlying geology) the use of this technique is most successful and why. Interim findings from the DART project are beginning to define the impact that seasonal changes in ground conditions - particularly soil moisture content - have on data collected via various geophysical techniques and highlighting the complexity that must be understood when designing survey strategies. Once more, the question of how to manage the wealth of geophysical data now being generated was raised, whether now is the right time to implement a national (UK) mapping programme and if so, what pre-requisites: data standards, data sharing protocols, data access and protection of sites, etc. would be required.

The day was concluded by a series of varied presentations showing how geophysical techniques are being used today to further knowledge and understanding of settlements from Persian gardens in Iran, to a complete rethink of established understanding of late Iron Age and Roman period in Dorset, Southern England and the use of high resolution GPR data and 3D visualisation in a Medieval castle in Hungary and a Roman town in Portugal.

The conference was marked by its inclusivity, the consistent high standard of work presented and exciting developments which are taking archaeological geophysics beyond prospection and using it (challenging it?) to ask and answer complex and sophisticated archaeological questions. For those of us who are still taking our first steps in the field, it was a hugely enjoyable and instructive experience.

The meeting programme and abstracts booklet are available as pdf files from:
http://www.nsgg.org.uk/meetings/
Full versions of the presentations and posters will be published on the NSGG website as they become available:
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Alkali Station was a major trail facility used by travellers on the Oregon and California trails, the Pony Express, the transcontinental telegraph, and the frontier army. Co-sponsors for the workshop include the National Park Service's Midwest Archeological Center, the Lute Family, and the University of Nebraska's Cedar Point Biological Station.

This will be the twenty-second year of the workshop dedicated to the use of geophysical, aerial photography, and other remote sensing methods as they apply to the identification, evaluation, conservation, and protection of archaeological resources across this Nation. The workshop will present lectures on the theory of operation, methodology, processing, and interpretation with on-hands use of the equipment in the field. There is a registration charge of $475.00. Application forms are available on the Midwest Archeological Center's web page at http://www.cr.nps.gov/mwac/ .

For further information, please contact:
Steven L. DeVore, Archaeologist, National Park Service, Midwest Archaeological Center, Federal Building, Room 474, 100 Centennial Mall North, Lincoln, Nebraska 68508-3873: tel: (402) 437-5392, ext. 141; fax: (402) 437-5098;

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Archaeological Prospection – 20(1)

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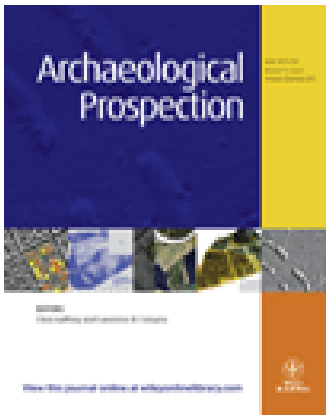
Conyers *et al* - An Upper Paleolithic Landscape Analysis of Coastal Portugal Using Ground-penetrating Radar

Teixidó *et al*. - The geo-archaeological context of the Motilla de la Vega site (Spain) based on electrical resistivity tomography



Bescoby - The Detection and Mapping of Saxon Sunken-Featured Buildings at Caistor St Edmund, Norfolk.

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