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Editorial

At a recent meeting in Cambridge to discuss Regional Research Frameworks a number of discussants indicated that archaeologists working in the commercial world share at least one common problem with UK aerial specialists – a lack of contact with universities. Attendees at the meeting came mainly from two sectors – county heritage organisations (who convened the meeting) and commercial contractors and specialists. I’d guess that the heritage people slightly outnumbered the commercials although that may have been because they have jobs that allow them to take time off (and be paid for it) without losing a day in a tight developer-pressured environment. There was only one full-time academic, Charly French. He worked in the region in the past, knows the local soils, and remains on call to local units as a geoarchaeological specialist although other research interests have taken him to different parts of the UK and abroad. He’s a useful bloke to have around and is in a position to encourage students.

There is a small number of contracting units in Britain that are tied to universities. Without checking a book, Cambridge, Birmingham and Glasgow come to mind – but most units are independent bodies without any academic link. Many have little wish to be academic and see their job as easing the way for developers who, after all, are the ones who are paying for the archaeological work. Speakers at the meeting suggested there was a need for collaboration with universities and that there may be the possibilities to suggest research themes arising from recent work and maybe fund or otherwise support their investigation. Similar comments were made during the AARG debate on Education where, in the UK but not in continental Europe, very few practitioners have university links and most of the rest have no research background or no time to pursue ideas.

On reflection we have comparable paradoxes. In the UK, regional research frameworks are being proposed by people with up-to-date local knowledge but who themselves do not undertake (much) research, while a few willing people in AARG have identified holes in teaching, and means to fill them, without most of them being in a position to do much more than talk or write about it. The cynic in me wonders whether these reports (regional frameworks, education, etc) are a product of current local and national UK government practice in which ‘advancement’ is measured by elaborate reports that discuss ideal progress while little actual progress occurs. This differs from the world I know in which an individual has an idea, may talk to a few people about it and then goes and tries it to see what happens. This was the way that research was done from Cambridge when I was a student (and still is as far as I can ascertain) with people following their own ideas and themes. And it raises one of the great problems with these research frameworks and, to go back a few years, with the calls for ‘inter-disciplinary projects’ that were common around the time of the first CBA aerial conference in 1974. It sounds good on paper (sic) but to make it work you need other specialists who want to be involved in ‘your’ project. This rarely happened in the 1970s because, other than a few notable cases where soil scientists were involved (Jones and Evans 1975; Cleere, Evans and Limbrey 1975; Limbrey and Evans 1978), most specialists from other disciplines had little interest in what archaeologists were suggesting. More recently, such research projects have been conceived and completed thanks largely to the recent increase in numbers of the necessary specialists (eco-this, geo-this, archaeo-that, etc) who

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have developed the relevant skills and approaches within the archaeological community. However, in Britain there remains a major proportion of archaeological ‘destructive’ work that is carried out in advance of development with virtually no research-guided intentions. A small number of individual sites or projects may be published outside the ‘grey’ (ie unpublished reports) literature (eg Abrams and Ingham 2008; Timby et al 2007) but the results of most of this work need to be searched for in local county Historic Environment Records.

Two recent books have made use of the past 15 years of commercial archaeology to synthesise British prehistory (Bradley 2007) or to examine specific components of past landscapes (Yates 2007), while the recently-published book on Northamptonshire landscapes (Deegan and Foard 2007 – see this issue, Books of Interest) shows what can be done using mainly aerial photo data. Bradley and Yates are both university based and were investigating how the recent flood of non-research based excavations had changed our concepts of the past. Deegan and Foard developed their NMP project within a county GIS and were thus able to link the AP data with far more sources of information, including some from development sites, than in other mapping projects to date. From my point of view, the main differences between these books is that Bradley and Yates rarely stray from facts confirmed by digging and dating whereas Deegan and Foard start from a basis of what is mostly undated mapped information, add the known facts, and extend their discussion of sites, systems and landscapes from there. The few reviews I’ve read of Bradley and Yates gave me the impression that the reviewers had been expecting a bit more from the authors by way of new ideas and change, but that academically the work is ‘sound’. OK, sound, safe and good for teaching for a few years – but doesn’t the discipline deserve a few ideas to be thrown around that challenge those people who like to be safely tucked up in their beds? Maybe this is why aerial survey and its results have never been fully welcomed by the archaeological establishment.

Sorry, that’s rattled on in my head for a month or so and still doesn’t come to an end although it may encourage a few of you to think about what we are doing, where we are going, and how we may be able to blend with other archaeological approaches. As I’ve said before – and this is relevant also beyond the UK – I think that the aerial world, especially those who promote what they call ‘aerial archaeology’, are creating specialists within a discipline that doesn’t really want us and with whom we cannot easily engage.

Computer disasters: ps
Almost as a follow up to his note in the March issue, Irwin Scollar sent me an email from which the following extracts were taken.

As I mentioned in our Skype conversation, lightning struck our house between 8 and 9 last Thursday with a very loud bang and flash, and all the lights went out. The house itself wasn’t damaged, perhaps because of our lightning rods, but the surge of voltage on the power line destroyed our deep freezer, causing an intermittent short circuit which repeatedly blew the main power switch fault current protector which jumped out again repeatedly. The refrigerator above the freezer seems to have survived.

Fortunately, an electrician came at about half-past 10 and until nearly midnight, he searched for damage. I had pulled all the plugs on the computers and the DSL line when the storm brewed up, so they were untouched…. I thought of my article in AARGnews on disaster, and this confirmed my view that when electrical storms are in the offing, or when one leaves home
for an extended period in an area where such things happen, all plugs from computers etc. should be pulled from the mains.

Irwin later added that the main problem is not a direct lightning strike on your house, but that strikes on the transmission network can send surges all over the place and it’s those that cause the damage. He has since discovered that, in Germany, it’s possible to buy and have fitted a relay that will cut power to a building when there is a threatening surge.

My next ‘use of English’ campaign
The substitution of photography when people mean photographs is not new but seems to be becoming more prolific, especially in UK government establishments. The latter even leading to the corruption of poor Cinzia (after they’d complained about her English) who, during a recent visit to Cambridge, told me that she’d been mapping military features from “… the World War Two photography.” I think I first met the corruption when I used to work for RCHME where a certain gent would propose, “Aaaah, let’s look at the photography” whenever a new batch of prints was delivered by the photographers. In a similar way to the impossibility of seeing ‘archaeology’ in a trench, it isn’t possible to look at photography. But archaeologists can be found in a trench – along with bits and pieces of junk – just as photographs can be found, and seen, in heaps, boxes and libraries. Even the Urban Dictionary (a great source of rude words: http://www.urbandictionary.com/) gets it right and has no definition of imagery (another horrid word) for which my Oxford English Dictionary includes the definition ‘images collectively’ although the word is often used to describe single images and, since the commonality of satellite images, is probably one cause of photographs becoming photography. Bleaugh.

Google Earth and similar web sites
Earlier this year an email exchange with Alison Deegan raised the question of how to refer to features identified on Google Earth and other similar sites that are likely be replaced by another picture at some future date. Some of the England cover – now aerial photos rather than satellite images – seems to be replaced frequently, sometimes less than a year after its inclusion, as was recently the case with some very informative photos in and around Bedfordshire that included, for example, one of the clearest photos of Cardington causewayed enclosure that I’ve seen. Now they’ve gone, replaced with some boring green photos.

An immediate way of referring to this rapidly-changing source would seem to be to make a screen capture of any relevant parts of a layer and file it where it can be found. A reference should perhaps include the name of the copyright holder and the date of photography, something that GE now display in some places (but not the copyright date as GE seem to change these to the current year). The date of accession, something usually recorded in references to web sites, will be saved as part of the file name.

That was what we wrote before Irwin Scollar added Google Earth-ability to AirPhoto (see p##) and now it can all be done in that.

This issue...
There are two key contributions in this issue regarding use of Google Earth for Archaeology. In chronological order of their occurrence (to me) was first the automatic geo-referencing of GE images in AirPhoto by Irwin Scollar and then the survey of a large area of Afghanistan by David Thomas and his colleagues. Both of these need greater coverage than AARGnews is
likely to provide and I’m grateful to both authors for agreeing to contribute here and in
particular to David Thomas for producing his paper at extremely-short notice. At lower
altitudes are contributions about the role of flying maps (Cowley and Macleod), Greeks and
spectacles in Hvar (Radcliffe), headsets in Romania (Palmer) and the theory and practice of
digging crop marks by Kenny Brophy. Two contributions follow from AARG working
groups: the aims, objectives and progress of the Archives WG (Standring et al) and Bill
Hanson’s piece on the Glasgow Centre for Aerial Archaeology that was held over from the
last issue and derived, in part, from our Education WG. Bill’s piece, we hope, will introduce
other papers on education from our European members in the next issue – although they don’t
know that yet.

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Information for contributors
AARGnews is published at six-monthly intervals. Copy for AARGnews 38 needs to be with
me by February 14. Editorial policy (for want of a better word) tends to be that if I am sent
interesting contributions they go in up to an issue limit of about 50 pages. Vague instructions
for contributors are in the AARG website.

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Chairman’s Piece

Dave Cowley

This is my last Chairman’s Piece and I will start by saying what a privilege it has been to occupy the AARG Chair for the last three years, to thank the many of you who have provided advice and support, and to wish my successor the best. Beyond that, I do not want to attempt a ‘State of the Nation’ address, but will stress the importance of medium and long-term strategy and planning if AARG is to continue expanding and maintain its relevance in the face of changing approaches to (aerial) archaeological prospection. As a research group, AARG provides an excellent network to further the exchange of ideas and collaborative work. In recognition of this, the committee has co-opted a Development Officer to progress this agenda on behalf of the membership. We are lucky enough to have an exceptionally well-qualified officer in the person of Chris Musson, who as a lynchpin in the C2000 European Landscapes project, and with a long background in Training Schools, has a vast experience to draw on. Another manifestation of this approach is the formation of an ‘Archives Working Group’ with the aim of encouraging the use of archival collections (see p. #). However, I would encourage all members to take this ‘development agenda’ to heart and look to opportunities where the experience represented by the AARG network may have a role in facilitating, otherwise supporting or starting up projects.

Our recent experience in working with the EAC demonstrates that AARG’s reputation as a serious organization, representing a vibrant and productive sector of the archaeological community across Europe and beyond, is widely recognized and respected. This is a strength that we can build on, enabling us to influence decision-making, to raise funding and to otherwise encourage the appropriate development of an aerial agenda. Enough preaching!

AARG/EAC Aerial Archaeology Working Party

In June Ioana Oltean delivered a draft of the report of the Education Working Group to me, and since then it has been circulated to the members of the WG and beyond for comment and additions. I hope to have completed the compilation of these submissions by the end of August. Following this the draft report will be posted on the AARG and EAC website for a period of consultation, probably up to the end of 2008.

Work on the Standards WG will begin in early 2009, and I will be grateful if any of you who have views on this get in touch or speak to me at the conference in September.

When I reported to the EAC Board in March I suggested that the EAC symposium in 2010 should be on Aerial Archaeology, and I am pleased to report that this met with their approval. Planning for this event, which will be hosted by Iceland, will begin in 2009, but I see it as a great opportunity to develop our good relationship with EAC, and as commented on above, reinforce AARG’s reputation as a serious organization.

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Student and Young Researchers Bursaries

The AARG student bursary fund has once more been supplemented by a very generous grant from the Association for Cultural Exchange (http://www.acestudytours.co.uk/). This has allowed us to support 18 students from across Europe. However, this is not a source of funding that we can rely on in future and the continuing support of students will require us to identify other funding streams, as this is, I believe, an important part of AARG’s work.

Aerial Survey in Scotland – some excitement

I have not used my Chair Pieces over the last few years to report on the RCAHMS aerial survey programme, but this year I cannot help myself. By way of background the vast majority of the known plough-leveled sites that have been recorded as cropmarks lie in the east and south of the Scotland, where the climate is drier, where the majority of arable ground is found and where the better drained soils occur. This summer has not been a great one by any standards, being characterized by very unsettled weather with one low-pressure system after another. This has seen most of the country, and in particular the east coast, suffering from extended periods of rain and dull over-cast skies. However, the exception has been the west coast, which has enjoyed a very dry summer. The west, and in particular the far southwest of the Scottish mainland, has produced cropmarked sites in the past as shown on the left-hand map on Figure 1, but rarely in the density seen in the east. In the west the dry years that produce a return are few and far between, while the distribution of arable ground and well-drained soils are very localized. The excitement of the summer of 2008 has been a marked extension of the distribution of plough-leveled monuments into the west. This is a region that is most often associated with stone-built monuments and these cropmarked sites open up an entirely new dimension to the archaeological record of the area.

Flights to Galloway (Figure 1, C) on the 10th and 13th of June indicated the potential, but because of poor weather, principally in Edinburgh where our survey aircraft is based, it was not until the 5th of August that we were able to explore the far west. Islay (Figure 1, A) produced a handful of sites, but returning to the east via the Mull of Kintyre (of Paul McCartney fame) the narrow strip of lowland ground produced a good return of sites (Figure 1, B). Subsequent flights on the 8th of August to Galloway also produced an unexpectedly high return. This year has been marked by unusual weather patterns where the overall poor summer has been offset by an exceptionally dry season in the west, providing a chance to undertake survey outside our usual ‘comfort zone’ in the east. This opportunity has produced significant enhancements of a known area of potential in Galloway, but has also opened up an entirely new region in Kintyre and to some degree Islay (where several sites had been recorded previously).

It is in the nature of the challenges that face aerial survey in Scotland, that as I write this we are being buffeted by some torrential rainfall that have seen soil moisture deficits fall to 0.00 across most of the country. The heavy rainfall will have flattened many crops, bad news for farmers as harvest approaches, and the weather has been too unsettled to fly. Thus the window that has opened on the west of Scotland this year may well have been slammed abruptly shut, perhaps not to reopen for another decade. Such is the often-fleeting nature of opportunity!
I will finish with a pretty picture, assuming our editor allows it. Figure 2 is an aerial photograph of site discovered from the air on 8th August 2008 in Galloway (Figure 1, C). It was previously completely unknown and its discovery really made my day. The roughly rectangular enclosure at the centre is probably Neolithic in date and in itself represents a significant enhancement of the record of this period in the southwest of Scotland. An avenue runs in from the left and what may be a barrow lies to the right, with a scatter of pits and what may be a part of a pit-circle below the rectangular enclosure. I do not usually do requests, but I would like to dedicate (!) this image to Kirsty Millican, who is in the final stages of completing her PhD on *Contextualising the cropmark record: the timber monuments of the Neolithic of Scotland*. It is a reminder both of the major contribution that aerial survey continues to make to archaeological site distributions and, reassuringly, that new discoveries will continue to feed our research and knowledge, even if it may be annoying when one is trying to finish a PhD.
Figure 2: This sub-rectangular pit-defined enclosure is probably Neolithic in date and may be part of a complex of structures including a pit-defined avenue and ring-ditch. © Crown Copyright: RCAHMS, DP044522
The AARG Archives Working Group

Robin Standring¹, Matt Abicht and Dave Cowley on behalf of the AARG committee

The idea for a dedicated archives group within AARG arose out of preparations for the session on the archival collections in NARA (USA) and TARA (UK) at the 2007 AARG conference in Copenhagen. The session demonstrated that there is a mass of under-utilised and inaccessible archival material (mostly from the 1940s), which should have major implications for future archaeological research. However, as speakers in the session identified, much of the material is inaccessible to a European audience. One of the principal aims of the session was to dispense practical advice on finding and using this material – indeed finding aids were given out to delegates.

This interest prompted a proposal to establish a network of AARG members who wish to rectify this problem. The idea for an Archives Working Group was supported by the membership and this short paper sets out a series of preliminary aims and objectives that would benefit the varied research interests of AARG members.

Aims and objectives:

- To document and publish detailed information and research on the catalogued and uncatalogued holdings (aerial photos, maps, mosaics, photomaps etc.) at NARA, TARA and other major archives
- To seek funding for work by resident or visiting researchers conducting initial assessments or targeted research at NARA, TARA and in other archives
- To determine the significance of the collections for archaeologists and all researching any form of landscape history, through the establishment of a network of researchers in different countries
- To operate on a non-commercial basis for the interests of AARG members and to support *bona fide* archaeological research
- To encourage and support archaeological research and publication as a means of guaranteeing the long term survival of these collections
- To work with heritage agencies and heritage professionals at all levels in order to improve their holdings of ‘hard to find’ material
- To produce ‘Best Practice’ advice on the uses, advantages and disadvantages of the different types of material and the means of accessing them

The Working Group is being convened by Robin Standring, with the support of Matt Abicht, and members who have an interest in this area and are willing to contribute to furthering its aims should contact Robin. Since Copenhagen in 2007, the Working Group has progressed on three fronts.

Firstly, the Working Group has organised a session on *Archives and Applications: Historic Imagery as a Resource for Europe’s Cultural Heritage* for the 2008 European Association of Archaeologists annual conference in Malta on 16-21 September (http://events.um.edu.mt/eaa2008/standring.pdf). This session will draw attention to the huge

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potential locked up in archives of historic aerial imagery for the exploration and management of European cultural heritage. The session will have two components. Firstly, reviews of the major archives, with an emphasis on accessibility and finding aids, focussing on TARA, NARA and the First World War archives in Belgium and Australia. For illustrative purposes there will be an emphasis on the material available for the Mediterranean, to reflect the location of the EAA conference. Secondly, a series of case studies will illustrate applications of this imagery from across a wide range of heritage issues, from prehistoric cultivation and settlement patterns, to the impact of vegetation change on the management of cultural heritage and the issues associated with urban expansion and town planning, including dealing with unexploded ordnance. The session is sponsored by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) in its centenary year, during which it has assumed responsibility for TARA.

Secondly, under the auspices of the Working Group, a volume is being prepared under the title of *From Archives to Applications*, with the primary aim of demonstrating the enormous potential locked up in archives of historic aerial imagery for the exploration and management of the cultural heritage. Edited by Dave Cowley, Robin Standring and Matt Abicht, the volume will have an international appeal across a broad-based audience, principally in the heritage sector, but also looking more widely at landscape history in aspects such as vegetation history and geomorphology. This major volume will be brought together in mid- to late-summer 2009, for publication during the winter of 2009/2010. Beyond this, finding aids will be published on the web as PDF files in the spirit of encouraging access to collections.

Thirdly, in cooperation with the AARG Development Officer, discussions have been initiated on the possibility of seeking Culture 2007 or other EU funding for a project with the exploitation of historical air photo imagery as a major focus of attention. Ideas are still at an early stage, but it is hoped that AARG can develop this agenda in partnership with heritage agencies and partners across Europe.

The session at EAA, the *Archives and Applications* volume and a potential Culture 2007 or other project are all part of a strategy that AARG is pursuing to promote the use of archival historic aerial photography, extending beyond archaeology to encompass the broad range of landscape history. AARG’s interest in aerial archives is long-standing, but has been rather sporadic and based around individual members and their interests. We feel that a more structured approach is appropriate, in part reflecting AARG’s development from a special interest group to an international forum that draws on the broad-based expertise of professionals worldwide. It is in recognition of the importance of aerial archives that the Working Group has been formed, with a remit to assist access to archives, to lobby when appropriate and to fulfil aspects of the roles which previously fell to the now defunct National Association of Aerial Photographic Libraries (NAPLIB²).

*The Archives Working Group of AARG gratefully acknowledges RCAHMS sponsorship of the *From Archives to Applications* session at EAA 2008.*

² NAPLIB was an independent organisation with the aim of promoting the use and preservation of aerial photography. When it was dissolved last year it donated a share of its assets to AARG, and these funds will be employed to further the aims of the Working Group.
The Centre for Aerial Archaeology,
Department of Archaeology, University of Glasgow

W. S. Hanson

In January 2008 the Faculty of Arts at the University of Glasgow formally agreed the constitution for the establishment of The Centre for Aerial Archaeology in the Department of Archaeology at Glasgow, under the directorship of Prof. Bill Hanson, with the general aim of providing a centre of excellence for teaching and research in aerial archaeology.

Why Glasgow?
The Department of Archaeology has the greatest concentration of aerial photographic specialists in any UK University, which sounds impressive until you realise that, with the departure of Ioana Oltean, this now represents only two (Bill Hanson and Kenny Brophy, who is Deputy Director of the Centre), though this is further augmented by Dave Cowley who is an honorary research fellow. The Department already runs a well-established taught Diploma/Masters degree in Aerial Photography and Geophysical Survey in Archaeology which is unique in Europe. It also has a strong and continuing track record of successful doctoral programmes on aerial photographic related topics, focusing particularly on the integration of aerial photographic data into wider academic syntheses (e.g. Sharpe 2004; Oltean 2004; Poller 2005; Jones 2006). Staff and post-doctoral researchers have also made substantial contributions to research utilising aerial data (e.g. Brophy and Cowley 2005; Hanson and Oltean 2003; Hanson and Sharpe 2001; Oltean and Hanson 2001 and 2007). Finally, the Department has a good record of attracting research grant awards in this area in recent years, including support for a British Academy post-doctoral Research Fellow, Ioana Oltean (who is now a lecturer at the University of Exeter).

Teaching
The Centre will be able to provide a stronger and more explicit focus for teaching at both postgraduate and undergraduate level. The taught Masters degree has recently been revised and updated, and is looking to recruit more Scottish-based students now that we have gained access to regular Postgraduate Students’ Allowance Scheme Awards from the Student Awards Agency for Scotland. These grants are provided to the University to support students undertaking more vocational courses. In addition, a new Honours module in Remote Sensing has been through its internal validation process and will be coming on stream in the new academic session which commences in September 2008, so that undergraduate students will also have the opportunity to benefit more from the expertise available in the Department.

Research at Glasgow
Bill Hanson is continuing his close collaboration with Ioana Oltean. They are writing up their survey work in Romania in the form of a monograph, producing an edited volume on the use of historical, non-archaeological photography for archaeology, while seeking further grant support to develop the archaeological application of recent satellite imagery of Dobrogea. Kenny Brophy is expanding his work on cursus monuments into a wider monograph on Neolithic linear monuments, is involved with the ongoing Departmental SERF landscape

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project and planning a book on ‘reflexive aerial archaeology’. Other doctoral research is also ongoing, with two further students now approaching completion of their projects. Aqdus, whose thesis has just been submitted, has been working in collaboration with the Department of Geographical and Earth Sciences and was supported by a grant in kind for the provision of multispectral and hyperspectral data from the National Environment Research Council. Kirsty Millican has benefited from one of the two Arts and Humanities Research Council collaborative awards held in the Department in association with the Royal Commission (RCAHMS) in Edinburgh which is linked to the analysis of their aerial photographic holdings. The Centre is hoping to obtain more such support and seeking to ensure that the next generation of archaeologists are more aware of the potential of aerial and satellite data and more confident in its application.

The wider context
Readers of AARGnews are already fully aware of the immense impact of aerial photographic discoveries on British and European archaeology, facilitating not only recognition of the density and complexity of millennia of settlement across the fertile lowlands, but greatly extending the distribution of many site types. It has been calculated for example, that something in excess of 50% of all archaeological sites in Britain have been discovered from the air, the bulk of the photographs being archived in national and local sites and monuments records. Literally millions of both oblique and vertical aerial photographs of the UK are housed in the three National Monuments Records for England, Scotland and Wales alone, and this resource continues to be expanded annually with programmes of reconnaissance flying. In addition, there are vast collections of historical vertical photographs of continental Europe and beyond taken for purposes other than archaeological reconnaissance. Much of it is currently housed in archives such as The Aerial Reconnaissance Archive (which has recently moved from the University of Keele to the RCAHMS in Edinburgh), the Imperial War Museum and the US National Archives and Records Administration. We are also moving into a new era of data acquisition linked to new technology, with the recent massive improvements in the resolution and accessibility of satellite imagery and the progress being made on the application of LIDAR and multi-spectral/hyperspectral imagery in archaeology. These developments provide new opportunities for the analysis of ancient landscapes.

The primary expertise in aerial archaeology in Britain, particularly with respect to data acquisition and mapping, resides for the most part in national or local government agencies, such as English Heritage and the Royal Commissions on the Ancient and Historical Monuments of Scotland and Wales, or in the commercial or freelance sector. Despite the best efforts of English Heritage’s excellent National Mapping Programme, the level of new discoveries, whether from primary reconnaissance or archival imagery, has far outstripped the capacity of the discipline to contextualise them, since even mapping is only the first stage of that process. Surprisingly few aerial archaeology specialists seem currently to be found in the British University sector. Only nine AARG members are British University based, representing only six institutions. Similarly, a survey of teaching provision for aerial archaeology in Britain, undertaken recently by Dr. Peter Halkon of Hull University, elicited responses from only 10 University Departments, suggesting relatively limited coverage of the subject in current courses. If the topic is not being researched and taught widely across the University sector, then aerial photographic interpretational skills will continue to be the domain of relatively few and the research potential of the vast resource of photographic data which has already been acquired will not be fully realised.
The future
The Centre thus seeks also to promote the publication of more examples of detailed historical analyses of landscape development based on aerial and satellite data. This involves developing better networking and collaboration between scholars and specialists, not only within aerial archaeology, but in satellite remote sensing and period-based academic archaeology. More published examples of how the analysis of such data can revolutionise our understanding of a particular area or period will provide encouragement to new scholars, particularly postgraduate researchers, to engage with this exciting material.

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Using Google Earth Imagery

Irwin Scollar¹ and Rog Palmer²

I think that the availability of GE is the most important development in aerial archaeology since the introduction of computational methods to deal with such pictures in my lab back in 1976, and there will be many more new uses to follow. (IS, email, 24 June 2008)

Google Earth Images

In many areas of the world, Google Earth (GE) provides free high resolution geo-referenced satellite or aerial imagery. It may be of interest to use these images when either large scale maps of the area are not available or if coloured image backgrounds for rectified air photos are needed. However, although Google images have geographic information available, they are not usually taken from true ortho-photos, although there are exceptions. In hilly regions, grid lines as drawn by Google Earth may not be straight even though such distortion due to height differences is not readily visible in the picture itself. Also, default settings introduce extraneous information which may not be of interest.

Using Google Earth with AirPhoto

Recent developments allow users to run Google Earth as an import within AirPhoto. There are several advantages to this. These include being able to search for a location in any of the national or international grids supported by AirPhoto as well as in the native GE degree and placename search. AirPhoto can also enlarge the image downloaded from GE by a factor of up to 6 times the screen resolution, something which is not available in GE, and in addition, it offers a method for correcting the error in the GE positioning scheme which may improve precision by an order of magnitude.

To obtain a good and clutter-free image it is necessary to set certain options in GE and switch off others (details are given in AirPhoto’s Help). Multiple images can be saved with different names, or a mosaic made from them with choice of scale and all will be calibrated in the chosen grid and opened automatically in AirPhoto when you exit the Google Earth window. A large choice of lossless output file formats is also available, whereas GE itself supports only lossy JPEG.

Resolution

The best GE imagery is derived from vertical aerial photographs, the next best from one of the high resolution satellites like Digital Globe's Quickbird. CNES Spot satellite imagery is less useful at around 10 meters on the ground per pixel and Landsat imagery at 30 meters per pixel, available everywhere when the others have not been selected by Google, is rarely useful.

Grid

Google's latitude and longitude coordinates are based on the WGS84 ellipsoid which is used in GPS positioning. Most national and many international map grids don't use this ellipsoid which was standardized long after the mapping systems were defined. Therefore, if you want to display a national or international grid, a datum transformation between WGS84 and the chosen grid is required, or errors of up to a kilometre in positioning may occur. In AirPhoto, this transformation is done automatically when the GE window is closed and the image opens and is calibrated automatically in the chosen grid ³. If required, AirPhoto can overwrite a grid on the image.

GE's images are aligned to the WGS84 based longitudes and latitudes (but see below) so for further work in AirPhoto or export to a GIS the images should be aligned to the chosen grid. This will not

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³ Only those grids which either have no zones (smaller countries) or whose zone values can be computed from the longitude and latitude at the centre of the Google Earth image can be calibrated automatically. Others, like the Japanese Old Tokyo and Polish S65, grids require user entry of the appropriate zone number.
affect the calibration and the result can now be used as if it were a map for further work in AirPhoto. Edge extraction options in AirPhoto or other programmes can be used, if desired, to convert the GE image to a black and white drawing which shows field boundaries and roads.

The example in figure 1 compares well with a high-resolution calibrated map and verifies the quality of the coordinate transformation. Usually, the correspondence between the chosen grid coordinates and the GE coordinates will be of the order of +/- 2 meters at GE’s so-called “eye altitude” of 1000 meters. Altitudes down to 100 meters may be used on the best GE imagery.

![Figure 1. An extract from GE’s vertical aerial photo cover in the UK after selecting the image, saving it and overdrawing with a grid (left). The 1:10560 extract (right) shows a comparable grid position.](image)

**Google Earth Accuracy**
Google images do not usually have photogrammetric precision. The error at the centre of an image found by entering a latitude/longitude value and the correct position of that point may differ by more than ten meters even in areas of high resolution. If you know the latitude and longitude of a trigonometric point which is visible in GE, you can confirm this by entering the lat/lon in the Google search box and examining where GE puts its centre point relative to the visible trigonometric point. Figure 2 shows an example from the Isle of Wight in the UK.

In the UK, you can obtain complete lists of latitudes and longitudes for more than 6000 trigonometric point pillars placed by the Ordnance Survey between 1936 and 1962 from:


Unfortunately, many of these points are no longer maintained and many are not visible in Google Earth. However, checks made on a random sample of 12 trig points in England and Wales showed most to be positioned by GE within about 2.0m which is adequate for any work at 1:10,000 scale.

Similar lists of trigonometric points are available in other countries, but usually require payment for accessing them. The UK data probably gives a good idea of general GE accuracy under favourable conditions. AirPhoto now offers a means of improving poor placement in images saved from GE.
Figure 2. An uncorrected GE image of St Catherine’s Hill, Isle of Wight showing a trig point and the actual position of its coordinates. Using this information, AirPhoto can improve the location of the whole image.

Using GE data

First thoughts
Widespread availability of GE means that anyone can now examine vertical cover. Using GE within AirPhoto means that anything identified can be saved and automatically geo-located. Previously screen captures could be matched to a map in the usual way by adding control points to both. That’s fine where there are control points, but the auto-locating of GE image crops now means the data can be used in areas where there are no, or insufficient, control points. Moorland, coastal zones, those huge central European fields, Armenia, Egypt, … spring to mind and examples have been tried from all those places. Systematic examination of these vertical images – be they air photos or high-resolution satellite images – may also increase awareness of the extents that need to be searched by airborne observers and our expectation of how much may be seen or not seen by them.

Warning
Google images use the Plate Carée projection which is a transverse cylindrical Mercator projection to a sphere and not to an ellipsoid. The non-conformal Plate Carée projection is inherently distorted unlike most large scale maps which use a conformal projection. For areas smaller than about 2 kilometres square, the error is usually less than a meter or two and can be neglected. It becomes significant for larger areas, so try to zoom the Google image to enclose the smallest possible area required. AirPhoto does not correct for distortion in a Google Earth image but it does transform the
calibration points at the corners and centre of the image to the ellipsoid of the UTM grid before applying the datum transformation to the chosen national or international grid.

**Using GE directly as images**

If an area is systematically searched with GE imported into AirPhoto any places of interest can be saved when they are found and will automatically be georeferenced. When saving, they can be named and filed by grid reference in a similar way to air photos. For greatest accuracy, these images will be of small extent – in cultivated land perhaps restricted to a modern field or two, which is probably close to the view at which we are examining the images. The following images have been saved with the Status Bar switched on (Figures 3-5). This enables the date of photography (or image capture) to be written near the lower right corner and so answers one of the questions raised by Alison Deegan about what ‘meta data’ should be retained for GE images (Figure 6. See also Editorial).

**Using GE images as background maps**

This use extends what some of us have been doing with verticals for many years, but now has been made easier because of the automatic geo-location of the ‘background map’ from GE. Figure 7 shows how a mosaic can be built up on such a background by overwriting it with transformed oblique photos. This trial uses RP’s photographs of the Etton area in Cambridgeshire but it may have more useful application in, for example, Hungary where most of the 8288 colour slides (Stoertz 1996, 5) taken during our first training week in 1996 were ‘difficult’ to locate. A glance at GE recently showed there to be good-resolution cover of the areas we overflew.

Edge extraction algorithms can be used to make a more map-like background, but these, at present, are somewhat messy and experiment is needed to obtain a cleaner ‘map’.

**Note**

Microsoft’s Virtual Earth, which sometimes offers better images than GE especially in densely populated areas, requires payment of an expensive license fee to use their full image database. It is not supported in AirPhoto because there is currently no way to pass on the costs which are normally paid by Web site providers who use Microsoft’s data.

**Acknowledgement**

Thanks to Cinzia Bacilieri for providing coordinates of one of the coastal sites (Figure 4) in an area she was currently mapping.

**Reference**

Figure 3. Palaeochannel with deliberately-located enclosure system, SK9444. Top: The original image as saved from GE-AirPhoto. Bottom: After aligning to grid, adding a 100m grid and enhancing at AirPhoto’s default setting.
Figure 4. Fish traps at Easington Bay, Northumberland (NU1435). Geo-referenced image with grid added and suitable to be imported into CAD or GIS.

Figure 5. Defended hilltop near Solak, Armenia with recent or current overbuilding indicating the efficiency of their monument protection regulations. South is to top.
Figure 6. Extract from Figure 4 showing the status bar date of photography as Jul 14 2006. Image cropped from 2x enlargement (AirPhoto’s default setting).

Figure 7. An area of about 3 x 2 km with the village of Etton (TF1406) near the upper centre. Two transformed oblique photographs have been overwritten on to this background. Note that the misplacement on the east side of the lower oblique is because control surrounded the field with the two enclosures. In this example the Status Bar was switched off to leave a background that is clear of everything but the providers’ logos.
The Archaeological Sites of Afghanistan in Google Earth

David C. Thomas,¹ Fiona J. Kidd, Suzanna Nikolovski and Claudia Zipfel

The current state of archaeological knowledge in Afghanistan

Warwick Ball’s archaeological gazetteer lists nearly 1300 archaeological sites or groups of sites in Afghanistan dating to the Timurid period (1500 CE) or earlier. Exploration has, however, been very uneven, both spatially and across the major chronological periods (Ball 1982: 21). Although an updated edition of the gazetteer is about to be published, little fieldwork has been possible since the Soviet invasion in 1979 and large parts of the country remain inaccessible to Western archaeologists due to the on-going insurgency and banditry, and the indiscriminately scattered landmines. Many of the safer regions are topographically difficult to reach and survey. Consequently, archaeologists need to find alternative sources of data – aerial photographs and satellite images are the most obvious options.

The Archaeological Sites of Afghanistan in Google Earth (ASAGE) project²

From 1957-60, the Soviets and Americans participated in a project to map the whole of Afghanistan using aerial photographs, but these are now difficult, if not virtually impossible, to obtain, as are the resultant maps. Satellite images have, to a certain extent, superseded aerial photographs, partly because they cover larger areas and are less restricted by local security concerns. The detail visible in such images is impressive – modified Quickbird images of parts of Syria having a nominal ground resolution of 0.6 m, although in reality 2.4 m to 4 m resolution are the norm for Quickbird and Ikonos MS images respectively (Beck 2006).

As numerous other archaeologists have noted, older images, such as the declassified CORONA spy satellite series taken from 1959 to 1972, are an equally useful record of altered landscapes – urban and agricultural expansion have encroached significantly upon many archaeological sites in recent years (Goossens et al. 2006: 748; Parcak 2007: 77; inter alia). The comparison of successive satellite images is also enabling archaeologists to investigate and monitor the looting of sites in Iraq and Afghanistan (Stone 2008; Thomas and Gascoigne 2006).

High resolution satellite images are still relatively expensive and require geo-referencing and rectification. The launch of the ‘virtual globe’ Google Earth™ in 2005, however, has made medium and high resolution satellite images of parts of the world much more accessible to non-GIS specialists. The primary advantages of Google Earth are its negligible cost and user-friendly software.³ The major drawback is the currently limited availability of high-resolution images (Figure 1).

Archaeologists such as Anthony Beck and Jason Ur were quick to identify the potential of Google Earth (Beck 2006; Ur 2006), but few have gone beyond using its images to illuminate their lectures; members of the general public, rather than academics, have led the way in exploring archaeological sites and curious anomalies through Google Earth bulletin boards.⁴ To date, hardly any archaeological research using Google Earth has been published, partly because most archaeologists are able to conduct fieldwork, rather than being solely restricted to desk-based studies.

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² The ASAGE project is funded by a generous grant (to Dr Alison Gascoigne, University of Southampton) from the Cary Robertson Fund, Trinity College, Cambridge. David Thomas is the recipient of a La Trobe University Postgraduate Scholarship; he is in the final year of his PhD research into The ebb and flow of empires in twelfth-thirteenth century Afghanistan and neighbouring lands. Images courtesy of image to Google Earth™ mapping service.
³ Although Google Earth is free, we opted to subscribe to Google Earth Pro which costs $400 a year. Google Earth Pro does not provide higher resolution images – its chief benefits are the ability to save images at higher resolutions and access to enhanced tools capabilities, such as measuring the area of polygons and uploading data.
⁴ Handwerk 2006; see, for example, Mirmillo’s posts on the Mongol Empire: http://bbs.keyhole.com/ubb/showthreaded.php/Cat/0/Number/758258/page/0 [accessed 20/08/2008].
Google Earth coverage of Afghanistan

High-resolution Google Earth images presently cover only seven per cent of Afghanistan but this equates to a daunting 46,000 km². By creating coloured polygons around the high resolution areas and then importing the coordinates of the archaeological sites listed in Ball’s gazetteer,⁵ we identified that two hundred and fifty (19%) of the known archaeological sites in Afghanistan fall within high resolution Google Earth images. Two hundred and seventeen of these sites (87%) lack even rudimentary plans. For the purposes of our initial study, we focussed on the forty-five medieval sites which fall within high resolution areas. Only eight (18%) of these have plans.

The ASAGE project has, therefore, decided to concentrate on three potential avenues for research:

- the plans and descriptions of known sites can be checked and, where appropriate, enhanced
- detailed sketch plans of unplanned known sites can be generated
- high resolution images of unexplored areas can be analysed to locate possible unknown sites

Methodology

These potential avenues for research necessitate different approaches. The major site of Bust / Lashkari Bazar is an example of the planned sites we have studied. This site, which stretches for over eight kilometres along the east bank of the Helmand river, was the tenth to twelfth century Ghaznavid dynasty’s winter capital. It was surveyed and excavated by a French expedition over half a century ago (Schlumberger 1978). A decade after its publication, their work was re-assessed by the art historian Terry Allen (1988; 1989; 1990), following a brief visit to the site. No fieldwork has been possible since then.

⁵ The digital version of the data in Ball’s gazetteer was collated by Rebecca Beardmore, as part of the ArchAtlas project. We are grateful to Dr Cameron Petrie, University of Cambridge, for making it available to us.
By zooming in to a 100 m scale in Google Earth, many of the standing remains at the site are clearly visible. At this scale, the image on screen covers ca 400 x 250 m; if you zoom in closer, the images start to pixelate. Forty Google Earth 100 m scale images of the site, saved at high resolution (2400 x 1535 dpi) in Google Earth Pro, were ‘stitched’ together using ArcSoft Panorama Maker to generate a montage of the southern half of the site. Where the images overlap sufficiently, stitching errors are rare and can be corrected manually within Panorama Maker. Print-outs of the stitched images were marked up and digitised in Adobe Illustrator by Thomas and Zipfel (a professional cartographer, as well as an archaeologist), before being amalgamated into a modified plan of the site.

Most of the other previously known planned and unplanned archaeological sites we studied fall within one Google Earth image at 100 m scale and so did not require stitching. The Ghaznavid fortress of Qal‘a-i Hauz, the only previously known archaeological site in the Registan desert to the east of Bust / Lashkari Bazar, is an example of these unplanned sites.

For the largely unsurveyed areas of the Registan and Ghur, strips of high resolution Google Earth images were selected. By selecting strips which incorporate a range of environmental zones, we hoped to increase the likelihood of locating a wide variety of types and periods of archaeological sites. Each high resolution image or Study Area, roughly 17 km square (275 km² in area), was divided into strips 0.79 km wide and scanned by eye from north to south. This strip width is the most pragmatic – it fills the computer screen when you zoom in to a 200 m scale and balances speed of coverage with detailed visibility. On average, it took a total of ten hours to scan each Study Area.

Each potential site spotted was marked using Google Earth’s Placemark tool and the resultant data exported as a .kml file which can be imported into a spreadsheet such as Excel. After the five Study Areas in the Registan (Figure 2) were scanned, each of the 1830 Placemarks or potential sites was revisited and catalogued. Fourteen general site types were defined (Table 1) and locational information (Table 2) recorded, to facilitate the identification of typological and spatial patterning. An attempt was also made to assess each site’s rough date, based on its type, state of preservation and proximity to modern features (Table 3).8

All the sites were catalogued by Thomas, with the data on those categorized as ‘sites’ cross-checked by Kidd, in an attempt to minimise errors, reduce subjectivity and maximise standardization. The cataloguing process resulted in 451 (25%) of the Placemarks being designated as potential archaeological sites (Table 4). This significant reduction was largely due to the omission of the majority of isolated structures, corrals, ephemeral outlines and lines of underground water channels (karez), which were deemed to be of too uncertain function or date to qualify as potential archaeological sites.

Brief case studies, exemplifying the different avenues of research outlined above, will now be presented.

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6 We have only recently become aware of the AirPhoto software which offers a more accurate and less labour-intensive solution to the problem of large sites, and georeferencing in general. See Scollar and Palmer in this issue of AARGnews for further details.

7 We have yet to complete our study of the Ghur images.

8 Following Waechter et al. 2006, we have defined 1960 as the arbitrary division between archaeological sites and ‘modern’ sites. This relatively recent cut-off point is contrary to Ball who argued that if post-Timurid remains were included “… virtually every modern town and even many villages would qualify as a “site”” (Ball 1982: 14). While this reasoning is valid for his gazetteer, and for the country as a whole, it is less appropriate for the remote areas we have been studying (note also that a lack of systematic fieldwork, rather than different chronological criteria, largely explains why so few archaeological sites are known in these areas). We would also argue that, where practical, the later date is preferable since the relatively recent cultural heritage of Afghanistan is worthy of recognition, preservation and protection, just as it is elsewhere in the world.
Exploring known sites – Bust / Lashkari Bazar

A poster about our research on Bust / Lashkari Bazar was presented at the Sixth World Archaeological Congress, held in Dublin, earlier this year. The poster is available on-line, so this aspect of our research need only be summarised here. Detailed analysis of the Google Earth images has enabled us to add considerable intra- and extra-mural detail to the original site plan. An array of ‘résidences’, courtyard buildings (caravanserais?), mausoleums, walled enclosures (gardens?), canals and other less identifiable structures are visible in the Google Earth images, particularly within the lower walled town at the foot of the citadel, and to the north of the ancient canal. The fortifications of the citadel and lower walled town are also clearly visible in the Google Earth images. The remnants of a major earlier wall, which is sketched on the original plan, are evident to the west of the lower walled town, as is the fortress and famous Ghurid arch within the citadel.

Exploring unplanned known sites – Qal‘a-i Hauz

Qal‘a-i Hauz, ‘the fortress of the reservoir’, (Figure 3) is a spectacular site in the desert 75 km south-east of Bust. It is the only archaeological site in the Registan desert listed in Ball’s gazetteer, yet no plan of the fortress exists and the only descriptions of the site are meagre (Balsan 1972a: 169-173; 1972b: 156). The site consists of a fort, with a larger, less prominent, rectangular enclosure to the south and two enigmatic small U-shaped structures in the dunes to the north-east and east.

The fortress is trapezoidal in plan, with standing walls and circular corner towers which cast long shadows in the Google Earth image. The walls measure 46.0 x 41.5 m (ext.) and are orientated west-south-west to east-north-east; they enclose an area of 1,170 m². Sand obscures most of the

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Fig. 3: site SA1_094, Qal’a-i Hauz, Ghaznavid fortress and reservoir. 100m scale with south to top.

(presumed) internal structures, although several rectangular rooms or wall lines are visible along the interior of the west wall. Additional rectangular structures have been added (possibly at a later date) to the exterior of the south and west walls of the fort, abutting the southern towers.

Balsan (1972a: 172) hypothesizes that the rectangular enclosure to the south of the fortress is the eponymous reservoir. It has much lower extant walls, possibly indicating its largely subterranean characteristics. The enclosure measures 107.5 x 67.5 m (ext.) and is orientated north-east to south-west. Double wall lines are clearly visible in most places, with a possible entrance, 3.5 m wide, in the middle of the north-east wall. The centre of the structure is largely flat, suggesting a lack of internal dividing walls, other than possibly along the west wall. Enigmatic small features are visible in the southern and eastern corners. The latter is circular, 4.5 m in diameter. The large open space within the walls measures 5,850 m² (the whole structure is 7,325 m² in size).

Previously unknown sites
Table 5 summarises the numbers of previously unknown sites catalogued, by type and Study Area. The hundreds of sites we have identified in the Registan desert should not come as a surprise. Survey work in the 1960s and 1970s in the nearby deserts of Seistan (Fischer et al. 1974-76), the anecdotal reports from nineteenth century travellers in the region and the results of fieldwork in other semi-arid regions of the Near East show that deserts have been utilised by nomads with the appropriate knowledge and skills for millennia, as Cribb (2004) has argued convincingly. What is perhaps surprising is how visible the remnants of these activities are in the Google Earth images – in places even herds of goats are discernible.

Individual double-room, rectilinear dwellings and sub-circular corrals are clearly distinguishable in many of the abandoned hamlets (Figure 4). The dwellings tend to be orientated north-west to south-east, with entrances (where identifiable) favouring the eastern side of buildings, away from the prevailing wind. In numerous cases, the dwellings cluster around an elongated structure which we
Fig. 4: hamlet site SA3.499, including a central public building with what may be a mihrab, the prayer niche of a mosque. 100m scale with south to top.

initially interpreted as a communal reservoir or possibly a majlis (a meeting place / guest house for visitors), until we noticed a niche in the west wall of several such structures, which presumably indicates the mihrab of a mosque.

Two U-shaped structures close to Qal’a-i Hauz provide examples of some of the more enigmatic visible structures (Figure 5). These structures have irregular stretches of walls, some with niches / towers, and are usually open at one end. They range in size from less than 10 m to over 50 m long. These sites may be corrals, reservoirs, shelters for caravans crossing the desert or some form of hunting trap into which animals are driven. Two linear raised features (probably dams), measuring 58 m and 41 m, are also visible to the south / east, indicating significant attempts to harvest and manage the water that periodically becomes available in the desert – unsurprisingly, similar water installations form the majority of the sites found towards the south, deep into the desert.

Limitations
Although still in its infancy, the ASAGE study has significantly advanced our knowledge of important medieval sites across Afghanistan and identified numerous possible sites in the Registan desert, which were previously unknown. This form of ‘remote research’, however, does have limitations. The most obvious of these is the fact that it has not been possible to ground-truth the newly discovered ‘sites’. Foreign archaeologists are unlikely to be able to return to this part of Afghanistan for the foreseeable future, but this does not preclude the possibility that the National Afghan Institute of Archaeology (NAIA) may undertake some work in the region, should resources become available and the security situation improve. If such an opportunity arises, the results of the ASAGE project’s research will provide an invaluable data resource, both for the study of these sites and the development of a cultural heritage management plan.
The lack of ground-truthing means that many ASAGE site identifications remain tentative, particularly with regard to site type and date. This inhibits the temporal and spatial analysis which can be undertaken using GIS, although it should be remembered that the date(s) of many of the known archaeological sites are often themselves uncertain and periodically revised. One approach to this problem which we are investigating is the comparison of older satellite images such as the CORONA series with Google Earth satellite images – this should at least help us to identify, and thus filter out, the larger modern (post-1960s) sites.

While the general accuracy of Google Earth’s measuring tools has been demonstrated, the problem of georectifying satellite images remains, particularly in mountains regions such as Ghur. The detailed sketch plans we are generating using Google Earth images are not a substitute for proper on-site surveying, but they are better than nothing, and no worse than some of the schematic sketch plans other survey projects publish after fieldwork.

**Conclusions**

Warwick Ball (1982: 22) commented over a quarter of a century ago: “It may be argued that future guidelines for archaeological research in Afghanistan are now largely academic, as at the time of writing, field-work has ground to a halt. This should not mean, however, that all research should consequently be shelved… Much too can be achieved by re-examining and correlating past investigations, without the need for field-work. With the hindsight provided by this, more fresh avenues for research should open up than would otherwise have been possible…”

The ASAGE project is attempting to take up this challenge. Such studies are, of course, no substitute for fieldwork; the different approaches and the data they gather are complementary. If nothing else, this is reason enough to use a combination of fieldwork and the new technology available to
archaeologists to attempt to fill in some of the ‘blank’ patches on the archaeological map of Afghanistan.

References

Table 1: site types

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<th>Description</th>
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<td>cemetery</td>
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<td>16</td>
<td>ephemeral</td>
</tr>
<tr>
<td>17</td>
<td>merged</td>
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</table>
1 mud flat mud flat in desert (takyr / sebkha); tends to be lighter coloured than surrounding landscape - silty, light grey-brown

2 stony desert stony desert (dasht), distinct from more sandy areas like (1) and (4)

3 wadi dry water course, or edge thereof; varies from very shallow to clearly incised

4 plain sandy / stony, generally flat plain with some expanses of dunes; in true desert, ranges in colour from yellowy buff to reddy brown, although this is partly a factor of the satellite image and when it was taken

5 elevated hill top, ridge or other elevated location

6 dunes swathe of red, mobile dunes

Table 2: site locations

<table>
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<tr>
<th>Study Area</th>
<th>Area (km²)</th>
<th>Placemarks</th>
<th>Sites</th>
<th>Site density</th>
<th>Location</th>
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<td>0.35</td>
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<td>107</td>
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<td>0.19</td>
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Table 3: site dates

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<td>29</td>
<td>74</td>
<td>90</td>
<td>132</td>
<td>451</td>
</tr>
</tbody>
</table>

Table 4: summary of Study Area data for the Registan, from north to south.

Table 5: number of sites by type and Study Area, from north to south, where site type >25.
Towards more efficient aerial survey: notes on flying maps
Dave C Cowley1 and Kevin H J Macleod2

Introduction
This brief paper presents recent experience in creating maps to inform aerial reconnaissance during the annual summer ‘cropmark’ programme of the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS). Some of the issues that prompted us to undertake this development work will be aired, before presenting our basic map set-up and some of the advantages that have been felt since we started working with our updated flight maps.

RCAHMS flight maps – previous practice
Since the inception of RCAHMS aerial survey in the 1970s maps have been used to inform patterns of reconnaissance, to locate sites that have been photographed, to aid future cataloguing, and to build a cumulative record of what is known as a point of reference for future survey. The Ordnance Survey 1:50,000 scale map proved ideal for these purposes, with a reasonable level of mapped detail – roads, villages, woodland and water courses – clearly visible against basic contour information, balanced against an area of 40 km x 40 km that works for navigation and does not necessitate changing maps too often. The maps were marked up by the navigator with site locations as they were photographed, using a different colour pencil for each successive year and incremental numbering for the sites within individual sorties. This provided the basis for compiling a primary log of sites recorded immediately after the flight while memory was still fresh (without reference to the photographs, which with traditional film might not be available until months after the flight), and also the cumulative record of where sites had been photographed.

However, by 2000 various weaknesses in this system had become apparent, the more so for the involvement of new staff who had not participated in the earlier evolution of the survey. As the number of cropmarked sites had grown it had become more difficult to maintain the maps in a coherent and useable form, especially in areas with dense numbers of sites that might be photographed and re-photographed over the years, either in their entirety or piecemeal as crop patterns allowed. The theory of a neat, clearly labelled map (e.g. Brown 1995, 78-80) is laudable, but the reality had become very different (Figure 1). Sites were marked on the flying maps as a freehand dot or circle and, since the 1:50,000 maps did not have field boundaries on them, it was impossible to make judgments in the air as to whether known sites where producing new detail. As a result, by the end of the 1990s the flying maps were barely being maintained and the direction of reconnaissance and photography was heavily dependent on the memory of the survey team to inform what might be worth photographing.

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RCAHMS flight maps – developing previous practice
From about 2000 four factors combined to raise the issue of how to maintain the effectiveness of the summer reconnaissance programme.
- Firstly, additional staff became involved in the direction of reconnaissance and they did not have the vast memory of sites that the long-established staff could draw on; we needed some other way to maintain the continuity of the survey from year to year, irrespective of changes in personnel and their knowledge and experience.
- Secondly, analysis and reflection on our survey methodology and its products has raised issues over its continuing effectiveness (e.g. Cowley 2002; 2005; Cowley and Gilmour 2005; Cowley and Dickson 2007). The key issues are: firstly how to recognise new material/information in areas of dense cropmarking; and secondly managing repeat photography (see Figure 2). Both are crucial to delivering value for money.
- Thirdly, and more recently, there has been a growing awareness of an unsatisfactory division between the programme of reconnaissance and the subsequent mapping of that material.
- Fourthly, digital data has become widely available and together with developments in GIS, CAD and other software packages, this has made the compilation of maps very much easier.
Figure 2: This Iron Age fort in southeast Scotland has been repeatedly photographed, with excellent registration of features contrasting with the very poor. In this case a fundamental problem in making a decision on whether or not to re-photograph has been the dislocation of the flying from mapping and the analysis of ‘information return’. That is: - the flying programme has not been based on a structured understanding of what has already been recorded. Sites are re-photographed ‘because they are there’ or ‘just in case’ rather than because additional information can be gathered from the photography. This is partly a product of uncertainty over what has been recorded previously, both in extent and detail, because the airborne surveyor is relying on memory and only a dot on the map by way of depiction. © Crown Copyright: RCAHMS.

Figure 3 (following page): Two examples of RCAHMS flight maps. The upper map shows an area where there has been no systematic mapping of cropmarked sites, so most sites are shown as a single dot against a map that includes the field boundaries. This is crucial to be certain that a site is known or a new discovery. The lower map illustrates an area that has been mapped and the simplified linework is presented against a pale-coloured semi-transparent polygon background to help punch-out the mapping without obscuring map detail. In both cases, the labelling of modern settlements and features is a significant aid to navigation. © Crown Copyright and/or database right. All rights reserved. Licence No. 100020548 2008.
RCAHMS – creating flying maps
In addressing all these issues, the creation of up-to-date flying maps has been a central building block to maintaining and developing efficient use of aerial reconnaissance resource. The specification, which developed out of a rather drawn-out thought process, was for: maps that included more detail than the 1:50,000 maps, principally field boundaries; and maps that showed the detail of the aerial transcription programme, even if in a generalized manner, or a clearly visible dot to mark the accurate location of the site. This has been achieved by creating bespoke maps from a suite of datasets in the RCAHMS GIS. The 1:25,000 Ordnance Survey colour raster maps have been used, as, unlike the 1:50,000, as it depicts the field boundaries crucial for quickly locating and checking sites during survey. However, in order to extract the composite flight maps (basemap plus NMRS points of previously recorded sites plus 1:2,500 transcriptions of archaeology and geo-referenced aerial photographs) at the highest image resolution, a single 1:10,000 mapsheet is exported from ArcGIS at the highest output settings possible, and the mapsheets are tiled in Photoshop, and areas of coverage assembled. These are very large files, but when scaled down to approximately 1:40,000, and printed on A0 or roll paper, they maintain a very good level of detail, and are easily folded for use in the aircraft. The addition of place names and other key features in the landscape in bold print is an aid to navigation.

While it would be ideal to export or print the whole map directly from the GIS at present the output resolution is not high enough to produce a useable product. Newer versions of the software may improve this, and we may be able to bypass Photoshop in the future. This process would seem to be a logical step towards some form of GPS-connected screen and moving map in the plane, but in our view the aircraft is cramped and crowded enough without adding the clutter of cables, laptops, connections and power supply.

We now have a suite of maps for use in the aircraft during survey, and these can be easily updated as required with new discoveries. The digital files, which are the source files for the printed maps, are also an insurance against losing a valuable master paper map.

RCAHMS aerial survey – current practice
These maps have proved highly effective. The distribution of known sites is clearly visible at a broad landscape level, allowing reconnaissance to be directed to exploring gaps in knowledge, while rapidly assessing the requirement for repeat photography at a site scale. Where there is mapping, the detail of this assessment can extend to a consideration of whether or not a feature has been recorded crossing from one field to another, for example. In our experience this has not generated debate (which takes time) over whether or not to photograph, and this is certainly due to some basic principles that we take into the air. Firstly, flying time is expensive so, rather than endlessly orbiting until a decision is made, we record doubtful sites and sort out whether or not to keep the photographs back on the ground. We also operate a presumption against repeat photography. However, this is applied more rigorously in the intensively flown honey-pots, where we know sites are more likely to have been photographed in multiple years. In other areas where we know that sites may only have been photographed in single years, repeat recording is more routine. This presumption is offset to some degree at present because we want to collect colour photographs of known sites, the majority of which have previously been recorded only in black and white. Inevitably, we also make exceptions where the site showing in a spectacular manner. So in flying over an area, decisions about whether or not to go over to view a smudgy cropmark in a distant field can be made quickly – we find this has allowed us to cover very much more ground, emphasizing the discovery of previously unrecorded sites both in the honey-pots and beyond.
In these respects the maps complement the growing knowledge of the survey team. This has been immeasurably strengthened by the integration of the aerial mapping project manager (KHJM) into the reconnaissance, enabling us to draw into the survey process the experience of using the aerial photographs for mapping – something that we are lucky enough to be able to manage in a small organization. The regular summer (cropmark) survey team thus comprises both authors, between them bringing complementary knowledge of the existing photographs, the archaeology and the mapping. However, and just as importantly, the flying maps allow different pairings to undertake reconnaissance without compromising efficiency, as happened earlier this summer when one of the authors was thrown off a horse! In the longer term the maintenance of these maps is a solid basis to maintain the continuity of the survey in the event of new staff joining the programme, compensating for their relatively low knowledge base (e.g. Grady 2000, 17).

The production of target maps for architectural and other predetermined subjects is also benefiting from these developments. Requests for photography are compiled in our GIS, from which maps for individual sorties can be produced, and printed out as necessary.

Conclusion
While this paper had dwelt on practice in Scotland, there may be aspects that are applicable elsewhere. Certainly, the requirement to assess the effectiveness of survey is incumbent on all. Entrenched practice is an ever-present danger and can be seen, for example, in a view reported from many flyers (e.g. Grady 2000, 23) that the importance of maps diminishes as experience increases. This is of course true to a degree, but an individual’s memory is not infallible and the practice of undertaking expensive reconnaissance without reference to the up to date maps that will support an informed survey cannot be best practice. This is especially true of national survey programmes such as ours in Scotland. With developments in digital mapping and data handling through GIS, for example, the creation and maintenance of such maps is not the problem it would have been a decade ago, and in our view, is well worth the investment in time and resources to make reconnaissance time count.

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Cowley, D.C. and Gilmour, S.M. 2005 Some observations on the nature of aerial survey, in K. Brophy and D.C. Cowley (eds) From the Air: understanding aerial archaeology, Tempus, Stroud, 50-63.
Not Roman Centuriation but Greek Chora (land division): discovered from the air - ‘rectified’ by subsequent ground survey!

Francesca Radcliffe

In June this year - during a brief visit to the island of Hvar, in central Dalmatia - I had the opportunity to fly over the Stari Grad plain (Photo 1). It was a short but eventful flight. It was in John Bradford’s Ancient Landscapes that I first learned of the antiquity of Hvar. He described the Roman land division in Dalmatia, the remains around Salona, Split and Trogir in the chapter “Roman Centuriation: a planned landscape”. In the same chapter, his study of war-time vertical air photographs of Hvar had revealed the remains of an ancient grid of roads and boundaries in the large fertile plain to the east of the town of Stari Grad - the area between the town itself and Jelsa to the E (Fig 1).

In Ancient Landscapes, Plate 47 is a detail from a vertical aerial photograph showing an example of the land division in Stari Grad plain. In the caption, Bradford gives the measurement of the squares which form the regular pattern of this “planned landscape”; each “square equal to 5x5 actus (580 feet)” which, he points out, was “not only interesting but also unusual”. The town of Stari Grad, founded by the Greeks who named it Pharia, became Roman Pharia. The island has a long history: it was settled in prehistory, was colonised by the Parians in the early 4th century BC and became a Roman possession in 219 BC.

Bradford’s last paragraph on what he believed were the remains of Roman centuriation in Hvar says: “The need, now, is for fieldwork, on the ground, to follow-up this discovery. The status of this system and its Roman owners poses a good historical problem.” Bradford himself never had the opportunity to carry out this survey.

Local archaeologists and historians knew and recognised that there was a system of land division in the Stari Grad plain but they too believed it to be of Roman origin; many Roman (and to a lesser extent Greek) finds were uncovered over the years, and the Roman foot is very close to the (Greek) foot of Pharia. Bradford was probably also unaware of the Greek system of land division, and so everybody assumed that it was the Romans who had laid down the grid of roads and boundaries.

It was only when the ground survey he advocated and excavations took place that it was discovered that the foundations of the dry stone boundary walls, dividing the plots, date from

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1 francesca.radcliffe@btinternet.com
2 J. Bradford, Ancient Landscapes, 1957, 183-93
3 Op cit plate 47, p 192
4 Op cit, 191
5 Among classical historians who mention the island of Hvar are Strabo, Diodorus Siculus, Appian, Polybius and Ptolemy.
6 Op cit 193
7 Branko Kirigin, pers. com.
8 It was an international team of archaeologists who carried out extensive surveys including: “Hvar – Archaeology of a Mediterranean Landscape (from 1982)” and “Adriatic Islands Project (from 1993)” with Branko Kirigin the driving force behind these projects and excavations.
To know more these are excellent websites: http://www.iaa.bham.ac.uk/bufau/research/aip/aip.htm#hvar.
http://www.iaa.bham.ac.uk/research/vince/index.htm
Greek time, some 2400 years ago. The Romans merely took over the existing land division and re-used it. In medieval times, these fields were still in use and maintained, hence their survival. In July 2008 the Stari Grad plain was added to UNESCO World Heritage sites, because among other attributes it “is an outstanding example of a type of landscape which illustrates a significant stage in human history … an outstanding example of a traditional human settlement… especially when it has become vulnerable under the impact of irreversible change”.

But the chora, or Greek land division, is only one of the many outstanding features in the island of Hvar. Dotted around its magnificent landscape are many monuments: prehistoric barrows and Illyrian fortresses, (Photo 2), Roman villas, medieval monasteries, early Christian churches and a Venetian fortress in the town of Hvar to name but a few. Many more sites will be discovered when a planned aerial survey of its archaeology is carried out in February 2009 by Branko Kirigin.

As I mentioned at the beginning, this was a very short flight. I had to cut it short for two reasons: firstly, the weather was deteriorating fast, ominous leaden clouds loomed closer and closer & the pilot had to go back to Split airport. Secondly, as I opened the window to allow me to take the photos, my spectacles immediately flew away. I had forgotten that without a head-set this was likely to happen & did not take basic precautions … like glueing them to my ears!

So I felt rather handicapped, looking at an out-of-focus landscape, no chance of checking with the map (which had also disappeared). My photography was miraculously saved by long sight and by having taped the lens to infinity on my 35mm camera. With the digital camera things were a bit trickier, a lesson not to be quickly forgotten! I was lucky! I found my specs at the end of the flight, there they were on the back seat, grinning at me!

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10 Branko Kirigin, pers. com.
Photo 1. View of Stari Grad plain from the west, towards Jelsa. Hvar airfield, the pink long field, centre left, is the air strip from where we took off & landed. It looks abandoned and I suspect it was realised that building a proper airfield would destroy the archaeology and the ancient chora.
F Radcliffe 2008 ©

Fig 1. Map of Dalmatia, after Bradford. Drawing of the Dalmatian islands. The shaded area between Stari Grad & Jelsa is the Chora, the ‘territory’ where the Greek land division and the later Roman centuriation have survived for two millennia.

Photo 2. This is Hvar’s largest prehistoric Illyrian fortress at Gračišće, on the south side of the town of Vrbanj, surrounded by, and enclosing woods of maritime pines. The fortress is oval in shape & surrounded by a stone rampart. No excavations have been carried out so its date is still uncertain. According to Branko Kirigin – all this information comes from his Guide (note 8) – this fort, sited in a strategic position on the border between the Stari Grad and the Jelsa Plain, was most likely built to control the area and protect the local population.
F Radcliffe 2008 ©
Mostiștea River Project, Romania, 2008

Rog Palmer

Irina Oberländer-Târnoveanu (Institute for Cultural Memory (CIMEC), Bucharest) invited me to work again on their project regarding the archaeological repertory of the Mostiștea River in 2008 and I spent two weeks there from May 20. The proposal was that I’d work on the ground with Carmen Bem on earlier photographs and any that were taken during my visit. We managed to achieve quite a lot and to make three flights into our area. What follows are more my comments on flying in Romania than on results, and on the way we showed the location of photographs using Google Earth.

Flying was done from Clinceni airfield (on the SW side of Bucharest) in a Cessna 172. Carmen was in the front seat charge of navigation and photography while I plus one other was in the back. Carmen and I were on the left side so both of us could photograph from the open window. Because the Mostiștea area is quite small, a lot of the navigation was done by knowing where things were rather than using maps or the extracts from GE that we’d printed out. We were fairly GPS-heavy as I had my old Garmin to provide tracks plus a Di-GPS plugged into a Nikon to provide coordinates for each photograph. Carmen was trying out a new palm computer that included GPS. Not all of these worked all the time but it did mean that we had a record for each flight.

One curious thing for me, was that immediately after takeoff the pilot (then Carmen) took off their headsets. We talked about this later as I was used to wearing them throughout a flight and saw them as essential kit to talk easily with the pilot as well as keeping engine noise down. A flight in the UK needs to keep in contact with the ground and I’ve found the headsets and ‘cosy’ cockpit environment usually leads to a chatty flight (usefully pointing out things on the ground, talking about what I’m trying to do, the occasional joke, plus any relevant navigation directions) and my view was that a lot of useful archaeologist-pilot contact would be lost without their use. However, in an area with few other aircraft where there is no need to keep in touch with the ground between takeoff and landing I can see that headsets may be considered an uncomfortable encumbrance. This seems a general trend in Romania as Chris Musson later flew there with Nico and observed the same thing and Ioana Oltean told me that she doesn’t use them because they are uncomfortable and, being Romanian, she doesn’t mind shouting at the pilot or Bill Hanson in the back seat. All three have attended past training schools in which we made considerable effort to ensure that all four people in most aircraft had headsets. Perhaps there is a difference between learning from a pilot in training courses and real life, or perhaps we have never taught anything about ‘proper’ communications between observer and pilot in normal flying conditions. Or doesn’t it matter?

Anyway, back to the Mostiștea Valley…. Back on the ground, even with all the GPS data, we still needed to pinpoint the location of each photograph. We soon realized that this was easier using GE than with outdated 1:25000 maps and that from GE we could read off the latitude and longitude of each photograph. A step further from this was to use pins in GE to mark each photo, with the pins being identified by the frame numbers. This was a fairly rapid way

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of locating each photograph using either two monitors or a split screen with photos in one and GE in the other. If the following steps can be made, it also avoids completely the need to copy and write coordinate values and lessens chances of mistakes occurring.

I think, but have not followed through, that is should then be possible to collate the resulting kmz files for each pin into a longer sequence that will allow a list to be made (initially of frame numbers and locations) and that it ought to be then possible to import that list, or each individual kmz file, into the database that CIMEC are compiling. I didn’t have the time (or knowledge) to take this further than a thought and hope that some progress has been made, if only to avoid typing (and mistyping) coordinates. From what Irwin Scollar learned and told me during his work with GE, this has probably already been done (for which see Thomas et al this issue) as there is a vast GE user group and many email exchange lists that cover aspect of its potential.

Results were good and we photographed a number of known sites, fields in which sites were known but nothing was visible and some new features. At a number of sites we photographed both the sites and their context as the relationship to the river (although now much changed by damming) is an important part of understanding the sites. Closer to the Danube, which is just south of our area, were many palaeochannels (some with adjacent sites) and on one return flight we flew along the south/west edge of the Mostiștea terrace which seemed to offer good potential for later investigation.

Further flights have been made since my time in Romania but it will require another visit (please) to see what is being done with the results and how aerial survey has added to what was already known in the area.
Digging cropmarks: 
the Forteviot cropmark complex, Perthshire, Scotland

Kenneth Brophy

The nature of cropmarks – what they are and, more importantly, what they may represent – has been discussed in the pages of AARGnews before. One of the key issues for me in dealing with cropmarks is to see beyond the indicator to what is indicated. In other words, treat cropmark sites like the archaeological sites they are, interpret cropmarks as archaeological features, and view transcriptions as plans. In the past decade or so, I have been fortunate enough to be able to do this through excavation. This allows the cropmark to be physically transformed into a sub-surface feature. Sometimes, this has been a dramatic process, such as Gordon Barclay’s excavation of the Littleour late Neolithic ritual enclosure in Perthshire in 1995 (Barclay & Maxwell 1998). Here, the rectangular trench that was opened in the area revealed a mirror image of the cropmark, but played out in the medium of soils rather than cereal crops. Digging cropmarks may be an oxymoron, but it seems to me that excavation is a rather effective tool in persuading our archaeological colleagues to see beyond cropmarks to what lies beneath.

1. Map showing the main SERF study area in relation to the city of Perth

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Strathearn and Environs and Royal Forteviot Project (SERF)
The SERF Project is a long-term study centred on Forteviot and Dunning parishes just to the SW of Perth, Scotland, UK (Illus 1). The Project was instigated by the Department of Archaeology, University of Glasgow, and pilot stages funded by Historic Scotland and the British Academy. The tiny village of Forteviot was a major ceremonial centre in the Neolithic, and a Pictish Royal centre millennia later. SERF seeks to explore the early prehistoric origins of the Pictish royal centre at Forteviot and document the area’s subsequent evolution. Forteviot occupies a special place in the history of Scotland, being located at the geographical and historical heart of Scotland. The death of King Kenneth mac Alpin, one of the first kings of a united Scotland, was recorded at the ‘palace’ of Forteviot in AD 858 and at this time it is clear that this site was the most important royal centre in a fledgling Scottish nation. Forteviot is also the location of one of the largest and most extensive concentrations of prehistoric ritual monuments identified by aerial photography in mainland Scotland.

A range of researchers has been drawn under the umbrella of SERF, bringing with them individual projects that aim to fulfil the research objectives of the project that include looking for evidence of Early Medieval Forteviot, interpreting the wider environs including excavating a series of hillforts, survey work on potential Early Christian buildings, and documentary and environmental analysis. Built into the project design are a number of cropmark-related issues that I would like to develop in this short paper. Firstly, the process of treating cropmarks as archaeological sites; secondly, integrating cropmarks of natural features; and finally, the ongoing plough-damage of a nationally-important monument.

Digging cropmarks
One of the key elements of the Project is the cropmark complex just to the south of Forteviot village. The Neolithic monuments were first recorded as cropmarks by J K St Joseph in the 1970s. He identified the palisaded enclosure and a variety of possible henge monuments, timber circles and other prehistoric enclosures (St Joseph 1976; 1978). Subsequent RCAHMS aerial photography added detail to the complex, but also revealed traces of long graves and square barrows, characteristic of Pictish and a early Medieval cemetery in an adjacent field (Brown in Alcock & Alcock 1992). Coupled with the historical significance of this place, it seems clear that Forteviot was a major centre both in prehistory and then again some 3500 years later.

The avenue of the palisaded enclosure was the main target of our excavations in 2007 (see Illus 5). The features that looked very much like avenue postholes on aerial photographs turned out to be just that; postholes (Illus 2) that would have held massive oak timbers in the Neolithic (perhaps 8m in height) defining a narrow avenue of about 4m width. This avenue would have opened out into an enclosure with a

2. From cropmark ‘pit’ to excavated posthole: section through a posthole on the western side of the palisaded enclosure avenue
diameter of around 265m, also defined by large timbers. A number of shallow scooped pit features dotted around the avenue were investigated, but these were not visible as cropmarks.

The later element of the cropmark complex, the early medieval cemetery, was also investigated in summer 2007 (Illus 3). The area focused on included a pair of conjoined square barrows and several long graves. Again, on opening the trench, the visible features mapped well with our expectations based on the available cropmark evidence. A few additional features not recorded as cropmarks were found however, also noted, including four-post settings around the central grave pits of both square barrows.

3. Aerial photograph showing the cropmarks representing the Pictish cemetery (Crown Copyright RCAHMS)

The process of revealing on the ground what has already been hinted at on the photographic print is a hermeneutical one. There are a series of expectations and assumptions – not always
helpful – based on the crop formations. There are also discoveries that do not tie up with these tidy expectations, but in hindsight can often be seen in the original photographs. Our experiences so far at Forteviot have embodied elements of predictability and surprise, our trenches reflecting versions of the cropmarks. Revealing the features that caused the cropmarks allows us to see beyond cropmarks.

**Cropmarks of natural features**

Amidst the anthropomorphic features encountered as part of the Neolithic enclosure, several tree throw pits were also found and excavated. These distinctive crescent-shaped features are formed when trees fall (or are pulled) over (Illus 4). In hindsight, some of these were found to show as cropmarks and indeed one of the cropmark tree throws was initially identified as a posthole on the avenue; this is an especially important discovery as the tree stood where we would have expected to find a timber post marking the northern end of the entrance avenue. The positioning of this tree, potentially forming part of the avenue, does not prove that it was contemporary with the avenue, but does throw up the intriguing possibility that a living tree may have been retained in this location and incorporated into the monument. The mapping, and excavation, of such natural features will be an ongoing element of the project.

As well as allowing us to undertake this ‘archaeology of natural places’, the cropmark evidence is also central in helping us understand what we are excavating and informing our understanding of the layers and sub-surface features within our trenches. A major issue we encountered in the Neolithic element of the project was a band of silt spread across the central part of our trench, a layer which obscured the postholes of the eastern side of the avenue. This was not because it covered them, but because the postholes were dug through a silted up old palaeo-channel. When the postholes were abandoned, they gradually refilled with the silt they were dug into to, so the edges of these features were very difficult to spot in plan. Again, with hindsight, we looked back to the air photos and noted that the palaeo-channel was visible as a cropmark (and indeed was very clear in air photos taken during the excavation (Illus 5)). Clearly such evidence will be very useful in developing strategies in subsequent excavation work, but this is also a strong indicator that aerial photographs can be an essential resource to have to hand when monitoring machine stripping and during excavations.

4. A possible tree throw feature before excavation

5. Aerial image of the avenue excavation. August 2007 (Crown Copyright RCAHMS). The palaeo-channel is the darker mark running across the centre of the trench.
Protecting cropmarks
The Forteviot cropmarks are the remnants of at least two distinct important episodes of human activity in this area, and as such are rightly protected as Scheduled Ancient Monuments. However it is of great concern to us that this is a diminishing resource because of the continued ploughing of these fields, and a historic five-year cycle of potato planting. Although at an early stage, we are trying to develop an element of cropmark management and protection into the SERF Project, and part of this will be monitoring any ongoing plough damage. Regardless of the technique we use to monitor this, from the spreading of coloured gravel in excavation trenches to measuring caesium levels, we are not in a position to stop this decline. Our objective is, by the end of the Project, to have raised this issue of our declining archaeological record more widely.

Conclusion
The SERF Project is not all related to aerial archaeology. Nonetheless, the mapping of the cropmark record in partnership with RCAHMS, ongoing excavations of monuments known only as cropmarks, and the monitoring of plough damage, form major components of the Project. Crucially, the cropmark evidence is being taken seriously and being integrated with the results of other fieldwork techniques and approaches, such as geophysical survey, fieldwalking and topographic survey. We hope in the coming years to continue to better understand the enduring significance of Forteviot and its surroundings. Cropmarks are one way of allowing us to do this.

For further information and updates, please visit our Project webpages: www.gla.ac.uk/departments/archaeology/research/projects/serf/

References


Mapping Ancient Landscapes in Northamptonshire

by Alison Deegan and Glenn Foard

Aerial reconnaissance and the National Mapping Programme project in Northamptonshire have recovered and mapped evidence of archaeological activity of widely varying character, from field systems through settlement remains to funerary monuments, and ranging in period from the Neolithic to the 20th century.

This volume presents research and analyses of the project's results. The introduction is followed by two chapters that consider the reasons for the biases in the distribution of aerial photographic evidence in terms of reconnaissance and the impact of soils, geology and past and present land use on the survival and visibility of earthworks, cropmarks and soilmarks. The subsequent analyses of the project's results are presented primarily by period.

The monuments and landscapes of the Neolithic and Bronze Age are discussed in the context of results from archaeological excavations, in particular the Raunds Area Project, followed by a review of the wider evidence for these periods in Northamptonshire and the Midlands. For the Iron Age and Roman period there is an attempt to characterise the settlements, boundaries and communications across different landscape zones.

The three chapters on the Anglo-Saxon, medieval and post-medieval landscapes and on 20th century military remains review the contribution of the aerial archaeological evidence and consider whether this was maximised by the project.

The final chapter assesses the methodology that evolved during the course of the project and its impact on data creation and subsequent data manipulation, interrogation and dissemination.

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Cropmarks

AARG postcards
AARG will soon have four handsome postcards for use in advertising our Group. Combining hi-impact images taken by Otto Braasch, Darja Grosman, Wlodek Rączkowski and RCAHMW (Toby Driver) and basic information about AARG on the other, these are designed to catch the eye and hopefully encourage people to look up the website, find out more ….. and join. Delegates at the conference will be encouraged to take a handful for distribution.

We owe a special thanks to Krzysztof Maciejewski for his help in producing the postcard, to our members who have made their images available to us and to Toby Driver and Kevin Macleod for layout.

…. and for the future, when we have used up the current stock of 2800 cards (!), we will be looking for replacement images – perhaps not just pretty pics, but perhaps some mapping as well (anything to keep Rog happy..).

Aerial photography on the BBC
Thanks to Pete Horne, English Heritage, for reminding me about the current series on BBC TV called Britain from Above. To date two episodes have been broadcast and I thought them interesting because the programme took an unusual look at the country that was more than just a series of pictures of (e.g.) country houses. They have a website covering the basics of the programmes: http://www.bbc.co.uk/britainfromabove/

There’s not much archaeology in Britain from Above (though notable for the erroneous description of the Windmill Hill earthworks as ‘crop marks’), but there is another website that includes stuff from BBC’s archives This has at least two programs of possible interest: a radio broadcast about how Aerofilms ‘does it’ and a Chronicle made in the late 1970s (and given the unfortunate title of Digging from the Air) that includes John Hampton, Jim Pickering, Bob Evans and your editor on (and off) his bike. http://www.bbc.co.uk/archive/aerialjourneys/

Unfortunately internet access to the videos is confined to the UK only.

Exmoor’s Past, an Aerial View: The 8th Annual Exmoor Archaeology Forum
To be held on Thursday 25th September 2008 at Dulverton (Exmoor, UK)

This year we will be exploring aspects of Exmoor’s historic landscape from the air. For the past 100 years archaeologists and landscape historians have relied on air photographs to give new insights into the past. The day will illustrate how air photography is being used to unravel Exmoor’s complex historic landscape with a series of brief illustrated talks by those working on the subject. We will look at the range of air photographs of Exmoor; how those photographs are used and interpreted to build up a picture of the past; in particular how air photographs give insights into certain aspects of Exmoor’s archaeology, such as: the prehistoric landscape, settlements, land reclamation and the use of Exmoor during WWII.

All Enquiries should be made to Katherine Toms or Cristina Orchard, c/o English Heritage, 5 Marlborough Court, Manaton Close, Marsh Barton, Exeter EX2 8PF; 01392 824901; Katherine.toms@english-heritage.org.uk or Cristina.Orchard@english-heritage.org.uk
Book of interest?

Rog Palmer


Martyn Barber reviewed Kitty Hauser’s book on ‘the archaeological imagination’ in *AARGnews* 35. That was based on her D.Phil and the Crawford book is an offshoot of the same research programme. There were, she wrote, 49 box files full of photographs by, or collected by, Crawford. There was a small number of aerial photographs but most were ground photos of (for example) ‘…inscriptions… signs in the street… adverts… housing estates, burial mounds… doorways… and ‘Marx-sites’…’ as well as boxes of archaeological sites and finds (ix). Hauser knew, as we do, of Crawford as a field archaeologist and pioneer of aerial survey – but the boxes showed her a different man. As she wrote: ‘I had to find the mirror in which the archive and its contents made sense. The mirror was the man. I tried to find him.’ (x). Dramatic stuff – and her search was helped considerably by Crawford’s papers in the Bodleian, some of which had, on his instructions, remained unopened until 2000 and which she is, therefore, one of the first to see.

Through reading works by and about Crawford over the years, as well as a few reminiscences told to me by Irwin Scollar, I had built up a mental picture of him as, I imagine, had many other AARG members. Hauser gives us a new Crawford in a book that takes us from the archaeologist we thought we knew to the bitter man awaiting the end of Britain as he had come to dislike it. The book covers some, but not much, of his archaeological life and work among which are accounts of his early influence by Harold Peake. Crawford acknowledged this influence, but Hauser’s writing turns Peake into the original flower-power hippie. Further along the way we are also given Crawford’s reasons for starting *Antiquity* and his hopes that aerial photographs would one day join together the small pieces into a complete way of seeing the past.

*BoB* attempts to describe and analyse Crawford’s approach to landscape (‘landscape archaeology’ had to wait many years to be named as a theme) in its contemporary political, philosophical and ‘intelligentsia’ context. This, however, becomes secondary to the observations on and derived from Crawford’s photographs – Hauser’s main stimulus for writing the book. Crawford became a Marxist, as did many of the intelligentsia in pre-war Britain and he travelled widely. His travels are reflected in his photographs but Hauser’s main interest is in his photographs of Britain which, after his visit to the Soviet Union in 1932, became a record of what he described as ‘pre-revolution’ culture (Chapter 7). They included the ‘anti’ – the anti-religious, advertising, landowning, etc – alongside the ‘pro’ – Marx’s house, political slogans, etc.

The book title comes from a work that Crawford began in 1937 and submitted for publication in 1943. It was deemed too unpatriotic and was rejected although it may make fascinating reading now. Hauser’s Chapter 8 identifies Crawford’s approach to his book as an archaeological one in which he examined the material culture of the 1930s to deduce things

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1 Don’t blame me – no one else will agree or offer to review or comment on new publications!
about society. He compared use (or usefulness) with appearance and concluded that the latter was deemed more important to the British [has anything changed?]. He was also complaining about the changing countryside and, perhaps as a result of seeing Major Allen’s aerial photographs, was lamenting the loss of archaeological evidence to gravel digging for ‘development’ – which he deplored.

My main criticism is that in a book about Crawford-the-photographer there is such poor reproduction of photographs. Poor-quality paper and small-sized reproductions have led to what are best described as grey and white pictures rather than black and white. Despite that, the book is worth buying and, just as different readings and readers focus on different parts of Crawford’s autobiography, *Said and Done* (1955), depending on their interest at the time, it is likely too that we will find different emphases in *BoB* and that, as with Crawford’s own writing, it will be read several times and dipped into for specific reasons or references.


Firstly, I congratulate the authors on finding a simple title that avoids the currently-fashionable (or eye-catching?) first part, colon, real title. I have the book, I have the PDF download and both have their uses – the latter if nothing else than providing easy access to some useful illustrations. Furthermore, the digital mapping is searchable via an interactive map on the Archaeological Data Service website. This really is a high-tech ‘publication’ and perhaps shows how we can expect future NMP projects to be delivered. I won’t dwell on the fairly appalling proof reading from which, for example, the reader has to deduce that the Panel 1 referred to on p21 is really Panel 3.1; or the curious sequence of dates in Table 2.2. I do not understand how readers and editors do not see these things when they leap out at me, especially when one considers (from inside knowledge) how long EH sat on this book before deciding to publish it. It ought not to happen in any book and is not expected from a supposedly leading government body. Throw out the editors - my taxes could be better spent.

Ranting aside, this book is an excellent demonstration of what can be achieved from a project that begins with mapping air photos. Or more correctly in the case of *Northamptonshire*, that begins with many years of investigative observation and aerial photography by Glenn Foard without which the results of the project would have been considerably diminished, if indeed it would have been worth doing, without Glenn’s input. In Chapter 2 there is a good summary of the methods used to undertake Glenn’s reconnaissance programme and an analysis of results. It shows what we no longer are able to do in the UK after changes to the Civil Aviation Authority’s rules resulted in a huge reduction of the numbers of local observers who were able legally to undertake aerial survey. Chapter 3 examines the significance and limitations of the survey data and the resulting bias in recorded features. Among this are good summaries about how crop marks, soil marks (yes, they are something different) and earthworks become visible and may be photographed. There is also useful discussion about soils, permeability and the distribution of sites (or ‘objects’ as they are often called in *Northamptonshire*). In a circular way, accumulated knowledge about the ‘best’ soils on

² Save two quid at Amazon or Tesco.
which crops have indicated sites can also inform where new sites may be found in future surveys. But I don’t remember any discussion about the possibility that currently blank areas may have been as densely used, perhaps in different ways, to those currently mapped (although there is some comment about field walking difficulties). This chapter also notes the roles of climate and landuse plus the reduction of evidence due to development and quarrying – the latter being responsible for significant destruction in the county.

Chapters four to nine are period based but grouped in a slightly different way to the norm. In the previous chapter it had been noted that guessing the dates of sites is usually just that – guessing – although in some publications it seems that these guesses become written in stone once they’re in the database. Most of us are aware that, for some types of site, dates can be relatively-accurately guessed, but others have little to substantiate them and in Northants this uncertainty is reassuringly never far from the surface. In their analysis of Northants mapping the authors have been helped considerably by the ability of their database to cross-link to HER data, including some from recent developer-funded investigations, which has provided an amount of definite dating evidence to help separate the mapped evidence.

These period-based chapters range from the Neolithic-Bronze Age to modern military remains and bring in specialist writers where appropriate. To review these fully would require an article (and decipherment of my scribbled notes) which may be better done by period, or Northamptonshire, specialists. Within these chapters it seems as if a range of different map styles is used to test which may work best. For me the simpler maps were the clearest with the efforts at hill shading mixed with colours to show heights (which then change colour when shaded) being a bit of a failure. I was also confused by the curious division of the references into books plus periodicals, maps and digital without any clues in the text as to which type of reference an entry belonged. My first reaction was to think that half the references had been omitted.

The volume ends with a critique of Northamptonshire’s NMP and, in parts, it seems surprising that EH let it be published. This chapter should perhaps be read after Chapter 3 (because it emphasises some aspects of bias) and then again at the end to see how future NMP projects may benefit from the experience of applying archaeological thinking to all levels from the aerial photography to photo interpretation, mapping and analysis.


The review gets off to a good(?) start by defining ‘aerial archaeology’ in a paragraph that doesn’t make much sense to me. But that didn’t put me off flicking through my pdf copy and realising that there is some better stuff elsewhere in the review. The definition is followed by a series of recommendations and then by another longer definition of AA in a chapter headed Background that continues with a brief history of aerial work in Ireland and identifies sources of ‘photography’ (by which he means photographs). The third chapter usefully summarises just about every type of aerial photograph, image or data available, using examples in most

cases taken from, or of, Ireland. And there’s even a bit about mapping and integration with other information and a short but important sub-section on Context mapping (p62) that notes the need to understand why features have been visible and why some land is ‘blank’. In Ireland, as in some other countries, the archaeologists do not readily accept information from aerial photographs without a follow-up field visit. This led to a memorable quote:

In commenting on the high rate of discovery of new sites in 1989, Power pointed out that the apparent cost-effectiveness of the method was substantially compromised by the need for ground verification.

… which seems a valid point to remember next time someone rattles on about the number of sites found. It was, if you remember, the reason why the Danes asked St Joseph to stop flying there (Wilson 2004, 36).

The chapter then continues into brief comment about classification in which it is gratifying to see that they tried and discarded MORPH and seem to have moved to something simple. Irish archaeologists also recognise that morphological classification is ‘… not seen as a high priority compared with clarifying other issues of form and sequence in complex sites.’ (p63). The importance of integrating aerial evidence with other sources is noted and discussed. However, as most of the present mapping is sketched, useful integration may need to wait until more-accurate mapping has been completed by experienced personnel – a need that has been recognised by users of the existing data (p74). Gillian Barrett’s work on (mainly) her own photographs is one of the exceptions.

Chapter 4 deals with uses of air photos and air photography in research, conservation and educational access (whatever that is). The confusion between photographs and photography continues in this chapter as Lambrick looks at how it/they help enhance the archaeological, historical and industrial records. Early in this chapter are elements of the biases that affect the archaeological record – for example, different counties treat aerial information differently, and assorted ways of classifying have confused knowledge of what is what and what is where. There are figures showing the increase in numbers of sites following photo interpretation or from new observer-biased flying and how these activities have enhanced archaeological and other records. In discussion of these Lambrick always identifies pros and cons and this division is likely to be useful in directing any work that evolves from his survey. The chapter continues with discussion on research themes and the role that aerial survey has, and may in future, play in them. This is analysed in some detail under broad period- and theme-based headings.

Discussion of the roles of aerial photography and its interpretation is examined in the context of current and future development (section 4.3). A considerable amount of development has taken place between 1989 and 2006, with the final six years seeing a large financial investment. Aerial surveys are often undertaken in association with these developments but Lambrick highlights the need for these to be carried out at potentially good times to identify archaeological features. It is also agreed that a search of all photographs should be carried out on major development areas or routes to help guide field investigation. Good. Aerial photographs are also seen as valuable for recording excavations and the progress of developments plus their illustrative role in reports and presentations. There follows a chunk covering various types of development, including rural development, changes in land use, agricultural improvements plus the rural environment protection scheme – all with reference to the role of aerial photography and photographs.
A final two chapters deal with the present organisation of ‘aerial archaeology’ and teaching and training. A lot of observer-directed flights appear to have been undertaken by inexperienced personnel and, again, the work of Gill Barrett is highlighted. This time as a model of good practice as she is the only person to provide in-depth flight reports and to note the relevance of soil types to archaeological sites and their discovery (p102). Rates of discovery and the usual cost-effectiveness of observer reconnaissance are noted, although not always favourably (one bloke in particular, Power, seems very anti aerial survey). Lambrick encourages people to join AARG (have we had an increase in our Irish members?) but also notes the virtual absence of any conferences on ‘aerial archaeology’ in Ireland [no bad thing].

The shortish chapter on teaching and training scans through what is currently available in the UK (this may be of interest to our Education Working Group) and ends with a suggestion that training may be welcomed although they only mention this need in regard of flying to take oblique photographs. Grrrrrr.

Overall, the review gives a good summary of the present state of aerial photography and its uses in Ireland. It is well-illustrated with air photos and, hopefully, will encourage the development and expansion of uses of aerial data in that country. The recommendations given in the opening chapter are good, but should perhaps not be followed in the order given which seems to put bureaucracy before practice.


I haven’t fully read this book, and not just because the title is upsetting, but intend to spend more time with it on a future train journey. In a sentence, the project looked at the ‘quality’ of crop-marked evidence then dug a few holes to see what’s going on under the surface. The ‘winners’ seem to be the prettiest sites that show best on most photos on most dates. Has much changed since the 1930s and is this another example of a use of bias in taking and using aerial photographs…?

I’m sure there’s more to it than that, but so far the book has raised questions that it hasn’t seemed to consider. I’ll begin with a brief autobiographical note. I’m not good at winning job interviews because I’m not good at giving the expected answers. In 1976 I think I blew my chances of becoming the first field officer for Wessex because of one particular answer. (There may have been other reasons, of course, such as picking the mud out of the grooves of my cords while I was there – posh trousers for an interview, but maybe I ought not to have used them previously for digging…) Anyway, Geoff Wainwright asked whether I would fight to preserve a round barrow that was going to be taken into cultivation [how many hundred of those are there in Wessex?] and I answered with enthusiasm, “No, let’s plough the thing and study what happens to it. This would be experimental archaeology using a real archaeological site.” It seemed to me to be an ideal case to scientifically investigate the changes from a mound and ditch to a levelled site and then – if we were lucky – to a series of soil and crop marks. But that wasn’t the answer they wanted to hear and so, presumably, I kept my freedom and was saved from a lifetime of failing to give future right answers.
The relevance to the *Cropmark* book, or the relevance as I see it, is that nowhere in the pages I’ve looked at do the Producers question why we should want to conserve levelled archaeological features. It seems to be taken for granted that this is a Good Thing – which presumably means that our heritage organisations have decided so in order to keep themselves in work for a few more years. I also wonder if this conservation mentality returns us to the ‘single site’ concept as it can, and does, deal only with individual modern fields or small units of land. Certainly it seems far from the viewpoint that anyone familiar with aerial survey would adopt where, even in Scotland, long-term aerial observation has led to the recording of linked elements of past landscapes. If, as seems very likely, people in the past were doing something just about everywhere ought we to think about conserving ‘sites’ any more? Ought we to think about conservation of anything, or should we sit back and let our past be worn away by various mechanisms while ensuring that we make the best possible record of it while it is still visible? Are conservationists getting a bit like old King Cnut and trying to stop the unstoppable?

That was just thinking out loud. I intend to read this book a bit more thoroughly but if any AARG member (preferably not from a biased heritage organisation – what about one of the university people?) is a bit more conservation-aware than I am and offers to review the work for its intended purpose I’ll be happy to try and scrounge another copy. Deadline for *AARGnews* 38 is 14 Feb 2009.

**Other publications of interest?** (sorry, no time to write comments…)


**References**


The Aerial Archaeology Research Group

The Aerial Archaeology Research Group (AARG) provides a forum for the exchange of ideas and information for all those actively involved in aerial photography, photo interpretation, field archaeology and landscape history. This also includes the use of aerial photography in defining preservation policies for archaeological sites and landscapes.

Since its foundation in 1980, AARG has actively encouraged such exchange through its annual conference, specialist meetings and, more recently, through the biannual publication of its newsletter, AARGnews.

Membership of AARG is open to those interested in aerial archaeology as well as its active participants. All applications for membership, subscriptions and changes of address should be sent to the Secretary:

Lidka Żuk, Institute of Prehistory, Adam Mickiewicz University, ul. Sw. Marcin 78, P61-809 Poznań, Poland. lidkazuk@amu.edu.pl

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Anyone wishing to apply should write to Dave Cowley, RCAHMS, 16 Bernard Terrace, Edinburgh, EH8 9NX, Scotland (Dave.Cowley@rcahms.gov.uk) with information about their interests in archaeology and aerial archaeology, as well as their place of study. Annual closing date for applications to the annual AARG conference is 31 May, other meetings for which bursaries may be available will be advertised on an ad hoc basis.