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[Cover photo: Lindsey, the Unmanned Aerial Fairy, patrols the world in search of the elusive crop mark. Background photo, Rog Palmer 20130719_102. Balloons. Cameras, straps and GPS from internet sources].
Editorial

It seems to have been an unusually quiet six months with preparations by the local host (DECARS) and the AARG Committee for the September meeting. Then in July the weather in Britain became sub-tropical and crop marks began popping up and distracted some of us from more serious work for the couple of weeks before the rain returned.

Thirty years of AARG

One of the questions often asked by new committee members is why there aren’t more members of AARG. For many years we’ve had relatively stable membership numbers if you discount the occasional false peaks provided when we used to give a year’s free membership to those who attended training schools and workshops. Occasional membership drives have come to little so it is probably safe to say that AARG’s membership represents the world interest in whatever it is that AARG does. The committee sometimes has tried to broaden that membership by taking on new blood to fill various posts in the hope that this may be a way of taking AARG in new directions and thereby attracting new people. Or that may mean that all the old blood had already done the job – perhaps this is a disadvantage with such a small group and the percentage within that prepared to help in its running. But it works – or seems to.

AARG and its forebear were created to examine a problem – what can be done with the evidence on aerial photographs? I’m not sure if we ever solved that problem but since then there have been no stated aims and we have followed where interest has taken us. It seems curious to look back and remember that in AARG’s early days there was discussion about the merits of 35mm and medium-format (60mm) cameras, whether zoom lenses were good enough for aerial use and that colour film should be secondary to black and white. Maps were drawn using pencils and pens. Computers – which occupied a room, not a desk top – had only recently been persuaded to transform digitised hand-drawn interpretations to a scaled vector drawing. Image processing was just about possible but – as far as I know – image transformation was not. Satellite images at the time had, at best, 80m resolution and had aroused some interest in archaeologists working in the Near East but seemed of little interest to most AARG members. Communication was by letter, fax, phone, or person-to-person meetings at a pre-determined place and time organised without the assistance of mobile communications.

Between then and now we examined in some detail the development of digital cameras and rapidly took advantage of that new technology. At the same time we, or mainly Martin Fowler, have looked at the potential of satellite images. More recently we’ve had excesses of presentations on uses of ALS and we’ve been introduced to drones and their on-site uses along with Structure from Motion as a way of presenting results. Our European colleagues have shown us wider ways of using aerial data than the original Brittocentric membership had applied and they also introduced the idea and possible relevance of theoretical approaches to aspects of aerial work. It is fair to say that in the past thirty years we have learned a lot, we’ve adapted to change, we have a larger number of people, scattered worldwide, who are accessible to be asked questions and, through EU and other grants, have reached a lot of archaeologists of all levels and tried to make them more aerially aware. This awareness has

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been hugely helped by the availability of images on the internet with several sites providing world-wide cover at differing resolutions, the more recent Geoportals in EU countries and some smaller collections becoming available in digital format for free – although some organisations and people still want paying.

It’s impossible to predict the technological changes of the next thirty years – no one would be daft enough to try. But technology is only one aspect of AARG’s interests, the other – how does using aerial information help us understand the past – is not so dependent on technology and we may be able to make some guesses about some of that. One big thing is that in the next thirty years archaeology as a profession will need to come to terms with the widespread destruction of its resource (to use the modern word), with population growth, agriculture, development, wars and their aftermaths, plus changes in sea levels and to climate all eroding away at traces of earlier occupation of our planet. Aerial survey, be it from kites, drones, aircraft or satellites, offers perhaps the most powerful way of recording traces of some of that past and I would hope that AARG would take some interest and involvement in promoting these methods in a much more global way than our present ‘local’ interests. If we don’t promote them, no one else will and we will be overtaken in the quest for funds by galloping geophysicists who are good at selling their ground prospection as a means of recording past anomalies. But on a smaller scale….  

The Flying Archaeologist
This was the title of a series of four 30-minute programmes on BBC in April-May this year. Ben Robinson, the presenter, comes over as an enthusiastic bloke (which he is) but the programmes tended to be more earthbound than aerial. They took four ‘sites’ – the Norfolk Broads, Stonehenge, Hadrian’s Wall and the Hoo peninsular in Kent – flew around then a bit and then made ground visits. Programmes were well researched, thanks to EH-NMP links (Ben now works for EH), and most took a theme and developed that through the programme. The format for the programmes worked reasonably well. We go from ‘here’s a site’ (or a something), to a little bit about wondering what it may be, then to lot about finding out by excavation. We know that TV audiences enjoy holes in the ground but I would have liked to see a bit of an extended ‘what is it’ section including some photo interpretation, mapping and use of archives. But that aspect of real life may be boring for TV viewers – almost as boring as a complete half-hour programme of stuff from the air that I have somewhere upstairs which was made by St Joseph years ago for one of the commercial TV channels. Like the Somewhere from the Air books, it’s a good way of helping you go to sleep.

A spokeswoman from the BBC told me that the first programme had high viewer numbers and that these increased for the rest of the series. I would rank the best as Hadrian’s Wall because it seemed to hang together and focused on the wall and its immediate environs. The poorest was Stonehenge with its ‘links’ to fairly-unrelated excavations and locations within a 50-mile radius.

There are limits to what can be squeezed into a 30 minute programme and its budget so I won’t complain about things I felt were missing. However, I will note the excellent use of SfM and other means of displaying aerial information that have recently been part of longer programmes about aspects of WW2. These need stereo aerial photos as a starting point but I’m sure that all observer-photographers take these by now – if not see elsewhere in this issue.
Ben’s series was a bit too over-English Heritaged and short-sighted as is evident from the first link on the BBC web page being to the NMP, another to EH, yet there was none to AARG. And I wondered if the budget was a bit tight as either all the airborne shots were done on the same day or Ben has a pile of red check shirts.

**UAVs**

Trying to call these Unmanned Aerial Systems (UAS) rather than vehicles is a bit like trying to rename lidar as ALS. It’s too late now. However, they do seem to be taking over from ALS as the currently fashionable letters to slip into a title. Soon we may be able to read, *An ALS survey using a GPS-IMU controlled UAV of my 1km square Landscape: a GIS and SfM solution*. That aside, there is a lot going on at the moment and although without much movement away from just the site-centred use of the things. A recent meeting at Worcester included at least one professional, Nigel King of QuestUAV (http://www.questuav.com/index.php), who manufacture and use fixed-wing systems. Their website includes an image titled ‘70-100ha survey’ – a small patch but perhaps a beginning? Worcester manage a facebook site – but note the word ‘small’ in its title (https://www.facebook.com/pages/Remote-Sensing-from-Small-UAVs/225042217637712) – whereas I want to see something about BIG UAVs. One small hope may come from ArcLand who are supporting a round-table meeting in Crete early next year. But even though the working programme includes words like ‘route planning’ and ‘landscapes’ I think it is still about little boys and their small toys (http://www.archaeolandscaeps.eu/index.php/en/capture/uav/451.html). We know there are ‘local’ uses for these things, good and useful uses, as we have had them demonstrated to us. Now it’s time to think bigger and move on. Am I nagging too much or might this be a way of achieving at least local-level aerial photography of the diminishing resource noted above?

**CUCAP**

From the beginning of this academic year (ie now) the library at CUCAP will be open full time. This is largely due to the success that Alun Martin (librarian) made of the two years of part-time opening – and to you, the customer, of course. Keep it open – buy more photos.

**This issue**

We include some offerings, in part or complete, celebrating 30 years of AARG and are pleased to include a reflective piece by Cathy Stoertz about the beginnings and development of AARG. There are five current members who attended that meeting – so if you see anyone old at AARG, please buy them a drink. Two other contributions cover events that took place with ArcLand support and reaffirm the links between the two ‘organisations’. One of these, the exhibition that opened in Dublin, will continue to promote remote sensing in archaeology for some time and is a measure of what ArcLand has made possible in its short life. The other is one of many past and future training schools that enable us to pass on knowledge to younger generations of archaeologists. Knowledge and experience don’t stand still and we are all learning by reading, talking, listening and trying things. It was trying things, or pressing the wrong button, that led Lidka Žuk to find ways of adding precise locations to the Exif files of aerial photographs whether these are originally digital or have been converted from analogue originals. Her Help-like contribution follows one by Irwin Scollar that allows corrections to be made to the position of images saved from Google Earth. Finally, you are encouraged to go and take stereo photographs.
AARG is celebrating its 30th anniversary – that’s official! It is a time for celebration: to have some fun and games. But it is also a time to reflect a little on the past 30 years and what has been achieved. In fact, the opening session at the conference this year will hopefully do this, addressing what AARG has achieved in the past, what it is currently doing in the present, and what it might do in the future. In March I discussed some of the differences and similarities between AARG 30 years ago and now (Chairman’s piece, AARGnews 46), so I don’t want to go over the same ground again. In the spirit of what we (the committee) are aiming for from this year’s conference, I’d like to briefly raise some broad items that are being brought to our attention in connection with the AARG ‘machine’ and the work that it does. At some point we will need to discuss these items as a group, but I want to pre-empt that discussion in this issue of AARGnews. These items are arranged as four questions.

Is AARG’s name outdated? The Aerial Archaeology Research Group may have been a useful way to portray the identity of what it is we have been doing over the last 30 years. Although in recent years, AARG has been changing. I think now ‘Aerial Archaeology’ is a little confusing as we are part of a much wider group of people that include archaeologists, remote sensing archaeologists, landscape archaeologists, and just plain old archaeologists. As we’re not exclusively ‘aerial’ what is it that defines who we are? I would also argue that we are not ‘remote’ either. We are certainly not remote from the subject of archaeology – perhaps we can be physically distant, but not in terms of what we want to do with the archaeological matter we encounter. What then is a good solution? The question pertaining to AARG’s name is also related to another question.

Should we begin the process of formally integrating with other groups, such as ISAP and become a more comprehensive entity? This question is not simple to answer. There are good reasons for staying separate and other reasons for integrating, if the opportunity arises. In recent years, there has been closer and closer cooperation between the different groups that are fairly similar to AARG. Collectively we could form a new entity. For instance, AARG has often been joined at its meetings with the 5 year project ArcLand (2010-2014), and it recently held a joint conference with EarSel. There have been joint meetings with ISAP and AARG, such as the recent 10th International Conference on Archaeological Prospection in Vienna. Furthermore, ISAP and AARG have a joint responsibility within the European national heritage management agencies council – EAC - as a special working group ‘Remote sensing for archaeology’. Many members of AARG are also members of ISAP, as are many members of ArcLand with ISAP and AARG. These are some good reasons to consolidate then? But doing so, also risks losing AARG’s identity, its purpose, and what it stands for in the archaeological world.

Another question to ask is what does AARG stands for today? In 1983 there were clearly different concerns driving the need for a group than exist now. Archaeology, according to David Clarke, had matured in 1983, though it was still trying to determine what it was like; for instance exploring new technologies, fitting in new information to the grand historical

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narratives, asking different kinds of questions about the past. AARG was essentially a place
for like-minded individuals to meet and discuss the field of aerial archaeology that also
captured this awakening spirit mentioned by David Clarke, and especially the topic of map
making. After a few years, AARG grew in stature, and began to branch out beyond its
borders, encompassing Europe, rather than just being concerned with the archaeology of the
UK. AARG also developed several educational platforms so that others could learn from the
experiences of its members; this took the form of events such as workshops, meetings for
professionals and students to learn about techniques and approaches to taking photographs
and interpreting them, and now extended to other kinds of sources such as satellite and lidar.
AARG also entered into heritage policy and strategy, contributing to the shaping of national
and European standards in aerial archaeology and remote sensing. It also paved the way for
European networks, to foster new ways of integrating archaeological data, how to discuss it,
and establishing standards. AARG has been central to all of these developments, but we’re a
long way from the initial meeting in 1983. AARG is still today, I hope, a place for like-
minded individuals to discuss from-above-matters, but this now also routinely involves
discussing not only photographic interpretation or capture, but also other kinds of imagery
such as satellite and lidar. And it is also a place, I hope, to discuss archaeology.

What kind of community are we now, compared with 1983? As a community, we’re a diverse
bunch. We are an amalgam of different practices, nationalities, ages and genders. The
community is much larger now than it was in 1983, and this is inevitably reflected in a larger
scope in its agendas and requirements. Our conferences routinely have 100 or so people
attending, rather than the 30 or so initially. The AARG membership is also larger than it was
30 years ago, though this fluctuates year on year, depending on who remembers to pay their
subscription; usually it hovers at around 120. As a community we’re not very active in
recruitment. We still rely on old fashioned networks of experts; hoping at each conference
we’ll convince enough people to remain members when it comes to subscription time. The
diversity is also reflected in the range of papers and posters that are proposed for each
conference. Accommodating the diverse range of topics can be difficult. In recent years our
conference venues have been in Central Europe. Our next conference is in Amersfoort. We
are a mobile organization – the committee is made up of 4 different nationalities – and we
collaborate with a different organization in hosting each conference. However, in contrast to
meeting the demands of an increasingly large and diverse membership, we are quite
conventional in our dissemination methods. We have an online presence. We publish books –
or help to with support of our AARG stamp – often in English! And we meet once a year. As
I have suggested in a previous Chairman’s piece, the format of the conference has not
changed; and it is worth perhaps asking ourselves whether the present format still meets our
needs and expectations? And if not, what would we like to change or enhance?

These are not urgent questions to have answered. Nor do they need definite answers. But
given the opportunity that AARG’s 30th anniversary offers us, I think we should at least create
some discussion that we can use to move forward in generating a plan for the future – perhaps
for the next 30 years? I would like to end by reminding members of why AARG exists? At the
time of AARG’s establishment, and what I feel it does today, the main concern has centred on
archaeological questions that arise from using airborne sources of one kind or another. If in
the next 30 years we keep this at the heart of AARG – or whatever it becomes – I think it will
still have a reason to exist.
Anniversary Reflections from a Founder Member

Cathy Stoertz1

Those who have made a close study of the AARG website and recent editions of AARGnews will have noticed that there are conflicting accounts of exactly when AARG came into being. The home page refers to “its foundation in 1980”, while the “About AARG” section says the group “began life in 1981 as a small seminar called to discuss ideas raised by Paul Ashbee (then of the University of East Anglia) and David Wilson (of CUCAP).”

On the basis of the 1981 seminar, we have already had one 30th Birthday party in Poznan, complete with tasteful commemorative souvenirs for those founder members who happened to be in attendance – some of which (the souvenirs, that is!) managed to make it home in one piece.

Since then Wlodek, Rog, Oscar and others have continued to discuss the merits and validity of the many possible foundation events – there was a further seminar in 1982 – and at last it has been determined conclusively, or at least convincingly, that the AARG we all know and love came into the world in September 1983.

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In my personal version of our tribal Origin Myth, the beginning of AARG in its true form was marked by the invitation that I, along with many others, received in the Spring of 1983. This is surely our foundation document: together with the minutes of the resulting meeting, it can be regarded as both birth certificate and a record of the infant AARG’s first steps.

AERIAL ARCHAEOLOGY: A PROPOSED RESEARCH GROUP

In November 1982 an invited group of archaeological administrators, field officers and research workers met in Cambridge to discuss some of the problems associated with the post-reconnaissance use of air photographs. In the course of that meeting it became apparent that an increasing number of individuals, often independently and in relative isolation, are at present attempting to devise procedures which will allow them to effectively interpret, map and classify the vast existing backlog of such information. Because this is still a relatively new and untested area of study, however, many of the techniques and methods being used also tend to be experimental in nature. One of the principal conclusions of the Cambridge meeting was that a need now exists for the closest possible cooperation and communication between all those who are closely involved in this kind of work. In addition to providing essential stimulation and cross-fertilisation of ideas gained from experience in differing lowland and upland environments, such contact will be essential if work on air photographic material is in future to be carried out to the high, consistent and mutually agreed standards that are so urgently required.

One suggested solution to this problem of communication lies in the establishment of an informal air-photographic research or study group whose members would have the opportunity to meet once or twice a year to discuss and compare current work and common problems. The purpose of this preliminary notice is to invite anyone interested in joining such a group to a pilot two-day meeting to be held in Cambridge during either June or September 1983. While it is intended that the discussion during this and subsequent meetings should be as free and wide-ranging as possible, some initial thematic structure may be useful. It is therefore proposed that the opening session might sensibly take as its central topic the important, but still vexed, subject of mapping. What methods of transcription are different people using and why? What map-scales and levels of accuracy are preferred; how far is it either possible or desirable to standardise cartographic procedures, styles and conventions.

Anyone who might be interested in participating in this venture (and it is important that membership should be as wide and open as possible) is asked to complete and return the accompanying form as soon as possible to:

Dr R.P. Whimster
Committee for Aerial Photography,
Mond Building,
Free School Lane,
Cambridge CB2 3RF
(Tel 0223-358361 ext. 347)

20 April 1983

The 1983 invitation – AARG’s Birth Certificate?
The meetings in 1980-1982 were attended by specially invited individuals. From some list of the Great and the Good of British Archaeology – department heads, county archaeologists, university professors – those who were known to have an interest in taking or using aerial photographs were selected to attend high-level discussions in order to determine what part aerial photographs ought to play in the archaeology of the time. The 1983 meeting differed from its predecessors in one very important respect: its stated aim was “that membership should be as wide and open as possible”. Practitioners and their bosses were invited to participate on an equal footing, as colleagues. It is difficult to comprehend, from the perspective of 2013, just how unusual that was but, at that time, it seemed almost revolutionary.

From that invitation grew a collaborative community, open to all who were interested in any aspect of Aerial Archaeology – and it gave us a title for our field of interest. The many air photo interpreters who worked alone in county archaeology units found they had counterparts and comrades across the country. Project staff, field workers and PhD students had opportunities to present and share their work first-hand, not mediated through an official senior spokesman. We all gained confidence and experience, received feedback and support from our peers, shared experiences, discoveries and questions, and beer – and thus became true colleagues. Of course, many of us probably would have met sooner or later, through other archaeology conferences, but I like to think that AARG brought us together more quickly, and on common ground. This probably sounds like the misty-eyed reminiscences of an old codger, but at the time it was truly new and unusual (in Britain, anyway) and incredibly exciting.

It was with some amusement that I looked over the minutes of that first meeting and realised that many of the issues that occupied us then still appear on the AARG agenda to this day. Does this mean we have made no progress, that we have resolved nothing in 30 years? I don’t think so. I know the recurrence or persistence of some subjects has been much discussed at meetings and in AARGnews and is a matter of frustration to some, but it doesn’t especially worry me – it simply indicates that certain concerns are always present.

There will always be contrasts and tensions between the priorities of national heritage organisations, with responsibility for archives, databases and conservation, and the detailed and rigorous requirements of university research agendas. We will always need to discuss and refine our ideas about how best to present information derived from aerial photos, to make it understandable and useful to others. The fact that we keep discussing these issues is not a sign of our failure to resolve matters or make progress, but a recognition of the ever-changing requirements of a developing sphere of interest. The more questions we can answer, the more we want to ask.

Positive progress has certainly been made in some areas. Much of the first meeting was devoted to reports on regional mapping projects, each of which began with a description of the mapping methods used. Many projects employed manual transcription techniques, including the Möbius network. Some used photogrammetric machines such as the stereo-facet plotter and the Thompson-Watts plotting machine. Those who were able to use computer-aided mapping methods frequently had to rely upon mainframe computers (remember those?) which were often housed elsewhere and shared with other users. Desktop “microcomputers” were just beginning to be available and affordable, and great interest was generated when a team from Bradford University introduced and demonstrated the prototype
of the transformation program that became Aerial. The advances in transformation and mapping technology undoubtedly would have happened anyway, but AARG brought together developers and early adopters and, perhaps, influenced the development and achieved a successful, purpose-built product earlier than might otherwise have happened.

AARG was born in the days of pigeon-post and snail-mail, the Iron Curtain and the Berlin Wall. In 1983 there was no internet or email, no Channel Tunnel, no RyanAir, no European Union. We have grown up – from a small group of 35 British archaeologists sitting around a table in Cambridge discussing a rather specialised shared interest, to an international community with the confidence and expertise to apply for and distribute Eurofunds to great effect, via projects like Culture 2000 and ArcLand, and to share that interest around the world. We have made links across many communities and disciplines, and have gathered many friends into our wide-reaching family.

I can’t conclude my ramble down Memory Lane without paying tribute, and saying Thank You, to the person who sent that first invitation. Rowan Whimster, then working at CUCAP, had been involved in the preliminary seminars; he took responsibility for organising the meeting that became AARG, and the next four or five gatherings. The group was not his idea alone: he was not AARG’s sole parent, but he was perhaps the midwife who helped us into the world and set us on our way.

The midwife? Rowan Whimster, AARG’s first Secretary.

In 1985, Rowan succeeded John Hampton as head of the Air Photo Unit at RCHME. Although his professional path eventually took him away from the Aerial Archaeology world, I think Rowan would be proud of the group he instigated, and how we have grown up.

Rowan’s introduction to the first meeting, recorded in the 1983 minutes, states: “The purpose of the present meeting was to bring together as many as possible of those working with air-photographic evidence in the hope of establishing a permanent forum for the discussion of common objectives, shared standards and individual problems.” And here we still are…
So here’s a sobering thought – having celebrated a significant birthday of my own earlier this year, I find I have now been a member of AARG for half my life…! I am one of those described by Oscar, in his Chairman’s Piece of AARGnews 46, March 2013, as “the wise dog-eared, hard-nuts who attended the first meeting who still participate in AARG.”

Hmmmm – “dog-eared” certainly; not so sure about “wise”; and if I am a “hard-nut”, at least I’m not yet “cracked”? As I reflect upon where AARG started and how far we’ve come, I am in no doubt as to its importance and continuing relevance. My own professional experience has been enriched enormously by my membership of AARG, and I count many AARG members among my dearest friends. It was a fortunate day when that invitation arrived – I can honestly say that it changed my life!

Happy Birthday, dear AARG – and here’s to many more!
Non-invasive Archaeological Training School in Pécs, Hungary: Remote sensing from sky and ground

Mikołaj Kostyrko¹ and Adam Lokší

From 4th to 11th June 2013 we had the chance to attend to the Non-invasive Archaeology Training School which was organized by the Department of Archaeology of the Janus Pannonius Museum in Pécs within the framework of the ArchaeoLandscapes Europe project. The first aim of this project is to popularize and develop new remote sensing techniques for archaeology, the second goal is to create the international European forum to give a chance to exchange experience on different fields of non-invasive archaeology. To achieve these goals, conferences, workshops and training schools are being organized. The target of the Hungarian school was to learn the theory of geophysical and aerial archaeological prospection and to gain experience in action. We had the chance to participate in collecting, processing and comparing data from different sets of instruments, techniques and sites.

Fourteen participants from across Europe were divided in to 4 groups for the most efficient learning and prospecting. Theoretical lectures were presented on the topics of geophysics, aerial photography and LiDAR prospection. Geophysical prospection was pursued on a Roman villa and a Neolithic rondell and aerial reconnaissance was carried out within a 15 km radius from Pécs - Pogany airport.

Aerial archaeology and other non-destructive archaeological methods are still underestimated in Poland, where we are students. The first application of aerial photography in Polish archaeology was in the 1930s but the technique is still mainly regarded just as a tool of documentation and illustration. The lack of wider perspective for the usage of this remote sensing technique disregarded its potential for discovering new sites and monitoring those which are already known. The situation changed in the 1990s thanks to workshops which were organized by archaeologists for archaeologists. Those workshops gave the opportunity for beginners to learn how to take aerial photos and how to interpret and work with them. One of the very first of such opportunities was in 1996 in Hungary in Siófok and was organized by AARG and the Janus Pannonius University of Pécs, Hungary.

The base for our aerial reconnaissance was the airport in Pogany (code ICAO: LHPP) which was just a few minutes ride away from the centre of Pécs. The airport has an asphalt runway in the direction 16/34 and it is characterized by low traffic density which gave a good opportunity for short training flights. We had a chance to fly in two types of aircraft: a Morane-Saulnier 880 and a Cessna 172 Skyhawk. The pilots were from the local Aeroclub Pécs and one of them was the head organizer of the whole training school – Gábor Bertők. The aircraft were picked specially to give a chance for the participants to gain experience in flying in high- and low-wing planes, which give different opportunities for photography in the air.

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During our flights we were mainly in teams of three and we were practicing communication in air on the line: observer-to-photographer, and photographer-to-pilot. The first flight overwhelmed us with the large quantity of information which we tried to comprehend 3000 ft above ground. We also had a problem with orientation. The first experience also gave some sensation in the stomach. But as we had a chance for further flights our skills improved and bodies got used to being lifted in the air. This practice gave us opportunity to get a new perspective on aerial archaeology, and proved that the effectiveness of applying this technique is not a simple one and is affected by many different factors. The ones that are the most important are: the season of the year, time of the day, moisture of the earth, type of agriculture, and of course, the flight path.

As the young adepts of aerial photography we have unanimously agreed on the pre-eminence of high-wing Cessna above the low-wing Morane. Taking photos from the second one requires more skills from the pilot as the machine has to be tilted at a greater angle. But on the other hand, some found the window opening system in the Cessna a disadvantage in contrast to the Morane which has a sliding window which was quite easy to use.

To sum up, we made a total of 32 reconnaissance flights with an average duration of 30 minutes. The afternoon sessions gave us the opportunity to have a look at the photos that we had taken and time to interpret the features we had photographed. We talked about natural features which resemble archaeological remains and we also had a chance to try looking at the photos using a stereoscope. This really gives a lot of new information and it is a way of making two dimensional pictures look like 3D just by using two pictures that overlap and using glasses (a stereoscope) which at first sight look quite simple. These classes where conducted by Cathy Stoertz, who was sharing her great experience which she had gained while working for English Heritage. We were also introduced by Gianluca Cantoro to computer-based techniques. For example, we used open-source software to set up a data base and georeference the photos we had taken earlier, and another program to make plans of the sites that we had flown above.

The second part of the workshops focused on gaining practical experience in near remote sensing. This part was conducted by Kevin Barton, Piotr Wroniecki and Csilla Gáti. During this training school we had a chance to prospect two sites near Pécs. Both of them, the Neolithic rondell and the Roman villa, were known beforehand thanks to aerial archaeology. Those two were chosen due to their different morphological properties. This was supposed to give us different results using the same techniques which we could later compare. Both sites are completely invisible to the human eye when one is standing on the ground, therefore, our task was to reveal their unseen structures. The villa site was expected to reveal itself by
having higher resistance than the surrounding ground. The rondell ditches, on the other hand, were expected to be visible because of their lower resistance and higher magnetic values.

Although geophysics when compared to digging may sound “clean” to some, during the rain and especially after it, it can get really muddy in the field. And that’s what actually happened to us on the very first day at the villa site, so the wellingtons came in handy. Also we had to be careful while operating Ground Penetrating Radar – the mud was sticking to the wheels of the cart with the antenna which was slowing it down and making it harder to push.

Our activities on the field were preceded by theoretical lectures and discussions about case studies from different parts of Europe. After the morning classroom sessions we tried to accomplish as much as possible on the site, of course the showering weather did not stop us. We were in the group which was investigating the Neolithic rondell and although we could not have access to the whole structure due to the crops, we still had quite interesting results. For the efficiency of the work we divided the ground into 20 meter squares, and each was prospected using different techniques to get us much done in the field as possible. Everyone had their chance to try all the methods during this time. We made the electric resistance prospection taking a reading every 0.5 meter which means that for every square we took 1600 readings. The other methods that we had a chance to use were the Bartington fluxgate gradiometer, Overhouser magnetometer, magnetic susceptibility meter and we also made a slice through one of the ditches using electrical resistivity tomography.

By applying different methods of geophysical prospection in the field, we also had an opportunity to compare the data that they provided as well as their pros and cons. In the evening we attended ‘geophysical clinic’ sessions during which our tutors were introducing us
to downloading and basics of processing of the data and, what is even more important, thinking in a way that geophysicists do.

The sixth day was devoted to an introduction to Airborne Laser Scanning systems which was divided in two parts. During the first we learned about the theory of collecting the data and the possibilities of the outcome product. Gábora Molnár and Žiga Kokalj introduced us to the idea of reflectance of the laser beam, how the full-wave form looks and how it is processed. They also focused our attention on ways of visualizing the digital elevation models, for example, using sky-view factor technique. The second part was in the computer lab where we had a chance to work on different sets of data.

On the very last day of our Non-invasive Training School in Pécs we worked as teams on the data that we had collected during these few days. Each group had to prepare a summary presentation about a different site and a different remote sensing technique. Thus, we ended up having a small international conference during which everyone had a chance to speak. The whole week gave us not only the opportunity to learn in action how to collect and process remote sensing data but it was also a great opportunity to work in an international group and gain new friends from all over Europe.
Traces of the Past Exhibition Opens in Dublin

Rob Shaw

Traces of the Past is an exhibition that has been created by the EU co-funded project ArchaeoLandscapes Europe (ArcLand). The theme of the exhibition is Archaeology, Technology and Imagery, and it has been designed as a travelling exhibition, to be hosted across Europe by the project partners.

The exhibition was officially launched in Dublin, its first venue, on the 8th May by the Minister for Arts, Heritage and the Gaeltacht, Mr Jimmy Deenihan, TD. In the opening address of the exhibition the Minister said:

I have enormous admiration for the work which these professionals have undertaken and for their predecessors who first exploited the potential of the earliest aerial photography, and prepared the way for the incredible images that form the exhibition. I believe that use of remote technology will engage and fascinate the public at large through delivering new and exciting visions of our most well-known heritage sites. This can only assist us in our roles as the guardians and conservers of the monuments which we have been bequeathed.

Traces of the Past showcases the finest examples of the EU ArchaeoLandscapes project, highlighting the technology available to archaeologists today. It aims to show visitors how this technology has been used on iconic archaeological monuments and landscapes in Ireland and throughout the rest of Europe. The exhibition presents the development of remote sensing technology – from the earliest aerial photography to the latest unmanned aerial vehicle systems. Techniques and concepts are explained and illustrated using case studies and examples selected by the various ArchaeoLandscape partners. As a result a diverse range of spectacular European archaeology and cultural heritage is displayed, including in the Irish launch exhibition some of the most prestigious and iconic sites in Ireland: the passage tombs of Brú na Boinne, the monastic settlement of Skellig Michael, and the royal site at Hill of Tara. Future host venues will have the opportunity to edit and change the content to reflect their own archaeological heritage.

In conjunction with the launch Dublin Civic Offices Wood Quay venue hosted the ArcLand conference, K2 > U2 - From Known Knowns to Unknown Unknowns: Remotely Detecting the Past. This two day conference brought together a series of international speakers to showcase many of the remote sensing techniques displayed in the exhibition. The speakers explored the application of remote sensing; how its results can be used in heritage management, education and to support community based projects. For many of the delegates one of the highlights was a presentation from Balla School, Co Mayo, Ireland that showed how transition year students (15-16 year olds) had been enthused to undertake their own geophysical survey and in the process further their understanding of the underlying sciences.

Arch in the Park rounded off the conference with a number of outdoor remote sensing workshops held in Phoenix Park, Dublin, including geophysical survey, kite photography and field walking.

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Decisions are expected shortly on the next European countries and venues to host the exhibition. Also, due to the success of the Dublin exhibition, further host venues in Ireland will be announced giving those who missed *Traces of the Past* in Dublin another chance to see it.

Information on future venues of the exhibition will be available online ([http://www.archaeolandscapes.eu/index.php/en/outreach/exhibitions.html](http://www.archaeolandscapes.eu/index.php/en/outreach/exhibitions.html)). If you are interested to host the exhibition feel free to get in touch with exhibitions@archaeolandscapes.eu.

Anthony Corns, The Discovery Programme explains lidar to Minister Deenihan at the opening of the exhibition.

The gallery section of the exhibition contains a number of striking images submitted by ArcLand members.

The K2U2 conference was hosted in the Wood Quay venue of the Dublin Civic Offices, with the back drop of an exposed section of the medieval wall.

Kevin Barton entertaining the Arch in the Park attendees while Ger Dowling gathers electrical resistance data in Phoenix Park.
Google Earth: Improving Mapping Accuracy

Irwin Scollar¹

“All science is either physics or stamp collecting.” Lord Kelvin

Google offers high resolution imagery of many regions of the Earth at no cost. It is tempting to use this very large data collection for mapping of rectified aerial images and as a background for a GIS application. However, Google Earth images with rare exceptions are not true orthophotos and do not have photogrammetric accuracy. True orthophotos are digitally corrected to show buildings or other structures which are higher than the surface of the ground in true plan form like in a drawn map.

The Google imagery comes from many different sources including satellites with world-wide coverage, vertical aerial photographs from local or national mapping services and near-orthophoto collections in GeoPortals. These are stitched together manually to cover large areas. The work for joining many overlapping images is frequently done in low labour cost countries. Resolution and quality varies greatly from place to place.

The application programming interface for developers using Google Earth in their software offers many features. For mapping, the most important of these is being able to display a full screen image centred on a point whose latitude and longitude in the WGS84 Datum and altitude in meters can be specified by the programmer following a user's choice, and the latitudes and longitudes of the corners of the image are returned to the calling programme. If other search options such as finding a place by name are used, these values are also available but positioning is not under user control.

The centre of an image found by entering a latitude/longitude value and the correct position of that point may differ considerably. Ten metres and more have been observed. However most imagery in developed countries is located to five metres or less. This error is mainly introduced by the manual image stitching operation as described above. Additional errors come from inaccuracies in listed lat/lon values for known points. Furthermore, Google uses a spherical rather than an ellipsoidal model for the Earth, and this causes an error if a large area is displayed. All of these errors are present at once and combine in an unknown way.

If a known point is visible, a simple linear shift correction for the calibration (georeferencing) of a Google Earth image is easily implemented. This correction is good enough up to two to three kilometres from the known point. For larger areas many known points used with a non-linear correction method would be required, but these are rarely available.

The accuracy and precision of the values of the “known” point depends upon its source: In order of decreasing precision these may be:

1 - Differential GPS or RTK (CPGPS) measurement of a highly visible point in Google Earth with appropriate hardware, giving centimetre resolution. http://en.wikipedia.org/wiki/Real_Time_Kinematic


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2 - A trigonometric point visible in the Google Earth image.

In the UK, you can obtain complete lists of latitudes and longitudes for more than 6000 trigonometric point pillars placed by the Ordnance Survey between 1936 and 1962 from: http://www.haroldstreet.org.uk/waypoints.php?hill=trigpoints

Unfortunately, these points are no longer maintained and many are not visible in Google Earth, but if one is visible in your immediate area of interest and in the same flight imagery, you can use the British National Grid coordinates or their values converted to WGS84 lat/lon from the list in the link above.

Lists of trig points are sometimes available elsewhere, but many countries require payment for using them. The UK data gives a good idea of general accuracy under favourable conditions.

3 - If you know the coordinates in the preferred local grid of any visible point from a GeoPortal site, you can also improve the accuracy of GE calibration considerably by using the coordinates from the mouse position if the GeoPortal displays these to meter precision or better.

4 - The coordinates of an aircraft navigation aid which are usually visible in Google Earth. A Navaid defines a point in space used for navigational and air traffic control purposes. Those with high power antennae are much easier to see than trigonometric points. Over 11,000 such aids with geographic coordinates can be found on the Internet. The best quality points, those with the most accurately listed coordinates, are close to major airports in developed countries, but elsewhere accuracy as given in a number of lists available on the Internet can not be verified.

See: http://en.wikipedia.org/wiki/VHF_omnidirectional_range Their latitudes and longitudes are given in lists prepared during the first decade of the 21st century by a US agency, but these lists are no longer maintained. There is no documentation on the accuracy or measurement methods used.

Several other useful lists are available: https://www.google.com/fusiontables/DataSource?dsrcid=934957 This is a comma-separated variable list of over 11,000 points from all over the world with specified latitudes and longitudes and details which can be loaded into an Excel or Access compatible programme for searching and sorting. It can also be searched with a simple editor like Notepad somewhat less conveniently.

See also: http://www.airportdatabase.net/navaids This lists all the sites in somewhat more convenient verbose form. There are more than 40,000 entries.

The Web site: http://www.ourairports.com/big-map.html displays many of them along with airports on a Google Maps/Satellite background as symbols. Details can be obtained by clicking on each.

The latitudes and longitudes in some of these tables are given with as much as 18 decimal places. These are computational artefacts produced by the software used to construct them. True precision is far less, usually 6 or 7 digits to the right of the decimal point (ca. 10 cm at middle latitudes) is appropriate.
The author's free programme AirPhotoSE provides a number of useful tools for working with Google Earth imagery and the data from the sources cited above.

When you search and download a Google Earth image using AirPhotoSE, a record containing geographic coordinates of 5 points is written to a calibration file which also records the user-chosen grid from the European Petroleum Survey Group database and other data. This file contains more information than the georeferencing files usually used in GIS programmes and permits working across meridian or latitude boundaries in all mapping systems.

Four of the points are near the corners of the image. The fifth at the centre is where the GE application code calculation puts the chosen latitude and longitude of the search coordinates. From the five points, the coordinates of any point in the image can be calculated with a minimized least-squares error, and displayed in any of the thousands of grid systems recorded in the European Petroleum Survey Group database. Georeferencing can also be written to the simpler files used in ArcGis and MapInfo.

The central point may be used to correct minor errors in the Google Earth image coordinates interactively. All 5 points will then be moved to new positions after the centre point is dragged by the user to overlay a known point. Depending on the precision of the known point and the image resolution, and the goodness of the image stitching, the remainder of the image will be geo-referenced with nearly this accuracy up to the limits of GE projection distortion.

**Errors in Google Earth images:**

*Displacement (Horizontal and Vertical Shift):*

Displacement is a shift of a few meters in the entire Google Earth image, with the shift nearly constant over the whole of the area. GE images of different dates may not always be centred correctly and the central calibration point in AirPhotoSE is displaced. The use of the Google Earth TimeLine shows this clearly as, for example, at an Ordnance Survey trig point pillar on
the Isle of Wight as captured by AirPhotoSE in three different years:
In this case, the image with the displaced calibration point is unfortunately the sharpest of the three. The error can be corrected as described below. The error is more than ten metres in the worst image. The others are almost as good as the values from the published tables permit.

Height (Buildings etc.)

The Lieve Vrouwe (Holy Virgin) Church tower in Amersfoort is used as the centre of the Netherlands national grid. Google Earth images from three different years have been captured with AirPhotoSE. The faint white lines show the true ground position of the grid centre, and the central calibration point lies within a pixel or so of this point but, because GE is not a true orthophoto, the building is displaced considerably. A true orthophoto shows no perspective in vertical structures and requires no correction. In practice, an image with the known point under a building should not be used for calibration since it is not possible to estimate its true position accurately.

Distortion (due to bad stitching of multiple images):

Distortion imposes a varying error which is not constant over an area in Google Earth. This is probably introduced by careless stitching at Google's subcontractors. The image on the right shows the airport near Yerevan in Armenia:
It was recorded in Digital Globe satellite images used by Google more than a dozen times over a ten year interval. Many of the images of the straight runway are distorted:

There is no way to correct for this distortion. If there is a feature in an area of interest which is known to be straight, a large unseen error can occur. If there are images from different dates available, examine each for this type of distortion and look for straight features and use only non-distorted images.

The central calibration point may wander up to 20 meters or more. Although distortion always creates displacement, and displacement can be corrected with a linear shift, distortion cannot be corrected because we don't know how it happened.
Calibration Correction using AirPhotoSE:

Correction with linear shift of the central calibration point in AirPhotoSE may be made using Navaid coordinates for rough initial searching. Here is some typical data from http://www.ourairports.com

In AirPhotoSE or using stand-alone Google Earth zoom in to see the antenna clearly. Preferably choose one with ‘high power’ if there are more than one available. Using the link above, you can see an extract from Google Maps. Navaid coordinates can not be counted upon to be reliable and accurate in many parts of the world. They are probably not as accurate as those obtained from a good GeoPortal, but they are useful for an initial search after which GeoPortal coordinates may be used for fine positioning.

In AirPhotoSE you have more control, because you can enter coordinates in any of the thousands of supported grids along with a search altitude. Select ‘Find in Grid’. Make sure that you have chosen your desired grid in Options first. Copy the coordinates from the Navaid list to the Clipboard an paste them into the selection fields in AirPhotoSE. You can also enter longitudes and latitudes in several forms.
Select a suitable height using the slider to show the Navaid sharply. Display the selected area in AirPhotoSE's Google Earth implementation.

Here, you can see that the central calibration point computed by the AirPhotoSE GE implementation is displaced to the north-west due to displacement error in Google Earth combined in an unknown way with those from the Navaid coordinate database.

Select the Move Cal Point option in AirPhotoSE's calibration menu. A magnifying window will appear when you move the mouse. Move this to cover the visible calibration point and drag it to the desired position. However be aware that this does not correct for a possible error in the Navaid coordinates themselves.

If you have a high resolution GeoPortal which covers the region of interest, you can usually obtain better accuracy by using the coordinates shown in the GeoPortal window in
AirPhotoSE rather than those shown in the Navaid lists. You can capture these for more accurate searching.

Then use the Calibration menu again and the Move Cal Point option as before.

The central calibration point using the GeoPortal values has moved to the south, but its distance from the centre hasn't changed much.

The result in Google Earth will be almost as accurate as the GeoPortal, with a very small difference attributable to the resolution and hand-placement of the calibration magnifier.
This method is usable up to about 2-3 km from a known point. Accuracy decreases as a function of distance because of the distortion in Google's use of the Plate Carée projection (latitudes and longitudes used as if they were X and Y coordinates) and neglecting the ellipsoidal shape of the Earth. Misplacement of imagery from different sources or dates adds an unpredictable component to the error which may be severe and which is not compensated by this technique.

Google Earth permits showing a much wider area at high resolution than that available at most GeoPortals and it offers the possibility of using images of different dates. Correction to near GeoPortal accuracy or known point precision is helpful for accurate mapping for long term recording of site details from rectified oblique images in the future when the appearance of the landscape has changed.

References:

(Free PDF download from: http://www.mdpi.com/1424-8220/8/12/7973)
4G (GeoSetter, GoogleEarth, Geoportal, GIS): or a new dimension in the use of spatial data

Lidka Żuk

1. Where do we begin?
The following contribution stemmed out of a need to improve the ‘post flight essentials’ (cf Palmer 2010) of geolocating, indexing and archiving of aerial photographs. After a spectacular but singular event in Leszno (Anonymous 1998: 28) there has, since 2004, been a steady and considerable growth in the numbers and frequency of archaeological aerial surveys carried out in various regions of Poland. This resulted from involvement in EU- and government-funded projects as well as a number of other smaller projects commissioned by local heritage and research institutions. The most noticeable outcome is a massive increase in the amount of post-flight photographic documentation required, especially since the dawn of digital cameras which lifted traditional limits in numbers of photographs taken. This work takes proportionally longer to complete but has been greatly assisted by technological advancements which open new possibilities for recording metadata.

The modern era of aerial reconnaissance in Poland (A.D. 1998) started in an analogue epoch with paper flight sheets, films developed in labs and photographs located with the use of a ruler on maps at 1: 100 000 scale (Dolatowska, Goliasz and Żuk 2000). The next decade saw a digital revolution: a rapid development in digital cameras which also record a broad spectrum of information including the date and time of exposure (Doneus, Scollar 2006); dissemination of GPS which speeded up geolocation (e.g. Crawshaw 2001) and a number of free map services such as Geoportal, Google Maps or Google Earth which provided much more accurate spatial information – both visual and georeferential (e.g. Palmer 2005; Palmer, Scollar 2008). We had all the required data to hand yet they were held separately in various formats and files and to create a complete single record for each photo still required a lot of copying and pasting from different sources. Thus the question is whether and how we can combine and use this information to the best effect: can we improve this situation by editing Exif files, extracting and processing metadata and reuse of existing databases?

2. GeoSetter: setting photographs spatially
Three years ago we brought to your attention a small freeware programme called GeoSetter. At that time it was introduced as a solution for those with non-GPSable cameras (Palmer 2010: 4, 46). It can indeed do the same work as a camera GPS (see below). I had been using GeoSetter in a straightforward way until, by making a few ‘wrong’ clicks, I discovered that its application can be much wider and that it can be used to edit and modify the content of Exif tags. Its main advantage is ability to change geo data and this greatly increases its potential use to anyone dealing with post flight data processing, camera GPS users included2.

a) writing georeferences to any digital image
Perhaps the work of GeoSetter is exemplified with scanned images which are saved automatically with Property files but not always (especially from old scanners) with Exif files. The assumption was simple: as Exif is a standard format for storing metadata of digital

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2 It may be worth noting that Geosetter is just one example of a programme of which there may be others that perform similar tasks.
images then GeoSetter may be able to write to, or otherwise create, an Exif file with coordinates to any digital photograph regardless of its source. This was tried with examples from the 1998 Leszno set which were scanned between 2004-2007 as a part of the Culture 2000 Project: *European Landscapes. Past, Present & Future*. The original coordinates obtained from paper maps were also digitised and used to create a distribution map of photographs in QuantumGIS. This helped to quickly identify site locations but also showed errors which were probably imperceptible on a 1:100,000 map but are unacceptable on a background of high-quality orthophotomaps from the Polish Geoportal. The next step was to pin in the correct location in GeoSetter and use an option, **Assign position to selected images**, which writes to, or creates, an Exif file holding the coordinates. The programme permits a user to select a number of photographs thus it needs to be done only once for all photographs of the same site (fig. 1). After saving changes, coordinates will be kept in an Exif file, and accessible for further use (fig. 2). GeoSetter writes coordinates in WGS-84 but, if required, this can be easily converted to local grid system in any GIS software.

Fig. 1. Distribution of photographs taken during Leszno training week generated from the original ‘manual’ coordinates and shown in QuantumGIS (left). The ‘ruler effect’ can be seen in regular spacing of points. It helped identify the correct position of a photographed object and assign more accurate coordinates to selected images in GeoSetter. The new coordinates can be seen below thumbnail frames and are written to each Exif file (right, highlighted in blue).
b) synchronisation of data coming from various sources

GPS has certainly improved and made it easier and faster to locate photographs. But if we use a stand-alone GPS a certain amount of juggling may be necessary to match coordinates to digital images as these data will be stored in separate files. GeoSetter permits a user to synchronise and combine information coming from GPS and a camera and store them in one place. If the clocks of GPS and camera have been synchronised then it is enough to select **Synchronise geodata of selected images with GPS data files.** The program then will assign coordinates from the GPS to an image and save them in Exif files. This can be done once for all photographs from a flight (fig. 3).
The key factor is matching the time of taking photographs with its position in the GPS track – which GeoSetter does by synchronizing the time of photography with a GPS trackpoint. It then writes coordinates of that point into the photograph’s Exif file. For those who did not pay much attention to setting the camera clock correctly, GeoSetter permits you to adjust the time once the discrepancy has been calculated by a user (fig. 4). But I would rather remind you of the first lesson taught at every aerial workshop: reconnaissance is costly and our job is to make sure that data collected are of best quality. Matching a camera’s time to that of a GPS before taking off does not take much time but it certainly saves plenty of it later and makes a job much easier as will be demonstrated below.

![Time adjustment before synchronisation of a GPS track with photographs.](image)

**c) correction of a known location**
A common problem for all GPS users (camera GPS included) is that it registers a position of an aircraft and not that of a photographed location. For some this may be good enough but it was demanded that I provide precise coordinates for sites. The solution is similar to that of scanned images. Once we find photo locations (after synchronisation with GPS tracks or downloading coordinates directly from Exif files), it is enough to pin in the correct position and assign it to selected images (fig. 5). In case of images georeferenced with a camera GPS, GeoSetter will overwrite the original coordinates (fig. 6).3

**d) adding other information**
This function is optional and depends on indexing system used in a given country (or institution). GeoSetter allows a user to edit other data stored in Exif files such as administrative location, authorship, copyright, etc.. Administrative units can be entered manually or automatically downloaded from web (fig. 7). The latter is probably much more efficient but the accuracy of the source information may not be adequate at a local level. It may be also worth considering the efficiency of adding such information to each photograph individually but it is probably a matter of personal preferences.

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3 I have been working with copies saved as tiff files. However, as pointed out by Rog Palmer, for those who work with originals (in particular with RAW format) it may be recommended to download and copy a backup set to save master Exif files. From that set a user can download RAW files in GeoSetter to geolocate or correct location of photographs, save changes and then convert them to a more handy format, e.g. *.jpg.
Fig. 5. Correction of a site’s location. New coordinates are saved in Exif files while the main window displays only one pin for selected photographs. This can be done once for all photographs of the same site (thumbnails highlighted in blue).

Fig 6. GPS information from an original camera GPS (left) and after correction of a location (right). Original coordinates were overwritten while date stamp remained unchanged.
4. GeoSetter to GIS: how to extract necessary data

Georeferencing and editing of Exif files allows us to gather all required information in one place but this can be done only for individual photographs. A standard practice is to create a full record for an aerial survey. Currently there are two potential options: either read Exif tags directly in other programmes or export data to GoogleEarth and process them for further use (if required). My usual working environment is GIS and thus I tried to convert Exif metadata to GIS standards. However, since there are as many indexing systems as there are operators, options presented below can be regarded as separate ways of creating a record, depending on the preferences of an individual user who may either work with GIS, GoogleEarth or store information in a standard Excel sheet. Each option has its pros and cons which will be presented below.

a) GIS: direct reading of Exif tags

This is probably the quickest and easiest option. It was tested with QuantumGIS which offers a plugin called photo2shape (http://gis-lab.info/qa/photo2shape-eng.html) to create point shape file from a set of geotagged photos. The shapefile is accompanied by an attribute table with records for each individual photograph. It contains basic information such as file name,
coordinates and date of acquisition. This needs to be done once for any number of photographs stored in a given directory. The main disadvantage is that metadata are selected automatically and a user cannot control table’s structure and content (fig. 8) but perhaps other GIS programmes are more user-friendly.

![Fig. 8. A shapefile created from a set of geotagged photographs and displayed against a background of an orthophotomap in QuantumGIS (left). It is accompanied by an attribute table which contains basic information about each photograph (right). Original set uses WGS-84 projection but QuantumGIS allows ‘on the fly’ transformation to match a local grid system of the orthophoto (ETRS89/ Poland CS92).](image)

Users, who prefer a better control of data, may try ‘intermediate’ programmes which allow the extraction of basic Exif information from any number of photographs and stores them in a text file, e.g. BR’s EXIFextracter which was tried for a quick test ([http://www.br-software.com/extractor10_setup.exe](http://www.br-software.com/extractor10_setup.exe)). This software offers a tool to select information to be displayed from Exif files and saved in a CSV file. With a little of editing work, data are ready to be imported to QuantumGIS or to any other programme capable of reading CSV files (e.g. Excel) if records need completing with information not held by Exifs (see below).

b) to GoogleEarth
At present, the only export option available in GeoSetter is Export to GoogleEarth which also offers a very precise tool to select information to be displayed from Exif files. In fact every single line can be ticked separately, including file name, taken date, exposure time, coordinates, administrative location etc. (fig. 9). The only disadvantage I noticed so far is that there is no possibility to ‘untick’ a miniature which is created for a preview/ quick viewing in GoogleEarth but maybe other users will find it useful. The final product is a *.kmz file which displays pins for each site location and holds all information extracted from an Exif file. From this single pin in GoogleEarth a user can display all the images located there. This needs to be done only once for a batch of photographs loaded to GeoSetter but it may be worth noting that
the program tends to be slow if there are too many photographs opened at once. At that stage it is worth saving the file with the *.kml extension if a user intends to process it further.

c) Excel: sorting and cleaning data

As mentioned above, I aimed at converting Exif metadata to be usable in GIS and thus it was necessary to lay out a table to accepted standards and complete it with information which was lacking in the Exifs. This can be done either with data obtained from EXIFextracter’s tools or *.kml files edited in Excel (or OpenOffice Calc) *.kml files (although the latter may not be the most professional method of dealing with these files). EXIFextracter provides a straightforward table while *.kml requires some sorting, cleaning and separating of data obtained from tags. But it may be worth noting that, after opening a *.kml file in Excel, a user obtains a sheet with separate entries for each photo regardless of the fact that a number of them share a Google Earth pin with the same coordinates. The final result is like a standard spreadsheet (fig. 10) to which we can add as many photo batches as required. Furthermore, data can be easily imported to QuantumGIS with the original table layout.
5. GIS and back to GeoSetter: reuse of existing databases

Regardless of a method used to extract Exif metadata, we are still dealing with a number of separate files for each flight. However, there are tools which allow us to design a database compatible with GIS programmes. One of those tools, an open source library SpatiaLite, was tested by a Ph.D. student, Miłosz Piguła, who designed a simple database to store information obtained as a result of the project *Non-invasive support of AZP in the vicinity of Poznań*. Currently we are working to extend that database to be able to store information about photographic documentation resulting from field walking survey and aerial reconnaissance. The main aim is to have a full record of photographic archives in one place which uses a standard data format and makes other files (*.kml, *.xls etc.) transitory. This will also make it easier to use existing information to locate photographs taken in subsequent years. A common practice is to repeat aerial survey in a given area on regular basis which results in an increasing number of photographs of the same site. Rather than trying to pin them time and again, we can reuse coordinates identified in previous years. GeoSetter allows a user to load a number of standard formats for spatial data\(^4\). Again the Leszno set makes a helpful example. Over a very short period of time a small area was flown several times along a few selected routes which resulted in tens of photographs of the same sites. Once these basic sites were identified and located, it was possible to load coordinates of each location and assign them to the remaining photographs. This gives a single coordinate pinned to a single site rather than several slightly different coordinates as I do not believe it possible to hit exactly the same position several times. This also helped create a much orderly database and considerably shortened time required for geolocation (fig. 11).

\(^4\) Theoretically a wide range of file formats is available for an import in GeoSetter but in practice it works best with *.gpx and *.kml.
6. Summary

While writing this paper I came across the following statement ‘The majority of innovations originate from laziness, a desire to improve one’s work, decrease an effort, or time spent to complete a certain task, or even - make a life more pleasant.’ (Bendyk 2013: 16). This is probably the best summary of a philosophy behind the presented post-flight documentation. It does not introduce groundbreaking technology but allows efficient use of data which we have already collected. How does it stand against the above statement? At first sight laziness or decrease in effort and time looks unlikely because the user is required to operate several different programs. In fact getting through all the stages takes less time than reading this paper (and certainly a lot less than editing it! – Palmer pers. complaint) and is mainly a matter of clicking and ticking relevant options. As a result, it allows work on a number of photographs together rather than as a series of individual photographs to accomplish the most tedious work which is likely to cause the majority of errors such as copying and pasting of data from several files/ sources or entering a mass of boring and repeatable information. How about fun? It cannot replace a thinking human being and this is a bad news for those who think that computers can do it all. But, for those who regard pinning the b***y photographs as fun, the good news is that finding a correct location is most time-consuming part of the job. I would also like to emphasize two major points: work can be completed with a set of freeware programs, accessible to any user and the results make an integral part of a digital image and can be recalled any time. This is not an ideal solution and I am not even sure if it meets a call of our Editor to hear from the professionals (Palmer 2010: 4) but any suggestions and improvements are welcome.
Acknowledgements
I would like to thank Wojtek Mania for bringing GeoSetter to my attention. This was probably one small step for humankind but a giant leap in my daily routine.

Bibliography
Stereo photography for airborne observers

Rog Palmer

It may seem a bit out of place for a ground-based interpreter to write about taking aerial photographs but, as I have to use the things, this is a move to get them taken to provide the most useful data. We all know that viewing in 3D is the most informative way of looking at aerial photos – and this also goes for the handful that provides illustrations. So where are all these pairs of pictures? Now we all use digital cameras, there’s no excuse not take stereo pairs unless you’re using minuscule memory cards and will run out of ‘film’.

Some books explain how and why vertical aerial photos can be taken stereoscopically so that they provide the viewer with apparent height, but they rarely mention that oblique aerial photographs can easily be taken to provide the same three-dimensional facility. There’s more to stereo viewing than just 3D, as examination of a pair of prints will help an interpreter eliminate ‘sites’ that may be caused by processing marks or dust on sensors. Stereo viewing also helps eliminate confusing effects of wind-rippled crops, sometimes helps understand cloud and other shadows, and can allow increased precision in placing control points on photographs that are to be transformed. The ability to see in stereo is recognised as an essential qualification for professional photo interpreters, therefore it should be taken as evidence of good airborne practice that we are provided with such images routinely.

The fact that this does not happen as much as we would like is perhaps because some archaeological observers don’t know how to take stereo pairs or are unaware why we like to use them. In the past, some were taken by chance, and CUCAP’s boxes include some superb panoramas of areas around the England-Wales border taken on one of those days when visibility is restricted only by the curve of the earth. The aircraft was presumably in transit with the photographer taking the occasional picture, but many of these can be paired together and viewed in 3D even, in places, showing a scatter of clouds behind the mountains (see, for example, box CIH if you want to pursue this). There are also accidental stereo pairs of coastal surveys where, again, the aircraft was flying at a set distance from the coast and the camera shutter was fired periodically. As the usual practice in CUCAP was that only verticals were viewed under a stereoscope, while obliques were scrutinised using a large magnifying glass, it is fair to use the terms ‘by chance’ and ‘accidental’ regarding those oblique stereo pairs. So what did we have other than accidents? How did people learn?

Derrick Riley, whose book includes a chapter about aerial photography (Riley 1987, 48-59), deals with stereo oblique photography in 41 words that do little more than mention it as a possibility. John Hampton, who insisted on stereo obliques being taken and used, and who pioneered their use in an archaeological context, mentions problems due to cameras but, unless I’ve missed something, wrote nothing on how to take such images although he once used a stereogram and a comparative map as illustrations (Hampton 1989, 19; Figs 4.8-4.9). However John’s legacy lives on in the working practice of Aerial Reconnaissance in the English Heritage Remote Sensing team where stereo oblique photography continues to be standard working practice, and in the instructions provided for those in receipt of grants (Grady D 2011). More recently Tim Gates, an aerial observer who uses his own photographs, described in some detail how he achieves blanket stereo photography of upland areas (Gates

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2005, 131-2) – of which more later. And finally, I note there is no guidance to taking stereo photographs in the recently written *Characteristics of aerial photographs* for the ArcLand web site (Cowley and Palmer 2012).

It is common knowledge that stereo vertical aerial photographs have about 60% overlap but for optimal viewing, oblique photos, including ground shots, are best taken to show the same view from two different positions – ie close to 100% overlap. This can be demonstrated on the ground by taking a photograph of a scene, moving a pace to the left or right, and repeating the shot from the new viewpoint. Prints from this demonstration can be viewed using a pocket stereoscope or made into an anaglyph using Photoshop (eg, Geowall 2013) or free software and then viewed with red-cyan or red-blue glasses².

Taking stereo pairs on the ground is easy and from an aircraft all you need to do is let it move you along while keeping the camera pointing at more-or-less the same target. Then take two similar views that stereoscopic examination will combine in much the same way as a normally-sighted person sees in 3D because their brain merges two slightly dissimilar views of the real world. Test this, if you wish, by looking across a room and closing each eye alternately to see how parallax shifts and depth diminishes between objects in the foreground and background. When flying, we are using the moving camera as two widely-spaced eyes.

² Pete Horne (pers com) notes a preference for red-cyan glasses over red-blue as the latter darken the image more. Use of red-cyan matches the process to make anaglyphs in which, traditionally, red (left) and cyan (right) layers are set for the paired images.
The optimum time between exposures at your normal flying height can be worked out experimentally but, in theory, the longer the ‘base’ – the distance between exposures – the better will be the vertical exaggeration (Avery and Berlin 1992, 65-7). I tend to think something like click...wait...click which gives me an interval of less than a second but I remember Pete Horne saying many years ago that, at 2500 ft using a standard or wide angle lens, he can allow up to a couple of seconds between exposures – so somewhere between the two ought to be about right for normal archaeological work. In general terms, the nearer you are to the target the closer together (in flying distance and time) should be the two exposures. As this will vary with flying height and aircraft speed there is no definitive time. For example, the photos that make the pair on the right were taken 5 seconds apart from a commercial flight at, perhaps 35,000 ft.

Commercial airlines provide a good platform as their flying is generally straight and level. When we were experimenting with anaglyphs about 10 years ago, Toby Driver noted that the pairs that went together best were those taken while the aircraft was flying straight and level. This provides fairly high oblique photos and is fine for panoramas, buildings and other lumpy objects.
Orbiting, as is more usual when recording an archaeological target, leaves us with a series of pictures that have been taken while circling around a central point. So not only do we have the usual scale change up and down each oblique photo but they are also overlapping differently in the foreground and background. Interpreters viewing prints of stereo pairs are used to compensating for this by sliding one of the prints around but I don’t think this is possible yet using on-screen stereo viewing.

Making gentle turns in a Cessna flying at about 80 knots and taking fairly high oblique photos will let you take a pair of similar pictures with 100% overlap at half- to one-second intervals. If you leave longer time intervals than that you can compensate slightly by tilting the camera to adjust for the turn although that’s cosmetic rather than essential. Although it is worthy of note if you want to make anaglyphs using freeware, as not all free software allows you to rotate images to match alignments. For example, the originals of the anaglyph below were taken 0.21 seconds apart. Looking with naked eyes you can identify angular differences of a few degrees but using red-cyan glasses seems to cause no problems (to my eyes) and a single fused 3D image can be seen and even the strut in the upper right corner appears to be more or less in the right place 3. However, my usual working area is around the Cambridgeshire flatlands and I think it would be useful to try these demonstrations somewhere more lumpy.

That’s all very well, but for near-vertical photos we need to put the aircraft in a tighter turn so that the observer is able to photograph downwards without hanging out of the window. Turning in this way follows a tighter curve (some of you may remember René Pelegrin’s film of him turning within the width of a canal) and so the radial differences increase between

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3 The effect of the ‘flying strut’ is because I have moved inside the aircraft (Pete Horne, pers com).
adjacent frames taken at the same time interval as those in the gentler turn. And if we shorten the time interval we lose some of the vertical exaggeration\(^4\). Also, in very tight turns there is the possibility of losing height and so introducing slight changes in scale to adjacent images. As an extreme example, the two photographs below were taken 1.5 seconds apart in a tight turn and show about 30 degrees difference in alignment as well as a slight change in scale. My free anaglyph software can’t make a 3D view from those photos unless I use another program to rotate one to match the alignment of the other but there’s no great problem using them with a stereoscope – although life would be easier if we didn’t have to align them at some 30° to one another.

The above photographs were taken from about 2000 feet asl. Sometimes we were slightly lower, but if the altitude is increased the turns do not need to be quite as steep to photograph a similarly-vertical (ish) view. This point was noted by Dave Cowley (pers com) who sometimes increases his flying height depending on the results he is trying to achieve. However, we could question the need for an archaeological observer to take near-vertical views in the 21\(^{st}\) century. A preference for those goes back to the days of mapping by hand and was made possible by poking the photographer out of the luggage hatch of a Cessna 172 (Hampton 1989, Fig 4.5). Before the CAA stopped it, it was a really efficient way of following long linear ditches such as are found in Wessex and the Yorkshire Wolds. But images of higher obliquity may often record the archaeology most clearly and are vital when directional crop markings are being recorded. It may also be claimed that use of higher oblique images allows greater accuracy in the placement of control points as an interpreter really can see the middle of the bottom of a tree and other symbols of precision.

Following long features or recording a pre-defined area in stereo now requires the aircraft to be flown in a straight(ish) line to avoid, or minimise, rotation. Variants on the method outlined by Tim Gates (2005, 131-2) have been used, for example, by RCHME/EH and Dave Cowley. Basically what is done is to slow the aircraft, drop the wing on the photographer’s side and then use the rudder to bring the aircraft back on course after exposure(s) have been made. Flying into the wind can help maintain a lower airspeed. Tim Gates kindly provided

\(^4\) In a really tight turn, it may be that the best vertical exaggeration is achieved by using images (which will be vertical or nearly so) that have been taken at 180° intervals (Pete Horne, pers com). To the best of our knowledge, no one has tried this.
an example (letter, 3 September 2013) in which he was flying 2200 feet above the ground into a 12 knot headwind that helped maintain airspeed at about 60 knots. This allowed him to take runs of stereo images of the vallum at Hadrian’s Wall of up to 3km in length with about 80% overlap. Photographs were taken at about 10 second intervals during which time the pilot had to get the aircraft back on course for the next shot. The photographer must look ahead to judge and remember where the next exposure will be and direct the pilot accordingly. This ‘straight line course’ may look like a saw edge if a GPS is set to record at short time intervals. It can also be used to photograph a single feature while flying past it rather than orbiting.

The ‘fly past’ method uses a similar manoeuvre which is done by putting on the power just before banking the aircraft and putting on opposite rudder in an attempt to keep on course. This is a fairly quick ‘over and back’ manoeuvre while a pair of shots is taken that, wrote Dave, ‘produces a very curious (some say unpleasant!) sensation’ (Cowley, email 20 July 2013) – which it does. During flights this summer I tried it a few times, more to get an impression of what could be done than to try and photograph anything while the aircraft was going sideways and the nose was dropping. Crossed controls introduce a crabbing flight which also moves the strut forward and out of the way and it would work for those targets that were photographed on the way past without the need for a near-vertical view. But for those sites that need examining from different directions we need to go back to the orbits.

This note may have changed a bit from ‘how to take stereo pairs’ to ‘how to fly an aircraft’ but the two are linked and it definitely helps aerial photography if the photographer has a good appreciation of what an aircraft can and cannot do. It has upset a couple of pilots in the past when I’ve said that students need to learn how to ‘take control’ of their pilot – but only the photographer is looking through the camera so, for the best results, needs to be in charge (not ‘in command’ – that’s still the pilot’s responsibility) when photographs are being taken.

Acknowledgements
Thanks to Dave Cowley and his pilot, Ronnie Cowan, for email discussion of various practices and to my pilot, Richard Francis, for experimenting with various combinations of crossed controls and tight turns. Thanks also to the lengthy comments made by Tim Gates and Pete Horne on an earlier version of this note – comments that led to considerable revision of my original five pages.

References
Roger Agache 1926 – 2011

Irwin Scollar¹

Roger Agache was born in Amiens, 16 August 1926 and died in Abbeville, 17 September 2011. After the end of World War 2 in 1945 he carried out research at the eponymous palaeolithic sites in Picardie made famous by the Abbé Breuil in the 1920’s. In 1959 under influence of Raymond Chevallier he started flying systematically in northern France and amassed a vast collection of pictures of crop, frost and soil marks. From 1963 to 1985 he was director of prehistoric antiquities of the Nord - Pas de Calais - Picardie region.

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He was the author of over 200 papers and books and received the Grand Prix National d'Archéologie (1983), and the publication of the 1992 Colloque International d'Archéologie Aérienne was dedicated to him. He specialised in winter flying, looking for soil and frost marks as, for example, the Roman villa below as a soil site at Warfussé.

With many crop sites found later in the year, as below at Conchil-le-Temple in the Department de Pas de Calais.
A mass of documentation and his publications can be read on the web site of the French Ministry of Culture.

http://www.culture.gouv.fr/culture/arcnat/aerien/fr/index.html

A short overview of his life and work is available on Wikipedia.

http://fr.wikipedia.org/wiki/Roger_Agache

A short film made near the end of his life uploaded to YouTube in 2008:

http://www.youtube.com/watch?v=M_gayOtpHvg

shows him still active in the air, aged 82.

Earlier films edited and uploaded by his son Nicolas can be found at:

http://www.youtube.com/watch?v=RXPRL-xByjE

http://www.youtube.com/watch?v=XhnllvtZKIE

http://www.youtube.com/watch?v=tm9366bTW3M

http://www.youtube.com/watch?v=NXr-bZXexIQ

There is a web site with 30,000 scanned slides from the Agache collection:

http://www.culture.gouv.fr/public/mistral/memoire_fr?ACTION=RETOUVER_TITLE&FIELD_6=REF&VALUE_6=ARR22%2b&GRP=5&SPEC=9&SYN=1&IMLY=&MAX1=1&MAX2=1&MAX3=50&REQ=%28%28ARR22%2b%29%20%3aREF%20%29%20%29&DOM=Tous&USRNAME=nobody&USRPWD=4%24%2534P

50 years go in 1963, after publication of some of my own photos taken in the Rhineland in Archaeologia, Roger visited me at my lab in Bonn with his wife Linette and their young son Nicolas. This was followed by a number of my visits to Abbeville during the decades which followed. I lost a close friend when he passed away in 2011.
Forthcoming workshop

UAV Roundtable in Crete: 22 - 23 January 2014

ArcLand plans to organise a small 2-day experts roundtable meeting in Rethymno, Crete, together with the TOPOI excellence cluster of the Berlin Free University (http://www.topoi.org) and the Institute for Mediterranean Studies of the Foundation for Research and Technology Hellas (IMS-FORTH, http://www.ims.forth.gr/index.php?l=en) to bring together 10-15 experts with a known expertise in using UAVs for archaeology and to discuss some of the main topics related to uses of UAVs in archaeology.

There will be no registration costs to attend this roundtable meeting in Rethymno and IMS-FORTH will try to provide affordable accommodation (30-40 € per night) in Rethymno within short walking distance from the meeting venue.

Please send a short description of your recent work with UAVs/drones if you would like to contribute to the meeting with your experience and expertise by sending an email to all three of these before 15 October 2013 (Dr. Axel G. Posluschny axel.posluschny@daimst.de, Undine Lieberwirth, M.A. undine.lieberwirth@topoi.org, Apostolos Sarris asarris@ret.forthnet.gr). Letters of confirmation for accepted participants will be sent by 5 November 2013.


Information for AARGnews contributors

AARGnews is published at six-monthly intervals. Copy for AARGnews 48 needs to be with me by 14 February 2014. Editorial policy (for want of a better word) tends to be that if I am sent interesting contributions they go in, so feel free to contact me with topic ideas or completed papers. AARGnews is not peer reviewed (although some contributions are checked by others) so you’ll get no points for publication. Vague instructions for contributors are on the AARG website and please do not use any ‘clever’ formatting.

Address for contributions: rog.palmer@ntlworld.com
Cropmarks

Interpreted by Rog Palmer

Oldest surviving aerial photograph
Appears to be one taken over Boston, US, in 1860 as the real first aerial photo, taken by Nadar (Gaspard-Félix Tournachon) over Paris in 1858 seems not to exist according to the Smithsonian. Both dates may mark an excuse for a party in a few years…


Vale of Pickering, UK
Archaeological research in the Vale of Pickering over the last 35 years has identified an entirely unanticipated level of past activity, particularly around the margins of the valley which formerly held Lake Pickering, the largest inland body of water in Britain. The lake mostly drained away about 12,000 years ago leaving a broad wetland with a network of interconnected lakes in the centre of the Vale and extensive light sandy soils on the margins of the valley.

Aerial photography, geophysical survey, excavations and other fieldwork undertaken by the Landscape Research Centre and the Vale of Pickering Research Trust have completely transformed our understanding of the archaeology of the Vale from the Late Palaeolithic to Medieval periods. Research programmes at Star Carr and West Heslerton indicate that what we have seen up to now is merely a sample of much more extensive archaeological resources which show much higher past populations and, although apparently ‘unique’, are a reflection of the scale and intensity of activity we should expect in similar valley landscapes elsewhere in lowland Britain.

In 2011-12 English Heritage commissioned the ‘Vale of Pickering: Statement of Significance’, which is the first stage in developing an overall strategy within the Vale of Pickering Historic Environment Management Framework Project. The Statement of Significance document has been prepared by Dr Louise Cooke in collaboration with a wide range of stakeholders, both organisations and individuals, representing a range of different backgrounds and interests including cultural and natural heritage, and planning. The document is designed to be used to underpin planning policies that help sustain heritage resources or the development of long term research strategies to enhance a more detailed understanding of the fragile evidence of the past which is increasingly under threat from industrial farming and other developments.

The detailed statement is at: http://www.northyorks.gov.uk/CHandler.ashx?id=22213&p=0
The document is summarised in: The Vale of Pickering an Extraordinary Place Statement of Significance
(Source: The Landscape Research Centre comment-reply@wordpress.com)

Some American uses of ALS
Uses of ALS for finding large ‘sites’ under forests.
http://www.theverge.com/2013/6/20/4445568/lasers- lidar-archaeology-detailed-topographical-maps

rog.palmer@ntlworld.com
More fun from and for ‘amateurs’
The aerial world has relied on ‘amateurs’ for years, especially where aerial photography is concerned and most of them are, or were, as good at spotting crop marks, etc as those who are paid to do the same. It could be suggested that most ‘professional’ archaeologists are ‘amateurs’ in the aerial world as there are few places of higher learning that teach the subject adequately, if at all. That aside, an ‘amateur satellite archaeologist’ has claimed to have found a complex of pyramids and lesser tombs in unexplored parts of Egypt. Geologist and archaeologist ‘authorities’ have, of course, dismissed these as natural but the finder is determined to mount a scientific expedition to check the things out. Reminiscent, perhaps of the ‘Bosnian pyramid’ that seems to have gone quiet since their ‘scientific investigations’.

http://news.discovery.com/history/archaeology/long-lost-pyramids-found-130715.htm

Second in the ‘amateur’ section is a serious call from the organisers of the Oxford and Edinburgh English Landscapes Project (see AARGnews 43 & 44) for members of the public to scour archives and Google Earth and send them information to help build up a database and atlas of hillforts. Nice idea perhaps, if the project has people skilled enough to check out what may be a deluge of misinterpreted sites. The person who discovered the ‘hillfort’ with its internal ‘henge’ (right) and was never satisfied with the natural explanation will probably propose it again – or perhaps others will also discover the same site. However, any of you with new hillforts, can start to feed information about the characteristics of their local hillfort into online forms on the project website.

Great Eversden, Cambs, UK. Source: Google Earth.

Summer in Wales
A surprise aerial find of a new Roman Fort in Powys, Wales seems to have been guided to the location (well, the general area) by anomalous Roman coins in the area. Good to see ground and air working together. http://www.bbc.co.uk/news/uk-wales-23628630

Geoportal sites for Germany, France and Austria
The German site includes air photos with 40 cm /pixel ground resolution for the whole country and has a search engine by place name. All the imagery seems to be true orthophotos taken in the last few years (there is a way of showing individual photo tiles with their dates). Coordinates when moving the mouse are displayed with 1 meter accuracy. The Java version zooms to larger images and the screen quality is as good as GE but the Geoportal image screen is quite small. http://sg.geodatenzentrum.de/web_dop_viewer/dop_viewer_geoview.htm

http://www.geoportail.gouv.fr/accueil

The French have done it again! Their new GeoPortal (below) now offers a superb (and I mean super superb) collection of historical verticals from the original negatives at 1:7000 which can be loaded with full coverage and different dates going back, in places, to 1919!

www.geoportail.gouv.fr/accueil

In contrast, I’ve found the Austrian orthophotos. They now want 1 Euro per sq. km for the 1 meter resolution version and they have removed all the previous orthophotos from their web sites. For higher resolution the costs range between 8 and 20 Euro per square km.

(thanks to Irwin Scollar)
**Obliques of Estonia**
This site seems to be the enterprise of photographer Mait Metsur. Mostly scenic but a well-designed site that advertises what is available and show what photos have been taken of where. [http://www.aerofotod.ee/AF/?pilt=22131](http://www.aerofotod.ee/AF/?pilt=22131) 

(thanks to Helena Kaldre)

**A trip round the island?**
I’m just thinking of the potential for this sort of thing to show students, etc how sites change as you circle round them. Perhaps something for the Austrian mob to think about..<br>[http://www.estonia360.ee/panorama/kumari-laid-sipelgarahu-pondirahu-vainameri-matsalu-rahvuspark/](http://www.estonia360.ee/panorama/kumari-laid-sipelgarahu-pondirahu-vainameri-matsalu-rahvuspark/)

(more thanks to Helena Kaldre)

**Of kites and kids**
John Wells, of the West Lothian Archaeology Group, is a very busy bloke and we’ve mentioned some of his work in past issues. The latest is SNAPS (The Scottish National Aerial Photography Scheme) which has the support of ArcLand, an EU Culture initiative and various others. Information on the website will give a good start to anyone wanting to start kite flying (or using poles) and the fact that most of John’s work is with kids bodes well for the future of aerial photography. The fact that this work came about is in part due to John’s late wife, Rosie and is explained in the site:

In 2012, terminally ill Trust and Group co-founder [Rosie Wells](#), asked for some of her money to be set aside for funding a pilot project to investigate and introduce [cheap, simple, low-level aerial photography techniques](http://www.armadale.org.uk/snaps.htm) to children and students. Therefore, as part of our [activities](#), we donate kite aerial photography starter (and some standard) kits to a range of groups and individuals. This pilot project is partly to establish a reliable system for working with children and to encourage the progression to more interesting techniques, such as working in the [near infra-red](http://www.armadale.org.uk/snaps.htm).

The site is at [http://www.armadale.org.uk/snaps.htm](http://www.armadale.org.uk/snaps.htm) and you’ll find links to several Flickr sites – one of John’s photographs, another which helpfully deals with All problems concerning Aerial Photo Interpretation. The [snaps](http://www.armadale.org.uk/snaps.htm) site includes a list of those who have received kite aerial photography kits and it is satisfying to see that this includes a mixture of schools, local societies, plus professionals and their organisations.

Seasoned veteran, [WLAG member](#), Bronwen (Linlithgow Academy) age 12, flying a £600 rig on a HQ Flowform 2.0 kite (£700 if you include the kite). Sony Nex 5R camera with a Samyang 8mm full-frame fisheye lens. Clothes to match the jeep were not a requirement ;)

**Exhibition in Scotland**
Susie Green (mentioned in the last issue) and Kieran Baxter are PhD students and have a combined exhibition [High & Low - An aerial view of prehistoric hill forts across Fife &](#)
Angus at the Falkland Estate, Fife. The website says the exhibition has been extended until further notice.  
http://www.topofly.com/highandlow/  
(thanks to John Wells)

Aerial photography for beginners…
A web search brought up an unexpected and reasonable article on how to take and log aerial photos.  

…and for big boys
If you want to see how retarded we are by hanging out of a Cessna, scroll through this site and begin to think big if you want to achieve effective aerial cover of your area:  
http://www.petriefled.info/Petrie_Croatia_Multiple_Oblique_Camera_Systems2.pdf

…and how to do it in French
After discovering that we, or I, didn’t know that Agache had died, and my comment that France was a bit of a black hole to AARG, Irwin Scollar did some searching for French aerial sites on the www. I think we’ve noted Jacques Dassié’s site before, but it seems well organised in French with a shorter version in English.  
http://jacques.dassie.free.fr/index.htm#Menu

Found Roman frontier
Examination of declassified satellite photographs by archaeologists at the Universities of Glasgow and Exeter has led to the identification of a 60 kilometre wall that ran from the Danube to the Black Sea in Romania. It is considered the most easterly example of a man-made frontier barrier system in the Roman Empire.  
(thanks to Ioana Oltean)

Free access to Polish historical cartographic resources
In recent years we have been observing an enormous effort by various enthusiasts to make accessible resources of historical maps for the area of Poland (also from the pre-WWII period). Results, usually high resolution scans of map sheets but also georeferenced raster mosaics, are accessible in the Internet.  
The Mapster service (www.igrek.amzp.pl) is a platform, which provides access to vast collections of historical cartographic resources with map indexes. Polish, Russian (Soviet), German (Prussian) and other maps are available. For those familiar with the collection of photomaps that were produced by the Luftwaffe between 1930s and 1945 it may be interesting to know that a number of sheets covering a part of the Wielkopolska region and held at Adam Mickiewicz University in Poznań were scanned and also made accessible through this service (www.igrek.amzp.pl/mapindex.php?cat=PHOTOTK25). Each individual sheet can be opened for viewing or downloaded.  
Cartomatic company used existing historical cartographic resources to create a fully functional web service Cartoninjas Geoportal (www.hgis.cartoninjas.net). It offers Polish military topographic maps from 1919 to 1939 at scales: 1:500 000, 1:300 000 and 1:100 000 as well as German topographic maps Messstischblatt, mainly from the first half of 20th century, at 1:25 000 scale. All map sheets are available as continuous raster layers and can easily be incorporated into GIS through WMS servers. The data were transformed into Polish Coordinate System “1992” (EPSG:2180) and WGS-84 (EPSG:4326). Resources are available for non-commercial use, including academic research and education.  
(thanks to Wojciech Mania)
Books of interest?

Rog Palmer


This is the text of one of the *Position Papers* which was commissioned to encourage debate at AARG 2012. It’s worth reading to get another view on what we might be trying to do by using aerial images. [http://www.academia.edu/3401453/What_Next_Aerial_Archaeology_as_Landscape_Archaeology](http://www.academia.edu/3401453/What_Next_Aerial_Archaeology_as_Landscape_Archaeology)


This does little more than use CORONA images to illustrate four desert castles and thus demonstrates another use of this source. Illustrations show that much work is needed on interpretation and mapping before the analysis promised by the title will be possible.

*Archaeological Prospection* Vol 20, Issue 2 (April/June 2013) is a special issue on satellite radar in archaeology and cultural landscape edited by Rosa Lasaponara and Nicola Masini with papers drawn from a 2012 Earsel meeting. A lot of the radar resolution is coarse and some interpretations seem optimistic and imaginative. However, the German TerraSAR-X has 1m resolution and seemed to give fair results over a Roman fort in Syria. But if you like pictures of pixels, this is the issue for you.


It seems that nobody publishes books in the summer months. However, Oxbow’s *Summer Bargain Catalogue 2013* includes at least three books at reduced prices that may be of interest to any of you who don’t already have them [www.oxbowbooks.com](http://www.oxbowbooks.com):


Blog of interest? Technology, but it mentions archaeology [http://fiducialmark.blogspot.co.uk/](http://fiducialmark.blogspot.co.uk/)

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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.

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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.