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Editorial

I am grateful to Otto Braasch for permission to use his maize photograph. This is perhaps an appropriate aerial way of celebrating the Olympics and is better than moaning about the effect on archaeological survey of the huge restricted zone around London from July 13/14. In a good summer this would have been an appropriate date to stop flying in the south as by then most cereal crop markings would have ripened and perhaps been harvested. But in Britain we had a record-breaking wet year and, to judge by Damian Grady’s few flight reports and my own observations (see cover photo – May 2012), there have been very few growth differences that can be perceived in visible wavelengths. We can begin to see how this has affected the DART project (see p.42) which, although using wavelengths beyond the visible, still (I suppose) needs stresses in crops before even that technology will register a signal.

Very low altitude aerial photographic devices

It can’t have escaped most of you that a current fashion in ‘aerial photography’ is the use of various models, drones, balloons, kites, even long sticks or anything else that a camera can be attached to and raised a few metres off the ground. These devices have been popping up everywhere and there have been several contributions in past issues of AARGnews about using them. In this issue (p.37) there is another.

I’ve never been all that sure about their relevance to AARG – although this may mean relevance to the aims and interests of AARG in the last century – but there is no doubt that these contributions are about means of taking aerial photographs and uses to which they have been, and can be, put. Not only that, but these low level photographs are used more often with the ‘new technology’ than are higher-level oblique and vertical views. I’ve seen quite a few uses of PhotoScan with low-level images (see, for example, Verhoeven et al in the last issue) and not much other than my own games with oblique and vertical photos using AirPhoto SE (Scollar and Giradeau-Montaut, last issue) although, prior to increasing use of these SfM programs, we had been shown aerial photographs draped over DTMs or ALS models. With this low-level use it is easier and cheaper to take a high number of overlapping images from a kite (etc) than it is from a Cessna – although the minimum of two images required to create a DTM and orthophoto in AirPhoto SE is easy to achieve from a Cessna or by using 60% overlapping vertical photos.

Using this range of machines for prospective survey requires a higher altitude and perhaps delivery of a few government-surplus Predator-type aircraft that can be programmed to fly a track and thus record extensive areas. Meanwhile we should be happy to see the development of use of these closer-range devices for photographing excavations and small areas. Clearly, they are ideal for this role as many of them use good-quality DSLRs and the resulting high-resolution images are much better than we should expect from those taken from an orbiting Cessna even if a long telephoto lens has been used.

I suggest they also could be co-opted to provide data to complement our traditional earthwork surveys – so we await use of these, or at least testing, by the Scottish and Welsh Commissions to provide high-resolution earthwork pictures that can be turned into 3D models and will also

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2 http://olympics.airspacesafety.com/
provide orthophotos that may, perhaps, form the background for any interpretative drawings. Just a thought…but I would have enjoyed having such data when I was finding, surveying and trying to understand the Neolithic and later earthworks on Hambledon Hill.

Aerial iPads?
While on new technology, a newsgroup recently drew attention to a student at Liverpool University (UK) who is studying the uses of iPads in archaeological fieldwork (which, in this case, means digging). If they are waterproof, dustproof and can be dropped a few times they may be useful but – from what I remember of fieldwork in UK – they’re going to get mucky and scratched and probably will not be too happy working in the rain. However, the inside of a cockpit is not usually wet so they may have uses for flying. Some come with a GPS of some kind so they may be useful with a Google Earth background for navigation or even for use as a notebook in which to ‘scribble’ observations (do any but students actually write anything when they’re flying? I know that I don’t but I’m an amateur aerial photographer). Apple’s website may give some clues about the GPS but is easier, and probably of more relevance, to ask if any of you have been using these things in the air. In the past, AARGnews has included contributions on use of Windows-based notebooks in the air, so it’s only fair to give the others an airing if they’re any use. Comments please…

Archive photographs
There is a comment and link about the Aerofilms collection (Britain from Above) in Cropmarks and this marks a big step forward in the availability of archive photographs in the UK. We just need to persuade Heritage Lottery Funds to part with more money to provide similar access to the other few million photos in our archives. Once we have digital availability of archive photographs we users may be able to work more efficiently with them. In recent years access seems to have become more restricted in at least one large collection in Southern England, where first we were stopped from using transparent overlays to interpret the photos at source, next the laser copying machine broke and they can’t afford to replace it (pers com). Which leaves copies to be made either using a Xerox at 20p a sheet or paying £10 to use your own camera – hand-held, without a tripod and with lots of lights reflecting from the ceiling. All this while wearing regulation rubber gloves and not drooling on the prints. These restrictions have been summarised by Chris Cox (who is trying to cut through these rules and regulations delicately) as “they are not letting us do our work properly”. Why? Because commercial archaeology in England works to a short timescale (usually 3-4 weeks from go-ahead to completion) and cannot wait for prints or scans to be made officially so we have to work from more-instant copies. Xerox copies do not record all the information on a photograph (nor did laser copies but they were fractionally better…perhaps) and it is impossible to photograph curly prints at good quality with a hand-held camera and dismal lighting. Some other archives provide proper copy stands for this work – ie giving a stable camera platform, proper lighting and a means of holding a print flat. I’ve said in the past many times, perhaps even in AARGnews, that it seems now that the archives themselves are more highly valued than the information they contain. And this does not seem a healthy situation for those who need to work with old (or any) aerial photographs. What is the point of spending a fortune maintaining these archives if they cannot be used effectively? Furthermore, despite a number of meetings with users, there seems to be no outward evidence of even a will to copy and make available digitally old archival photographs, let alone any action to do so. So we should all ask HLF (and its European counterparts if such exist) to

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3 https://news.liv.ac.uk/2012/08/16/archaeology-trials-ipad-for-fieldwork-study/
hand out some pennies to get the things copied so that archivists can safely lock up the originals and gloat over their collections while they moulder away while the rest of us can efficiently stay at home and search high-resolution copies for the information they hold.

I didn’t mean to get sidetracked into that rant – but it’s a valid one so I’ll leave it in. Rather, I meant this heading to lead into a few comments about the contribution by Ole Risbøl and Susanne Kaun (p.20). Ole contacted me in February about the discovery of some early balloon photos that had come about as part of his research in ArcLand’s WP5. It sounded good to me even when he said that the contribution may run to 20-30 pages. And good it is. The phrase ‘I couldn’t put it down’ is usually applied to novels but is also the way I felt when first reading this contribution. Not only is it a fine example of detective work but it shows a way that old photographs can be used that goes beyond ‘our’ usual search of them for archaeological sites. Alun Martin has said much the same of the CUCAP material of which he is part-time curator – that they are perfect material for ‘social historians’.

Ole’s contribution and reports on recent schools/workshops make this quite an ArcLandish issue. But we also look forward to next year’s 30th birthday with a contribution by Kenny Brophy (p.42) in which he analyses a package from Jim Pickering (a founder member of AARG and our second Hon Member) and, in doing so, shows some of Jim’s outspoken ideas that so used to upset ‘the establishment’. Work in Scotland (Cowley, et al, p.64) is breaking new ground with its maritime survey – or at least with the concepts behind the work. I read this paper with a sense of excitement that something in our small world is taking aerial survey into new territory. The past few years have seen a bit of an ALS overdose, especially at our meetings, and it’s good to read that conventional methods remain useful as also can be seen in the summary of recent work in Jordan (p.74). Buried in the Jordan update is reference to a new initiative – an online collection of photographs of Europe. This is something that is tremendously important and should be discussed and acted on by AARG and ArcLand as something to achieve for future researchers.

These and other treats make this the ‘fattest’ issue to date so I hope you have all remembered your password or filed it somewhere sensible (eg a directory called ‘Password’ in your main ‘AARG’ directory) because the AARG secretary is gadding about for a few weeks and won’t be able to help you…

Titles
I’ve never seen much sense in these two part titles for book or papers – you know the kind of thing … A Day in the Life of a POP Drinker: Interpreting Aerial Photos for Beginners. I’ve been told that they help draw attention to the thing but maybe I’m not romantic enough to appreciate that. I prefer to be told what I’m getting as concisely as possible. These comments are brought about by two things. Firstly, trying to fit the titles from this issue on the front page and secondly by a nice short title to a paper that Dave Cowley has just sent me that shows it can be done (see Books of Interest), although he didn’t manage quite as well in his contribution to AARGnews…

Chairman’s Piece

Oscar Aldred

This year – my first as chairman – has been full of activities, which has meant a steep learning curve in matters of administration and problem-solving. Many activities have been done remotely, but several have been face-to-face with colleagues. A meeting in Budapest to discuss conference matters with Dr. Zoltan Czajlik; another meeting in Budapest with the AARG committee, again to discuss conference matters and other issues; and another, to come shortly, in Budapest, but one that we’re all eagerly anticipating: the 2012 AARG Conference.

As more visible points in a chairman’s role, often coupled with the activities of AARG’s committee, they belie the ‘real’ work that goes into making AARG, and in particular the conference, work year-on-year. Collaboration, hard work, and some exasperation, are all part of the package. And at the helm of the aeroplane that steers AARG is not the chairman, but the AARG committee, made up of just a few, but which ensures that AARG functions and (hopefully) remains relevant for its members. What I have been continually impressed with during my first year is the committee’s level of commitment and degree to which they instil enthusiasm and interest in AARG’s subject matter – archaeology. However, the success or otherwise of AARG depends on the contribution that all its members make towards working out the future direction that AARG should take. This is something that we hope to partly address during the 2012 conference but of which, on occasion, everyone needs reminding.

What have we achieved over the last year? An area of importance, which at least I feel is a justification of our discussion time, is helping to support publication, whether by assigning our official AARG stamp or in helping to fund network and training activities that as a result lead to the collaboration between individuals. Besides AARGnews, there have been several other publications this year that are available or will be imminently, with the AARG occasional publications stamp. For example, Interpreting archaeological topography – airborne laser scanning, 3D data and ground observation edited by Rachel S Opitz and Dave C Cowley, and Chris Musson as editor for Flights into the past, published jointly with ArcLand.

In a review article in the last AARGnews, Dave Cowley drew attention to issues of publication. A precis of the issue was the idea that conference proceedings are not a reflection of the dynamic field in which AARG is situated – in its capacity of dealing with the developments in aerial archaeology and remote sensing fully. This is partly because technology, approaches and directions are constantly shifting in our field. As a result, most publications need to take overviews or positions which reflect standpoints that will continue to shape the structure of things to come. Most (though not all) conference proceedings are too much a part of the normal flow of development as they are usually about work in progress, caught within the flow. Publication of these types of articles therefore tends to reduce or stagnate development because, by the time they are published, they will often have been improved upon by newer, and often better, knowledge. However, recognising which areas are important to promote while passing over others can be difficult. In particular, we need to ask

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ourselves which developments will continue to have structuring influences on the shape of aerial archaeology? Or perhaps something more banal: which ones are simply fun?

There is another question to consider here that may help us decide, or at the very least help to recognise significant pieces of work – what is AARG’s future direction? If that question is addressed, I am confident that it will help find the balance between identifying standpoints while limiting others that are just transitory, perhaps even along the way exploring new ways to publish that might involve greater reader participation. For example, if we had a better understanding of what our direction is and where we would like to be in the next few years, this could help to find which paths we want to take, therefore recognising standpoints that should be developed. A caveat though, is that one needs to consider that not all progress or improvement is about looking forwards. It is also retrospective. My own personal opinion is that we need to look back as much as forwards in order to find the right type of publication balance, and direction; and I have given cause to this point of view in my previous Chairman’s piece (AARGnews 44) by calling for a return to some of the original intentionality laid down by those that developed aerial archaeology alongside landscape archaeology in the early-20th century. This task of identifying standpoints and building AARG’s future is perhaps rather apt one because of the 30th anniversary of AARG in the forthcoming year.

However, the danger is that in looking back to look forwards, it is as if one is fleeing while looking back. One holds a gun to the future. While all development is historical, in the sense that it lies along a continuum and all points along it are important, not all are equal in their influencing weight. Members and AARG committee alike hope that they can recognise these trends and help shape relevant areas of development. And in a long-winded way, returning to the start of this chairman’s piece, in order to shape the future direction of AARG we need participation. Obviously, the conference as a venue to express ideas and thoughts is one such place. But there is a need for more, and not only at the visible points along the way.

In this respect, as chairman, another of my opinions is that we need to have consensus in these matters of direction and balance, in order to collectively move in a similar direction. As AARG’s committee, a part of our responsibility is to continue to ensure that our decisions are made in light of what we consider to be what our members interests. But in order to do this we need to add other opinions or voices, to ours. One of my disappointments this year has been the extent to which I have only heard the same people discuss matters, and have had relatively few emails from others. This should not sound like a complaint, more of an aspiration. Without wanting to add too much to the burden of my work levels, I would like to have constructive opinions expressed about AARG matters. Obviously there are differences in the level of activity for each member, but this might be a result of hesitancy or perhaps even apathy. To partly remedy this, AARG will be holding a meeting exclusively for younger AARG (YAARG) participants who find themselves at the beginning of their careers, but who also have tremendous enthusiasm. While this mode of mentoring has been a feature of AARG (as far as I remember) for the past decade or so, in recognising the value of its younger members to AARG, we will hopefully encourage a greater number of voices to speak, while continuing our mentoring role by fostering the exchange of experiences and skills. We have some way to go before this can be assessed fully, but I have every confidence in it becoming successful and a feature of subsequent AARG conferences. Bursaries provided by AARG, and those workshop activities supported also by ArcLand and other institutional support in small grants for travel, will help AARG’s grass-root development. In doing so, I hope this will
result in a productive and measured period of change, steered by more members rather than just a few.

These sentiments are a feature of this year’s conference in Budapest. And there is a quite deliberate structure and a well-defined narrative to this year’s conference, as far as it possible in meeting all of its objectives. The conference narrative will examine aerial archaeology and remote sensing as a production, or a process, and not just viewing the end-product which is often a photograph or image. This is defined by, but not limited to, papers that will examine the acquisition of knowledge, its interpretation, and in their application for research and cultural heritage. And just as landscapes are messy (after Dimitrij Mlekuž), so too is the archaeological process. This is of course not a new notion, nor is it terribly progressive, but it goes some way to situate aerial archaeology and remote sensing within the wider discipline of archaeology. It does this by demonstrating the extent to which aerial archaeology and remote sensing are a part of an enchained production, which is called the archaeological record. There are several ways that the archaeological record can be considered. For example, as a formation process from the systemic record to archaeological record; as a type of archaeological practice that is producing new knowledge and ‘archaeological’ entities; and as a statement of empirical fact – our knowledge that is ‘out there’ in the landscape. Whatever way it is defined, however, it is an assemblage or ensemble of practices and materials that demand particular ways of seeing. What are these ways of seeing? Essentially, this will be one of the forums for discussion at the conference which will assess aerial archaeology and remote sensing from two different perspectives – from geoarchaeology and landscape archaeology. Hopefully the conference will give us some stimulating thoughts that will help to promote more participation and mentoring, and in developing future directions in AARG, at least for the next year.

I look forward very much to the next year, with the possibility of new opportunities to develop and hearing more voices from all members. Hopefully I will see you in Budapest. Till then, Cheerio!
Aerial Archaeology Course, Czech Republic, 18th – 23rd June 2012

Tutors: Martin Gojda, Lucie Culikova, Lenka Starkova

Countries represented at the workshop: Czech Republic (12), Great Britain (1), Poland (2), Germany (3).

This aerial archaeology course has been held for many years, however, this year for the first time we changed it into an international workshop “Sazená 2012”. The workshop took place at Airfield of the Air Club of the Czech Republic in Sazená. It was organized by the Department of Archaeology, University of West Bohemia in Pilsen with financial support from ArchaeoLandscapes Europe (ArcLand). Eighteen students (12 from the Czech Republic and 6 students from abroad) participated in this six-day course.

The course was divided into 2 main sections:

Air and field school

In the first phase students were introduced to the theoretical background and principles of archaeological remote sensing. The participants were also able to acquire basic knowledge in the practice of archaeological air survey carried out at low altitude and focused on identification and documentation of buried archaeological sites and features displayed via crop-marks. Flights were carried out above the archaeologically-rich landscapes of Central Bohemia.

During the practical air survey, performed in Cessna 172 owned by the Czech Academy of Sciences, Institute of Archaeology, students recorded some previously-known archaeological sites (from Prehistoric to modern) and they also found some new sites, which always caused great joy among the students.

Flights were followed by downloading and primary processing of GPS data and aerial photographs that they had taken during the flights. In several cases students carried out inspection and mapping of crop-marked features on the ground via GPS and Total station.

Ground school

The next part of the workshop featured practical training in the processing and mapping of aerial photographs and lidar data. Students were introduced to advanced processing of aerial photographs (rectification of oblique aerial photographs, their archaeological interpretation and mapping of recorded sites and features using GIS). They also had the opportunity to learn how to work with data from airborne laser scanning (lidar data).

All students were excited not only because of acquiring new knowledge and experiences but they also had a lot of fun especially at the evening events and during the field trip. We hope that the workshop increased their interest in aerial archaeology.

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Group photo (students from abroad, pilot, author)

Sazena airfield

The local landscape

Inspection and mapping of crop-marked features on the ground via GPS and total station
A picture is worth a thousand words…
at least at the Aerial Archaeology Training School in Merida!

Cristina Charro Lobato

If you had asked me before attending, I would have answered clearly I was not expecting much of the course. At first, it seemed more of the same: five days in Merida (with June heat!) of theoretical and practical aspects that are becoming more known (and used) in Landscape Archaeology in Spain. Of course, my view is not objective: I'm doing my PhD in this discipline and I am used to attending seminars that contain much theory about how things should be done, much of what each does and, in the end, little practice and little reflection and discussion. So I didn’t expect much from a course with a title and content similar to several previous disappointments.

Once we started with the real photo-interpretation, my perception changed from a "this sounds familiar" to a "this is new" and what is better, to a "this is useful". The course was organized around several themes: introductory issues and interpretation of images, data collection and processing thereof, including a field practice with a balloon held on the last day.

Besides an historical overview on Aerial Archaeology in Europe, the introduction focused on something I consider more important: the reflection on the importance of images and how we approach them. That is, for what purposes, from what perspective and previous experience ... because in the end (and from the beginning), we see what we want / are prepared to see, and this is attenuated only being aware of it and taking a deep understanding of the historical, archaeological and geological photographed area. If we also are aware of the biases of visual perception, our background, interests, etc, we have a good starting point. A good exercise was the interpretation of aerial imagery we were doing in turns, trying to identify archaeological features (and even calculate their size) from cropmarks, difficult as they come. At first we participated shyly, but a couple of days later even presented some of our own images. During these practices, we were shown the importance of showing our photos and interpretations to others to get different opinions, and thus avoid biases caused by the knowledge we have and shapes we seek. And to try not to be too imaginative with what we find in spite of trying to be open-minded, because not everything is interpretable (although there’s always a chance to serendipity) ...Kind of riddle? And do not forget: always, always, always, in 3D (I have already got a portable stereoscope, just in case ...).

During classes devoted to data collection and processing we could mess around with different software for image rectification as well as generation of both surface models and orthophotos, thinking of its next implementation on GIS. One phrase stuck with me because it is precisely

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At the classroom (kindly provided by Consorcio de Merida) … and guided tour around Merida

Field practice taking photographs at an archaeological site using a balloon with a radio-controlled camera
one of the strongest criticisms usually made to GIS, turned into virtue: *One of the good things GIS have is that you can ask them stupid questions* (Rog Palmer *dixit*, June 2012). Copied!

We had a thorough talk (and fast!) on the several different ways of taking photographs (UAV, parachutes, helikites, etc.) where, seen from others’ experience, even to modify a normal camera to an infra-red looked easy! In fact, Michael and Christoph fancied making a model of the Roman theatre of Merida with their own pictures to test the software we were using. The result ... well, everything is improvable. In the field practice we came down when we found that driving a remote-controlled car is not the same as managing a radio-controlled camera in a balloon (but they looked so alike ...).

In my opinion, a strong point has been the practical part of the course (when the combination RAM-heat allowed it), but would have been nice to have been able to include more time on photointerpretation. It is often difficult being able to find archaeologists who really know how to interpret images, at least in the Iberian Peninsula. They are usually geologists, agronomists and cartographers (among others) who actually work on photo-interpretation, obviously from their own disciplines. So it is a luxury to learn from archaeologists working regularly with flights and interpreting images, because it allows us to know how other countries give importance to this activity as it is part of the heritage conservation planning. In our own institutions the lack of resources, the changing political interests and, sometimes, the obsolescence of methods, provide the guidelines of what archaeology is done.

In and out of the course, the atmosphere was pleasant and facilitated contact between all potential photo-interpreters / aerial archaeologists, who mostly work in the Mediterranean area (with some exceptions like Kasper in the Chinese desert). Sometimes there was no time to get together after lessons because there was too much to visit (for future occasions, no monumental cities with so much heritage to see, please!), so some of the visits were made jointly and guided by the organizers (collective thanks from here to Victorino Mayoral and to *Consorcio de Merida* for providing us with free entrance to all monuments). *Cáñes* and *tapas* helped us to pass the week of intense heat that we endured as we could, within and outside the classroom (Marco even made a targeted high-tech hat in the field practice, while others took advantage of the sunshine to get tanned – I’m not going to tell names...).)

Sincerely, I am grateful to this *ArchaeoLandscapes Europe* initiative, as well as to Merida Archaeological Institute (IAM) and Institute of Heritage Sciences (Incipit) as co-organizers. I hope this course leads to others about uses of Aerial Archaeology within the type of Landscape Archaeology practiced in the Mediterranean areas, whose concerns are *slightly* different from elsewhere. As a minimum, it has provided many ideas, many perspectives, much reflection and, above all, much motivation. For myself, I can say that, despite having an irrational fear to fly, I am left with the desire!
I was really grateful when I realized that I was to be one of the participants at the summer school “Potential of satellite images and hyper-/multispectral recording in archaeology”. We are all aware of successful aerial photography summer schools around Europe; however, this was the first summer school of this kind. The summer school was held at the Adam Mickiewicz University in Poznań and supported by ArcLand as well as Institute of Methodologies for Environmental Analysis and Institute of Archaeological and Architectural Heritage in Tito Scalo-Potenza.

Another thirteen graduate and postgraduate students as well as academics had the same opportunity as me to come to Poznań to learn about the principles and processing techniques of satellite imagery and their application to archaeology. Over five days, seven lecturers from all around Europe, assisted us in such learning (Fig. 1).

On the first day, we were warmly welcomed by Włodek Rączkowski and other tutors at the Department of Prehistory. Włodek gave us the first lecture about an introduction to aerial photography. This was necessary to understand the principles and development of remote sensing techniques as the majority of students had had no previous experience in this field. This interesting lecture was followed by an introduction to the basic concepts of satellite and airborne remote sensing by Veronique De Laet. The last session of the day was delivered by Rosa Lasaponara and Nicola Masini and brought an overview about the potential and

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limitations of the satellite data in archaeological prospection. An interesting part of the day was a practical experiment with the use of two basil plants. One was selected to be watered, whilst one was allowed to dry out and become dehydrated. These plants were chosen to prove that the technique of spectroradiometry can recognize the differences between a healthy plant, and one under stress. This is important in archaeological research as the vegetation cover can be associated with the better health of the plants or possible archaeological features buried under the ground.

In comparison to the first day, the second day was more intensive. The lectures were focused on particular satellites types with their detailed description. Veronique, Anthony Beck, Rebecca Bennett and David Stott did their utmost to explain to us the characteristics and technical terms of the data which can be overwhelming at times (Fig. 2). It was loads to take on board; therefore, the afternoon practical session was a good opportunity for a change. This part of the day allowed us manipulate the satellite images for the first time.

Fig. 2: Tuesday’s lectures by Anthony and Rebecca.

On the third day, Anthony presented the DART project, which deals with remote sensing data. In the presentation, many different sensors, and their availability to detect archaeological features, were mentioned. A lesson about feature formation was given by Rebecca and David dealt with the different factors which can influence the visibility of features on sensors. All these lectures were prepared with appropriate case studies for easier understanding. The afternoon practical session was held in the park close to the department where we tested our two basil plants with the spectroradiometer. We were divided into several groups which allowed each group to measure different types of material (Fig. 3), and to later in the computer lab to see the difference in the spectral graph. After an hour in the sun on the hottest day of the week, we were happy to get back to the air conditioned computer lab and see the result of our measurement. Thanks to a spectral band visualisation we were able to see that spectroradiometry is able to detect the differences between healthy and stressed vegetation and on different materials too. This was a really exciting afternoon.
The fourth day was, at least for me, one of the best. We learnt from Veronique about several processing techniques which can be applied to different satellite datasets and Rebecca presented a lecture about LiDAR. Both sessions were completed with a practical session in the computer lab. We were able to apply the most common processing techniques to a dataset, a good basis for the participants to take away and use on their own projects in the future.

The last day of our summer school was a whole day of practical sessions in the computer lab. We were divided into the pairs to answer several questions on a data integration exercise. Each pair prepared a presentation which was later delivered to the rest of the class and tutors (Fig.4). The final discussion (which Anthony joined, at least for a while, from England via Internet) was successful as every student took part. In the end, the nice surprise was prepared for us as each student received a certificate of attendance and completion of this summer school. This is useful for everyone as proof that we attended.

To conclude, the summer school in Poznań was a great opportunity to get knowledge of techniques which is difficult to access on the postgraduate courses. This was taught on a practical level with input and tuition from notable experts. It gave us a start for our research projects, ideas, new friendships and sharpens the community around remote sensing technique. Personally, I gained from the tutors great advice and many ideas for my dissertation work which deals partly with satellite imagery. Finally, it motivated me to stay in this field and attend more similar orientated workshops.
The First Aerial Archaeology Research and Training School in Turkey (AARTS) was held from the 20 – 30th July in the Kocaeli province near Izmit. The school was organized by Professor Ayse Çalık Ross from the University of Kocaeli and Gianluca Cantoro from the Institute for Mediterranean Studies - Foundation for Research and Technology, Hellas (IMS - FORTH) in cooperation with the DG for Education and Culture of the European Commission and with the economic support from ArchaeoLandscapes Europe project (ArcLand), which provided 3 bursaries for students and covered the travel costs for one of the tutors. The school brought together six tutors (Darja Grosman, University of Ljubljana; Dave MacLeod, English Heritage; Apostolos Sarris, IMS – FORTH, Cathy Stoertz, English Heritage and the afore-mentioned organizers) and eighteen participants from eleven different countries with an aim of better understanding and to experience aerial archaeology first hand. The program was divided into two parts:

- practical experience in reconnaissance and recording in the air
- geophysical field survey plus a presentation by Kevin Barton of his paper on combining several geophysical methods in surveying a cropmark².

Lectures were held in the Derbent Hotel of the Kocaeli University in various topics of air photo interpretation and mapping³:

- Introduction to Archaeological Aerial Photograph Interpretation:
  - Earthworks and stonework; Soilmarks and cropmarks
- Using Aerial Photographs:
  - Types, characteristics and sources of aerial photographs
  - Using a stereoscope
- Mapping from Aerial Photographs:
  - Manual transcription
  - Mapping using a computer rectification program
  - Landscape analysis using air photo mapping
- Satellite/remote sensing
  - types of satellite images and visibility
  - how to enhance the visibility of features.

The part of the school we were looking forward to the most was of course the flying, and we have our organizers to thank for finding such a suitable location for the flying school because our hotel was less than a 20 minute drive from the local Cengiz Topel Airport which was to be our base of operations.

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¹ marko.cekovic@gmail.com
³ AARTS 2012 Workbook
The work in the airfield was also divided into two segments: Dave MacLeod was supervising (holding our hands and subtly encouraging us not to think about airsickness) the students in the aircraft during the reconnaissance, and on the ground Darja Grosman explained to us with strong but gentle arguments the importance of a comprehensive database of all the photos taken during the flight, a job made easier with the use of Gianluca Cantoro’s small software. After all the flying was done we can safely say that Mr. MacLeod’s boasting, of our aerial archaeology school being the first one without the need for sick bags, was well grounded (no pun intended).

At the end of our training we all came to agree that the time spent doing aerial survey has really shown us how a simple change of perception can have a profound influence on our understanding and interpretation of the landscape and the traces of human activities hidden in it. We also learned first hand how difficult it is to make a truly good and useful aerial photograph. I believe that from now on we won’t be so quick to judge other people's work and will appreciate the hard work and effort that goes into, not only making good photographs, but also building a good, reliable and useful database for all the data collected.

We all took away something different from our experience in the air above Koaceli, but the one thing we all share: we can’t wait to get airborne again.
Forthcoming workshop and conferences

High resolution satellite imagery - the magnifying glass for science

University of Bern, Switzerland
8th – 10th of November 2012

The workshop on high resolution satellite imagery will serve as a platform to exchange experience and discuss best practice rules for utilization of earth observation satellites. Contributions from earth sciences and archaeology are particularly welcome. Details, etc: http://www.hi-res.unibe.ch

Archaeology from Aerial Photographs

12th – 18th February 2013
University of Bamberg, Germany

This ground-based workshop will introduce participants to uses of aerial photographs for archaeological research and conservation. Interactive sessions will guide students through ways of seeing information on aerial images to enable students to use their acquired experiences from fieldwork, etc to understand what can be identified on aerial photographs

Further details and contact addresses from:
http://uni-bamberg.academia.edu/JohannaDre%C3%9Fler/Papers/1886474/Archaeology_from_Aerial_Photographs_-_Workshop_Bamberg_Feb_2013

Archaeological Prospection 2013

10th International Conference on Archaeological Prospection

Austrian Academy of Sciences, Vienna
May 29th – June 2nd 2013

On behalf of ISAP and AARG the conference shall cover the entire spectrum of methodology and technology applied to the detection, localization and investigation of buried cultural heritage (aerial photography, airborne laser scanning, hyperspectral imaging, near-surface geophysics, data processing, visualization and archaeological interpretation).

Young researchers are invited to join the conference on a reduced conference fee.

Information, call for papers, etc is available at the conference website: http://ap2013.univie.ac.at/

Conference topics are:
  o Archaeological feedback
  o GIS and prospection
  o Integrated prospection approaches
  o Interpretation and presentation
  o Processing and visualization
  o Technical aspects (poster submissions only)
Four photos taken from a balloon over Berlin in the infancy of aerial photography

Ole Risbøl1 & Susanne Kaun
NIKU - Norwegian Institute for Cultural Heritage Research

Historical aerial photos kept in archives are to a great extent an untapped source which is little exploited by archaeologists and others interested in cultural history. One of the eight key objectives in the European Union-funded project ArchaeoLandscapes Europe is “Securing the better exploitation of existing air-photo archives across Europe by researching, assessing and publicising their potential for heritage interpretation and landscape conservation”. In the autumn of 2011 an online survey was accomplished in order to gather information about archives of aerial photos with a potential for archaeological and landscape research. In Norway the survey form was sent to all kinds of archives, museums, mapping authorities, municipalities and so forth – altogether about 700 institutions. So far we have not had the opportunity to go through the survey material systematically but one of the responses caught our attention in such a way that we wanted to have a closer look at the information we got. Preus Museum reported that they did not have any large collection of aerial photos but a few Second World War aerial images with unspecified origin and motive as well as a few other European, Canadian and American photos – all together about 30 shots. More interesting, they also reported the presence in their archives of four photos taken from a balloon above Berlin in the 1880s. The early date made it interesting to examine these photos, the motives and their biography more closely.

Preus Museum is the national museum of photography in Norway which administers large collections of Norwegian and international photography, albums and other kinds of images as well as cameras and other technical equipment of importance to the historical development of photography. The four balloon photos are part of a large collection of photos, books, magazines and correspondence that once belonged to a German professor Dr. Albert Narath. His collection was bought by Preus Museum in 1972 and was moved to the museum after his death a few years later. Dr. Narath was born in 1900 and was affiliated to the Institute for Applied Photochemistry at Technische Hochschule Berlin-Charlottenburg (now Technische Universität Berlin) from the mid-1920s to his retirement in 1965. In addition he worked as an engineer at the company AEG participating in the development of sound film. His scientific production covers a great number of articles about sound film and scientific photography and he published a book called “Physik und Technik des Tonfilms” together with Dr. H. Lichte in 1941. We have not managed to clear up how the balloon photos ended in Dr. Narath’s collection; the only connection is that some of the balloon photo motives are from Charlottenburg – the same Berlin district where the Technische Universität Berlin is situated.

Balooning

The first time a balloon took a person up in the air was October 12, 1783 when Pilâtre de Rozier was lifted a few metres in the air in a hot air balloon constructed by the French brothers Montgolfier. In the following days and weeks he made still new elevation records and on November 21 he carried through the first balloon journey in history when,

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accompanied by Marquis d’Arlandes, he took off from Paris and flew across the river Seine where they landed after a 25-minute journey. In this initial phase hot-air balloons were used but they were very soon challenged by balloons filled with hydrogen. Despite some fatal accidents in this pioneering period ballooning continued to grow in popularity. The first manned gas balloon trip was made in December 1, only a few days after de Rozier and d’Arlandes’ world famous milestone in the history of aviation. In the years that followed balloon voyages were carried out in more European regions and countries (Milan/Italy 1784; Scotland 1784; England 1784; Spain 1792; and the United States 1793). The first balloon journey from German soil was made by the Frenchman Jean-Piérre Blanchard who took off from Frankfurt on October 3 1785. The first German balloon pilot was Friederich Wilhelm Jungius who made a 50 kilometre journey from Tiergarten in Berlin to a place called Müncheberg near Frankfurt an der Oder on September 16 1805. He lived from 1771 to 1819 and worked as a professor in mathematics at the Friederich-Wilhelm-Gymnasium which was situated in Kochstrasse not far from Tiergarten. He made more balloon trips in the years to come, mainly with scientific purposes. His last journey was carried out in 1810, nine years before he died allegedly from the strain that ballooning at high altitudes inflicted on him. In the following years ballooning was occasionally carried out either as amusement for rich Berliners who paid for diversion or with some kind of scientific purpose connected to meteorology, practical physics tests, and so forth.

We do not know what the purpose of the voyage was when the photos dealt with in this paper were taken. The first aerial photo in history was taken from a balloon in 1858 over Paris almost 20 years after the invention of photography, but it was not until the 1880s that it became a more common activity to take photographs when ballooning. The exact date of the four Berlin photos are not known but the dating ca. 1886–87 is written on the back of three of the photos and ca. 1880 on the fourth, indicating that these are from the early stages of aerial photography (more about this issue below). It is also worth mentioning that the sentence Ballonaufnahme v. größter Seltenheit (balloon photos of highest rarity) is written on the back of all the photos.

We know about at least three balloonists who were active in Berlin in the 1880s and whom furthermore were interested in photography. The first one to mention is Hugo vom Hagen, an officer in the German airship unit who published papers about balloon photography and had a reputation internationally for his high-quality photos taken from the air. Another military man, Captain Georg von Tschudi and also Hans von Siegsfeld, took balloon photos over Berlin in those days and are other potential originators of the photos but the question concerning who actually took the photos remains open. After having a look at the motives we will go into more detail about the dating and origin of the four photos below.

The Berliner motives (Fig 1, 5, 7, 11)
In this section we have chosen a few sites, monuments and places of particular historical interest that are given a certain focus. Many of these sites were chosen because they have been subject to changes since the photos were taken and as such are interesting with regard to the development of Berlin.
Fig 1a: Photo 1. See the extent at Google Maps [here](#). North is approximately to the right in the picture. Two notes are written on the paperboard framing the photo: n. Berlin (nach Berlin = direction Berlin) and Charlottenburg aus 1400 m (Charlottenburg from 1400m) (Owner: Preus Museum, unknown photographer).

Fig 1b: View over Charlottenburg
1) Berliner Straße, today Otto-Suhr-Allee
2) Berliner Straße, today Straße des 17. Juni
3) “Am Knie” (by the Knee), today Ernst-Reuter-Platz
4) Bismarckstraße
5) Building site for the Physikalische Technische Bundesanstalt, finished 1887
6) Gas works
7) Technische Hochschule, today Technische Universität
8) River Spree with Kaffenkähne (river boats)

“Am Knie”, today Ernst-Reuter-Platz

“Am Knie” (by the knee) which is today called Ernst-Reuter-Platz was an important road junction in Berliner Straße, an entertainment and promenade street situated near Charlottenburg (Fig 2). Today Ernst-Reuter-Platz links Straße des 17. Juni with Otto-Suhr-Allee, the main east–west axis through Berlin. The area around Am Knie was heavily
influenced by the devastation of the last war and the district has been rebuilt in the style typical of the post-war era. At the same time Am Knie was renamed Ernst-Reuter-Platz in memory of a recently deceased Berliner mayor. Traffic is now regulated by a large multi-lane roundabout and tower blocks are built around the square.

**Fig 2:** Postcard from Charlottenburg showing Bismarckstraße, the square “Am Knie” and Berliner Straße around 1900.

*Kaffenkahn – “Berlin ist aus dem Kahn gebaut” (A saying: “Berlin is built by the river boat“) ii*

What was really conspicuous about the Berliner canals in earlier times was the presence of a dramatic number of Kaffenkähne (river boats) quite densely packed in the river Spree (Fig 3). The Kaffenkähne are lined up in a row like matches. Kaffenkähne are slim (4.6 metre) and as much as 40-metre long cargo boats which were used on the Berliner waterways in order to supply food, coal and building materials to the rapid growing city (Fig 4). Despite their simple and inexpensive construction they managed to carry 30–50-ton loads. For instance, Berlin was supplied with mortar and limestone transported by river boats from the quarries Rüdersdorfer Kalkbergen on canals made for this specific purpose. Not without reason these quarries are denoted “the negative impression” of Berlin which further explains the expression “Berlin is built by the river boat”.

The Kaffenkähne were commonly used on the rivers Elbe, Oder and in the Brandenburger area from the 17th to the 19th century. The name *Kaffenkahn* is due to the up-sweeping stems in front and astern. *Kaffe* means peak and *Kahn* barge. The peaks served as decoration and were also used for navigation. The Kaffenkähne were provided with trapezoid sails, but the boats were also moved with long poles (*staken*) or pulled with ropes from the river banks (*treideln*). The mast was relatively tall and it was not possible to raise and lower it without help; that is why many bridges in Berlin had a mast passage or were constructed as bascule bridges.
Fig 3: Kaffenkahn in Berlin.

Fig 4: Reconstruction of a Kaffenkahn. Copyright Michael Sohn at wikipedia.de.
**Fig 5a: Photo 2.** See the extent at Google Maps [here](#). North is approximately to the right in the picture. Two notes are written on the paperboard framing the photo: *Flora* and *Charlottenburg aus 1480 m Höhe* (Charlottenburg from 1400 m altitude). (Owner: Preus Museum, unknown photographer).

![Charlottenburg aerial view](image)

**Fig 5b: View over Charlottenburg**
1) Schlossstraße
2) Charlottenburg castle with park
3) Berliner Straße, today Otto-Suhr-Allee
4) The amusement park Flora
5) River Spree

**Charlottenburg and the Berliner Straße**

Until 1920 Charlottenburg was a separate town just outside the city gates of Berlin. It was founded in 1705 and proclaimed a town in 1893. In this area the Charlottenburger castle was built at the end of the 17th century. With the annexation in Greater Berlin in 1920 Charlottenburg became its own district and today Charlottenburg is a part of the Berliner district Charlottenburg-Wilmersdorf.
In the 1770s Berliners started to use Charlottenburg as a recreational area and little by little numerous restaurants and beer houses grew up along the Berliner Straße (today called Otto-Suhr-Allee, named after Otto Suhr who was the mayor of Berlin in the period 1955–1957). The Berliner Straße was a broad avenue with lime trees in six rows and magnificent villas. Many of the Gründerzeit-houses (houses from the Founder Epoch) in this district were ruined by bombing raids in 1943. The first track made for horse trams in Germany was laid down in the Berliner Straße in 1859 and connected Spandauer Damm with Brandenburger Tor. It was also here the gigantic amusement park Flora opened in 1874.

The amusement park Flora

The most spectacular attraction along the Berliner Straße must have been the establishment Flora – a large-scale amusement park with a banqueting hall, palm house and park. Ideally located to what was then the site of countess Lichtenaus’ palace, the pleasure ground covered a large area from Luisenplatz and Berliner Straße all the way to the Spree riverbank, Brauhofstraße and Wintersteinstraße. The establishment which was inspired by the Italian renaissance style must have been an impressive place where well-off Berliners could indulge in amusement. The main hall with a floor space of $23 \times 45$ metres with a height of 23 metres and was then the largest assembly hall in Germany. It included, among other things, a stage used for opera performances. The park ground offered a range of different amusement activities, for instance plant exhibitions and penny farthing bicycle rides as well as balloon voyages. Among the guests frequenting Flora we find the imperial family. Flora was built in the years 1871–74 after the sketches made by Johannes Otzen and commissioned by Flora Ltd., a company that was founded by some powerful businessmen who were active in Berlin at that time. The gigantic speculative enterprise was soon to become a deficit project and Flora existed only for about three decades and went bankrupt in 1904. Subsequently the large-scale agglomeration of buildings was demolished and replaced by apartment buildings. Today the Eosanderstraße crosses the area and only the name *Flora Apotheke* (a retail pharmacy) reminds of this former so spectacular site.

Fig 6: The amusement park Flora (1874).
Fig 7a: Photo 3. See the extent at Google Maps [here](#). North is approximately to the left in the picture. One note is written on the paperboard framing the photo: *Berlin aus 1540 m Höhe (von Tegel aus)* (Berlin from 1540 m altitude [from Tegel]). (Owner: Preus Museum, unknown photographer).

![Photo 3](image)

Fig 7b: View over Berlin toward east
1) Frankfurter Allee
2) Berliner Stadtschloss (City Palace)
3) Avenue Unter den Linden
4) Brandenburger Tor
5) Reichstag under construction
6) Siegessäule (the triumph pillar) placed on Königsplatz, today Platz der Republik
7) Lehrter Bahnhof, today Berliner Hauptbahnhof (Central station)
8) Tiergarten with Charlottenburger Chaussee, today Straße des 17. juni
9) River Spree
10) Railway tracks

**A view to the east**

Photo number 3 gives a broad but misty view of the Berliner hinterland to the east. The straightforward street in the mid-upper part of the picture is the Frankfurter Allee which by then was situated outside the city boundary of Berlin. Today Berlin has expanded much...
further to the east in those areas which appear as fields and woods in the upper part of the photo.

**Lehrter Bahnhof, today Berliner Hauptbahnhof (central station)**

Berlin once had 11 main railway stations all situated outside the city which until the mid-19th century was encircled by a customs wall. One of these stations was Lehrter Bahnhof which was between 1868 and 1951 the terminal station of the railway line between Berlin and Lehrte, a town near Hannover (Fig 8). Lehrter Bahnhof was situated in the northern part of Berlin, north of the river Spree, near Hamburger Bahnhof and Humbolthafen. The Lehrter Bahnhof was a magnificent building constructed in the style of French neo-renaissance with a richly decorated facade. It was heavily damaged during the Second World War and demolished in the late 1950s. Today Berliner Hauptbahnhof is located in the same area and is the most important railway junction in Berlin. It is a modern building designed by the architect Meinhard von Gerkan.

![Fig 8: Lehrter Bahnhof (1879).](image)

**Siegessäule (The triumph pillar)**

The protected monument Siegessäule stands at Großer Stern, a huge road junction in the middle of Tiergarten, and is one of the most well-known landmarks in Berlin. The pillar, designed by Heinrich Strack, was erected from 1864 to 1873 as a national monument in remembrance of the Prussian-German victory over Denmark, Austria and France. On photo number 3 (Fig 7), however, it stands at its original place on Königsplatz, today called Platz der Republik – the site where the parliament buildings were built (Fig 9). The Siegessäule has, since 1895, marked the end of the 750-metre long Siegesallee, a parade street that ran all the way to Kemperplatz. Originally the pillar was 50 metres tall and crowned with a bronze sculpture depicting Victoria, the Roman goddess of victory. As a result of the transformation of the architectural layout of the capital city during the national socialist regime, the Siegessäule was moved to Großer Stern in accordance with the plans made by Adolf Hitler’s chief architect Albert Speer. The Königsplatz would then be a more open place with room for marching and the Siegessäule was in the way of this. In connection with its relocation, the height of the pillar was increased to today's height of 66.89 metres. After the Second World War the Siegesallee was eliminated.
The Berliner Stadtschloss (The Berlin City Palace) was the headquarters for margraves and Kurfürsten von Brandenburg for centuries and later for the kings of Preußen and the German emperor (Fig 10). The castle was established in 1443 and situated on an island in the river Spree – the Spreeinsel, now the city centre of Berlin. In the 18th century the palace was rebuilt into a splendid Baroque palace designed by Andreas Schlüter and Johann Eosander von Göthe. The castle was heavily devastated during the Second World War and in 1950 demolished in accordance with a resolution made by the DDR regime in favour of a demonstration square called Marx-Engels-Platz. Later on in the 1970s the Palast der Republik (the Palace of the Republic) was built at the former palace square. It accommodated the DDR parliament and also served various cultural purposes. After an extensive asbestos removal the palace was demolished in the years 2006 to 2008 in order to make room for a reconstruction of the original city castle.
Fig 11a: Photo 4. See the extent at Google Maps [here](#). North is approximately to the upper left corner of the picture. Two notes are written on the paperboard framing the picture: Belle-Alliance-Platz (Belle Alliance Circle) and Berlin aus 1850 m Höhe (Berlin from 1850m altitude). (Owner: Preus Museum, unknown photographer).

Fig 11b: View over Berlin Friedrichstadt
1) River Spree
2) Bethlehem church, destroyed in the Second World War.
3) Jesus Church, destroyed in the Second World War.
4) Construction site for a building from the Equitable-security, finished 1886/87
5) Oranienstraße
6) Markthalle II (also called Lindenhalle)
7) Lindenstraße
8) Friedrichstraße
9) Wilhelmstraße
10) Belle-Alliance-Platz, today Mehring Platz
Belle-Alliance-Platz (today Mehringplatz)\textsuperscript{viii}

Belle-Alliance-Platz was a grand round plaza in the south of Berlin nearby Hallesches Tor (Fig 12). From this circus the traffic was led in three directions: to Wilhelmstraße, Friedrichstraße and Lindenstraße. The circus was established in 1730 in connection with the urbane development of Old-Berlin as the southern end point of Friedrichstraße. The so-called Friedenssäule (The peace pillar) designed by Christian Gottlieb Cantain and Christian Daniel Rauche was raised above a well in the middle of the circus in 1843. The monument was erected in commemoration of the victory over Napoleon in the battle at Waterloo. Belle Alliance was a farm lying near Waterloo and gave its name to the circle which previous to this was only known as das Rondell (the circus). The circus was almost totally destroyed during the Second World War like most of the surrounding neighbourhood. The rebuilding started in the 1960s after plans made by the architect Hans Scharoun led to alterations of street courses in this area and also to a renaming of the circus to Mehringplatz after the writer, politician and Marxist historian Franz Mehring. The Mehringplatz is today a pedestrian-only zone encircled by two concentric rings with blocks of flats indicating the original circular shape. The well in the middle and the Friedenssäule is what is left as a memory of the once so magnificent circus.

Fig 12: Berlin, Mehringplatz. View to Northeast, around 1900.

The balloon voyage and photographing from the air

So what do we know about the balloon voyage/voyages from where the photos were taken over Berlin about 130 years ago? Is it possible to deduce some facts about the journeys without any contemporary written evidence at hand? The motives of the four photos are all from places in Berlin and the points from where the photographs were taken show that the departure most likely took place somewhere in the Charlottenburger district. If the pilot and/or the photographer somehow were affiliated with the Technische Hochschule Berlin-Charlottenburg – as the first known owner of the photos might indicate – this could be a clue.
The Technische Hochschule was situated in the north-western part of the zoological garden (Tiergarten) which is a large park area. That open spaces, such as parks, were preferred departure places for balloon voyages makes Tiergarten as a departure point a qualified guess. The fact that the first manned German balloon trip actually departed from Tiergarten – as did many of the later departures – strengthens this hypothesis. Another guess could be “Flora”, the above mentioned amusement park which was situated just up the road 1.5 kilometres north-west of the Technische Hochschule and which, according to sources, offered balloon journeys for the public as one of its attractions. But if we study the motives of the photos more closely another and more probable story about the voyage can be proposed. Photo 1 (Fig 1a) is more or less a vertical photo taken at 1400 m and might have been taken shortly after the departure. In the right part of the photo we see an open space which seems to be a perfect departure point for a balloon trip. That this might be a correct assumption is substantiated by the presence of four cylindrical installations resembling gas containers. A detailed map of Berlin from 1902 confirms that the cylindrical constructions actually belong to a gas works (Fig 1b: 6) which was situated at this site by the Spree river bank on the lot which today is occupied by the Universität der Künste Berlin. As mentioned above, the first manned balloon voyage in 1783 was done in a Montgolfier hot-air balloon but only 10 days later the first manned gas balloon took off and both lifting principles were in use simultaneously throughout the following century and until the early 20th century when airships and aeroplanes more or less ousted balloons. Thus gas was obviously a requisite when using a balloon not lifted by hot air. When using gas (mainly hydrogen) one had to fill the balloon before take-off and we know that ascents often took place near gas works (see Barber 2005, figure 5 and 2011 figure 3.15). A scene showing the filling of gas balloons at the Berlin-Schmargendorf gas works in 1905 was perpetuated by the artists Philip Braumüller and gives us a good visual impression of this initial part of a balloon trip (Fig 13).
The next photo (number 2, Fig 5a) is oblique and taken from an altitude 80-metres higher than the previous one. The camera’s direction is towards the west where Charlottenburg castle and Flora is captured. After ascending another 60 metres the camera was pointed towards the east and an oblique shot – the third one (Fig 7a) – was taken over a large area north and east of Tiergarten showing a large part of Berlin and its surroundings. The fourth and last photo (Fig 11a) was taken at an altitude of 1850 metres and depicts the streets and blocks of houses north of Belle-Alliance-Platz. This photo is slightly oblique but with a more acute angle than the previous two. The four photos form a sequence that makes this course of events probable. The fact that the direction of the sunlight (from south-south-west) is the same on all four photos supports this assertion. However, the state of vegetation disputes that photo 4 is taken at the same time of the year as the others. Foliage is clearly visible on the fourth photo as opposed to the other three which show more or less naked trees. This makes us conclude that the first three photos most likely were taken on the same voyage and that number 4 is from another journey conducted at another time of the year.

But when did these voyages take place? The dating of 1886–87 and ca. 1880 are written with pencil on the reverse of two of the photos (1 and 4 respectively) and are probably a later addition compared to the other remarks written with ink – a fact that makes this dating a bit uncertain. Still, studying the motives more closely has brought us closer to an answer to this question. The empty lot on photo 1 that we anticipate is where the departure took place was built-up in connection with the establishment of the Physikalische Technische Bundesanstalt in 1887. The white square visible on the northern part of the site indicates building activities. Furthermore, the size and the shape of this square is identical with one of the still-existing buildings at the Physikalische Technische Bundesanstalt which is still situated there. Thus photo 1 must have been taken in 1887 or the year before. On photo 3 we have identified the absence of the church Gnadenkirche which opened in 1895 – a terminus ante quem for this photo. On the same photo we also see the Reichstags building under construction. The foundation stone was laid down in 1884 and the building began to be used in 1894. A terrestrial photo from 1888 (Fig 14) shows a situation quite similar to the one in photo 3 (Fig 7a) with the Reichstag under construction but at a slightly later stage in the building process, it seems.
If we accept that the first three photos form a sequence from the same flight, all these circumstances render probable the dating 1886–87. The presence of Markthalle II (also called Lindenhalle) which was opened in 1886 shows us that photo 4 cannot be older than this. A small white square on the mid-right side of this photo shows a site where an apartment building is under demolition. This is a building on the corner of Friedrichstraße 59–60 and Leipziger Straße 101–102. According to the Landesarchiv Berlin, a building which was ruined during the Second World War was built at this address in 1886/87. On the photo the site of an older building is under demolition and we must assume that it was replaced by a new one straight away. Hence it is most likely that this photo also is taken in 1886 or 1887.

By studying photos 1 to 3 more closely we have tried to line up a probable course of events and made plausible that this took place in 1886 or 1887. This is also a valid date for photo 4. But what about the purpose of taking photographs on this voyage? What is perhaps most evident is the lack of focus on certain sites or monuments. Even though more historical sites like castles, churches, parks and so forth are visible on the photos, none of them is focused like one would expect if the purpose was to make good postcard-like illustrations. The motives look a bit random which perhaps mean that the photographer just wanted some photos taken from aloft, testing how photographing works from the air? The 1880s was still the infancy of aerial photography and the sources tell about the difficulties that were faced when taking photos from balloons in terms of vibrations, movements and so on which made it a challenge to take photos of good quality. How different landscape parts would appear on the photos in different weather conditions was also unknown and called for a lot of testing.

**Aerial photos as an archaeological-historical source**

To observe a landscape from above – whether a rural landscape or a city landscape as in this case – was a totally new possibility that came with the invention of the balloon. Prior to this man had a limited range of spectacle perspectives. To be able to have a bird’s view of the ground must have been fascinating (and still is) and from the beginning ballooning became an amusement adventure for those who could afford it. To observe the world from above gave a breadth of view that was entirely different from the perspective people were used to and could in itself instigate such journeys. In addition, ballooning allowed a lot of new scientific tests and experiments driven by the urge to make new discoveries or find out more about the state of things – now from higher altitudes. Soon cameras were taken up in the air and the world documented from above.

Aerial photos constitute a source of great interest to archaeologists, historians and other groups with interests in cultural history. Aerial photos are mostly used for recording crop and soil marks by archaeologists who take the initiative to take these photos and control the whole process involved. In addition to this, historical aerial photos taken in their millions for different purposes throughout modern times are kept in archives and represent a source so far given little attention by archaeologists. Many of these hold the potential for discovering sub-surface structures of archaeological interest. This is not the case with these Berliner photos which not are interesting crop and soil mark wise but, first and foremost, as a valuable source for documenting change in a built-up landscape.

The brief presentation above of some selected sites and monuments – and how these have changed throughout the period subsequent to the taking of the photos – is only the tip of the iceberg. Obviously the images hold a lot more information to be deduced from a thorough
study of the photos. Berlin was a rapidly growing city with a population figure doubling from 1 to 2 million in the 30 years from 1880 to 1910. Obviously this urban development resulted in a high level of building activity with the city spreading out to new areas but also resulted in a rapid change in the existing structure plan. From 1910 onwards the population continued to increase and more than doubled to 4.5 million until it decreased dramatically during and right after the Second World War. The heavy bombing of Berlin during the Second World War resulted in the destruction of most of the city leading to a severe change in the layout of the city in the rebuilding process succeeding the war. The subsequent division of Berlin into a western and an eastern part after the war also had consequences for how post-war Berlin developed. All these circumstances have marked the development of this city and historical photos – both from the ground and from the air – are important documentation of this progress. For archaeologists focusing on recent parts of the history and working with, for instance, garden or industrial archaeology aerial photos can also provide detailed information of importance not available through other sources. The four photos dealt with here give a unique bird’s-eye glimpse into parts of Berlin in the years 1886/87.

Acknowledgements
We would like to thank photo archivists Hege Oulie and Arne Langleite at Preus Museum for informing us about the Berlin balloon photos and for kindly providing us with digital copies of the photos and for information about their origin. Landesarchiv Berlin by Michael Albrecht helped us with the dating of a building which we really appreciate. We would also like to thank Jörg Schmallfuß and Martin Brennigk at the Stiftung Deutsches Technikmuseum Berlin, Historisches Archiv for their obligingness concerning the oil painting by Braumüller. Also thanks to our colleague at NIKU, Sigurd Nesse, for helping us with adjusting and enhancing the photos.

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Things on strings and complex computer algorithms

Kite Aerial Photography and Structure from Motion Photogrammetry at the Tulul adh-Dhahab, Jordan

Jochen Reinhard

What to do when your next excavation project needs proper photographic overview documentation but the topographic situation of the site does not allow access by either fire trucks or cherry pickers or similar heavy equipment? Helicopters are of course way too expensive, because there's no budget to speak of. And to make things even more complicated your excavation site lies in Jordan, only about 10 kilometers east of the Israeli border – anything RC controlled will probably lead to serious trouble, an autonomous UAV is nearly unthinkable. Well, you can always reuse your childhood toys...

In 2008 I was offered the opportunity of participating in an excavation project led by Prof. Dr. Thomas Pola of the Technical University of Dortmund, Germany. The project focuses on interdisciplinary research on the Tulul adh-Dhahab: two neighbouring peaks in the lower Zarqa river valley in north-western Jordan. Inhabited since at least the Bronze Age until Late Antiquity they comprise a wealth of archaeological traces, numbers of which are still observable on the surface (Gordon, Villiers 1983; see also http://en.wikipedia.org/wiki/Tulul_adh-Dhahab, where some of the aerial imagery shot during the 2008 campaign is also included). The yearly field campaigns, since 2011 directed by Hannelore Kröger, take place on the topmost plateau of the western tell: the Dhahab el-Gharbiyeh site. To overcome the photographic problems described above, Kite Aerial Photography (KAP) seemed to be the best solution because of its simplicity, inconspicuousness and transportability. Basically all you need is a kite, a camera and a clever device called a rig which holds the camera, keeps it steady and points it in the desired direction.

Lifting cameras with kites is not a new idea, first successful images were obtained by the French Arthur Batut in 1888 (Batut 1890; Autha et al. 1988). Although Batut already considered an application of this new technique to archaeology, the first archaeological use of Kite Aerial Photography was initiated by Sir Henry Wellcome and executed by A. G. Barrett at the 1912/13 campaign at Jebel Moya in Sudan (Addison 1949, e.g. 6) – hey, we are nearing the centenary jubilee! Since its invention, researchers have made regular use of Kite Aerial Photography in various scientific disciplines including archaeology (Żurawski 1993; Tielkes 2003; Verhoeven 2009, 237 f.; Aber et al. 2010, 103-109; Bibi et al. 2012). It has never been a common standard method, but lately the emergence of digital photography has led to a new rise in scientific kiting.

Having decided to give KAP a try I set out to get the necessary equipment: a 9 megapixel digital compact camera, a FUJIFILM FinePix E900, was already in my possession – and I was mercilessly willing to risk smashing it on the rocky slopes of the Jordanian hills. (My wife maybe was not so willing, but in the end the camera lived to tell the tale!) As the kites of my childhood seemed a bit on the small side for lifting a camera I bought an Invento HQ Flowform 4.0. The equipment was completed with 100 meters of kite line, a winder and a

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Brooxes Servo-BEAK rig kit (http://www.brooxes.com; http://www.kapshop.com). This device hangs from the kite line by a gimbal contraption made of string called a picavet and triggers the camera via a small servo actuated lever pushing on the shutter release button about every 10 seconds (Figure 1). Adapting to the needs of the Tulul adh-Dhahab excavation the equipment was intentionally kept as simple as possible. Of course the last bits of equipment arrived only days before departure so prior testing had to be cancelled, everything had to be “tested on the job”.

And the testing went well: Even the very first KAP flight yielded good imagery! In only five flights of about 10 to 25 minutes (plus a few unsuccessful low wind attempts) we succeeded in getting vertical shots of all our trenches during and at the end of the dig and an additional number of low oblique images documenting the work on the ongoing excavation (Figures 2-3). The application of the method is simple: Start the kite, let out line until it flies safely, put

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3 Many hearty thanks to Christiane Kühne, Christian Günther, Gerke Sedat and to my wife, Miryam, for helping to navigate the rig above the wanted motif, sorting out kilometers of tangled line and rescuing rig and camera more than once!
on the camera rig, let out more line until the rig reaches the desired flying height, adjust rig position by walking around (a second person functioning as a navigator is very helpful here) and let the intervalometer do the work while enjoying flying the kite.

The surprisingly good and easily achieved results encouraged me to pursue the project. When I attended the dig the next time in 2011, my equipment had been thoroughly upgraded: The old camera had been replaced by a 10 megapixel Canon PowerShot G11 with image stabilisation running a CHDK intervalometer script (http://chdk.wikia.com/wiki/CHDK), the rig had been fitted with legs and little ball-bearing blocks to provide less friction for the picavet lines and the old flowform kite was substituted by a Gomberg Dazzle Delta kite with a higher flying angle and far less pull. Together with a better routine these improvements resulted in a considerably lower percentage of unusable pictures and a distinctively better image quality. Additionally a Holux M-241 GPS logger was flown on the kite line directly above the rig to get a rough measurement of the camera location during flight.

The wind situation at the Tulul adh-Dhahab is generally very stable in late summer: Only occasionally a light eastern morning breeze is strong enough for getting the 500 or 650 grams of KAP rig airborne and taking a few photos, but normally it dies down shortly after sunrise. A bigger kite or less rig weight could help here. During the day the wind usually is quite calm, so taking pictures with a high sun is hardly possible. But around late afternoon a moderate to fresh – and sometimes even strong – western breeze very reliably sets in, blowing up the Zarqa river valley. This wind is perfectly suited for getting low altitude aerial shots of virtually all archaeological remains on the hill. At this time of the day, shadows already grow longer, but the less harsh evening light is much better suited to photography than the midday glare.

The camera height usually varied between 20 and 60 meters, allowing for a field of view between 19 x 25 and 56 x 75 meters with ground sample distances of 6.8 to 20.5 mm respectively – but of course a kite’s flying height is only a matter of line length. The cameras were set to the highest JPEG quality setting and minimal focal length as more detail is much easier achieved by flying lower than by zooming in. To counteract motion blur all pictures were shot in shutter priority mode with the fastest shutter speed possible while keeping the ISO value low. The images provide an excellent addition to the ground based excavation photography as they supplement unique vertical and oblique perspectives and give a great overview otherwise only obtainable with much higher costs and hassle. Even after the advent of autonomous camera carrying drones Kite Aerial Photography proved to be a valuable tool in the aerial archaeologist's tool kit – and it’s fun, too!

Another bonus is that KAP is not only valuable for documentation purposes: While shooting verticals of the ramparts at the tell’s northwestern flank the kite suddenly pulled sideways in a gust – and inspecting the

Figure 4 - Accidental KAP survey. A previously unknown structure could be detected after a 2008 KAP flight in the upper right of the image. The rampart's tower can hardly be seen at ground level below the footpath leading to the hilltop.
photos back in the camp I discovered to my surprise that the image taken just in this moment showed a rectangular structure previously unknown to us (Figure 4). The structure, the ruin of one of the rampart’s towers, is almost impossible to see at ground level between the rubble of the tumbled down walls and several robber trenches, even if it's existence and position is known. So kites are also valuable tools for survey work – on a different scale to aircraft of course.

The valuable images of the KAP flights above the Tulul adh-Dhahab were improved even further when I by chance stumbled upon the Agisoft PhotoScan software (http://www.agisoft.ru/; Verhoeven 2011; Verhoeven et al. 2012a; 2012b): Suddenly the superfluous pictures recorded by the intervalometer trigger weren't superfluous at all – suddenly they provided necessary overlap for the Structure from Motion algorithms PhotoScan uses to calculate its 3D point clouds! And the unordered, unsystematic vertical kite imagery seemed to be ideal for this kind of photogrammetry as the lightly swaying kite provides imagery with different angles only slightly deviating from nadir but providing lots of overlap (Figure 5 left and middle). Virtually every single picture of a successful KAP flight can be incorporated in the final 3D model. Georeferenced to the excavation grid this model provides not only a precise DSM of the trenches and their surroundings but the professional version of PhotoScan also allows the export of true orthophotos, too!

However the use of Agisoft PhotoScan at the Tulul adh-Dhahab is not limited to kite aerial imagery: In 1953 the British Hunting Aerosurveys Ltd. flew an aerial photography mission over western Jordan (e.g. Kennedy, Bewley 2009, 70). The resulting imagery, some 4,000 vertical images in 1:25,000 scale, is held in the ‘Royal Jordanian Geographic Centre’ in Amman. The ‘Aerial Photographic Archive for Archaeology in the Middle East’ of the University of Western Australia (http://www.apaame.org/) is in possession of a set of copies and thankfully provided me with the necessary high resolution scans. PhotoScan had no problems calculating the camera positions and produced a nice DSM of the Tulul adh-Dhahab area. Astonishingly the flight path of the Huntings aircraft nearly 60 years ago could be reconstructed with ease (figure 5 right). What makes these DSMs valuable for archaeological work is that by using current SfM software we are able to reconstruct a topography now severely changed by erosion and bulldozers.

And while you have read all this, the author hopefully is again flying one of his kites over the Jordanian desert – of course with a camera dangling from its line...
References


What a difference a year makes: Preliminary DART datasets from Cherry Copse, Cirencester

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Introduction
The DART Project (www.DARTproject.info) has been running for over two years and data from our collection program are beginning to be collated and analysed. The fifteen month data collection program is now nearing completion, with monthly geophysical, monthly spectroradiometry, and hourly in-situ Time Domain Reflectometer (TDR) and temperature recordings captured on both clay and free draining sites at Harnhill (Cirencester, UK) and Diddington (Cambridgeshire, UK) (Fig. 1). The main goal of the DART Project is to further understand the dynamics of archaeological feature detection (in this case a ditch) using these techniques, especially over the more traditionally difficult soils such as clays. It is envisioned that the project will aid the future detection of archaeological features by providing a better insight into optimal detection times and techniques.

One of the greatest factors affecting the successful detection of archaeological features is the ever-changing climatological conditions, which affect the subsurface environment. Such aspects greatly affect the success of archaeological prospection (both geophysical and aerial). Over our study period, the British weather has been less than ordinary. The summer of 2011 was one of the hottest summers on record, and it was followed by an equally record-breaking warm and dry winter, causing drought conditions in January and February. This unprecedented hot and dry spell was then followed by the wettest April to June period ever recorded, making our survey year one of the most unpredictable and extreme years on record. This has meant that the DART project has been in the fortunate position of being able to record extremes throughout the survey, and has a dataset indicative of both drought and saturation conditions on both fine grained and freely draining soils.

The basis of this article is to look at how the dramatic weather affected the ground-based (geophysical and TDR) data from one of our free-draining sites, and to assess how these responses may impact the aerial based data. The datasets represent two snapshots in time from a site near Cirencester named Cherry Copse. Data from June 2011 and June 2012 are used to represent how different the response has become over the last year. The ditch at Cherry Copse is cut directly into freely draining coral limestone bedrock, and contains a loamy-silt ditch fill (Fig. 2).

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Fig. 1: Cherry Copse, Harnhill, Cirencester. Showing cropmark in 20cm spatial resolution orthophotography and the areas of investigation. Imagery acquired for the project by the Geomatics Group on the 28th June 2011.
Geophysical Survey

The geophysical location was guided first by a fluxgate gradiometer survey to locate the ditch, from which a 10m x 10m earth resistance survey grid was established (Fig. 3). Measurements were taken at a monthly interval using a multiplexed-twin probe instrument configuration using a Geoscan RM15 data logger, with multiplexer attached to a PA20 frame (more details on the geophysical methodology can be found at http://dartproject.info/WPBlog/?p=861).

The earth resistance data collected with a twin-probe separation of 0.5m have an estimated depth of investigation of between 0.25-0.5m, and prior to analysis, was minimally processed (de-spiked to remove erroneous measurements caused by poor ground contact). A visualization was

Fig. 2 The excavation of the ditch at Cherry Copse with vegetation-mark in the background (image available from Flickr: http://www.flickr.com/photos/49053676@N02/5633654389/sizes/l/ under a Creative Commons licence provided by Robert Fry).

Fig. 3 Fluxgate gradiometer survey over the ditch at Cherry Copse with associated earth resistance survey area outlined in red
developed to examine the lateral feature response between different surveys at different times (in this example June 2011 and June 2012). Data transects running approximately perpendicular to the feature (an E-W orientation) were taken across each grid to delineate lateral variation. Twenty transects are available in a 10x10m grid. To determine heterogeneity in feature response these transects were added together and averaged. The results, along with the associated box and whisker diagram for each averaged data point can be seen in Fig. 4.

![Earth resistance measurements over the ditch at Cherry Copse between June 2011 and June 2012](image)

Fig. 4 Graph showing the differing earth resistance response caused by the ditch at Cherry Copse over the same area at different times of the year

The difference in response from the two surveys is rather dramatic, the hot summer of 2011 showing a clearly marked ditch response, although a much higher (noisier) spread of data. Some of this variation can be explained by variations in the feature width and orientation. The background response decreased by around 55-60 ohms (Ω) between the two dates, suggesting that the soil composition (a mix of solid particles, moisture content and gas) altered significantly over the course of the year. The magnitude of the anomaly caused by the ditch also reduced significantly. Although still visible in the dataset, the difference between the ditch and background readings were only around 5Ω in the latter survey, compared to a contrast of around 18Ω in June 2011. Given the extreme weather between April and June, it is likely that the 2012 readings show the soil in a state of near saturation, where both the ditch fill as well as the bedrock surrounding it have become similar in their moisture content as to leave little trace of the anomaly at all (Carr 1982, Cott 1997, Hesse 1966, Scollar et al. 1990). These sources indicate that the moisture content is by far the biggest factor, and will be discussed here.

Temperature profiles were also recorded and will be discussed in later publications.

**Moisture Content**

In situ time domain reflectometer (TDR) sensors are installed both within the ditch fill and around the ‘natural’ soil surrounding the ditch at Cherry Copse. TDR is a widely used electromagnetic method of monitoring both geophysical parameters of the soil (relative dielectric permittivity (RDP) and conductivity) as well as water content, through a variety of mixing models. A full discussion of the operation of TDR will not be provided here, but more detailed information can be found on the project blog (http://dartproject.info/WPBlog/?p=1512).
Fig. 5 Calculated volumetric moisture content throughout each survey day from two TDR probes placed at depths between 20-30 cm within the ditch-fill and the ‘natural’ at Cherry Copse.

Data taken from two probes at the monitoring station have been taken from the same days the monthly surveys were carried out, and the RDP has been converted to volumetric water content (VWC, \( \theta \)) (Fig. 5) using the model suggested by Topp et al. (1980):

\[
\theta = 4.3 \times 10^{-6} \times \varepsilon^3 - 5.5 \times 10^{-4} \times \varepsilon^2 + 2.92 \times 10^{-2} \times \varepsilon - 5.3 \times 10^{-2}
\]

Where \( \theta = \text{VWC} \) and \( \varepsilon = \text{apparent permittivity} \).

A depth of 20-30 cm was chosen for analysis, as owing to the shallow nature of the soil outside the archaeological feature (c. 25-30 cm), this provided a compromise between a depth representative of the earth resistance measurement volume and contiguous data between the ditch and ‘natural’ soil. Additional probes from the same depths and contexts showed values consistent with the data presented here (within 1% VWC). As expected, the data for 2012 show a much higher volumetric moisture content, supporting the idea of lower earth resistance. However, the overall contrast in VWC between the ditch and the surrounding soil seems to be greater in 2012 where the ground saturation is highest.

**Discussion of the ground-based techniques**

At these two dates, there appears to be a definite correlation between increased moisture content of the soil and the decline in the earth resistance anomaly for the ditch feature at Cherry Copse. However, in June 2012 there appears to be a larger contrast in the moisture content data between the natural and the ditch fill than in 2011. This appears to contradict the earth resistance data, which show greater contrast in 2011 during the dry period (further discussion below). Another unusual feature of the TDR dataset is that in June 2012 the ‘natural’ topsoil appears to have a larger moisture content than conditions within the ditch, inverting from the original order in 2011.

During times of saturation, the topsoil is more water-retentive than the material making up the ditch-fill. This would usually result in an inversion of the ditch response from a lower resistance anomaly to a higher resistance anomaly; however although the contrast has considerably reduced, the feature remains lower resistance with respect to the background. This can potentially be explained by the volume of soil sampled by resistance measurement. The TDR probes measure a much smaller volume of soil in a known location, and are therefore more specific, whereas the earth resistance method employed relies on a larger volumetric measurement with greater uncertainty in the induced...
measurement location. This means that each measurement of earth resistance is potentially a combination of many different archaeological contexts, which, off the ditch, will include not only the topsoil, but also a considerable influence from the shallow bedrock across the site. This can explain why the ditch anomaly, although significantly reduced, remains a lower resistance anomaly overall.

Another factor to consider is that the earth resistance technique is dependent not only on moisture content and temperature, but also the availability of soluble ions to carry charge. Conductivity increases with VWC at low overall water contents but the rate of increase can slow as water content increases before stopping in many soils at c.20-30% VWC (Smith-Rose 1933). An increase in water content, beyond the point where available ions exist, will therefore not necessarily increase the conductivity any further, and it is possible that this saturation level has been reached in June 2012. Further investigations into these values will be based on both laboratory measurements and the multi-temporal sensor readings.

**What does this mean for aerial detection?**
Both the earth resistance and TDR readings indicate there is a significant difference throughout the year in terms of the physical properties (such as the ability to retain moisture) of the ditch and natural soils. This has obvious implications for aerial detection as it will cause a differential growth of plants. This will result in variations in the vegetation canopy, both in terms of biomass and stress and vigour seen in foliar biochemistry. The contrast detected in the earth resistance data during 2011 is mirrored by vegetation-marks formed by the ditch in a mature, pre-senescent spring wheat crop in airborne hyperspectral and orthophotographic imagery captured on the 28th July 2011 (see Fig. 1). During 2012 the land was under pasture, and this contrast is less visible. This may be caused as much by changes in land management as changes in soil moisture. Interestingly the TDR data during 2012 indicate that the ditch is actually drier than the surrounding background. This is contrary to what we would normally expect at this time of year. However, there is still contrast expressed in the vegetation above the ditch. This contrast is subtle in the visible spectrum (see Fig. 6), but is much stronger in the near infrared portion of the spectrum (see Fig. 7). These contrasts are consistent with the conditions for growth over the archaeology being more favourable, leading to the formation of a vegetation mark.

This indicates that the current basic model of vegetation mark formation being dependent on soil moisture as the most important factor is an oversimplification, and that there are other factors at play. Nutrient content, compaction and temperature all also play a significant role. In this instance the shallow topsoil (c. 0.2m) over fragmented bedrock is probably contributing to the formation of the vegetation mark as, even though the background is wetter, constraints on the depth of the roots will limit the availability of water to the plants. Further analysis will validate this and explore how these factors influence the expression of archaeological features as vegetation marks.
Conclusion
Contrast in heritage remote sensing is ultimately a product of soil properties and environmental conditions. Understanding these phenomena is critical for future airborne and ground based heritage detection strategies: particularly those that use novel sensors. It is clear that moisture content, although a big factor in this changing response may affect different techniques in different ways - and is not the only factor in the detection of archaeological remains. This ongoing analysis will continue through the next year as the DART project moves from the data collection phase into the analysis phase.

References


Pickering’s packages: some thoughts on cursus monuments

Kenneth Brophy

Preamble
I have a guilty secret. In July 1999, as I neared completion of my PhD I received a package from Jim Pickering. Although the material he sent me had been put together with great care and a good deal of thought, I did not respond to it. Indeed when I finally came around to dealing with it, so much time had elapsed that it felt rude, and too late, to do anything about it. And so the package remained, propped up beside my computer, occasionally thumbed through, but never answered. And of course it became definitively too late when, in October 2004, Jim Pickering died. At that time I knew little about the man. In fact Jim was ‘the most eminent amateur archaeologist in Leicestershire’ (Hartley 1999, 225), an active aerial photographer responsible for the discovery of thousands of cropmark sites in the English Midlands from the late 1940s (cf. Webster & Hobley 1964; Pickering & Hartley 1985). His aerial experience began as a Spitfire pilot in the Second World War, and he went on to be a leading figure within the British aerial archaeology scene at times flying in tandem with Derrick Riley and Arnold Baker (AARG conversation 1994; Barber 2011, 218-9). He was a man of strong conviction on the difference between aerial archaeology and air photography, contributing an occasional column for the now defunct Aerial Archaeology journal entitled ‘Pickering’s Piece’ from the late 1970s (Figure 1). At the time I knew none of this however and the package remained where it was. Fast forward to 2010, when I began work on a book on Scotland’s cursus monuments (early Neolithic rectangular enclosures, Brophy forthcoming). My PhD, completed in 2000, had been on this same topic, and as it happens this too was the theme of Jim’s package that he sent to me all those years ago. Reflecting now on the contents of that package, it seems the right time to seek a sort of academic closure, and so this short paper is my attempt to do so and to acknowledge Jim Pickering’s package. This, then, is my Pickering’s peace.

I met Jim only once, at a Prehistoric Society event in 1997, but it seems that his letter to me was provoked not by that fleeting meeting (where I gave a lecture on cursus monuments), but rather by a short article I wrote for British Archaeology magazine (Brophy 1999a). This short piece focused on the possible purpose of cursus monuments, and inevitably ventured into the realms of educated speculation with more than a hint of postprocessualism. In my conclusion I suggested that cursus monuments were a sort of ‘cultural’ response to rivers. ‘Rivers are both life-giving and dangerous places. They provide water, and food, and a means of transport; they also drown, and flood. The effect of a flood can be double-sided, destroying crops, but leaving nutrient-rich soils behind when the waters subside. I would suggest that cursus monuments were perhaps built as a response to this paradox of nature’ (Brophy 1999a, 7). This idea would ultimately be downplayed in my thesis, and more recently Roy Loveday

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(in his excellent book on cursus monuments) suggested that, ‘there are problems with this [theory]’ (2006, 136) summing up Jim Pickering’s personal response to me. So it was with some trepidation that I once again went through the contents of Pickering’s package, as I was pretty sure that my ‘phenomenological’ approach would not be his cup of tea. And indeed so it proved.

**The Brophy package**

The package itself was an innocuous brown A5 size jiffy-type padded envelope (Figure 2). It was addressed to me at my place of employment at the time, RCAHMS in Edinburgh, although my name had been added in blue pen, while the rest of the address was in black ink.

![Figure 2: The envelope that held Pickering’s package to the author.](image)

Either the envelope was set aside for me, with the address added later, or my name had been forgotten and written into a space left for it. Curiously, RCAHMS had been added to the address, off-set to the right, perhaps an afterthought or initially forgotten, and the postcode was similarly off-set. Deliberate, firm pen strokes underlined RCAHMS and Edinburgh. I was referred to, in a rather old-fashioned touch, as ‘Esq[uire]’. The package was sent at a cost of 50p, and post dated 8 / 7/ 1999 at 9.15pm, stamped SHROPSHIRE & Y CANOLBARTH which I found confusing as the former is in England, the latter in Wales. This confusion was compounded by the little personalised ink stamp on the rear of the envelope, giving Jim Pickering’s name, address and phone number (although the area dialling code was not legible). He was based in Leicestershire, Hinckley to be precise, separated from Shropshire by Birmingham and at least an hour’s drive.
The envelope contained the following:

- One handwritten letter on squared, A4 foolscap style paper (Figure 3)
- Three pages high quality A4 letter paper with typed script (Appendix a)
- Seven plastic pouches created from A4 ‘pockets’, each containing one or more photographic prints, and sealed with a small sticker labelled A–G, circled, in red ink, and a second sticker was appended to each with a geographic location written in red ink
- A selection of paper clips

The letter (Figure 3) was addressed to me, formally, as Mr Brophy, and dated June 22 1999, suggesting some period of time elapsed between commencing the letter and getting to a post office (16 days). The address was stamped on the letter in the top right-hand corner, although a different ink stamp had been used to the one on the envelope exterior as they contained roughly the same information, but in a different layout. The letter was written in blue ink with flowing handwriting. The purpose of the letter was directly addressed from the off: ‘material in this envelope relates, I hope, to your article in British Archaeology May 1999, on cursuses’. The letter moved quickly to a discussion of pit-alignments, and then a question, directly to me (which remained unanswered sadly): ‘Is there evidence of round or long barrows in seeming association with the cursuses of Scotland – in particular in the area of the terminals?’ Then to the crux of the letter, which I took to be personal criticism, or at least misgivings, about my British Archaeology article. ‘I think it is necessary to omit references to mystic rituals or ceremonies for which there is no evidence’. The letter concludes with one of the main sources of my guilt: ‘I’d be grateful for the return of the photographs, but make any copies if you wish. I do not retain any copyright’. And with this legal nicety, Jim Pickering signed off with a line underscoring his extravagant signature, probably not suspecting that he would never see his photographs again. (Although other correspondence with ‘professionals’ had been equally fruitless for Jim (AARG conversation 1994).)

The attached text (reproduced in full at the end of this article) consisted of three A4 pages of typescript with no formal heading, a reflection on the role of aerial photography in finding cursus monuments and similar rectangular enclosures. Analogies for cursus monuments from within and outwith Britain were explored, drawing on sites recorded from the air by contemporaries: Otto Braasch; Roger Agache; Arnold Baker. The tone of the text was of a draft paper, perhaps intended for publication somewhere, maybe AARGnews, and a basis for short notes published elsewhere (e.g. Pickering 2000). The typescript had occasional corrections, with tiny white patches (presumably dispensed from a correction tape roller) on the text re-typed over (possibly using a different typewriter), although one correction was made in blue pen. Various key phrases relating to illustrations were underlined in red ink, while A–G (circled, in red ink) had been added to the left side of the text which could be cross-referenced to the packaged illustrations (see Table 1).

The text began with this sentence. ‘The article by Kenneth Brophy on cursuses requires a wider context than Scotland. The variety of cursuses is far greater and their distribution far wider’. (In the second sentence, the original ‘or’ had been changed to ‘of’ using a blue pen.) This seems to me an entirely reasonable standpoint to take, although my British Archaeology paper was always intended to be about sites in Scotland (the brief given to me by the editor of the magazine) with a wider remit taken by the likes of McOmish (2003) within the same
Figure 3: The Brophy letter
through Pickering was thinking out loud (which is, indeed, the tone of much of the text). Postholes, within landscapes recently cleared of woodland, was not followed up, almost as though Pickering was thinking out loud (which is, indeed, the tone of much of the text).

Table 1: The contents of the ‘pockets’ within the Brophy Package. Writing on the back of the photographs is replicated in CAPITALS

<table>
<thead>
<tr>
<th>Pocket</th>
<th>Label</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SMALL STANDARD TYPE ENGLAND</td>
<td>Photocopied map centred on Dorchester-on-Thames (Map 36 from Benson &amp; Miles 1974, 67) with cursus monuments coloured in yellow and ‘bank barrow’ in blue. Photocopied map centred on Drayton (Map 33 from Benson &amp; Miles 1974, 61) with cursus monument coloured in yellow. 6 x 4cm colour print of un-named cursus cropmark. Label on back ‘Lincolnshire’. Written on back ‘489/91 TF085068’ (Figure 4). 5 x 7 colour print showing same cursus from a wider perspective. Written on back (on sticker) ‘(421) TF085068 SF1714-7 14.07.79’</td>
</tr>
<tr>
<td>B</td>
<td>COCHEM</td>
<td>Two 5 x 7 colour prints of a possible German cursus cropmark. Both dated 02-07-93 on the front of the print, and both with stickers on rear. One has two stickers, ‘MOSELLE TREIR’ and ‘E506 CURSUS AS IN THAMES, AVON AND TRENT VALLEYS’. The other has one sticker, ‘E506 MOSELLE (TREIR) CURSUS’ (Figure 5).</td>
</tr>
<tr>
<td>C</td>
<td>Blank</td>
<td>5 x 7 colour print showing what looks like a stone circle and ‘avenue’ or cromlech setting, within a ‘shield-shaped’ earthwork enclosure. Dated 08-06-94. Stickers on rear say ‘HUNGARY’ and ‘475-8 08-06094’ (Figure 6). 5 x 7 colour print showing a possible earthwork rectangular enclosure. Dated 06-06-94, with 447-6 hand-written on back in black pen. Sticker says ‘Hungary – North of the Danube, where most sites in poor soils are prehistoric. Possible ditches lower right’ 5 x 7 colour print showing a rectangular enclosure, possibly still a slight earthwork, in scrubby field. Dated 05-06-96. Sticker on rear says ‘T.103 05-06-96’. 4 x 6 colour print showing cropmarks of two small sub-rectangular enclosures and a ring ditch. Dated 03-06-96. Written in back in faded black ink ‘S68’.</td>
</tr>
<tr>
<td>D</td>
<td>BALUCHISTAN</td>
<td>4 x 6 colour photograph taken of a page from an unknown book showing a black and white air photo of a series of earthworks and mounds, with caption ‘Fig. 16. A CONTINUATION OF FIG. 15. IN THIS CAN BE SEEN THE LONG WHITE STONE AVENUE, A VERY LONG RECTANGULAR STRUCTURE AND TWO WHITE CIRCLES’ (Figure 7).</td>
</tr>
</tbody>
</table>
Figure 4 (above): A Lincolnshire long enclosure or cursus (from Brophy package pocket A).

Figure 5 (right): The Moselle cursus (from Brophy package pocket B).

Figure 6 (above): Unusual ‘shield-shaped’ setting with internal standing stones, Hungary (from Brophy package pocket C).

Figure 7: The Baluchistan image from Brophy package pocket D.

Figure 8: Possible ploughed out long barrow or mound with adjacent round barrows, from Hungary (from Brophy package pocket E).
The text also existed as a commentary on the associated images within the seven pockets (contents summarised in Table 1). Cursus monuments in the Thames and Trent Valleys (such as around Drayton and Dorchester-on-Thames) were discussed as ‘a standard type of cursus’ and illustrated with ‘coloured-in’ maps within pocket A using yellow and blue coloured pencils. More recently, Loveday (2006, 28-30) has characterised such cursus monument as Bi sites, that is, with square ends and ‘precisely laid out’ (rather than having wobbly or irregular boundaries, common for instance in Scotland). Interestingly, in pocket B, two prints showed a very convincing looking cropmark cursus of almost identical form photographed presumably by Jim (perhaps on a flight with Otto Braasch) at Cochem, Germany (Figure 5). Loveday (2006, 199-200) cites only two convincing ‘Euro-cursuses’, neither of which are in Germany, suggesting this may be a significant (but unpublished) discovery. The extension of the cursus class distribution was something Jim was very interested in, stating elsewhere, ‘I’ve recorded a cursus in the Avon Valley and one in the Moselle – I think this is important and interesting’ (AARG conversation 1994, 33 and see Pickering 2000). Another possible cursus in the Rhine Valley is also noted, but not named or illustrated. Pocket C contained images of several rectangular monuments from Hungary, some earthworks, although none of these convince me
as being ‘cursiform’ but rather small rectangular enclosures of some kind. This discussion is followed by a slightly stranger analogy, based on ‘narrow’ linear monuments of the Thames valley such as North Stoke which is likely to be some kind of ploughed out ‘bank barrow’, that is, an extremely lengthy long barrow mound (Loveday 2006, chapter 7). Here, Pickering draws parallel with a stone-defined avenue in Baluchistan, West Pakistan (Figure 7). This discussion ends with this sober comment: ‘Postulated connection with Sanskrit and Indo-European languages is premature’ and probably outwith the scope of a discussion paper on cursus monuments.

Pickering’s discussion then turned to the relationship between cursus monument / long enclosures, and round mounds / long barrows. This spatial arrangement has long been recognised, most explicitly around the Dorset cursus (cf. Barrett et al. 1991) but also within other cursus monuments in England and Scotland (Loveday 2006; Brophy 1999b). Pickering suggests a similar relationship also existed in Hungary, between long barrows and round barrows or mounds (Figure 8). Connections between long enclosures and round mounds are flagged up in the cropmark record of France and Warwickshire as well. The potential connections between various ‘long enclosures’ is re-iterated, and it is notable that Pickering himself was responsible for the initial discovery of many such sites, including small cursus monuments, in the Midlands in the 1960s (cf. Webster & Hobley 1964; Loveday & Petchey 1982; Loveday 2006, 54). Pickering’s postulated European dimension - in terms of both long enclosures and cursus monuments – is perhaps the most intriguing and tantalising aspect of his paper however and Jim was aware of the significance of these discoveries. Remarkably, research into cursus monuments in mainland Europe remains largely undeveloped to this day.

A second package
While researching this paper, Roy Loveday told me that he had also received a package of cursus related material from Jim Pickering. Roy kindly passed on to me a typed letter from Pickering, sent to him, and dated 11th October 1993 (Appendix b). Roy was also sent a series of 16 prints of various sizes, and a further four aerial photographs that had attached tracing paper with a rough tracing of the relevant cropmark, mostly cursus-like sites (details of which are summarised in Tables 2 and 3). Roy noted (pers. comm.): ‘Jim’s photos. Some labelled others frustratingly not but with the exception of the Moselle cursus the unlabelled are almost exclusively Hungarian sites if I recall his comments correctly’. The sites recorded on the various air photos have close similarities, and indeed in some cases are the same photos sent to me, while the October 1993 letter alluded to some of the themes covered in the longer paper sent to me in 1999. The letter sent to Roy was two pages long, with a handwritten note at the top in blue ink that reads: ‘I wouldn’t regard this as an adequate summary of the thousands of sites [unclear] recorded and the much larger number [unclear] seen, but it will have to suffice’. The letter covered some of the key discoveries of cropmarks sites, by ‘Herr Braasch’ in Germany and Roger Agache in France, which had British parallels. Although brief, this was a wide ranging summary, covering Neolithic through to Iron Age themes.
Table 2: The contents of the Loveday package: loose prints

<table>
<thead>
<tr>
<th>Print type</th>
<th>Date</th>
<th>Labels / description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 5 colour print</td>
<td>02-07-97</td>
<td>No label, but recognisable as the Moselle cursus from Brophy Package B</td>
</tr>
<tr>
<td>2 x 4 x 6 colour print</td>
<td>02-07-93</td>
<td>No label, but recognisable as the Moselle cursus from Brophy Package B</td>
</tr>
<tr>
<td>3 x 4 colour print</td>
<td>02-09-84</td>
<td>No label. LBK enclosed cemetery consisting of four rectangular ditched structures</td>
</tr>
<tr>
<td>2 x 4 x 6 colour print</td>
<td>Undated</td>
<td>Labelled 'Hungary'. Series of parallel rectangular ditched structures of different lengths - cemetery</td>
</tr>
<tr>
<td>4 x 6 colour print</td>
<td>20-06-95</td>
<td>No label. Cropmarks of a long barrow and two round barrows on the same alignment. Same site in Hungary as shown on two photos in Brophy Package E but this image is slightly out of focus</td>
</tr>
<tr>
<td>4 x 6 colour print (trimmed)</td>
<td>Undated</td>
<td>No label. Rectangular enclosure with very narrow ditch (Figure 9)</td>
</tr>
<tr>
<td>3 x 5 colour print</td>
<td>23-06-95</td>
<td>No label. Sub-rectangular enclosure with very narrow ditch</td>
</tr>
<tr>
<td>3 x 4 colour print</td>
<td>09-06-94</td>
<td>No label. Rectangular enclosure with very narrow ditch</td>
</tr>
<tr>
<td>4 x 6 colour print</td>
<td>08-06-94</td>
<td>Labelled 'Hungary'. A stone circle and 'avenue' or cromlech setting, within a 'shield-shaped' earthwork enclosure. Larger version of the same print included in Brophy Package C</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>02-07-93</td>
<td>Labelled 'E479 Treis long barrows + ring ditches' Note in pencil added 'More likely horse lunging circuits'. Air photo shows three sets of marks, two forming sub-rectangular shapes, one a circle. They look 'worn' into the crop</td>
</tr>
<tr>
<td>Pair of 5 x 7 colour print</td>
<td>19-06-97</td>
<td>One labelled ‘STOTTENHEIM LKR Erfurt’ and ‘A48 THURINGIA GERMANY’, the other ‘A44 STOTTENHEIM NEOLITHIC’ and ‘GERMANY LKR ERFURT’. Small sub-rectangular enclosure and widely spaced, irregular, roughly parallel ditches</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>29-06-93</td>
<td>Labelled ‘C405 Reisa (Elbe). Chamhead ?. Massive cemetery or geological effect? Small rectangular simple ?’. Trapezoidal barrow and a lot of pits.</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>29-06-93</td>
<td>Labelled ‘REISA (ELBE)’ and ‘C409A Multivallate fort similar to many in Scotland and Wales’. Looks more like a Neolithic causewayed enclosure (Figure 10)</td>
</tr>
</tbody>
</table>

Figure 9: Rectangular enclosure, presumably not in England, from Loveday package.

Figure 10: Reisa causewayed enclosure, from Loveday package.
Table 3: The contents of the Loveday Package: prints with tracing attached

<table>
<thead>
<tr>
<th>Print type</th>
<th>Date</th>
<th>Labels</th>
<th>Tracing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 x 7 colour print</td>
<td>18-06-95</td>
<td>‘D136’ and ‘N Hungary’</td>
<td>Narrow rectangular enclosure and what seems to be a strip field boundary between two fields</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>18-06-95</td>
<td>‘D169’ and ‘Hungary’</td>
<td>Curving trackway or field boundary (an earthwork not a cropmark)</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>20-06-95</td>
<td>‘E139’ and ‘N. Hungary’</td>
<td>Rectangular enclosure, looks like a strip field</td>
</tr>
<tr>
<td>5 x 7 colour print</td>
<td>18-06-95</td>
<td>‘D132’ and ‘N. Hungary CURSUS?’</td>
<td>Parallel ditches (earthwork), rather close together, and a round and a sub-rectangular enclosure</td>
</tr>
</tbody>
</table>

The lucky dip
The packages sent to Roy and I offer an interesting insight into the passionate views of Jim Pickering on the use of aerial photographs, the interpretation of cropmarks and their formation, and the relationship between cropmarks and excavation. Pickering was very keen to emphasise the role of the ‘cropmark’ as a primary source of evidence if correctly interpreted. For instance, the identification of the Cochem cursus was viewed as a valuable means to culturally connect central Europe and Britain, while cropmarks indicated British ‘Western Neolithic’ type monuments were identified along the River Elbe. ‘It is the spatial distribution of sites of different types and periods that adds a new dimension to archaeological evidence’ (Pickering in the Loveday letter). Geographical distance meant little to Pickering if the cropmarks looked the same: ‘But it’s near enough – it’s the Avon and the Moselle as far as I am concerned’ (AARG conversation 1994, 33). In contrast, Pickering had little faith in excavation being able to make sense of sites recorded as cropmarks. The vast numbers of images recorded across Europe, with countless thousands of cropmark sites, could only ever be randomly sampled by excavation, a ‘lucky dip’ (Pickering in the Brophy letter). Here Pickering despaired on the attitude of archaeologists, unwilling to engage with cropmark evidence without the certainty of excavation. ‘Excavations continue to be the main preoccupation of archaeologists’ (Pickering in the Loveday letter). This was a recurring theme of Pickering’s, the professional archaeologist falling back on ‘conventional evidence’ through ‘ritual’ excavation” (Pickering 2001, 37). The Pickering solution? More telescope, less microscope. Make more use of air photos by looking at them and synthesising the material they contained more widely via trained air photographers, and let excavators get on with what they normally do in a separate sphere, careful not to confuse vertical with horizontal stratigraphy (AARG conversation 1994; Pickering 2001).

Having looked at the context within which Pickering was working, and what he believed, I now view the packages that Jim sent with ambivalence. On the one hand I can appreciate the scope of Pickering’s ambitions for aerial reconnaissance, that it exposed the sense that every field is potentially an archaeological site, and that the simple shapes that cropmarks make can be recognised and compared no matter where they were found. On the other hand, as a ‘ground’ archaeologist, who has excavated many cropmark sites (e.g. Brophy 2008) and takes cropmarks as a form of evidence very seriously, I cannot agree that the telescope and microscope cannot work in tandem. My study of cursus monuments fundamentally depends on cropmark evidence, and with the engagement of excavation another (hidden) dimension to these sites can be revealed. This is not about questioning the validity of cropmarks, it is adding depth to them. It is absolutely the case that academic archaeologists have not engaged
with cropmarks nearly as much as they should have. But it is surely incumbent on those who gather the thousands of cropmark sites referred to by Jim to engage more closely with excavators and others who make sense of the past: this should be a dialogue, not a divide.

Perhaps the most compelling thing about these packages and the images they contain is the basic excitement inherent in all oblique images showing cropmarks. The mystery of what lies beneath, the potential impact one photo can have on our understanding of whole time periods, and the sense that past lives and actions have left traces that are now transmitted to us through the crops. These are packages of potential, hinting at connections and differences, leads to follow, loose ends to tie up. It is a pity I did not reflect on this more clearly at the time when I received my package. The thoughtful correspondence from Jim Pickering, and his carefully collated package, deserved a better response from me. I hope by bringing his letter and some of his images to publication that I have gone some way to making amends.

Acknowledgements
Many thanks to Roy Loveday for his help with the second package and passing on some Pickering anecdotes. I am also grateful to Dave Cowley for looking over an earlier version of the text, and to Rog Palmer for his encouragement and suggestions. Finally, of course, I am grateful to Jim Pickering for sending me my package, and only sorry I did not act upon it sooner, and return the contents to him.

References
Brophy, K forthcoming. Reading between the lines: the Neolithic cursus monuments of Scotland, Amberley.
Loveday, R 2006. Inscribed across the landscape: the cursus enigma, Tempus.
McOmish, D 2003. Cursus: solving a 6000 year old puzzle, British Archaeology 69 (March 2003)
Appendices
a. The Brophy text

The article by Kenneth Brophy on cursuses requires a wider context than Scotland. The variety of cursuses is far greater and their distribution far wider.

With every crop mark there is a geological caveat. Sites on marginal land are less likely to have been destroyed by later ploughing. Conversely, they might have been concentrated on marginal land to avoid using land of better economic potential.

Cursuses were first recognised because of their size, but elongated enclosures are now known from crop marks down to sizes as small as long barrows with square, curved, or rounded ends. Perhaps one difference between long barrows and small cursuses is that the latter has an entrance or entrances.

The largest cursus, on Cranborne Chase is more than 10Km long, but how could this have been laid out and dug in a landscape with trees or the roots of recently felled trees. This same problem applies to pit alignments in that evenly sized and spaced pits could only be dug in landscapes cleared of standing timber. A far wider foliage context than river flood plains.

The Thames Valley and Trent Valley contain what may seem to be a standard type of cursus between 500 and 1000K(approx.) long, but one of similar size has been recorded by Otto Braasch at Cochem in West Germany (between Trier and Koblenz), above the E. Mosel flood plain, and another in the Rhine Valley on the flood plain. Other probable cursuses recorded by him in Hungary have not yet been confirmed by excavations.

In the Thames Valley, another type of cursus is very narrow (approx. 5 metres) and has been recorded at both Dorchester and North Stoke. A similar shape in association with rings has been recorded in Baluchistan (West Pakistan) but created by stones instead of ditches and banks. Postulated connection with Sanskrit and Indo-European languages is premature.

There is a significant relationship between long barrows and round barrows in Hungary in that many long barrows (mostly still
standing) have a round barrow sited approximately in line with their length. Some have round barrows at both ends. Some are in close proximity to the end of the barrow and some are up to 100 metres away. There is a similar relationship between some cursuses and ring ditches in Britain.

There are a variety of constructions of long barrows in Hungary. Some have square ends, some curved ends and some rounded ends. Some seem to be of simple construction and others built up in sections, but this may have been caused by internal divisions or by digging into the barrows. Elongated enclosures larger than long barrows also can have square, curved or rounded ends. Some have one curved or rounded end and one square end. Otto Braasch has recorded many scores of such monuments in Hungary.

A long enclosure with rounded ends and associated ring ditch has been recorded by Roger Agache in Picardy, and Arnold Baker has recorded one similar at Charlecote in Warwickshire, to quote two examples that can be verified. The Charlecote site was excavated some 30 years ago with inconclusive results except that it contained breaks in its ditch that suggested entrances.

It is suggested that using the examples quoted above the definition of "cursus" should be applied to far more sites than the large ones of the Thames Valley, Trent Valley and Scotland and that their survival as crop marks is due more to their sitting on marginal land than any connection with rivers and a neolithic preference in Britain for living on flood plains. In any case, a characteristic of neolithic monuments on marginal lands of all kinds is a paucity of contemporary occupation evidence.

I have included an illustration of a small cursus like elongated enclosure near the centre of England in North Warwickshire. It is parallel to a boundary ditch of unknown provenance and has in proximity a small square enclosure. Their survival is due to protection by regenerated woodland, only recently cleared. Within a radius of 2km, there are ring ditches, pit alignments and enclosures assumed to be pre-historic. Field walking has collected flint tools. I suggest that such land use is more
likely to have been normal than exceptional, but evidence of it is more likely to have been erased in successive cultivations of continued land use. Associating archaeological sites of any kind with mystic rituals for which there has never been the slightest evidence is of little value.

The accumulation of seven decades of new information from the air has been mainly ignored by archaeologists except as a "lucky dip" for excavations. Other forms of archaeology are required to make use of the air information, but archaeologists have not developed ways of doing so.
b. The Loveday letter and text

Recent discoveries by aerial archaeologists in Europe (mainly from the exploitation of "crop marks") are of significance to British archaeology. Whilst interpreting crop marks is not an exact science, they identify many types of sites and some of their areas of distribution and permit comparisons of different areas for sites that are similar and for those that seem native to only limited areas.

Through the generosity of Herr Otto Braasch of Schwäbisch Gmünd, during the last ten years several British aerial archaeologists have been able to accompany him on some of his wide ranging reconnaissances that identify the current areas of volatile crop mark development, followed by more intensive recording at times when most information is visible. Removal of the "Iron Curtain" has permitted extension of this surveillance into countries where such research was previously forbidden.

In the last 10 years, Herr Braasch has accumulated three quarters of a million air photographs in Central Europe of archaeological interest. It is impossible to commence a research with this quantity of continually expanding material. Similarly in Britain, the seventy years accumulation of aerial evidence has long expanded beyond any comprehensive grasp by archaeologists. Some of those who have been able to accompany Herr Braasch for a number of years have the advantage of a progressive absorption of the new archaeological evidence in both Britain and Europe.

There is no possibility of all the sites already known being excavated in hundreds of years. It is necessary to ask however whether the continued excavation of what can only be a random and statistically insignificant percentage of sites contributes as much understanding of the past as archaeologists believe. Excavation made, and makes, no prediction of the new aerial evidence. Unless new ways can be found to use it, it can only continue to be disregarded.

Treating the crop mark evidence as a primary source of information, different hypotheses can be constructed from those of excavated or documentary evidence. The aerial research is concerned with areas, both geological and multi-period cultural. It is the spatial distribution of sites of different types and periods that adds a new dimension to archaeological evidence.

It can be reported, for instance, that along the newly available west side of the River Elbe between Magdeburg, Halle Leipsic and Dresden there are many sites that from their types would be defined in Britain as "Western Neolithic". They include henges, long barrows, chambered tombs, ring ditches, tumuli, long houses and avenues of pits. This area also has a large number of pit alignments. Until recently pit alignments were thought to be unique to Britain. As in the Britain, the alignments in Sachsen are found in seeming association with both Neolithic and Iron Age sites. This same area has many types of large ring earthworks with single, double and multiple ditches. Some should be described as oppida. There are limited areas of field systems defined by ditches with associated ring ditch cemeteries and these latter can be tentatively interpreted as Celtic Hallstadt.
In East Germany there is no Roman layer of evidence that separates the late prehistoric from the early medieval, but cemeteries with mixed types of graves suggest an overlap from the Celtic period into the one identified by grubenhäuser.

In contrast with the above Elbe area, sites along the south side of the River Moselle between Trier and Koblenz are mostly in "parish" or "estate" size forest clearings. Roman type "villas" have been recorded in many of these clearings and many have cemeteries of square graves of varying sizes from the large "garden graves" to what in Britain would be described as Iron Age square barrows. It is probable there are both villas and cemeteries in all clearings. These are defined as Celtic La Tène.

This area also contains a cursus of the type recorded in the Thames, Avon and Trent Valleys. (The first such cursus recorded outside Britain). There are some ring ditches and long barrows with oval ends. The latter similar to one in Britain at Charlecote (Warwickshire) also with a cursus context.

The La Tène character of the area can be linked to the Romano-Gallic villas of Picardy recorded by Roger Agache. These are mostly larger in size and more numerous than those so far recorded in the Moselle context but garden graves and square barrow are few in Picardy, and in isolation not in cemeteries. Square barrows in Britain are also few and far between, except in Yorkshire.

There are however long barrows with oval ends in Picardy similar to those of the Moselle and Charlecote.

In neither the Hallstatt or La Tène areas defined above are there areas of square fields defined in British archaeology as "Celtic fields". Nor is there much evidence in the Elbe and Moselle contexts of Iron Age hillforts similar to those of Southern Britain and Wales.

Also typical of Iron Age and Roman Britain are the hundreds of rectangular enclosures of many types and wide dispersion, some of which can be related to elements of erased field systems. There are many (but not all) with resemblences to some of the sites recorded by Roger Agache in Picardy, where for geological reasons, relationships of these enclosures to earlier and later periods are more obvious than in Britain.

The above analysis only relates to limited aspects of limited areas which, as in Britain, will continue to provide new crop mark evidence for decades. Not even a start has yet been made applying similar surveillance and recording to most of Europe, let alone Russia, China and India. Excavations continue to be the main preoccupation of archaeologists, but their selection whilst the main body of information available for selection is disregarded, is less than a scientific investigation into life in the past.

In the aerial evidence of the areas briefly reported there are indications of some of the movements and interchanges of culture that were stages in the development of what we call "Western Civilisation". Is for instance the dichotomy between round and square barrows a matter of language or chronology. Is the distribution of neolithic or Celtic portable artefacts more a matter of trade then the emigration hypothesised by excavated evidence?

Aerial evidence can pose such questions and at the same time indicate where excavations can seek the answers.
Aerial reconnaissance of maritime landscapes in Scotland – some preliminary observations on context, methodology and results

Dave Cowley¹, Jonathan Benjamin² and Colin Martin³

Introduction and aims

This paper reports on a programme of aerial reconnaissance of maritime landscapes pursued over the last six years in the west of Scotland. With over 12,000 km of coastline and a heavily indented, jagged western seaboard, Scotland’s maritime cultural heritage is rich and diverse (Figure 1). However, the inventories of known sites are often sparse and regionally varied. Thus, while recorded shipwrecks have been added to the national database (cf. Martin 1998; Historic Scotland 2009a; Wessex Archaeology 2011), the shallow water, shoreline and near-shore areas that comprise the maritime landscape as defined here are relatively poorly represented in heritage inventories (Historic Scotland 2009b). The programme of aerial reconnaissance is making major contributions to creating reliable systematic inventories that inform both an understanding of the ways in which these coastal, intertidal and marine landscapes may have been used by people in the past as well as their effective management for the future. This is especially important as many of these environments are fragile and threatened by coastal and sub-tidal erosion. The aerial approach has developed alongside a growing awareness of the importance of these cultural remains; the individual missions, or projects, form part of a wider goal within an overarching research framework (cf. ScARF 2012).

Figure 1: The maritime aerial reconnaissance described here was been undertaken along the western seaboard of Scotland from Cape Wrath (A) to Argyll (B) and extending west to St Kilda (C), though the principles have also been applied more sporadically in exploring the rest of the coastline, for example in Orkney and Shetland to the north. The image on the right is taken looking south along the typically jagged coastline with Handa Island in the foreground and the mountains of the northwest Highlands beyond. (Left – © Google Earth; right – DP093045, © Crown Copyright: RCAHMS)

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3. colin@arnydie.demon.co.uk (Morvern Maritime Centre)
The origins of the maritime aerial survey programme lie in the systematic survey work undertaken by Colin Martin and his colleagues at the Morvern Maritime Centre in Argyll, drawing on fieldwork around the coast and on and under the water, supplemented by documentary research, in an integrated approach which seeks to understand how these environments were used in the past. To these approaches aerial reconnaissance was added as an effective means of primary reconnaissance and recording, both at detailed site level and in wider landscape context. In 2006, recognising how under-represented these remains were in the national database, Dave Cowley of RCAHMS began a more extensive reconnaissance of the entire western seaboard, and this quickly developed into a partnership with the Morvern Maritime Centre, with flying undertaken collaboratively within the overall framework of the RCAHMS aerial survey programme. This partnership has continued over subsequent years and since 2010 has been strengthened by the addition of Jonathan Benjamin, who has a particular interest in coastal and prehistoric sites that, due to rising sea levels, now exist in the intertidal and marine environments (i.e. the integration of terrestrial and submerged prehistoric landscapes) – all conducted with good humoured patience from pilot Ronnie Cowan. These developments have drawn together expertise in aerial, ground and underwater reconnaissance and recording to excellent effect, with a synergy of varying experience, knowledge and perspectives that inform reconnaissance and recording. The integration of differing perspectives in the aerial survey process is also reflected in connections to research projects, community engagement, and management, aspects of which are discussed below.

The legislative and management context

The Marine (Scotland) Act 2010 has created a new, over-arching framework for the Scottish Government to manage its coastline below high water mark to 12 nautical miles from shore (after which the UK government has shared responsibility). Unprecedented national responsibility for sustainable development and overall management has generated a proactive stance from the Scottish archaeological community, which has been directly involved in providing advice, suggestions and ideas to policy makers; this has allowed legislation to be updated and will directly impact upon marine heritage in Scotland for decades to come (cf. Historic Scotland 2009b; Wessex Archaeology 2011; ScARF 2012). Coupled with increased growth in marine development, due mainly to offshore renewable energy sources, the emphasis on heritage management in this environment has grown considerably in Scotland with an expansion in interest in maritime archaeology, marine geophysics and submerged prehistory alike. One expression of this growth is Project Adair, a recently (2011) launched partnership between RCAHMS and Historic Scotland. This aims to enhance and promote information on the marine historic environment, providing the best possible information to industry, government, academia and the wider public. The project will collate various datasets, develop links to amateur enthusiasts and professionals with an interest in marine archaeology, and present marine heritage information in as accessible a way as possible.

Presently-available information on the maritime environment in Scotland is highly variable. For example, the RCAHMS database holds records on over 1500 wrecks, and nearly 18000 losses of vessels in the period from the 17th century to the present day, as well as an extensive collection of photographs, drawings and reports. There are currently 15 underwater historic wrecks with a statutory designation under laws administered by Historic Scotland (www.historic-scotland.gov.uk/index/heritage/wrecksites/scotlands-historic-wrecks.htm). Work to archaeological standards has been conducted on several. Three have been investigated in association with the National Museums of Scotland (a Cromwellian warship off Duart Castle in Mull (1653); the
nearby wreck of the 5th-rate warship Dartmouth (1690); and an unidentified early 17th century vessel with Iberian associations off Kinlochbervie in Sutherland). The Armada ship El Gran Grifon (1588) off Fair Isle and the Dutch East Indiaman Kennemerland (1664) have been excavated in conjunction with Shetland Museum. However, while wrecks have proven to be a relatively small component of sites recorded from the air, the aerial approach to the maritime environment is creating a vast amount of complementary information, including all manner of features produced by fishing, transport networks and settlement.

Maritime aerial reconnaissance: methodology

The scope of maritime archaeology encompasses shallow water, the shore, and the immediate coastal hinterland. Thus it includes submerged features, generally in water up to 5m in depth, the inter-tidal zone, which can be extensive, and coastal settlements and structures within 200-300m of the shore. It should however be recognised that these boundaries are arbitrary and do not inhibit the recognition of connections without spatial limitation. Accrued experience suggests that the maritime environment is best explored as the principal focus of activity on flights, rather than as a mixed economy of covering both inland and coastal areas. This is partly because of the sheer density of remains in some areas, but also because of the need to focus on understanding these landscapes and their particular challenges as a whole.

Aerial reconnaissance in a light aircraft over western Scotland presents many practical challenges, including tremendously variable weather, a relative lack of airfields and extensive water-crossings, for which a twin-engine aircraft is required. The mountainous areas of the northwest coast, for example, can generate potentially lethal ‘mountain wave’ winds that can force an aircraft to the ground, while severe turbulence at low level (i.e. 700-1000m) may require higher operational heights. Above all it requires care, patience and a respect for a potentially dangerous environment.

Many factors impact on visibility of features, beyond the obvious ones of vegetation on land, where bracken, for example, can completely mask even large features. In the water, visibility of features depends to a large degree on a smooth surface, but is also heavily dependent on the strength and direction of sunshine, as a bright sunny day can create reflections off the water surface that block visibility around part of an orbit. The character of the sea-floor is also important as, unsurprisingly, a light sandy floor will show up features better than a rocky, irregular seabed. Water level can also be a significant factor, but not with a simple equation of low water being better. Indeed, on a rocky seabed overgrown with kelp or other underwater vegetation, shallow inundation can sharpen interpretation as it helps to lift vegetation off man-made structures on the foreshore, rather than draped across and obscuring, and in some cases hiding them entirely (similar to the aforementioned bracken on land). For many of these reasons it is our practice to structure reconnaissance with the aircraft following the shoreline from a short distance offshore, and make tight orbits to closely observe particular locations. Because reconnaissance is linear and conducted along a narrow and well-defined band, systematic coverage of long stretches of coastline can be obtained on a single well-planned sortie. The effectiveness of this approach increases as familiarity with an area and the disposition and type of remains develops. The relative visibility of underwater features on block-coverage vertical photographs has not been systematically assessed as yet, but on the basis of some cross-referencing there is a surprisingly low strike rate from the verticals. Perhaps this is a case where observer-directed reconnaissance and the ability to orbit a target to see it best are paramount in achieving good returns.
A crucial part of the reconnaissance process is the insights it gives to understanding how these past landscapes worked (and were worked). In essence the challenge is to escape a modern perception of the sea as a barrier, and appreciate how it may have connected communities that now appear remote and difficult to access. This is especially true of the heavily indented western coastline, where access by road is very limited and where travel by foot is arduous. However, by boat these same locations may be relatively close and, weather allowing, easy to access. Thus, while it would be fatuous to suggest that the light aircraft emulates the experience of these maritime landscapes in a past where boats were a standard means of transport, we have found that it has helped us to appreciate the connectivity of many maritime areas, and to escape our modern ‘landlubbers’ view of water as a barrier.

Results, context and integration

To date we have spent some 105 hours in the air, taken thousands of photographs (of which analysis and cataloguing is ongoing) and recorded many hundreds of sites for the first time. The sites are recorded into the RCAHMS national database (www.rcahms.gov.uk) where they support heritage management and research. This programme has demonstrated its effectiveness in placing sites on record for the first time, including many sites that cannot be observed effectively in any other way (Figure 2). Beyond the basic, but very important, process of inventorisation, the results are feeding directly into ongoing research programmes on maritime and submerged landscapes, aspects of which are outlined below.

Figure 2: tidal fish-traps and kelp grids.
A: the large stone-built fish-trap in Airds Bay near Oban, at high tide when the floating seaweed gives a clearer rendition of the structure beneath than when the weed is draped over the stonework at low water.
B: the circular fish-trap and associated features at Gruline on Mull, revealed by floating seaweed at mid-tide.
C: fish-traps (1) and kelp grids (2) in Loch Snizort, Skye. The kelp grids comprise regular settings of boulders in shallow water to encourage the growth of kelp, which was harvested for use in glass and soap industries in the early 19th century.

(A & B = © Colin Martin; C = © Crown Copyright: RCAHMS, DP 109303)
The Cattle-Droving Infrastructure

The exploration of cattle droving in the west, which involved either the sea’s resources or transport across it, has been a long-standing research interest of the Morvern Maritime Centre. Inspection of the well-known early 19th century cattle-droving piers at Lagg Bay, Jura, revealed a smaller rubble-built curved jetty close to the high-water mark which had not previously been recorded (Figure 3: A). This appears to be an earlier structure built for the same purpose. Cattle dislike walking over loose shingle and therefore had to be loaded near the top of the beach, at high tide. By providing a ramp the later structure allowed loading throughout the tidal cycle.

Similar jetties have been noted at the cattle ferrying-point at Fishnish on Mull (Figure 3: B), and at the complementary terminal at Ardness on the mainland opposite (Figure 3: C). The identification of these structures, and others like them, is leading to a better understanding of the complex network of sea crossings associated with cattle droving, a trade which flourished from the 16th to the 19th centuries. Paradoxically these crossings sought to minimise the number and duration of sea passages necessary because, unlike other commodities, livestock (being self-propelled) were cheaper to move by land than by water.

Figure 3: The cattle-droving infrastructure depended on harbours and jetties to move stock to market from outlying islands.

A: at Lagg Bay on Jura the remains comprise an early 19th century cattle ramp (1), a passenger jetty (2), and an earlier curved cattle jetty (3).

B: at Fishnish on Mull the sloping pier at bottom left (1) is a cattle ramp for shipment throughout the tidal cycle. At the top of the bay is an earlier curved cattle jetty (2) protected by a breakwater (3).

C: the short curved jetty at Ardness in Morvern on the left side of the water channel was the mainland terminus of a cattle crossing from Mull.

(All images © Colin Martin)
Landing Places and Harbours
An ongoing research project by the Morvern Maritime Centre seeks to examine landing places and harbours, vital in a seascape where communication and trade relied on seaways (Figure 4). Many early landing places and havens were purely natural features, though it is often possible to hypothesise such use by their proximity to fortified sites or settlements on the coast. Sometimes, however, the existence of cleared strips which allowed boats to be drawn up to the shore can be recognised, and sometimes these were enhanced with built stonework. A fine example has been recognised beside a prehistoric fort at Port Haunn on the west side of Mull (Figure 4: A). Although the association cannot be proved directly, it is unlikely that the harbour is the work of 19th century crofters, the only likely alternative. A similar cleared strip has been identified in the bay next to Castle Coeffin on the island of Lismore (Figure 4: B). A stone-built fish-trap respects the prior existence of the strip, while the foundations of a small jetty lying at right angles to the strip without blocking it, suggest a contemporary facility which allowed vessels to load or unload at high tide.

A detailed investigation, supported by aerial reconnaissance, is currently being conducted at Rubh’ an Dùnain on Skye, which appears to have been used for harbourage of one kind or another from prehistory until the comparatively recent past (Figure 4: C & D). It may have been used in the Norse period as a winter harbour, and perhaps a raiding base. The features so far identified include a headland fort of presumed later prehistoric or early historic date, cleared access along a creek to two boat nausts (boat shelters) adjacent to the fort, a canal leading into a shallow loch, and stone-built quays inside the loch (Figure 4: ). The loch has also yielded part of a 12th century boat of Norse character.
Figure 4: Landing places and harbours are vital to the infrastructure of any community that relies on the sea, and these take a variety of forms, from entirely natural to heavily modified landing places. The consistent juxtaposition of prehistoric fortifications indicates the enduring importance of the sea, though further work is required if the dates of structures are to be established.

A: At Port Haunn on the west coast of Mull the prehistoric fort (1) makes use of a natural rocky knoll, beside a natural harbour and cleared landing strip with built revetments (2).

B: At Castle Coeffin, Lismore, a cleared landing-strip (1), a jetty (2), and a fish-trap (3) lie in the bay beside the shattered remains of the medieval castle, which may occupy the site of an earlier fortification.

C & D: Rubh' an Dùnain is a remote location to many modern visitors, jutting out from the Cuillin Mountain range on Skye. However, seen from a maritime perspective of contact by sea it occupies a central location with good access to the Western Isles and along the western seaboard. A small natural loch at the end of the peninsula has been a focus for sustained activity. A massive arc of stone walling cuts off a headland forming an Iron Age defensive enclosure (D: 1), beside which there is a cleared strip leading to two boat nausts (D: 2). Beyond this there is a canal with a central blockage (D: 3) leading into the loch with stone-built quays extending from either side of the canal mouth (D: 4). A 12th century AD century boat timber was recovered from the loch, suggesting this may have been the site of a medieval boatbuilding facility, with the potential for this to extend to earlier periods.

((A & B = © Colin Martin; C & D © = Crown Copyright: RCAHMS, DP 098286 & DP098277)

Community engagement

The general public has a significant role to play in archaeological discovery and for maritime archaeology underwater features are often first encountered by fishermen, sports-divers or other non-professional enthusiasts. This is especially true for small or more ephemeral sites where local knowledge of the environment can be critical to the discovery of less obvious cultural material (Benjamin and Hale 2012). Larger sites, including fishing installations and shipwrecks are also routinely identified by local community members, and this is especially true in rural areas. Thus, community engagement in the processes of site discovery and recording add considerable value, and this is recognised by several initiatives that seek to capitalise on these strengths. For example, SCAPE (Scottish Coastal Archaeology and the Problem of Erosion: http://www.scapetrust.org/) is a charity that seeks to research, conserve and promote the archaeology of Scotland's coast, especially where remains are threatened by coastal erosion. SCAPE has just launched the Scotland's Coastal Heritage at Risk project to encourage and support community initiatives to identify and record sites under threat (http://scharp.co.uk/). The Outer Hebrides Coastal Community Marine Archaeology Pilot Project (OHCCMAPP), a partnership between WA Coastal & Marine, RCAHMS and the CNE-Siar, the Outer Hebrides Archaeology Service, provides another case in point. OHCCMAPP was designed to investigate the potential for discovery of intertidal and marine archaeological sites in the Outer Hebrides (www.wessexarch.co.uk/alba). The project combined public outreach and ground visits and was supported by a programme of aerial reconnaissance in November 2011. Each of these processes produced its own set of information, and while aerial survey resulted in the discovery of an intertidal fishing complex at Hairteabhagh (Figure 5) field visits allowed the survey team to record the post-medieval remains and provided additional information on the use of the location possibly dating back to at least the Bronze Age; finally, adding a further dimension local knowledge informed the survey team that the inlet is haunted.
Submerged Prehistory

The period between about 14000 and 4000 BC saw massive sea-level rise that inundated large areas of the landmass of what is now Scotland (Bicket 2011; Benjamin et al. 2011; ScARF 2012). However, exploration of these submerged landscapes is in its infancy, certainly compared to England (Momber et al. 2011; Tizzard et al. 2011) and parts of continental Europe (cf. Benjamin et al. 2011), though the potential is indicated by two Mesolithic (c. 10000 – 5000 BC) sites known from the intertidal zone (Balin et al. 2010). The intertidal zone is particularly important to the study of submerged prehistory in Scotland due to the large tidal swing around its shores (up to 5m between low and high tide), in direct contrast to parts of Europe where tidal range is limited. Therefore, the identification of intact submerged and intertidal palaeosols (prehistoric land surfaces) has an important role in studying Scotland’s prehistoric natural history and the identification and understanding of these extensive inundated cultural landscapes. Identification and analysis of prehistoric woodlands, peats or other soft sediments in what can be extremely high-energy environments (e.g. wave action or tidal currents) is a priority and can be addressed through a variety of survey methods. Indeed, it was an aerial photograph showing underwater features in a bay on Orkney that prompted further investigation that confirmed the presence of a submerged peat – definitive evidence of an inundated landscape (Cowley 2010, 29; Dawson and Wickham-Jones 2010). This highlights the effectiveness of aerial recording in the context of ongoing research, especially where landscape understanding is paramount. Aerial recording has also helped to provide a context for sites, such as the tidal pond at Tòb Lundale (Figure 6). Already known as an intertidal peat, the basin was prioritised because of its sheltered location and catchment, which protects the environment from otherwise erosive activity. Snorkelling survey in 2012 has indicated the survival of prehistoric palaeo-environmental material, which with 3D-modelling of the surrounding landscape from aerial photographs enhances our understanding of the contexts in which prehistoric cultural material may be preserved under...
the water. Throughout the project, the aerial perspective is helping us to think about how these landscapes worked in the past and the active processes affecting them today.

What next?

Our broadly-based survey of maritime landscapes underway along the western seaboard of Scotland has demonstrated the effectiveness of the aerial perspective for the creation of primary records of sites that are very under-represented in heritage databases. Moreover, the aerial perspective has proved to be a powerful tool to develop understanding of how these landscapes may have worked in the past. The aerial work has been effectively integrated into thematic and area-based research projects where the positive feedback between different sources of information has helped to add value. While the assimilation of the primary site records into the national and local databases continues as a first task, the discoveries throw up many research questions that will be explored further. These include the reasons for the irregular distribution of tidal fish-traps, and the context and extent of the kelp grids, the very knowledge of which is due to aerial reconnaissance. Moreover, preliminary analysis of the survey data is identifying further questions that will be addressed through targeted reconnaissance, such as the relationships of prehistoric terrestrial sites to landing places.

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Aerial Archaeology in Jordan 2010-2012

Bob Bewley1, David Kennedy, Rebecca Banks and Mat Dalton

It has been a busy two years since we last reported on the project (Bewley et al. 2010), and the political upheavals in the Middle East and North Africa might have been enough to deter progress. However the opposite has been the case in terms of funding and achieving the key objectives as outlined in AARGnews 41 as a five-year strategy, 2008-2012.

The major impact of the political situation has been the lack of opportunity to continue the programme of aerial archaeology workshops, having done two in Jordan - one in 2006 and one in 2008. The good news is that through the links with the Institute of Archaeology, University College London (UCL), an Introduction to Aerial Archaeology workshop is planned for February 2013 in Doha, Qatar. UCL provides postgraduate archaeology courses in association with the Qatar Museum Authority and the Qatar Foundation; so this may be a good venue for future workshops too.

The other good news is that the Australian team keeps refreshing itself with young and very capable new staff, namely Mat Dalton, Rebecca Banks, co-authors of this paper, as well as Simon Rutter who joined the team in Jordan for a short time (as IT consultant). Without their hard work and digital capabilities the project would not operate as efficiently as it does, both in the air and in creating digital access to the photographs (see below). In addition Don Boyer, a geologist and now studying for an MA has become a regular member of the team.

In the five year strategy mentioned above there were eight objectives, and one – the workshops, has had to be postponed. Five of the objectives were related to aerial reconnaissance and developing research projects, both within and outwith the project. All these have been achieved, including publication of the results of the survey of the southern ring-road of Amman (Kennedy and Bewley 2010). The reconnaissance programme for monitoring the changes in the landscape (see Figures 2-4), as well as discovering new sites, continued at the accelerated rate started in 2008 (Kennedy and Bewley 2010).

Figure 1. Don Boyer, Mat Dalton and Rebecca Banks relaxing, at a re-fuelling stop at Azraq on 27th October 2011. (APAAME_20111027_DLK-0767)

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Figure 2. Dolmen under threat in the Al-Murayghat area south-west of Madaba, Jordan. Small limestone tombs which appear as small mounds on the surface (indicated by arrows), were photographed on the request of Dr. Steven Savage. Extensive quarrying has destroyed many already. See Scheltema 2008. 10\textsuperscript{th} October 2011. (APAAME\_20111010\_DLK-0047).

Figure 3. One of many recently recorded sites in 2011, and included as a new discovery. Ausaji walls and kites (site 17) 17. May 20\textsuperscript{12}. (APAAME\_20120520\_DLK-333).
Figure 4. Menzil South World War One trenches. These trenches are a trace of Jordan’s more recent past and its role during the Great Arab Revolt and the First World War, a time period to which we can attribute the birth of aerial photography in Jordan. These trenches are often located to protect strategic locations, in this case Menzil Station on the Hedjaz Railway south of Amman. (APAAME_20111013_RHB_0035).

The reconnaissance time (in the air) began to increase in 2008 as a result of a successful application to the Packard Humanities Institute (PHI). The grants from PHI have continued, for which we are extremely grateful. The graph below, Figure 5, shows that this level of flying (over 30 hours or more per year) has been maintained; there was a peak in 2010 with
over 50 hours, and we had always planned for only one short season in 2012 (in May in which c 10 hours were flown). May 2012 also saw the first signs that the trusty Huey helicopters, which had been the mainstay of our flying since we began, were not going to last for ever. The Royal Jordanian Air Force was able to provide a much more comfortable, but cramped Eurocopter (EC635), for two days flying (c 10 hours); a perfectly acceptable (if smaller) aircraft from which to operate.

This brings to the total number of hours to almost 300 hours (297 and 1 minute) and a total of 63,510 photographs.

Further reconnaissance is planned for April and early May 2013.

Figure 6. Distribution of photographs taken between 2008 and 2011
Figure 6 shows the distribution of photographs taken in the four years (2008 to 2011), demonstrating the planned increase in reconnaissance in the ‘panhandle’ – the eastern desert area, famous for its prehistoric kite sites (see Figure 3). However surveys of the main plateaux, above the Rift Valley (Dead Sea and Jordan valley) have also continued to yield good results.

**Archive and website.**

A key objective was the development of a website “on which all our images can be displayed and viewed” (Bewley et al 2010, 13). The APAAME website (http://www.apaame.org/collections) now has a blog (http://www.apaame.org/) and over 60,000 photographs, which are predominantly from the project’s collection of reconnaissance photographs taken since 1997, but also contains a number of historical (black and white) photographs – see www.flickr.com/photos/apaame/6115722472/ for example.

We have also begun to include many of the photographs taken whilst on field trips, as an important record of the sites visited and the changes happening on the ground (these have the reference APAAMEG), see Figures 7 and 8. Also in the archive are a number of maps, historic and more recent, to support researchers with their studies.

The archive also includes the 4,000 film diapositives of the 1953 Hunting Aerial Survey sorties, which are not yet available to view in our online archive. These high-resolution vertical black and white photographs (at approximately 1:25,000 scale) are an important record of western Jordan, taken before the rapid expansion and recent development in and around Amman, other cities and many towns and villages.

In 2010-2011 Kennedy explored a number of archives, finding some very interesting and important material in The National Archives at Kew, west London. Several hundred old RAF and German aerial photographs of ‘Palestine’ and a few of ‘Mesopotamia’ of 1917-18 and the 1920s, all of which have now been digitized and included on the web archive site.

Another example is within the Aerofilms collection, which English Heritage and others are making available (thanks to a grant from the Heritage Lottery Fund, see www.britainfromabove.org.uk/). There are a couple of folders of aerial photographs (prints) of Jordan and Egypt, taken by the pilots when they were in transit, or just enjoying themselves; we are exploring how we might digitize the negatives.

More archives with relevant imagery for the region, are being found all the time – the latest being the collection of 1.5 million survey photographs (see David Kennedy’s blog on July 31st 2012 on the website), in Rhodes House, Oxford, containing imagery from all over the world including c. 50,000 of Saudi Arabia and Yemen.

Bewley and Kennedy (forthcoming) provides an overview of the current state and usefulness of archives in the region and especially for Jordan.

In 2011 there was an increased amount of publicity surrounding the project. This has caused awareness of our online archive to increase. After an article in LiveScience by Owen Jarus, ‘hits’ on the archive jumped from our daily average in the hundreds to over 100,000. Articles published in Journal of Archaeological Science (Kennedy and Bishop 2011) led to reports in New Scientist and stimulated Google to send a team to Australia for three days of filming and
interviews. That led to a short video illustrating one way in which a Google product can be exploited but also looking more generally at the entire flying programme:


Other publications in the last two years were Kennedy’s article on the pioneers (Kennedy 2012) and the frontispiece in the (same volume) of the journal Antiquity (86 page 293) of Machaerus, Jordan, where John the Baptist lost his head as a result of Salome’s machinations. Kennedy (2011) also provided the final analysis of a site which we had spent much time searching for, eventually to conclude it had been completely destroyed. Kennedy was able to show it was an early Islamic village, and not a ‘fishing village’ as published by Crawford. Kennedy (2012b) provided an editorial for the Palestine Exploration Quarterly, with a study of the types and distribution of ‘wheel houses’ in the Harret el-Shaam area of Jordan.

One spin off of the project has been the start of an online (associated) collection of photographs of Europe, with the reference APAAE (the E being for Europe). So far this contains a small selection of Kennedy’s photographs from recent forays into Europe and Bewley’s reconnaissance in the Gloucestershire and Wiltshire area (but there is a backlog waiting to be catalogued) see www.flickr.com/photos/apaae/.

The only other objective not yet mentioned was ‘increased ground investigation’. Understanding what it is we have seen from the air requires fieldwork and the team has undertaken more fieldwork in the past five years than was possible previously. One very instructive and memorable trip was to ‘Maitland’s Fort’, also known as Maitland’s ‘Mesa’ (Rowan et al 2011), 60kms south-east of Azraq in the Wadi al-Qattafi. This required a particularly early start, even for us – leaving the Institute at 0430 am and not returning until

Figure 7. Landscape of Maitland’s Fort and ‘mesa’ country in Wadi – al Qatafi. Note the ubiquitous bulldozer tracks, even in this remote area, leaving their destructive marks. October 16th 2011. (APAAMEG_201111016_RHB-0049).
c 2000 hrs; however the landscape we visited is remarkable not only because of its isolation and stunning scenery but also the wealth of archaeological sites. Recent excavations by Professor Gary Rollefson have shown that some of the features are not ritual as expected (Rowan et al 2011) but much more likely to be Late Neolithic houses, perhaps a village of c 7-8 dwellings, and thus older than originally thought (see http://www.apaame.org/- Rollefson’s blog posted on August 17th 2012).

There are also surprises too, when you find carvings of modern trucks, done in the ancient style.

Figure 8. Throughout Jordan there are many inscriptions and petroglyphs, of all dates, on walls, tombs, and rocks in the landscape. The tradition continues to this day, with this representation of a lorry, as a petroglyph. October 16th 2011. (APAAMEG_20111016_RHB-0106).

Other related ventures
A pilot study carried out in late 2010 on a high-resolution ‘window’ of Google Earth of an area near Jeddah in Saudi Arabia, has been pursued via a much larger and more complex ‘window’ over part of the Harrat Khaybar in Saudi Arabia. 3,285 ‘sites’ have been mapped including – very surprisingly, 297 Kite sites (Kennedy and Bishop 2011 and Kennedy 2012c). A systematic pilot research project on a second high-resolution window into Saudi Arabia in Google Earth has been largely completed and analysis and interpretation is in progress.

We never really believed we would have been able to continue the project into its third decade, for a whole host of reasons, but it is still producing invaluable results and helping many researchers in the country (both foreign and Jordanian, and in 2011 alone we supported over a dozen projects and researchers working in Jordan). Even at its most basic it is making
permanent records of sites many of which were not even previously dots on maps; at its best it continues to support and generate its own research projects.

The lesson learnt from other countries (e.g. Sweden and Holland) is that once a reconnaissance programme stops, it is very difficult to start it up again; so for the moment, we are planning to stay airborne for a few more years yet – Insh’allah.

References:


Cropmarks
Interpreted by Rog Palmer

Aerial work in Spain
Those of you who think that nothing happens in Spain are invited to have a look at the work of Julio del Olmo Martín in the Castilla y León area at http://usuarios.multimania.es/arqaerea/aerea/portada.html. The site includes an English option.

(Thanks to Victorino Mayoral Herrera)

Britain from Above
This is the website of the Aerofilms collection which has ‘over 16,000 high resolution images to explore’ and download. Images can be zoomed on screen and downloaded as files of 820x654 pixels at 300dpi making files of 100-150KB. This is not what I’d call ‘high resolution’ but it’s good to have this collection (or the beginnings of it) on line and it shows the way that large collections can, and should, be made accessible. It looks as if the initial 16,000 images (no, I haven’t seen all of them) are selected to be of identifiable places so you won’t find much levelled archaeology among them. This is a good way of generating interest and sales as we all know that people like a different view of something familiar, or even of ‘my village’.

In an archaeological context, these ‘large thumbnail’ images are sufficiently good to see (for example) if they have adequate control points and show archaeological information. So this is the way we should anticipate that other collections will eventually be available and that high resolution copies, as with the Aerofilms collection, can then be ordered – hopefully, for immediate download.

http://www.britainfromabove.org.uk/

The BBC have made a seven-minute news item of the collection showing a sample of the photos with enthusiastic words spoken by Katy Whitaker, the ‘Aerofilms’ person at EH. Variously-volumed background music and what sounds like a cine camera are a bit annoying but the pics and Katy make a nice presentation. http://www.bbc.co.uk/news/magazine-18542080 (As with other BBC stuff, this may not be available outside the UK.)

And while on Aerofilms and aerial photography and mapping there’s a 1946 Children’s Hour talk from the BBC archives: http://www.bbc.co.uk/archive/aerialjourneys/5301.shtml It makes a jolly good (to use a phrase from that era) advertisement for working in aerial survey. I wonder if Aerofilms were deluged by potential applicants…

(Thanks to Dave Cowley for this link)

DIG
‘the archaeology magazine for kids’ says the subtitle of this production from USA. I discovered it after I’d been volunteered as a contributor for an issue about uses of satellite images and they were a pleasure to work with. Publication is at 9 issues per year and the contributions in the two issues I was sent seem accurate and well written. DIG also maintains a website with a range of archaeological information: http://www.digonsite.com/

 rog.palmer@ntlworld.com (All web links accessed in August 2012)
This may appeal to any of you with archaeological children (etc) as a supplement to any local children’s clubs such as YAC in Britain: [http://www.yac-uk.org/about](http://www.yac-uk.org/about)

**GM crop marks?**
What I take to be a TV news feature from Poland shows some clips of archaeological features from the air. Judging by the content I think the clips are from France, perhaps taken by Agache. Otherwise the discussion of grasses may be of interest to any Polish speakers. [http://youtu.be/334yJhYS4U?t=2m30s](http://youtu.be/334yJhYS4U?t=2m30s)

(Thanks to Lidka Żuk)

**ArcLand and remote sensing**
There is a report about ArcLand and Remote Sensing in Archaeology (mainly LiDAR) in *Spiegel online*.  
English version: [http://www.spiegel.de/international/zeitgeist/remote-scanning-techniques-revolutionize-archaeology-a-846793.html](http://www.spiegel.de/international/zeitgeist/remote-scanning-techniques-revolutionize-archaeology-a-846793.html)

Interesting too that it has taken EU funding for people other than myself to propose that use of drones is the way forward (final paragraph).

**SUAVe for mapping**
SUAVe (Semi-autonomous Unmanned Aerial Vehicle) is a device being developed at Vanderbilt University which will be tested over a site in Peru. A flight pattern can be programmed into the machine and the resulting data can be transformed into three-dimensional maps. [http://news.vanderbilt.edu/2012/08/archaeological-mapping/](http://news.vanderbilt.edu/2012/08/archaeological-mapping/)

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**Information for contributors**

*AARGnews* is published at six-monthly intervals. Copy for *AARGnews* 45 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 on the AARG website and please do not use any ‘clever’ formatting.

Please remember too that in 2013 we celebrate 30 years of AARG being called AARG. Stories for possible publication are welcomed and we hope these can look forward as well as provide a few notes about our past.

Address for contributions: rog.palmer@ntlworld.com
Review Article (Historic Wales from the Air)

Oscar Aldred

Toby Driver and Oliver Davis 2012 Historic Wales from the Air / Cymru Hanesyddol o’r Awyr. Aberystwyth: Royal Commission on the Ancient and Historic Monuments of Wales. ISBN 978-1-871184-44-0. £19.95

Historic Wales from the Air is without question, an important contribution to the canon of similar books illustrating different geographic areas of the UK from the perspective of aerial archaeology. If I may be as bold as to suggest, the book will be as influential as Crawford and Keiller’s Wessex from the Air (1928), but for a number of reason far exceeds it. The book is a well designed, colourful and printed in a large-wide format. Comprising over 300 images largely derived from those taken over the 25 year period in which the Commission’s Aerial Investigators have worked (Chris Musson and Toby Driver, as well as others), and includes other earlier images that are contained in the Commission’s archive. Additionally there are several digital capture images of LiDAR and interpretative maps derived from earthwork surveys and transcription, as well as illustrative diagrams on techniques of analysing aerial photographs. The quality of Historic Wales from the Air’s photography, the overall design, especially the large-wide format of the book, as well as the themes that are addressed, establish this book amongst the top of the canon. The additional quality that comes with this book that makes it stand out even further is revealed by a provocative and thoughtful set of issues that link aerial archaeology with many similar themes that are being addressed in contemporary archaeology and heritage studies.

The book is introduced by a chapter on the aerial archaeology of Wales – Historic Wales from the Air (Chapter 1). The book then flows logically through 9 different themes, from a contextual and landscape setting - The lie of the Land (Chapter 2), ending with a reflective but intimate ‘halcyon days’ in Pleasure (Chapter 10). Along the way the book addresses Field and Farm (Chapter 3), Prestige and Power (Chapter 4), Communities (Chapter 5), Conflict and Defence (Chapter 6), Belief (Chapter 7), Industry (Chapter 8) and Communications (Chapter 9). While the sequence is relatively conventional in its approach (from larger setting to detailed locales) and uses a set of categories that could have been taken from a Monument thesaurus, the wording that is used to head each theme is novel in so far as it suggests alternative ways of thinking about what is being viewed on the photographs as archaeology. This facet of the book, in particular, makes the reader think more about the inhabitation of the archaeology on-the-ground, rather than from the air, switching it from the conventional to novel. Furthermore, the photographs that are used in each theme suggest that aerial archaeology has a significant contribution to make towards more ordinary archaeological interpretation, not just because of the ‘god-eye’ of looking down from above, but because there are many hidden depths in the photographs. This is brought out by the way that each theme is introduced with a short text and the informative caption text with each photograph. Each of the themes on which the book is structured displays a more personal and inhabited set of sites that moves away from staid, categorized monument definitions. As a result, there is enough left for the imagination to ponder and reflect, while being checked by the informative captions that are attached to each photograph. The cultural critic Roland Barthes would have surely been a happy man if he received this book as a Christmas present!

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For example, *Communities* (Chapter 5) is essentially another way in which to express settlement archaeology and one should immediately begin to view these photographs as reflecting this sense. The idea of communities instantly instils itself with the evidence of settlements, connecting it to a more dynamic past. This facet of linking a thematic sense to a visible and familiar type of archaeology through a collection of photographs is evident on most pages of the book. But it is not only the textual links that connect the imagery to an ‘imaginative’ archaeology. An important contribution comes from the quality of the photographs being used and the way in which they appear to be paired and ordered.

Various tensions are brought out by the juxtaposition of photographs in every chapter, drawing the reader into making critical commentary of the images and the features of archaeology that are not always so obvious. In the *Communities* theme the genre of archaeology spans a 6,000 year period which is represented in what is being portrayed, from the prehistoric cluster of Iron Age hut circles on Foel Drygarn (Figure 83, page 99) to the über Modern, transitory communities of caravans and tents that made up the National Eisteddfod of Wales in 2009 (Figure 100, page 118). Each of these figures supplements the other, and brings attention to different types of evidence, whether in terms of the form or the nature of the evidence itself as earthworks, crop-marks, or the conditions under which the subjects for photography were being seen/captured. For example, the snow covered hut circles that form subtle earthworks within a multi-vallate hill fort in Figure 83 are contrasted by the low sun shadows of a uni-vallate hill fort with few hut circles in Figure 82 (page 98). These kinds of juxtapositions are rife throughout the *Historic Wales from the Air*, but ones that appear to have been made deliberately to draw the reader even further into the photographs.

*Historic Wales from the Air* is also a characterisation of Welsh heritage, both in terms of landscape and its archaeology. As one of the captions from the publishers states: ‘Wales may not be the biggest nation but when viewed from the air its rich and varied landscape and landmarks belie its square kilometres’. This is a landscape more than its sum parts. And alongside this, the book showcases many of the most dramatic aerial archaeology discoveries from around Wales. This visually impressive book, and informative caption and introductory text, make this essential buying/reading. However, while this book is largely for general readers, it will nonetheless make a useful contribution to any specialist’s library. Toby Driver, Oliver Davis and the Commission should be commended on having set a new standard in this type of publication that we would all be encouraged to follow.
Books of interest?

Rog Palmer


Use of ALS data is becoming more widespread and, like interpretation of aerial photographs, is in danger of becoming ‘something anyone can do’. This paper offers some warnings and quantitatively compares five visualization techniques ranging from the commonly used shaded relief model to newer local relief and sky view factor modelling for a study area in the UK. Outputs are compared with the baseline data from English Heritage’s National Mapping Programme and assessed with respect to percentage visibility of feature length. The work makes no claims to be exhaustive but highlights the potential and pitfalls in each technique and notes that users should be aware of the biases introduced when modelling.

Arne Ramisch, Wiebke Bebermeier, Kai Hartmann, Brigitta Schütt, Nicole Alexanian. 2012. Fractals in topography: Application to geoarchaeological studies in the surroundings of the necropolis of Dahshur, Egypt. *Quaternary International* 266, 34-46.

According to the text, fractal geometry has made a considerable impact in the understanding of fluvial systems. This project begins by automatically extracting a channel network from a DEM and then looks at the fractal geometry of those channels. If I understand things correctly, there will be a difference between the fractal patterns of natural channels and those modified by human impact. However, it seems that other geomorphological processes can upset things so it’s not as straightforward as one would hope. Like most (?) methods of automatic detection, someone still has to look at the results and decide what they mean but this may be one way of narrowing what there is to be looked at.


This is an interesting addition to the history of aerial photography in the Near East. Poidebard is a well known figure in early aerial photography in that area but this paper balances that with work done by others. Initially this was by the German Air Force, Australian Flying Corps in WW1, and the Royal Air Force after WW1. As well as area surveys to make maps, oblique photographs were taken of known and new archaeological sites and much that was overflown was completely new ground for any observers. In the 1920s, Kennedy flags the work of several individuals within the RAF made significant contributions. Their work recorded hundreds of ‘hardly even guessed at’ structures (p487). Dating and interpretation may now be seen as incorrect but the ‘revealing’ of these structures is reckoned to be more important although even now these ‘Works of the Old Men’ are little known to local archaeologists.

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Here we have an example of publishing outside our own inner circle – or ghetto, if you like – and the paper explains how historic aerial photographs may inform our knowledge of the past in a variety of ways. Where this historic material survives – and we know that much has been lost (eg in the Near East – see Kennedy’s article above) – it can provide a base map against which to analyse change and, if conditions and scale were right at the time of photography, maybe some upstanding or levelled archaeological things. The question ‘why historical aerial photographs?’ is answered with examples where 1940s photographs show upland areas that were later destroyed by afforestation, where chance has included a crop-marked site, and by showing the scale of landscape change over 60 years. Use of these photographs also extends to what is now called ‘conflict archaeology’ – the reason that many of them were taken – as has been shown elsewhere by Stichelbaut regarding WW1 material (with examples also in this paper).

The paper describes major sources of these photographs (divided into WW2 + later and WW1) and how easily they may be accessed. Three examples of National Collections are examined (Denmark, Finland and Italy) but I think other countries may be less well served and some (I’m guessing the Balkan states) may still be unavailable for reasons of security. However, ease of access is key to the use (and survival?) of these collections and is addressed in its own short section. In most cases the word ‘access’ relates to how well indexed these archives are because without catalogues that show location, date and scale it is difficult (‘impossible’ may be a better word) to know whether these photographs will be worth consulting and whether they may fulfil the purpose a researcher. That point is demonstrated by use of a table that shows dates of the ‘cropmark season’ in different countries – basic knowledge for anyone hoping to find levelled sites in arable land. Added to these dates, a certain amount of historical farming knowledge is necessary as crops and their growing cycles have changed considerably during the timespan covered by archival photographs.

All this is useful stuff, not only because it is an attempt to spread the word about using aerial photographs but because buried within the text are elements that make you think and perhaps make you ask if there are different ways of doing what we now do ‘automatically’. Use of these Very Large Collections requires a different approach to those we may use on a daily basis. Questioning what we do is a Good Thing (or, at least, Dave Cowley and I think it is) and may lead to ways of advancing practice, of how archaeologists can grapple with and understand landscapes, and of tackling the threats made by development and change.


Good for Rebecca writing up bits of her PhD and publishing this the day I finish this issue of *AARGnews*. I haven’t read Rebecca’s paper – but it’s possibly of interest to all members.
The Aerial Archaeology Research Group

AARG provides an international forum for the exchange of ideas and experience on archaeology and landscape studies using all forms of remote sensing, especially airborne and satellite based techniques.

AARG is actively involved in promoting the collection, interpretation and application of remote sensing data in fostering research, conservation and public understanding.

Since its foundation in the early 1980s AARG has vigorously encouraged discussion and cooperation through its annual conferences, workshops, specialist publications and biannual newsletter, AARGnews.

Membership is open to all who have an interest or practical involvement in aerial archaeology, remote sensing and landscape studies.

AARG is a registered charity: number SC 023162.

AARG homepage. http://aarg.univie.ac.at/

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Student bursaries. AARG has a limited number of student bursaries for attendance at its annual meeting. These are aimed at supporting bona fide students who are interested in aerial archaeology and who wish to attend.

Anyone wishing to apply should write to Oscar Aldred, School of Historical Studies, Faculty of Humanities and Social Sciences, Newcastle University, Newcastle upon Tyne, NE1 7RU, United Kingdom (aargchair@gmail.com) 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.