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Editorial

AARG 2006
The meeting at Bath was memorable for the vast curry house somewhere in town (not bad grub either), for a relatively lazy field trip and for the time we had for discussion in the two days of presentations. Dave Cowley had designed the program so that papers could be discussed and had left loads of space between papers to enable this. In addition, Toby Driver and I had been deputed to organise a ‘contentious’ session with various speakers asking ‘is mapping working and is flying failing’. The session did seem to stir things up a bit and ended with observations by me that we need more involvement from permanent staff in universities if there is ever to be any worthwhile research using aerial data. In Britain we have only Glasgow and virtually everything else that has an aerial component in its work is government heritage organisations or the handful of people doing ‘commercial’ work. The situation in Europe is considerably better – or has higher research potential – as almost all the aerial people are employed by universities and so are able to influence their students in ways and for lengths of time that we part-time teachers cannot do. All this leads rather neatly into the proposed debate session on Education that Dave has scheduled for AARG 2007. Students who received AARG bursaries to attend the Bath meeting were asked to write ‘reviews’ of the meeting. The one we decided to include in this issue is by Aleksandra (Ola) Wilgocka who raises some very valid points that of which we need to be aware now that AARG has become international and is attracting younger members.

Crop marks in Poland
Nothing new perhaps, but these had been photographed in November 2006 on a flight made by Wlodek to record low earthworks. Those were showing very well and he also photographed what I remember as a group of pits (well, what else is there in Poland?) showing as darker and increased growth in young cereal. Not only were they darker in colour, they were also sufficiently tall to throw shadows giving some truth to the previously ridiculous statement that ‘crop marks are best photographed in winter because the low angle of sunlight helps emphasise their shadows’. Whatever the origin of such an interesting observation (I first met it in a Sheffield student’s essay), that muddle of effects and terms has been perpetuated and most recently appeared in an article in Antiquity on the use of ALS (Devereux, et al, 2005, about the middle of page 649). That really should have been picked up by a reviewer unless it indicates that our teaching really is at such a rubbishy level. Or am I missing something?

Access Grid Seminars
There is a note by Chris Gaffney outlining this innovative series of virtual meetings elsewhere in this issue. I have attended two of the seminars and it was quite an experience at the first one to be sitting here in Cambridge, listening to Dominic Powlesland talking in Birmingham, and seeing Ken Kvanme and his students in Arkansas and Michael Doneus in Vienna ‘at’ the same meeting. There is huge potential for Access Grid to provide venues for teaching as well as things like AARG committee meetings. You’ll never need to get out of your chair again....
Requirements for stereo viewing
Among the reading matter I took to Poland were some pages hastily printed from the web site of the Remote Sensing Core Curriculum (http://www.r-s-c-c.org/). What I had forgotten was that such printing sometimes crops the page width, as in the case below where the right side has been lost. In this case it was well worth the initial annoyance as the paragraph on Binocular Vision (below) shows. You won’t need to read it right to the end.

Desk-based aerial survey?
I imagine that most of you venture into Google Earth and, as I do, waste a lot of time there enjoying the aerial views. GE’s February newsletter mentioned David Riallant’s development of a drone (well, a radio controlled flying wing) with a digital camera mounted to take aerial photos. Flight control and navigations is done using virtual reality goggles and the results – on the web site demo – are transformed to fit maps in GE (http://www.piet-earth.com/indexuk.html). It seems to be very neat use of current technology and may give hope for the ancient aviators and aerial photographers among you who, using this, can continue to fly when you are grounded. The well-read among you will remember that I suggested doing away with airborne people and using drones seven years ago (Palmer 2000, 126) and it is good to see that technological advances are enabling this to become less costly and more possible.

AARG subscriptions
In case no one else explains in this issue, please let me point out that methods of paying subscriptions are inside the front cover of AARGnews. Much as we would like to take payment by credit card, it would cost too much to set up and pay the bank unless we multiplied either the membership numbers and/or the subscription. In this issue is a note by Helen Winton, our current treasurer, explaining all. She is also looking into payment by PayPal which may provide an easy way for many of you.

Cover pic
The editors’ preferred cover for Populating Clay Landscapes (see p43) using ditches from air photos and random boundaries on an undulating landscape provided by Kym Boyson.

References

Chairman’s Piece

Dave Cowley

At the time of writing the call for papers for the AARG 2007 conference has just gone out and with our conference in mind, some thoughts on, and arising from, Bath 2006 seems like a good place to start this piece.

Bath 2006

In 2006 we experimented with the format of the conference a little and, for the most part, this seems to have been successful.

The debate session organised by Rog Palmer and Toby Driver represented the main departure from normal practice and the short ‘positional’ papers stimulated a wide-ranging and frank discussion. It is my impression that this session set a tone for the rest of the conference in encouraging a wider base of contributions from the audience – and this should be one of characteristics of a research group, that we are all there to contribute to debate and the development of our discipline (see Ola Wilgocka’s conference review elsewhere in this edition). One criticism of the session was that it was very UK based and, as such, may not have been universally relevant. However, there is a value in highlighting the strengths and weakness of approaches in the UK where aerial work is still relatively well funded and established. As ever, the content of conferences reflects the interests of those who are willing to organize sessions.

The session presenting very brief summaries of the many of projects initiated through the C2000: European Landscapes – Past, Present and Future project was a tremendous showcase of what has been achieved through this initiative. Time constraints and the number of projects involved meant that the session ran at a break-neck speed and it is hoped that we will be able to hear more measured presentations of some of these projects during our 2007 conference (below).

The digital session provided an excellent insight into issues that are clearly important and about which all practitioners and serious users of aerial photography will have to be well informed. It is undoubtedly an area that will be revisited in future and plans are in place for a follow-up workshop in 2007. It is always exciting to hear about new projects and current postgraduate research.

The only low point in the conference for me was the paper by Tim Akers, whose extraordinary claims for his technique really were too good to be true. The presentation of sound research that is open to expert critique is vital – falling back on ‘it is a secret’ when challenged in your premises is never appropriate in a professional context.

EAC/AARG Aerial Archaeology Working Party

The AGM in September 2006 provided me with an opportunity to present progress on the proposals for a working party between AARG and EAC on aspects of Aerial Archaeology (see AARGnews 33, 7-8). While the assembled throng did not fall over itself in enthusiasm for the project, I took it from Pete Horne’s comment from the floor that the consensus of the membership was that this was an excellent idea that we should take
forward. In addition, from soundings that I have taken, before and since the conference, there is clearly strong support for the working party. We were fortunate to have Sólþorg Una Pálsdóttir in attendance, courtesy of Kristín Huld Sigurðardóttir of the Archaeological Heritage Agency of Iceland, who is our sponsor in EAC.

In discussion at the AGM, as a committee and with Sólþorg Pálsdóttir, we have agreed that the working party will have two foci, concentrating on Education on the one hand, and Standards on the other – both clearly areas of shared concern to AARG and EAC. I hope to convene two working groups, drawn from AARG membership, which will produce a clear and focused specification for both these areas, including a set of aims and products, and a defined timetable. The call for interested parties to make themselves known has produced some volunteers, and the working group for Education is being formed and will be the first focus for the working party. I see the debate session at AARG 2007 (below) as an important first stage for the working group, in helping to focus thought, define scope and stimulate contributions to this component of the working party.

Once we have a functioning Education working group we will need to turn our attention to establishing a working group to look at Standards and I envisage this forming the subject of the debate component of our conference in 2008, though we will want to show some progress before then. If you are interested in contributing to either of the working groups please do not be shy and contact me directly.

**AARG 2007**

An AARG conference in Denmark was first discussed with Lis Helles Olesen during the tour of the Stella Artois brewery in Leuven, in the hope that the free beer would override any doubts about such an undertaking. After a bit more negotiation since then I am delighted that AARG 2007 is being hosted in Denmark at the National Museum in Copenhagen. Good progress has already been made with arrangements by our Danish hosts and in particular Claus Dam, for which we are very grateful.

The call for papers for the conference has gone out by email, both to the AARG membership, but also to the mailing list of the Space to Place conference held in Rome in December 2006 (for which my thanks to Stefano Campana). This should ensure a wide circulation. It is also reproduced elsewhere in this *AARGnews*.

We have identified Education as the debate session for this year and it is important that the emphasis on short stimulating papers with plenty of time for discussion is maintained. A good representation of papers from Denmark and elsewhere in the Baltic area is expected and digital issues will be further explored in a workshop aiming to take forward the session from 2006, but probably in a less formal manner than a set-piece session.

**Rome: Space to Place**

It was a pleasure to attend the Space to Place conference in Rome in December 2006. Spread over three days with a packed programme, delegates would no doubt find more interest in some parts of the conference than others. For myself, I enjoyed the integrated landscape based projects that were presented from across the globe which drew on a wide range of data, from historic maps to satellite imagery. Here the aerial contribution was made as a matter of routine, rather than making a point about it – real archaeology! The
showcase of 3D and virtual presentations of archaeology was also impressive – a real challenge to both the presentation of archaeology in exciting ways, but also using the models and visualisation to enhance analysis of the past.

**Visualisation workshop**

During the conference in Rome Peter Halkon of Hull University suggested a workshop on aspects of visualisation organised in partnership with AARG and hosted by Hull at the HIVE (a venue in their Computer Science facility). As I write, the details of how this will work are being discussed, but I hope the event will take place on 12th December 2007 and further details will be circulated as soon as they become available. In the meantime the following links give an insight into this facility and details of a related workshop run in 2005.

http://www.dcs.hull.ac.uk/simvis/research/simvis_archaeology/simvisarch.htm
http://www.dcs.hull.ac.uk/simvis/research/simvis_archaeology/workshop/index.htm

**AARG 2008 and beyond…**

The vast majority of AARG conferences have taken place in the UK, and it is only recently with Vienna, Munich and Leuven that we have started to explore other countries. In my view, and that of the current committee, the increasing diversity in membership means that the venue should no more be in the UK than any other country where we can identify partners to host a conference. To that end at the 2006 AGM I asked for volunteers for host future conferences and am pleased that in 2008 we hope to go to Ljubljana. I have commented before on what a UK (and in particular English) based organisation AARG was even a few years ago, and on the need to ensure our activities clearly represent the membership base. The venue of the conference is one aspect of this, as are the subject matter of debates, sessions and papers, and the composition of the committee.

And that is probably a good point to stop – with a reminder that in September there are vacancies on the committee for Membership Secretary, Honorary Secretary and Treasurer.
Treasurer’s note

Helen Winton

Membership payments, or donations, can be made to AARG in a number of ways and receipts are available on request. If you have any AARG bank related questions then please contact the treasurer (helen.winton@english-heritage.org.uk).

1. **Direct payment** to the AARG GB sterling account or to the Euro account, both of which are with Lloyds bank (details below). You can do this as a one-off payment each year or, to save yourself the trouble, you can set up a regular annual payment to be made in January. Your bank will be able to advise on how best to do this. You do not require a form from AARG, all you need are the bank details listed below. Please remember to put your name in as a reference rather than “AARG subs” so that we know you have paid (we know it is your subs). If you are a new member (or a returning lapsed member), please remember to contact the Membership secretary with your address details so that you receive your AARGnews.

2. **British sterling cheque** made payable to “Aerial Archaeology Research Group”. Unfortunately we cannot take cheques in non-UK currency because it costs AARG almost as much as the subscription to process foreign cheques.

3. **Cash** in GB sterling or Euros. Please send to Cinzia or myself. It costs AARG almost as much as the subscription to bank non-sterling and non-Euro currency.

**AARG Bank details:**

Sterling Account Name: The Aerial Archaeology Research Group
Sort Code: 30-99-99
Account No: 00396885
BIC: LOYDGB21225
IBAN: GB32 LOYD 3099 9900 3968 85

Euro Account Name: The Aerial Archaeology Research Group
Sort Code: 30-99-99
Account No: 86174918
BIC: LOYDGB21225
IBAN: GB61 LOYD 3099 9986 1749 18

Bank address: Lloyds TSB Bank Plc, 2 Pavement, York YO1 9LB, UK

AARG is currently looking into reclaiming tax, where requested, on behalf of British taxpayers. Further information to follow.
* CALL FOR PAPERS *

International aerial archaeology conference

AARG 2007 COPENHAGEN

Tuesday 25\textsuperscript{th} to Thursday 27\textsuperscript{th} September 2007

The National Museum, Copenhagen, Denmark

** Proposals for sessions, papers and posters are invited**

Tuesday September 25\textsuperscript{th}. Conference Day 1 - \textit{Provisional sessions}:
Aerial Archaeology in Denmark; Baltic Archaeology; Education (DEBATE SESSION)

Wednesday September 26\textsuperscript{th}. Conference Day 2 - \textit{Provisional sessions}
New Projects & Postgraduate research; Taking Aerial archaeology forward; Digital photography (workshop); C2000 Projects

Thursday September 27\textsuperscript{th}. Conference Day 3
Field Trip

Note: session titles are provisional and offers of other papers are welcomed.

Oral papers should usually be 20 minutes duration, and equal weighting is given to poster presentations. It is hoped that the format of the session on Education will be on the model of the AARG DEBATE at Bath 2006 (see Chairman’s Piece \textit{AARGnews} 32).

Closing date for abstracts is 31st May 2007.

Address for conference correspondence:
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Email dave.cowley@rcahms.gov.uk

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STUDENT BURSARIES FOR AARG 2007

These are aimed at supporting bona fide students who are interested in aerial archaeology and wish to attend the conference. Anyone wishing to apply should contact Dave Cowley (by letter or email) with information about their interests in archaeology and aerial archaeology, as well as their place of study.

Closing date for applications is 31st May 2007 (note change in date).

Aerial Archaeology Research Group website: \url{http://aarg.univie.ac.at/}
Annual Meeting of AARG: 10th – 13th September 2006
(Lesson of juggling)

Aleksandra (Ola) Wilgocka

It is a great honor and pleasure to write about the AARG Annual Meeting that took place at Bath in 11th – 13th September 2006 from a student’s point of view, since I was one of the lucky students who were able to be there, funded by a student bursary from AARG and support from C2000.

In order to find some bad points - which I probably shouldn’t start with! - I have to mention that there was nothing about climbing to the top of the big university mountain on the “getting here” maps that we were given. What is more, there also wasn’t any advice about not trying to climb this mountain with all your bags by foot (which my Latvian friend and I did on our way to the university campus)! But – on the other hand – it was an occasion to see at least a sample of Bath’s architecture and views. As a result we were late for the first session but luckily we managed to arrive just in time for the lunch break. And what a relief it was to finally see some familiar faces welcoming us there.

Personally, I regret not participating in the General Meeting and first session about the use of historic photography, which were held in the morning on 11th September. Because getting to know different landscape reconstructions could be very informative, especially for someone interested in the processes of landscape shaping.

The afternoon session, though, was very absorbing. So many strong and reflective lectures about what was done during the last years and decades in aerial archaeology, what aerial archaeology is still missing and what should be improved. Some of the lectures were highly provocative and produced discussion, showing weaknesses of “mapping” and “flying” in Britain, as well as a lack of theoretical reflection and collaboration with universities in research projects, both past and present. On the other hand, we were given a more optimistic view of the great amount of work that had been done and which is improving with time in the British national programs of aerial archaeological data collections and mapping (if funding, hired specialists and working time are considered). These two – in some aspects highly different – perspectives were complementary. In my opinion it is valid to get to know how the system is working in Britain, the country which is leading in this subject among the European countries, since everyone else will, to some degree, take Britain’s experience into consideration while doing aerial archaeology in their own countries. The wide view matters to beginners who want to try working in aerial archaeology, to experienced scientists who are using the aerial data with their researches, and to those who produce aerial photography and map them. Although not every question that was asked was answered during this session, there are signs that in aerial archaeology – luckily – “not every mountain top has been reached” and that the discipline will continue to find new peaks to scale.

Next morning brought another session dedicated to new projects and postgraduate research. The first part was concerned using tools other than aerial photos – like LIDAR. For the student who never had the chance to use any of these, it was stimulating to see in what circumstances those tools can be effective and what kind of limitations they have.
After lunch we heard more about some researches made especially by young scientists, who were presenting their way of using and interpreting APs. Their work has been filling gaps in scientific research, showing how sometimes aerial archaeology data can generate more information and strengthen the interpretations made using other sources of information. The afternoon presentations considering digital data in aerial photography made me, though, a little bit confused. The high level of the lectures and discussion made me realize how poor my experience in the subject of digital data processing is. Nevertheless, it was stimulating.

The last day, though, was the most adventurous – a field trip across parts of Salisbury Plain ending up at Stonehenge. Many of the participants were very excited about visiting the most splendid and famous archaeological site in the UK, which is very well known also from aerial photos. For me it was the most important archaeological site I’ve ever been to, but the visit also caused me to reflect with some disappointment on how important is saving not only the monument itself but also the space around it, and how much will the way we treat the modern landscape influence our perception of the past and the monument itself? But I spent a marvelous time there chatting with people, admiring the beauty of English green grasses, taking nice photos and allowing myself some madness in the souvenirs shop. In a way I was there as an ordinary tourist – not a student of Archaeology – and it was a very relaxing role...

As a student I was very happy to participate in the Bath Conference. It was not only a chance to meet specialists in the discipline from different countries, but also young researchers who are making their first or second steps in aerial archaeology so that I could derive knowledge and experience from everyone there. I liked the AARG Meeting also because it made me think much about the path I should take in the future. What is more, I gained a scientific enthusiasm and opportunity to make and hear discussions about the subject of my interest. And as Alvin Toffler said in an interview – knowledge is the only real inexhaustible recourse of humanity nowadays, and discussing it is not only making it used but also produced. So I am glad that I participated in the production of knowledge on the Annual Meeting of AARG in Bath. However, it is worth pointing out that I struggled to clearly understand some of the lectures, which were full of specialized vocabulary, and that in producing knowledge clear communication is vital.

And if I can make one suggestion, it would be great if one of the sessions on the next AARG Meeting was dedicated to getting some practical experience in juggling – kind of “being in the air” that was gaining popularity during the conference’s evening…(!)
Terry James: a personal recollection

Chris Musson

Terence Alan James, Terry to all who knew him, died in January at the early age of 58 after a valiant fight against cancer. Long-time members of AARG will remember his mischievous smile and the twinkle in his eye. These never deserted him, nor did his love of debate, his passion for solving problems, his desire to help and encourage others, and his devotion to his wife and soul-mate Heather, whom he met at the fledgling Dyfed Archaeological Trust in the mid-1970s. By then Terry had already had an adventurous and varied life, a foretaste of the multiple skills and interests that were sharpened throughout his career by a wide-ranging and incisive intelligence. A Carmarthen boy – it was his already deep knowledge of the town that brought him to the attention of the Archaeological Trust – Terry left school with virtually no qualifications and took up an apprenticeship in printing, a move which later led him to run the last working letterpress enterprise in Carmarthen.

Throughout his life Terry was passionately concerned with politics. As a firebrand of the left he won a scholarship to Ruskin College, Oxford, where he also worked for the University Press. Returning home, he made a radical change of direction when invited by Don Benson to take charge of the Archaeological Trust’s study of Carmarthen. This soon drew him into excavation, at which he distinguished himself not only as a digger and project director but also as a rapid and effective publisher of excavations at two religious sites within the town.

Later Terry took on the task of developing the Trust’s pioneering Sites and Monuments Record. With Joe Jefferies he helped to create purpose-made ‘desk-top’ computer systems that typified his search for effective but economical solutions to problems that were then defeating others with notionally greater resources. This capacity to cut to the heart of the question, and his now wide knowledge of all aspects of archaeology and the man-made environment, earned Terry his next job, as Information Systems Manager (later Head of Information Technology) at the Welsh Royal Commission, where he battled for seven years against various impediments. Ill-health finally forced his retirement in 1998.

In the following years Terry was often in pain but rarely if ever despondent. He sailed the coastal waters of Britain and northern

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France, travelled the world with Heather, wrote articles on a variety of topics, developed new skills in colour-slide restoration, and continued to amuse and encourage all who sought his advice or who just enjoyed conversation and good company with Terry-and-Heather – the names went together as if they were one.

Among Terry’s many contributions to archaeology and landscape studies were his pioneering efforts in aerial survey, a virtually unpracticed art amongst Welsh archaeologists until Terry’s first forays in the late 1970s. It was Terry, and his early collaborator Doug Simpson, who first showed what ‘home-grown’ aerial survey (as distinct from occasional sorties by Cambridge University) could accomplish, despite lack of funds and other difficulties. With Simpson, Terry published the first popular introduction to the aerial archaeology of south-west Wales⁢³ and a number of ‘aerial’ articles followed in a variety of journals. Had Terry’s life not led him in other directions he would no doubt have added to these early accomplishments. It was typical of Terry that even in the final months of his life he took delight in advising Toby Driver on his sumptuous new book on Pembrokeshire from the air⁢⁴. What a pity he did not live to see his efforts of the 1970s come to such splendid fruition thirty years later. Thankyou, Terry, for everything.

The ‘AeroDat’ project – 21st century archaeological aerial survey

Patrick Nagy and Ulrich Schlenther

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Extensive building activity has been taking place for decades now in Canton Zurich, which is why the Kantonsarchäologie has been trying for quite some time by means of archaeological survey to detect the remnants of a long-forgotten past concealed below ground before it is too late. Archaeological aerial photography is a method particularly well suited and it has been one of the tasks carried out by the Kantonsarchäologie since 1991. The current aerial photographic library contains approximately 65,000 registered images. In order to best maintain and process such vast amounts of data and in order to ensure their subsequent use within the administration, it became necessary to develop a special computer application.

1 ARCHaeOLOGICAL AERIAL PHOTOGRAPHY IN CANTON ZURICH

1.1 Archaeological aerial survey

Despite the fact that building activity and intensive agriculture and forestry have brought about lasting changes in vast areas of our countryside over the past number of decades, many traces of millennia-old settlement activity and land use have been preserved in the region. While visible architectural monuments such as castles, fortified sites, bridges and roads immediately catch one’s eye, most of the remains bearing witness to past human activity are concealed below ground. The remains of these ancient settlements, abandoned cemeteries or transport links no longer used are now being extensively surveyed and recorded by the archaeological departments of the individual Cantons. Archaeological survey first and foremost aims to locate hidden sites and remains from past times below ground and, where possible without intrusions into the ground, to examine and describe these in as much detail as necessary. Besides aerial survey dealt with here, the various non-invasive methods available to achieve this goal also include fieldwalking and geophysical examinations (electrics, magnetics, radar). A method that is particularly well suited to carrying out extensive archaeological surveying is aerial prospection. Minimal differences in the growth and colour of the vegetation, which can be indicative of
archaeological sites, are much more clearly visible from a bird’s eye view; also, larger areas can be surveyed. Because the successful aerial survey depends on various factors, some of which are changeable in the short term, it is never possible to build a comprehensive inventory within a short period of time; on the contrary, it is necessary to fly over the investigation area repeatedly for a number of years. This is particularly the case in Switzerland, where the structure of the landscape is distinctively small-scaled and fields with suitable crops (cereals) are only small and change annually (Fig. 1). Nevertheless, aerial survey in conjunction with the information gleaned from archaeological collections and archives can greatly broaden our knowledge about the history of a cultural landscape within a short period of time.

Fig. 1. Rheinau (Zurich). Mosaic image made up of rectified aerial photographs from various years.
1.2 The beginnings of aerial photography

The history of aerial photography started with the development of both flying and photography in the late 18th and the first half of the 19th centuries. The first aerial pictures were taken in 1857 from a hot-air balloon and in the late 19th century, archaeological monuments had begun to be photographed from the air. The actual research field of aerial survey, however, was only developed during the course of the second and especially the third decades of the 20th century, when various people intensively studied the method of aerial remote sensing in order to track down archaeological sites. The Briton O.G.S. Crawford (1886–1957), the ‘father of aerial survey’, together with A. Keiller published a monograph in 1928, which comprehensively explained the methods used in archaeological aerial survey for the first time. This work essentially still forms the fundamental basis of archaeological aerial photography today.

Aerial photography in Switzerland can also look back on an eventful and successful history spanning over 100 years. E. Spelterini (1852–1931) pioneered the method when he took several aerial photographs in 1893 from the basket of a hot-air balloon. In 1917, P. Vouga (1880–1940) had a series of aerial pictures taken of the pile-dwelling settlements in Lake Neuchâtel. W. Mittelholzer (1894–1937), the famous pilot, also photographed several archaeological monuments, among them the fort in Pfäffikon-Irgenhausen (Canton Zurich) in 1920.

Despite repeated efforts on the part of individual archaeologists – including for instance H.-G. Bandi – aerial survey in Switzerland only began to establish itself as a research field in its own right during the second half of the 20th century: Aerial pictures have been taken regularly in Western Switzerland since the 1960s and in the north of the country since the late 1980s. Due to the constant growth in the construction industry, it was decided in the late 1980s in Canton Zurich to intensify the search for archaeological sites that had not yet been discovered.

At the same time, the famous German archaeological aerial photographer O. Braasch began his work in Baden-Württemberg. He was also asked by a number of archaeological departments to fly over Switzerland and between 1988 and 1991 he carried out several successful aerial surveys. As part of a five-year project in collaboration with O. Braasch and the Zurich Engine-Powered Flight Group, the Kantonsarchäologie built an in-house flight team. The results obtained by this team were so convincing that aerial survey subsequently became a permanent branch within the Kantonsarchäologie Zurich.

While during the early years this expert team focused its activities exclusively on Canton Zurich, the ‘Asterix Team’ began to offer their services to various other archaeological departments in the individual cantons and from 1996 onwards carried out commissioned flights outside of Canton Zurich. These were either individual flights as part of particular projects (e.g. documenting selected architectural monuments) or annual commissions to carry out archaeological aerial surveys (i.e. searching for unknown archaeological sites). Today, the survey team accrues between 40 and 60 flying hours annually, over all parts of Switzerland. Several thousand pictures are taken during these flights and the images are used by people from other cantonal departments and academic institutions (e.g. universities), by private individuals (e.g. local historians) and by archaeologists.
1.3 Technical means used in aerial survey

Archaeological aerial photography is best suited to open terrain without any constructions. However, the geological, climatological and pedological conditions and the agricultural usage must comply with various prerequisites. Flights are mainly undertaken during the months of March to September, when favourable climatic conditions (dryness) and ideal vegetation (e.g. cereals) lead to the formation of parchmarks. During the winter season, other types of marks are more prevalent (shadowmarks, frostmarks and snowmarks).

Before a survey flight is carried out, the investigation area and the fixed photographic targets are defined and, if necessary, the route is discussed with the air traffic control concerned. Meteorological data as well as information on soil humidity and evaporation (cumulative water balance) are also consulted and the known archaeological information concerning the area is compiled.

Only small high-wing aircraft, (e.g. Cessna 152 or 172) with very limited space, are used to carry out archaeological photographic survey flights. As opposed to topographic survey flights, archaeological sorties are not conducted along predefined lines but the landscape is overflown in circles and zigzag paths. The pilot must be able to overfly the targets as slowly and smoothly as possible and in steep turns, which is very demanding on a pilot’s flying skills.

The extant archaeological remains have up to now been recorded using conventional reflex cameras (35 mm and medium format) with high quality lenses and suitable films (good performance in terms of focus, granularity and resolution) in black-and-white photographs and slides. Nowadays, digital cameras (currently: Nikon D2X) are used, which, fitted with lenses of the highest quality and the latest image sensors as well as high-quality internal camera software produce pictures of a quality that is indeed as good as that provided by analogous images.

The advantages of digital pictures are varied. It is no longer necessary to switch from a camera with a black-and-white film to one with a colour transparency film during a sortie. Similarly, unfavourable lighting conditions no longer make it necessary to load a film with higher sensitivity. This considerably reduces the in-flight workload particularly in archaeological survey flights. The often problematic scanning of slides and prints for digital processing also becomes redundant. High-quality picture editing software allows for a varied range of processing of digital images.

In order to put the aerial photographs to a meaningful use, quick access to all the data produced is essential. Given the current intensive building activity, only this will ensure that none of the sites discovered are lost before they have even been examined. Therefore, both a well thought-out data recording and processing system as well as optimized archiving procedures are crucial.

In order to improve work processes and to ensure the quick conveyance and utilization of the data, various technical aids are also available to the aerial survey archaeologists in terms of both the processing and analysis of the data in the office. Computer rectification programmes allow the oblique aerial images to be corrected to vertical views so that they can be further analysed by means of a GIS (geographical information system). The knowledge gleaned from the aerial images is put into context with other data (e.g. coordinates from fieldwalking outings, results from geophysical surveys, photographs, old maps etc.). The concentration of the archaeological information achieved in this way allows us to assess the importance of a site and to better understand the development of
the landscape and the settlement history of the region studied. If this process indicates that a site is of great importance, the area concerned is classed as an archaeological zone. These zones provide essential information, which forms the basis on which decisions are made in terms of planned developments, intrusions into the ground in order to extract natural resources or restructuring projects, thus providing initial provisional protection. The relevant information can be made available via intranet and Internet both to the authorities concerned and to interested individuals. At this point in time, the aerial photographic library comprises 65,000 registered and mainly analogous images; the number of pictures and the amount of data connected with them is constantly increasing. This amount of information has made the professional digital processing and organization of the aerial photographs indispensable.

2 THE ‘AERODAT’ PROJECT

2.1 Situation analysis

Until quite recently, the photo targets were still marked in the conventional way during the flight on individual maps and journal sheets (Fig. 2); the infrastructure available did not allow for the recording of digitally important parameters such as the exact flight path, times and coordinates of the images etc. Most of the basic data were recorded after the sortie back in the office.

Fig. 2. Detail from an aerial map of Canton Zurich with highlighted flight zones and photographic points. Scale 1:50,000. Reproduction authorized by Swisstopo (BA068108).
The recording of the data was very time-consuming and error-prone, as was the subsequent processing and analysis of the aerial photographs. The numerous databases used were neither relational nor linked with each other, which made the GIS-aided analysis of the archaeological features more difficult. There was only limited access to the data and aerial photographs, which would have been important for the handling of internal and external enquiries and statements, for the planning of excavations and in general for record keeping.

2.2 The take-off

The people in charge had been aware of the limitations mentioned above for quite some time. The first preliminary studies in the context of the ‘AeroDat’ project were already carried out in the mid 1990s; concrete steps towards its realization followed in the autumn of 1999. The call for tender was released in the second half of 2002 and the contract subsequently granted to the company GEOCOM Informatik AG in Burgdorf on 1st June 2004. The project was completed in January 2006. The aim of the project was to develop a tool, which would allow us to comprehensively record all the data produced in aerial survey, analyse the information in the best way possible and make it available to the various users as quickly as possible (Fig. 3).

A central issue in this was the optimization of numerous work processes, thus reducing the time consumed by the gathering of data, eliminating as much as possible the mistakes that occurred while gathering and processing the data, and leading to a general improvement in the quality of the overall results. Ultimately, the system allows for the
optimal conservation of archaeological information, i.e. an improved protection of the cultural heritage.

2.3 The subprojects of ‘AeroDat’

2.3.1 ‘AeroDat Track’: hardware infrastructure on board the aircraft

The demands made on the hardware and its installation on board the aircraft were quite varied: It was important to achieve a user-friendly installation of all the equipment without any permanent fittings in the aeroplane so that the system would be flexible enough to be used in different types of aircraft. In case of strong vibrations and turbulence, the devices must be secured so as not to put the crew in danger and all the instruments relevant to the aircraft itself must at all times remain visible to the pilot. The equipment itself must be of compact construction and must be resistant to shock, vibration and fluctuating temperatures; it must not cause any interference with the electronics on board. The system must be easy to operate. The electricity supply must be guaranteed, either by an external power source or by the on-board power supply via the cigarette lighter. Even in difficult light, all the screens must show a bright and clear picture.

After a thorough evaluation of existing systems, it was decided that it would be best to opt for the development of a completely new system while using as many standard elements as possible. The hardware developed by the company GEOCOM Informatik AG is specially designed for installation on board small aircraft with limited space (Figs. 4 and 5).

Fig. 4. Schematic illustration of the hardware installation on board the small aircraft.
The most important feature is the ‘GEOCOM Track Box’; it is installed in the baggage hold of the aircraft and forms the link between camera, GPS and tablet PC, which the aerial archaeologist can either keep on his/her lap or can be held by a carrying strap. The track box combines the trigger signals and extends them so that they can be ‘read’ by the computer. At the same time, the power supply is converted and distributed (from 24 volts of the aircraft into voltages of 5 and 12 volts required by the peripheral devices). For this purpose, the technology department of GEOCOM developed special printed circuit boards.

For the GPS, a simple receiver was chosen, as an accuracy of approximately 10 m is perfectly sufficient. This receiver can be fitted in the best location within the aircraft and is connected to the tablet PC. For safety reasons, there is an additional GPS with current maps available to the pilot. An industrial monitor with colour TFT reflective display was chosen for the (co-)pilot, as it ensures clear images on the tablet PC screen, even in unfavourable lighting conditions.

Two customary analogous or digital cameras can be connected to the interface box. The photographs are still taken manually; the image is triggered via the shutter button on the camera. The signal cable can be connected either to the flash shoe of the camera or to the studio flash output and leads via interface box and cableform to the track box. When the shutter button on the camera is pressed, the track box converts the TTL signal of the camera into an RS-232 IEEE V.24 signal, which is conveyed to the tablet PC software.

2.3.2 ‘AeroDat Basis’: the software components

The requirements of the ‘AeroDat Basis’ application were outlined as follows: The application must run both on the computers in the office and on the mobile system. It must enable the collection and processing of data from the beginning of a project (upon receipt of assignment) to its completion (analysis, publication, delivery of the data to the client). In addition, the topographic information based on databases (GIS) must be readily available to the user.

The ‘AeroDat’ application had to meet the following requirements: The flight and office modules are based on a uniform technology with as many standard components as possible; the system must be linked to other applications (e.g. AirPhoto, meteorological data, Spatz, Denkbank2) via interfaces; the user-friendly and secure operation must also allow for individual tweaking by the administrators (main users). It will also be possible to add modules such as further workplaces and a multi-user access with ArcSDE (for cost reasons this has not yet been realized by the Kantonsarchäologie Zurich). The overall solution was devised by the company in a modular structure and currently runs on the basis of ESRI Personal Geodatabases on Arcview 9 by ESRI and the GEOCOM product ‘GEONIS expertBasic’ (Fig. 6). This is a generic extension developed...
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for the ESRI ArcGIS desktop family. It enables one to build and maintain geographic information systems (GIS) according to the latest ergonomic and technological standards. Because of its generic conception, it is easily modified via XML configurations to suit a varied range of applications. It produces so-called ‘media’ such as those devised mainly in the areas of network information systems and state survey. Additional special functions for individual expert fields are added via further software modules.

Fig. 6. Modules and software packages of ‘AeroDat’.

‘GEONIS expertBasic’ communicates with a central database, which integrates geometrics and alphanumerical data in a multi user environment. The product ‘GEONIS expertBasic’ is already used worldwide and is constantly being developed further by GEOCOM Informatik AG; updates are guaranteed as part of the service contract. The specialist application ‘AeroDat’ includes a medium based on ‘GEONIS expertBasic’ and developed specifically to meet the requirements of the Kantonsarchäologie Zurich. The actual application module with the specific menu, masks, displays etc. is configured by XML. Should the requirements change, these configurations can be adjusted by the ‘AeroDat’ administrators themselves.

Special functions such as the recording of the flight data or the communication with the image database were developed as stand-alone modules. As in the case of ‘GEONIS expertBasic’, this module uses the component library ‘ArcObjects’ by ESRI. The data management of ‘AeroDat’ employs several pGDBs (Personal Geodatabases) by ESRI. A pGDB contains the entire body of data with the complete project data from all the modules.

Users in the office can work both on the desktop and on the server via tablet PC. The simultaneous editing of the data by several users (multi user edit) is currently not possible for system-inherent reasons; however, several users can view data at the same time. When the mobile system is in use, a section of the database is extracted via a check-out
mechanism and installed on the flight system. Important information for the sortie provided by the system includes the locations and attributes of the photographic targets, archaeological zones, administrative boundaries and topographic maps for navigation. After the flight, the newly gathered data are reintegrated into the main database (check-in). During the synchronization between the mobile database on the tablet PC and the system on the server, a backup of the database is also created. The following stages of the work process are covered by the modular application ‘AeroDat’: the general management of the project, the preparation work carried out before the sortie, the collection of data during the flight, the processing of data after the sortie including the link to the photographic library, the analysis, and the management with queries, reports and exports as part of the completion of the assignment. The module ‘project management’ covers some of the administrative tasks. This module manages the details of an assignment including the targets, information about the clients and the planning of the flight programme. The module ‘flight preparation’ is used before a sortie to set up the flight path with current photographic targets. At the same time, the pilot’s GPS is supplied with the most important data and is then also ready for use. A special module was devised for the recording of the flight, which processes the signals from the GPS and the shutter release. Security in case of system failure is guaranteed by redundant saving of all the important data. Immediately before take-off, the archaeologist enters the basic data of the sortie into an input mask on the tablet PC. During the sortie, the flight path is continuously recorded in two-second intervals via the GPS tracking function (Fig. 7).

Fig. 7. Recorded flight path with superimposed photographic points. The survey points located outside the flight path derive from migrated data from gathered during earlier sorties.
As soon as the photographer presses the shutter button on the camera, a survey point is created by the system using the signal from the track box, to which various system features (coordinates from the GPS, height, angle of view, camera configuration etc.) are attributed automatically and which is linked with the photographic information. The pictures are recorded on image memory cards.

Extensive post-processing is carried out after the sortie, back in the office. The image data recorded during the flight are transferred to an image data server. Transfer, attributing and referencing is done in ‘AeroDat’ by means of an image database (ImageAccess). This ensures that all the key attributes remain consistent in both systems. First, the locations of the photographed targets are automatically established using the module ‘data processing’: In order to definitively record the photographic data in the archive, the national coordinates of the documented structures on the ground as opposed to the aircraft position recorded by the survey point are required, as these can be located hundreds of metres apart. In a first step, various parameters are applied to calculate a fan-shaped area for each survey point, from which the photo point is subsequently determined, i.e. the location of the photographed object, which ideally corresponds exactly to the actual position of the structure.

The calculation of the target areas and photo points are carried out by means of a software module specifically developed for ‘AeroDat’, which is based on standard GIS functions in ‘GEONIS expertbasic’. In order to keep the calculations as simple and exact as possible, various ‘calibrations’ are predetermined, which represent certain conditions and may come into play depending on the flight situation. These photo points are then attributed with particular information (e.g. canton, community, place name) either automatically or manually (Fig. 8).

![Fig. 8. Screenshot of a section of map with superimposed flight information and input mask for the interpretation of photographic points.](image-url)
The module ‘Analysis’ allows to analyse selected aerial photographs, which have already been rectified using the external software ‘AirPhoto’. All relevant features (individual or sets of features) are described, interpreted and finally saved in the GIS.

The aspect queries/reporting carried great importance in terms of an acceptance of a tender. The entire body of data can be used to create queries, reports and exports. Some of the more important standard queries and reports were predefined and can be accessed via the menu.

The module developed for the analysis of the cumulative water balance has no direct links with any of the other system elements within ‘AeroDat’. The Kantonsarchäologie Zurich receives daily data from ‘Meteo Schweiz’ (Federal Office of Meteorology), which are provided by various weather stations throughout Switzerland. These data are entered and analyzed in ‘AeroDat’. The development of the cumulative water balance can be displayed in a chart for each station.

2.3.3 ‘AeroDat’ GIS browser: Intranet usage

As part of the ‘AeroDat’ project it was intended from the very beginning to make the results of the aerial survey available to an extended circle of cantonal administration staff via the intranet. The goal is to allow staff members to access in an efficient and simple manner selected information about aerial photographs, to print them, to view digital images and if required to order them as well (Fig. 9). This is done with the ‘AeroDat GIS Browser’, which was developed independently from the other modules by the GIS Centre of Canton Zurich as part of the GIS browser that has already been used in the cantonal administration for quite some time.

Fig. 9. Aerial photographs and associated information in the GIS browser.
A data export is carried out at regular intervals from the ‘GEONIS expertBasic’ system via this interface between the expert application ‘AeroDat’ and the GIS browser. ESRI shapefiles are used as the data exchange format. Because the export is a standardized task, special scripts were developed, which collect the data and extract the information in shapefiles.

From day one, everyone involved was aware that the development of ‘AeroDat’ was not an everyday project. Thanks to the great commitment and the outstanding teamwork exhibited by all involved, the project was completed successfully and on schedule. ‘AeroDat’ has been in daily use since February 2006 and has proved a valuable tool up to now.

3 ZUSAMMENFASSUNG – RÉSUMÉ – RIASSUNTO – SUMMARY


Während des Luftbildflugs werden verschiedenste Parameter, u.a. die Flugroute und die Aufnahmepunkte, automatisch registriert. Auf Bildschirmen können alle für das Prospektionsteam wichtigen Informationen visualisiert werden.

Nach dem Flug werden zuerst automatisch die Positionen der fotografierten Objekte berechnet, anschliessend erfolgen die ergänzende Datenerfassung sowie deren Auswertung.

Damit die Resultate einem möglichst grossen Mitarbeiterkreis innerhalb der Kantonalen Verwaltung zugänglich gemacht werden können, wurde vom GIS-Zentrum des Kantons Zürich ein zusätzliches Browser-Modul entwickelt.

Summary. Extensive building activity has been taking place for decades in many areas of Canton Zurich. This has resulted and continues to result in the destruction of unknown archaeological sites. Since the 1990s, this has led the Kantonsarchäologie trying to detect remains of long-forgotten times concealed below ground by means of archaeological survey in time and before their destruction. Archaeological aerial photography is a particularly well-suited method and it has been one of the tasks carried out by the Kantonsarchäologie since 1991. The current aerial photographic library contains approximately 65,000 registered images.
In order to best maintain and process such vast amounts of data and in order to ensure their subsequent use within the administration, it became necessary to develop a special computer application. The essential hardware and software were developed between 2004 and 2006 by the company GEOCOM AG in Burgdorf in collaboration with the Baudirektion Kanton Zürich. The solution was developed in modules and runs on the basis of ESRI Personal Geodatabases on ArcView 9 and the GEOCOM product «GEONIS expertBasic». The hardware was engineered specifically with the aim of installing it in small aircraft with little space, while the software was developed to run on office desktops and mobile stations. Both digital and analogue camera systems can be used.

During the aerial survey flight, various parameters such as the course of the flight and the photography positions are registered automatically. All the important information can be displayed on screens available to the survey team. After the flight, the positions of the objects photographed are automatically calculated, followed by additional recording of data and the subsequent analysis.

In order to make the results available to as many members of staff as possible within the cantonal administration, the GIS Department of Canton Zurich has developed an additional browser module.

Translation Sandy Hämmerle

4 LITERATURE


Access Grid Seminars

Chris Gaffney

It is apparent from the faces seen and not seen at past Access Grid seminars that most of you are unaware of these seminars as I would like to think that, if you were, you’d attend them. Essentially these are a series of ‘virtual’ meetings made possible by the Internet. What have you missed so far?

- Chris Gaffney Geophysics and Remote Sensing: their role and future within Archaeology
- Meg Watters Through an anomaly, darkly: new perspectives on archaeogeophysics
- Dominic Powlesland Archaeological prospection at West Heslerton
- Keith Challis Airborne remote sensing in alluvial environments
- Michael Doneus Airborne Laser Scanning as a tool for archaeological prospecting in forests

Fortunately, the last three seminars were recorded and it is hoped that they will held again ‘as live’ in the near future. If that isn’t enough to tempt you to join in the seminars, the next one may be:

A one-day conference (14th, March 2007) on ‘North Sea Palaeolanscapes’
This special AG event is dedicated to the results of the ALSF sponsored North Sea Palaeolanscapes project and the archaeology and geomorphology of the southern North Sea. Speakers to be announced.

The following is adapted from ISAP Newsletter 9. If you want to keep up to date and be part of a thriving international seminar scene, then read on…

Visualisation and Remote Sensing: The Launch of an Internet based Seminar Series
Anywhere in the World, from 25th October 2006

These seminars on remote sensing in archaeology are organized by the HP VISTA labs in Birmingham across the Access Grid. For those who are unaware of the Access Grid it is way to support multi-site interactive conferencing over the Internet and is especially valuable for collaborative projects spanning many sites, regardless of location.

Some pertinent features of this system are:
- Internet based - no setup or conference costs
- Scalable from studio nodes using commercial software to desktop nodes using free client software
- Sophisticated compression – low latency and can be used over broadband
- Collaborative features include shared PowerPoint presentation, whiteboard and chat facilities
- Can be used alongside Virtual Network Computing to provide direct access to analytical or other software in real time.

What you need to join these seminars are (at the most basic level):
- A stable and speedy broadband internet connection
- A good web cam
- Headset or a microphone and speaker system
- Download and installation of the relevant free software (info will be provided by Helen Goodchild, below)
The main source of further information on the series is held at http://www.iaa.bham.ac.uk/Computing/HP_VISTA/Seminars/access_grid_seminars.htm. Updates will be posted on the ISAP Forum and Newsletter as well as the AARG website. If you have the technology and are interested in attending this or any other seminar or require any information on accessing the Virtual venue, please mail: Helen Goodchild at H.Goodchild@bham.ac.uk.

It is important to note that this seminar series is working at the edge of present technology and that participants must test before a seminar.
Did the digital (r)evolution change the concept of focal length?

Geert Verhoeven

Introduction
The advent of digital photography opened a completely new world for a lot of people. Just look around: there has never been a moment in photography’s long history that so many people actually had and used a photo camera. However, along with new technology always come misconceptions. One of these often heard and read delusions is the fact that “the focal length of lenses changes when used on a digital camera”, leading to strongly magnified images as indicated by a so-called digital magnification factor. The purpose of this article is to prove the above statement (and term digital magnification factor) to be incorrect by outlining the concepts of focal length and image sensor size as well as their combined effect on field of view.

Size matters
* Film formats
Although aerial photographers use(d) a variety of photographic film formats, this article will compare the 135 format to its digital equivalent, in order not to end up comparing apples to oranges. Launched in 1934, this format had the highest sales worldwide. Hence, a lot of people are not even aware of the fact that smaller as well as larger film formats exist. On one end of the range, one finds smaller film formats as the 110 or sub-miniature format (introduced by Kodak in 1972 and 16 mm wide) as well as the rather recently (1996) launched APS (Advanced Photo System) format, characterized by a 24 mm wide film. On the other side of the film spectrum, larger formats reside: the 120 and 220 format – which enable so-called medium format photography – and the large format films (4 in x 5 in, 5 in x 7 in, 8 in x 10 in, 11 in x 14 in and 20 in x 24 in).

Compared to these large formats, the rather small dimensions of the 135 format allocated this film to terms as “small” and even “miniature format” photography (while its popularity gave rise to the term standard format photography). The 135 film is characterized by frames which can hold an image of 36 mm by 24 mm (approximately 1.42 in x 0.94 in), thus having an aspect ratio of 3:2 (i.e. width/height). Because the film is 35 mm wide, the creation of images by cameras and lenses suited for such 135 format emulsions became commonly known as 35 mm photography.

* Sensor formats
Instead of emulsions, digital photography uses a digital image sensor to record the scene. Notwithstanding both medium and large format cameras can be equipped with digital sensors, this paper deals only with small format digital photography to make a valid comparison with the 135 film format. This restriction is just for a matter of convenience in choosing examples. A collection of different small format D-SLR sensors (i.e. sensors used in Digital Single-Lens Reflex cameras) is displayed in figure 1. Starting from the Four Thirds format onwards and ending up with dimensions equal to a 135 format frame, the sensor size of D-SLRs is characterized by a rather great variety. In general, three main categories of small format D-SLR sensor sizes can be distinguished:

1) Four Thirds (4/3”) format: mainly found in the E series of Olympus, this smallest sensor’s dimensions are 18.0 mm x 13.5 mm;
2) **APS-C format**: The main philosophy behind the APS film was the possibility to choose from three different film formats on the same emulsion. One of these formats is the “C” or Classic format, which uses 25.1 mm x 16.7 mm of the film. Hence, the name APS-C format in digital photography is given to all imaging sensors approximating the size of this “Classic” APS negative. Most D-SLR camera manufacturers (Canon, Nikon, Pentax, Sigma, Sony) stick to this standard, although their sensors mutually also differ to some extent. Nikon calls this format the DX format;

3) **Full Frame (FF) format**: This sensor equals the dimensions of classic 135 format film and is currently only found in two Canon bodies (EOS 5D and EOS 1Ds Mark II).

Illustration 1 also gives the diagonal distance for each sensor. This numeric value indicates the diameter of the circle which completely circumscribes the imaging sensor. The tinier the sensor, the smaller its encompassing circle. Because this value will be important in the following reasoning, the circle is shown for all different sensors in figure 1 as well.

![Figure 1 - Different digital sensors with their characteristics](image)

**Focal length**

Before explaining the importance of the encompassing circle, it is beneficial to present some terminology concerning lens systems. A photographic lens is a *compound optical system*,
which means it is created out of different single lens elements. Every such lens element makes the incident light bend. However, as one such lens element does not allow to get a pleasing image, a multitude of these simple lens elements is used to create a sharp image on the emulsion or digital sensor inside the camera. Together, the simple lens elements determine the focal length of the photographic lens.

To explain the term focal length in an easy way, consider the whole photographic lens to be represented by only one lens element (figure 2). When parallel rays hit this lens element, these rays of light will be brought together at a focus, the so-called focal point $F$. The distance (mostly expressed in mm) from the optical centre of the lens to the focal point is denoted focal length $f$. In other words, the focal length of a photographic lens is a quantitative measure of how strongly it focuses light. This focal length is always engraved on every lens: 150 mm, 70-200 mm, 35-80 mm etc. The larger this number, the greater will be the image size of distant objects. Lenses with a short focal length will on the other hand allow more of a scene to be captured on the same image area.

It is important to understand that focal length is one of those primary physical characteristics of a lens that remain unaltered, irrespective of the camera the lens is mounted on. A lens with a particular focal length (say 60 mm) will always be a 60 mm focal length lens, while a 350 mm focal length lens constantly remains a 350 mm focal length lens, whether the lens is fitted onto a film camera or digital camera (and even onto an enlarger or a projector).

**FOV**

It is now possible to show why the initial statement is completely wrong. Imagine the cone of light rays from a scene reaching the film or sensor after they are refracted by a photographic lens (figure 3). Due to the fact that all the lens elements of the compound photographic lens are circular shaped, the image formed is also circular. Hence, it is given the rather obvious name image circle. The size of this image circle is not an inherent property of the focal length of the lens, but entirely defined by the optical design.
At this point, the aforementioned sensor’s encompassing circle comes into play: one must be sure that the image circle at least equals the circle which just encompasses the film frame or sensor. A lens optimized for a 35 mm SLR must project an image circle of at least 43.27 mm in diameter. If not, totally black corners will be the result. (This explains why all “old” 35 mm lenses can be used on today’s small format D-SLRs. On the other hand, lenses designed for a digital sensor will yield black corners when used with the 135 film format).

Consider again a 60 mm lens, optimized for the 135 format. Let us fit this lens onto two bodies: a digital one (e.g. Nikon D2Xs) with a DX sensor of 23.7 mm x 15.7 mm and a conventional small format film body (e.g. Canon EOS 3) which creates rectangular negatives of 36 mm x 24 mm. The image circle the lens casts on both the sensor and the emulsion is exactly the same. Although a circular image is projected, only a square or rectangular image will be captured by all film frames and sensors. In this example, the digital sensor will store a smaller portion of the image circle as its dimensions are smaller (see figure 3a). In optics, the film frame or sensor is denoted the field stop, confining which part of the image circle is imaged.

From this, it will be apparent that the combination of both the physical size of the camera’s imaging plane and the focal length of the attached lens are important. It is the relation between these parameters that determines the Field Of View (FOV): the angle in object space – expressed in degrees (°) – over which objects are recorded in a camera. In the literature, diverse names are given to FOV: field angle of view, angle of view, angular field of view, picture angle or angle of coverage, but every term indicates the same thing. All misunderstanding is born from the fact that FOV is often quoted as a fixed lens characteristic. However, the only things fixed for a particular lens are its focal length and its specific image circle. Utilizing a lens with a certain focal length, it is only the sensor’s size that determines how much of the projected scene will be captured (again see 3a). As enlarging or reducing that sensor just alters the area recorded, the object’s magnification is not changed! Therefore, all lenses of a particular focal length produce the same image magnification at the plane of focus when focused at the same distances. The cropping of the image circle only brings the object apparently closer when the digital capture is enlarged to the same physical size as the film frame (see figure 3b).

Finally, it remains to say that FOV can be measured by three parameters: horizontal, vertical and diagonal FOV. The specific value only depends on the dimension being used to calculate the FOV: along the width, the height or the diagonal of the imaging area (figure 4).
In the following table, all three kinds of FOV are given for both the digital sensor and the 135 format in combination with the 60 mm lens.

<table>
<thead>
<tr>
<th></th>
<th>135 format + 60 mm lens</th>
<th>DX sensor + 60 mm lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>horizontal FOV</td>
<td>33° 23’ 55”</td>
<td>22° 20’ 39”</td>
</tr>
<tr>
<td>vertical FOV</td>
<td>22° 37’ 12”</td>
<td>14° 54’ 28”</td>
</tr>
<tr>
<td>diagonal FOV</td>
<td>39° 39’ 25”</td>
<td>26° 39’ 26”</td>
</tr>
</tbody>
</table>

It is now also numerically clear that FOV changes with the imaging format. But how much?

**Crop factor**

Due to the popularity of the 135 format, most FOVs associated with specific focal lengths are based on this standard. Hence, the FOV of a lens-sensor combination can be compared to the FOV of a lens with the same focal length on a 35 mm frame. This angle reduction is in the literature labelled *focal length factor*, *focal length multiplier*, *digital magnification factor*, *digital multiplier* or *digital crop factor*. Just as was the case with FOV, the reduction can be determined for all three dimensions. One just needs to divide the dimensions of the 35 mm frame by those of the sensor in use. In our example, this yields:
- horizontally: 36.00 mm / 23.7 mm = 1.519;
- vertically: 24.00 mm / 15.7 mm = 1.529;
- diagonally: 43.27 mm / 28.43 mm = 1.522.

To better grasp the meaning of these figures, consider again the 60 mm lens fitted onto a DX sensor. Now, a numeric constant is needed to find the focal length which would produce exactly the same image on a 35 mm film frame. This constant is any of the three figures given above. They can be applied to calculate the 35 mm *equivalent focal length*, just by multiplying any focal length used on the digital sensor to obtain the 35 mm equivalent lens:
- horizontally: 60 mm * 1.519 = 91.14 mm;
- vertically: 60 mm * 1.529 = 91.74 mm;
- diagonally: 60 mm * 1.522 = 91.32 mm.

Using the mentioned lens with a focal length of 60 mm on the D-SLR, the same scene will be recorded as a 135 film frame-91.3 mm lens combination would do. Therefore, 91.3 mm is said to be the *equivalent focal length* for the 35 mm format. For convenience on the one hand and to tackle the issue of different aspect ratios on the other, camera manufacturers mostly give the value based on the diagonal of the image plane. Sometimes, this equivalent focal length is given as lens specification rather than the actual focal length. The absence of calculations in determining equivalent focal lengths is of course a distinct advantage of the full frame sensors. However, the main point is that the actual focal length of a lens remains unaltered, no matter how big or how tiny the sensor’s dimensions are.

Mounting a 60 mm lens on a D-SLR with a Four Thirds sensor does not – as by miracle – yield a lens with another focal length. In this respect, “focal length multiplier”, “focal length factor”, “digital magnification factor” and “digital multiplier” are misnomers. A cropping effect of the imaging area is the only thing that happens, resulting in a narrower FOV. Hence, the terms *digital crop factor* or *FOV crop factor* seem to be the only valid ones. As a rule of thumb: the smaller the imaging area, the shorter the focal length lens is needed to yield the same FOV as a lens with a longer focal length on the 135 format. The particular crop factor exercised by a specific image sensor was therefore also indicated in figure 1.
Acknowledgements
This paper arises from the author’s ongoing PhD which studies the application of remote sensing in archaeological surveys. The research is conducted with permission and financial support of the Fund for Scientific Research - Flanders (FWO) and supervised by Professor dr. Frank Vermeulen (Department of Archaeology and Ancient History of Europe - Ghent University). Helpful comments on earlier versions of this article were received from Rog Palmer and Gwil Owen. Finally, the author’s good friend Wouter Van Hecke is acknowledged for proofreading the article and correcting the English where needed. All errors and misconceptions remain, of course, the author’s own responsibility.

Further reading

'Palmerstonian’ fortification in or overlooking Milford Haven. One of the air photos in Toby Driver’s Pembrokeshire from the air (see Books of interest?). Photo 2002-cs-0771_BW. Crown copyright.
Report on the XVIIth ISSA, Exploring Archaeological Landscapes
27 November - 1 December 2006, Rocca San Silvestro, Tuscany
Organised by the Universita di Siena and CNR Rome

Benjamin N. Vis

Unexpectedly, but with pleasure I report to you about the XVIIth International Summer School in Archaeology (ISSA), Exploring Archaeological Landscapes that your research group so generously sponsored. First of all I should mention that I am most obliged to Chris Musson who, without any hesitation, trusted my ‘blue eyed’ emails and supported me with C2000 funds when my own university appeared to lack a funding structure for this kind of event.

What initially attracted me to this school was the fact that a truly international orientation was chosen instead of merely European. A year before I participated in the RESPAL (Remote Sensing for Past Landscapes) course of the Erasmus/Socrates programme in collaboration with C2000 and AARG in Ljubljana and this was focused on European case studies. Except for participation in geophysical fieldwork and post-processing with Luis Barba (also tutor on this course) and Branko Musič (University of Ljubljana) in addition to some general introduction to Aerial Photography and GIS applications during university courses, I did not receive any formal education concerned with remote sensing. Nevertheless this had triggered my interest in the potential of such prospecational methods and taking into account that my cultural focus lies in Central America, I set out on my own little crusade to familiarise archaeologists in this region with this type of research. My previous research had shown that few successful attempts had been made to date, as little archaeological prospection is carried out there besides fieldwalking. Teaching staff at the XVIIth ISSA included some from the Americas, and, together with the Europeans, this mixture provided the perfect opportunity to learn about the most recent technical developments and successes both in Europe and elsewhere.

The base for the course was the idyllic place of Rocca San Silvestro in Tuscany, which proved to be an adventure to get to. I was part of the group that arrived Sunday evening and from the train station it was about a 20 minute drive up the hill on unlit tracks to the hostel and classroom venue. Fortunately all arrived safely and we were warmly welcomed by Stefano Campana and his organising committee, and with the first of many plates of pasta that week. The next morning we were woken by the first early truck that drove up to the nearby quarry on a track circling the hostel, but the environment was archaeologically inspiring as we were looked down upon by an enigmatic castle in ruins.

The restored villa below the hostel was an almost ideal place to immerse oneself in the subject matter we would study during the week to come. Besides the occasional dynamite explosion from the quarry there was nothing to distract you from the lectures. A good thing, because the weather was constantly luring you out. Despite taking place at the end of November it proved to be a true summer school.

The topics presented at the school varied from satellite images to geophysical surveys and from radargrammes to the most outstanding virtual reconstructions of archaeological sites. Since not all participants had a basic knowledge of the topics at hand, all of these had to be started off with general introductions before moving on to the more complicated or newly developed applications of those technical methods. This was a small disappointment as I expected this school to aim for more specialised students, nevertheless enough time was left...
to move on to those more complicated issues. It must be said that a lot can be done in about
eight hours of class per day, though it is extremely tiring. The school was broadly organised
in the following sections: photogrammetry and 3D laser scanning, airborne and ground based
remote sensing, and some particular case studies from different areas. All specialists offered
us challenging lectures on their field of research and there was ample time for questions and
discussion afterwards. Usually though, the real debates were held over a glass of Tuscan Vin
Santo with Cantuccini around the open fire in the evening hours. In this setting all lecturers
open mindingly engaged in discussions with the students and without it the school would
certainly not have been so successful. Additionally it was fundamental to the formation of
hopefully enduring international friendships amongst the students.

While the lectures were extensively informative and truly brought the students up to
standard in remote sensing applications in archaeology, one would have expected to have
more of a practical element included in the school’s education. There was only one
illustrating afternoon with a demonstration of the Leica laser scanner at the ruins of the castle,
but all software applications were merely shown on screen rather than with a network of
student pc’s, which was the strong aspect of the RESPAL course. This does not mean that the
school missed its purpose, since it was unbelievable how fast we moved from the theoretical
principles of techniques to the most modern applications of the methods on such a wide range
of themes. The school uncompromisingly introduced both traditional as well as current issues
in the archaeological use of remote sensing techniques, which formed the perfect basis for
pursuing further specialisation in the field and ensured that it was really worthwhile attending
the international conference in Rome after the school.

For me the sessions on airborne remote sensing were of special interest, because of my
own research plans. The successes that have been made with LIDAR data are an incredible
inspiration for any archaeologist and an especially nice surprise for me was the success of
using high-resolution multispectral satellite images to detect sites in the Guatemalan Petén.
This gets the hopes up for archaeologists like me, working in those areas, that the
impenetrable rain forests may yet have a great deal of information to tell us about the
archaeology beneath. Presentations by William Saturno, Michael Doneus and Danny
Donoghue provided information that I am currently using to prepare projects in El Salvador
and Nicaragua together with Leiden University. Nothing solid has come from this yet, but I
am convinced that somewhere in the near future I will be able to inform you about our
progress during one of the Annual AARG Meetings. The projects will include both site
detection as site mapping and it was my participation in the RESPAL course and this ISSA
that pointed the potential and possibilities out to me, for which I am very grateful.

Initiatives such as the ISSA are a welcome addition to the average academic
archaeology curriculum, as traditionally little attention is given to the current technical
possibilities or even the more conventional Aerial Photography. I think AARG is right in
supporting this kind of international course, in which education on academic level is
guaranteed. The intensity of these courses makes them far more effective than periodical
courses at university. As well as being an educational asset, they also increase the awareness
of archaeologists in all countries about the alternatives to the often destructive and archaic
methods of data acquisition. I hope this report encourages all organisers and sponsors to keep
organising similar schools and hopefully these will lead to developing more advanced and
specialised follow-ups to those courses they have organised in the recent past.
From Heavens Above: European Cultural Landscapes Revealed By Aerial Archaeology.
Seminar Schwerin (Germany), 29th-31st January, 2007

by Susanne Gerhard

Thirty aerial archaeologists from England, Wales, Belgium, Denmark, Germany, Poland and Italy met in Schwerin (Mecklenburg-West Pomerania, Germany) from 29th to 31st January 2007 to exchange research results and to develop ideas for future research. Susanne Gerhard (Department of Archaeology of the State Authority for Culture and Preservation of Monuments) had organised the meeting under the umbrella of ‘European Landscapes: Past, Present and Future’ (Culture 2000 project Nr. CH-A2-UK-2077). The conference was conveniently based in 18th century ‘Schleswig-Holstein-Haus’, a cultural centre situated in a picturesque, central part of the town. The programme started on Monday, 29th January, with some words of welcome spoken by Mrs Ewa Prync-Pomerence, temporary head of the Departments of Archaeology and of Built Heritage of the State Authority for Culture and Preservation of Monuments, on behalf of the organising institution. Bob Bewley (English Heritage) greeted the participants in the name of the Culture 2000 project.

Hauke Joens, director of the archaeology department of the Lower Saxony Institute for Historical Coastal Research (former head of the Department for Archaeology in Schwerin) then presented a brief outline of Aerial Archaeology in Mecklenburg-West Pomerania that did, due to political reasons, not start before 1990. In the years until now, there have been some important discoveries though, on land as well as under water in the coastal zone. Chris Musson followed with an overview of the Culture 2000 project.

The next session, chaired by Włodek Rączkowski (Poznań University), saw three presentations about the use of LIDAR prospection in archaeology, two coming from the Culture 2000 project (Benoît Sittler, Freiburg University ‘The potential of Lidar to generate 3D models of micro-relief features for the purpose of landscape historical surveys’; Joerg Bofinger, Landesamt fuer Denkmalpflege Baden-Wuerttemberg ‘Aerial archaeology, airborne laser scanning and recent excavations on the Early Iron Age hillfort Heuneburg’). Ralf Schwarz from the Landesamt fuer Archaeologie in Saxony-Anhalt presented the work of his institution, with LIDAR data from the Ordnance Survey office as well as with such explicitly made for the Landesamt for Archaeology in Saxony-Anhalt (‘The mapping of earthworks in woodlands by means of airborne laser scanning’). Włodek Rączkowski then led the audience in a lively discussion about the role of LIDAR in the framework of aerial archaeology and other methods.

Next came a session ‘Going public and forward’ with chairman Stefano Campana (Siena University). Susanne Gerhard presented a short overview on the appearance of (aerial) archaeology in German textbooks for schools and children’s books (‘We need them young: Aerial archaeology and the young public in German), closing with an appeal to not let teachers and authors alone with archaeology. Bob Bewley (‘Aerial archaeology: what next’) then summed up the many achievements made by aerial archaeology, the role of aerial archaeology in archaeology and drew the audience’s attention to future needs: push the creation of the e-landscapes centre, gain still more outreach through publications and other media, reach more countries, make intelligent use of financial means and develop our intellectual approach.
Next, chairman Joerg Bofinger presented a session on landscape surveys. Włodek Rączkowski talked about his fascinating discovery of a 13th-century town in west Poland (‘The lost town: changing medieval history ... from the air’), enriched with thoughts about perception, phenomenology and interpretation. Dave MacLeod from English Heritage (‘Beyond the wall: a Roman frontier in context’) showed the many faces of Hadrian’s Wall as well as the remnants of the prehistoric settlement of the region, making the audience familiar with heritage management aspects, too. Stefano Campana (‘From Space to Place or from Site to Landscape?’) talked about the research in Aiali done by the Laboratory of Landscape Archaeology and Remote Sensing of the University of Siena, being the starting point for a more wide-ranging approach to the study of landscape. The interaction between several methods of reconnaissance – from field walking to aerial survey and geophysics – and the amount and the kind of information revealed was highlighted. Again, the presentations were followed by an animated discussion.

In the evening, Otto Braasch took the conference participants as well as some interested Schwerin citizens with him on a flight from the Baltic to the Mediterranean (‘Seafog is lifting: coastal air survey’), showing sites as different as quite recent shipwrecks and stone age earthworks, beginning at the Mecklenburg coast and ending at Friedrich II’s famous Sicilian castle Castel del Monte and such conveying not only his research results but also the fascination of aerial archaeology.

The second conference day first brought three methodological papers, chaired by Chris Musson. Holger Behm (Rostock University) presented his and Axel Schulz’ research on the association between crop marks and pedological conditions in Mecklenburg-West Pomerania (‘Archaeological heritage as element of landscapes and new findings on the development of archaeologically relevant crop-marks’). Then, Otto Braasch took over again to illustrate some aspects of aerial survey of underwater sites (‘Water, wind and wrecks: facts on coastal air survey’), expressing some wishes and ideas concerning a morphological approach to shipwrecks. This was picked up by the Mecklenburg underwater archaeologist Mike Belasus (Landesamt fuer Kultur und Denkmalpflege) who in his presentation ‘A view from under water’ showed the limits of such an approach, demonstrating for example by sectional views the fortuities of parts of a ship being exposed and visible from above or not.

Jean Bourgeois (Ghent University) then was the chairman for a session of three papers on some aspects of landscape surveys. Ines Mueller and Beate Sikorski talked, on behalf of Baoquan Song (all three: Bochum University), about ‘Aerial prospection in South Iran’ that he had undertaken together with the German Archaeological Institute and the Irani heritage administration in the region that will be affected by the Siwan dam. Claudia Winterstein (German Archaeological Institute) then presented the work of herself and Werner Schnuchel (Institute for the History of Architecture, Karlsruhe) using kites for obtaining vertical photos at various archaeological sites in Turkey (e. g. Çayönü, Göllüdağ and Göbekli Tepe) and demonstrated the possibilities to transform these verticals to ‘image maps’, superimposing the verticals to topographical maps (‘Kite Flying: An Exceptional Method of Aerial Documentation and Mapping’). During discussion, it was suggested to bring together people using kites for archaeological aerial photographs as several parties seem to use them without knowing from one another. Going back to Northern Europe, Esben Schlosser Mauritsen (Arhus University) showed results from his ‘Aerial prospection in Southern Jutland and Schleswig’. Aspects of the influence of soil types were discussed because so far, his area of work mostly covers West Jutland and Schleswig with sandy soils.
The last session, chaired by Bob Bewley, first saw Michael Vinter (Moesgard Museum) talking about ‘Celtic Fields studies in Denmark’. Analysing several series of older verticals, comparing them to and complementing them with mappings from A. G. Hatt and other scientists led him to some basic questions concerning perception on the one hand, and influences of soil types and land use on the preservation of such field systems on the other. Birger Stichelbaut (Ghent University) was the last speaker and presented the Belgian part of the Culture 2000 project (‘Great War aerial photography: a “new” source for future archaeology’), using WW I photos from several archives in England, Germany, the USA, Australia and Belgium, combining them with recent aerial archaeological work and other sources for the analysis of the WW I landscapes in Flanders.

Partners from the Culture 2000 project then met for a management committee meeting to discuss the programme for the final months of the project. The evening united the conference participants in the charming restaurant ‘Friedrich’s’ where everybody was enjoying themselves with local specialities and beer until late in the evening. Wednesday morning, Sabine Horn, Dirk Handorf and Jan Schirmer (colleagues from the Built Heritage Department of Mecklenburg-West Pomerania’s State Authority for Culture and Preservation of Monuments) accompanied those who had not already had to leave during a walk around and in Schwerin’s romantic castle on its small island and to some of Schwerin’s major architectural attractions.

Although North Germany did provide icy wind and drizzling rain, the conference participants left Schwerin with an all around positive impression after enjoyable, fruitful and inspiring conference days.

Schwerin 2007. An AARG Spot the difference competition? [Thanks to the missing people for providing photos.]
Digital AARGnews?

Rog Palmer for the AARG Committee

Towards the end of 2006 John Richardson, one of AARG’s newish members followed up comments of mine from the March 2005 Editorial in which I mused on the possibilities of producing a digital AARGnews. “Well, how about it?” asked John and sent me an example of a monthly newsletter, Devon Strut, affiliated to the Popular Flying Association.

So the committee discussed various pros and cons and I made a few pages of mock-up which were received with enthusiasm. A summary of the committee’s responses follows:

Pros:
Financial. Our annual subscriptions are to support AARG and not only to pay for our copies of AARGnews which currently uses most of the income from those subscriptions. Without this continual expense, AARG would be in a favourable position to support research initiatives and assist more students to attend our meetings. Both are aims worthy of a research group.
Production. A digital newsletter can make more use of colour illustrations and will enable use of hyperlinks.
Design. We are in favour of retaining the current AARGnews layout with each paper beginning on a new page and being a unit in itself.
Distribution and access. We expect to distribute each issue to members as a pdf file. These, or parts of these, can be printed if, or as, required. As with the paper copies, these would be uploaded to the AARG website after about a year for free access by anyone. We do not anticipate a flood of pirated AARGnewses.

Cons:
Reading. Many of us like reading paper. Pdf issues will be printable in whole or part (see Design above).
Credibility. Will a digital AARGnews be a medium that can be quoted? This is probably answered by acquiring the required new ISSN and lodging issues with the British Library.
Addresses. Is there really anyone out there without an email address? It remains your responsibility to inform the Membership Secretary of any change of address.

The committee is in favour of this way forward and expect to go into digital production from September 2007 (therefore saving Rog the problem of carrying 100 paper copies to Denmark). If any of you haven’t seen the pdf versions of past issues, you’ll find them on the AARG web site. Just imagine the new digital issues to be more colourful. However, we ask for any relevant comments from members to be sent to the editor before the end of May 2007. Not, please, only those of you who do not like the idea or we’ll be like the rest of the world where one person complains about a flash of nipple and gets an ad banned which the remaining 50 million of us don’t find offensive. Maybe a selection (of your comments) will be printed in the next issue.
Cropmarks
(defn: differential growth of crop that indicate variations in subsoil depth and content. May include archaeological features.)

Weather on the www
Thanks to Otto Braasch for sending the following:

Perhaps you may wish to add a hint in next AARGnews on a European wide weather forecast system, which is quite usable for air survey. Just have a look at http://www.wetter-jetzt.de/. The program comes in English, German and French and advertises like this:

<< Welcome to Wetter-Jetzt
...where pilots feel good!
Wetter-Jetzt operates its own complex weather forecast model with which you can easily plan your flights. We have the right service for you -- whether you’re a pilot of an aircraft or ultralight plane, a delta plane or paraglider, a glider or a balloon. We invite you to take a look at our unique special products and unmatched chart contents.

With the help of Wetter-Jetzt, you can also plan your leisure time several days in advance. It doesn't matter if you want to go surfing or have a garden party -- our precise weather forecasts will help you to make the right decision.

Click through our website and convince yourself. We will keep our promise. >>

Otto added: “One good thing about the program is, that it forecasts cloud type and coverage at hourly intervals for almost all crop mark Europe up to 3 days ahead. I have checked it for about a year now and am quite happy with it - using its data at flights at the Continent only however”.

...and it does seem pretty good. There is a useful amount of ‘casual user’ information for free but to obtain the full-power pilot forecasts requires a small subscription.

Cheaper CORONA
Ordering scans of Corona images from the 1960-70s can now be one-third cheaper than as previously noted by Martin Fowler (AARGnews 31, 34-37). Formerly there was a charge per image of $24 plus $65 for the DVD, making an average of $45 per image if a DVD was filled with 3, but making 1 or 2 expensive to buy. Now the charge for the DVD has been scrapped and replaced with single charge of $30 per image plus $20 international shipping for the order. For example, a recent order of 9 KH-4A images from 1966 and 1967 at the highest resolution of 3600 dpi (7 microns) came in at $270 + shipping.

Using Martin’s figures of a nominal coverage per image 16 x 217km, this is only 0.86 cents per square km, or put another way, the size of Wales and a half for £147. The only problem is that you might need to upgrade your PC just to open the tifs!

(info from Robin Standring)
Populating Clay Landscapes
Edited by Jessica Mills and Rog Palmer

This book contains thirteen chapters most of which were presented as papers at the Clayday organised by AARG in November 2005. Publication is scheduled for May, June (or sometime around then) 2007 and Tempus have a special offer at £17.99 (incl UK postage) or €31.25 (credit card only, price including P&P) for AARG members which you’ll find on the insert sent with this issue of AARGnews.

Contents are as follows:

Jessica Mills and Rog Palmer
Introduction

1. Method
Bob Evans
The weather and other factors controlling the appearance of crop marks on clay and ‘difficult’ soils
Stephen Coleman
Taking Advantage: Vertical Aerial Photographs Commissioned for Local Authorities
Damian Grady
Cropmarks on Clay - Getting the Timing Right

2. Survey
D C Cowley and Amanda Dickson
Clays and ‘difficult soils’ in Eastern and Southern Scotland: dealing with the gaps
Grzegorz Kiarszys, Włodek Rączkowski, Lidka Żuk
In pursuit of the invisible: are there crop-marked sites on clay-like soils in Poland?
I.A. Oltean and W.S. Hanson
Cropmark formation on ‘difficult’ soils in Romania
Rog Palmer
Seventy years – v – ninety minutes: implications of the 1996 Bedfordshire vertical survey on our perceptions of clayland archaeology

3. Results
Alison Deegan
Archaeology on the boulder clay in Northamptonshire: some results from the Northamptonshire National Mapping Programme Project
Scott Kenney
A banjo enclosure and Roman Farmstead: excavations at Caldecote Highfields, Cambridgeshire
Jessica Mills
Surveying the claylands: combining aerial survey and fieldwalking methods in identifying archaeological sites on difficult soils

4. Endpiece
Patrick Clay
Claylands archaeology: summary and prospect
Books of interest?


Italian publishers do produce beautiful books at what today’s media would call ‘affordable’ prices. This makes the book a triple treat (pretty, cheap and interesting), or perhaps even quadruple for those of you who want to read it in English and Italian. John Bradford is, or was until this book, one of the mystery figures in the past aerial world: a brief ten-year surge of activity and publication followed by nothing but a few enquiries asking if he was still alive. Francesca Radcliffe has spent several years gathering information about Bradford and has condensed this into a biographical chapter very similar to that which she published in *AARGnews* 31. This is a valuable essay as it gives us Bradford’s background and indicates how and why he was able to do what he did by taking and using air photos over the Taviolere. From this we can imagine how different aerial survey may have been in Britain and Europe had Bradford been actively involved along with the few aerial photographers who took things in their own direction(s) after the Second World War.

The meat of this volume is the gathering together of Bradford’s four *Antiquity* papers in which he published results of his research, on and from aerial photographs, in southern Italy. These — as is the whole book — are in Italian and English, with the Italian newly translated by Francesca Radcliffe and the English as facsimile copies from ageing *Antiquity* pages. It is useful for English readers to have all these together and for Italians to be able to read them in their own language. As is proper, the facsimile copies use the original illustrations and remain faithful copies of the original publications. The Italian translations, however, are served by (usually) better-quality plates many of which Francesca tracked down in various collections (compare, for example, the new plate of Arpi on p140 with the *Antiquity* copy on p 227). So readers of the English version may find it worthwhile to keep track of the Italian illustrations.

I found it interesting to revisit Bradford’s *Antiquity* writings which, for me, are easier to read than the more formal tone used in his *Ancient Landscapes* (1957). The workings of crop marks are simply explained and he never seemed to lose sight of the fact that they were indicators of what lay underneath. There is also a sense that, when analysing the aerial photographic evidence, Bradford was seeing and describing a landscape and its population — a far step from today’s ‘rectilinear enclosures’ and ‘maculae’. Perhaps the strength of Bradford’s approach is that he writes as an archaeologist rather than a aerial specialist and is clearly using the photographed evidence as one step in understanding the past of the area. This would be enhanced by subsequent field investigation as is described in Francesca’s biographical chapter and in notes (published and typescript) by Bradford. Full publication was not completed.

The book includes a couple of other pieces by Bradford — an article from *The Times* for 28 August 1950 and the unpublished typescript report of fieldwork (mentioned above) undertaken in 1956. That typescript report includes a summary analysis of the air photographic evidence over all of Italy from Bradford’s ‘…research in the General Staff HQ of the Italian Air Ministry in Rome and the air photograph collections which I helped establish…’. A considerable feat for one person.
The volume is introduced with a foreword by Andrew Wallace-Hadrill (director of the British School at Rome) and an essay by Professore Giuliano Volpe (University of Foggia) outlining recent work in the Tavoliere. The latter brings us up to date with mention of Otto Braasch’s recent oblique photography, the several training schools run in Italy, as well as research by Volpe and others including the PhD research undertaken by Roberto Goffredo and Valentino Romano, both past students at our training courses. Volpe’s essay also mentions an initiative to locate, digitise and publish ‘...the entire air-photographic content of the ‘Bradford Archive’...’ which one hopes will then be freely available via the Internet as part of the growing archive of easily-accessible research data.

Rog Palmer

The book costs £18 plus P. & P. and will be obtainable in the UK from:

Castle Bookshop
The Old Rectory
Llandyssil
Montgomery, Powys
SY15 6LQ UK
Tel +44 01686 668484
Fax +44 01686 668842
e-mail castlebooks@dial.pipex.com
web http://www.archaeologybooks.co.uk

Or you can contact the publisher Claudio Grenzi in Italy:
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…after which, you’re on your own.


This is the only paper I’ve seen from the Rome Space to Place proceedings as BAR did not respond to my request for a review copy and £70 seems rather a lot to pay for what may be a 500-page mix of assorted papers that range from the old (aerial photography) to the new (ALS, satellites and VR). An idea of the range of the contents is in the BAR blurb which identifies the following sessions/book parts:

SESSION 1: Satellite Remote Sensing Archaeology;
SESSION 2: Aerial Archaeology; vertical and oblique photography;
SESSION 3: Aerial Archaeology: airborne scanning;
SESSION 4: Ground-Based Remote Sensing Archaeology;
SESSION 5: Integrated Technologies for Remote Sensing in Archaeology;
SESSION 6: Interpreting Landscapes and Settlement Pattern Reconstruction;
SESSION 7: Environment Analysis for Remote Sensing Archaeology;
SESSION 8: 3D Visualization of Place and Landscapes;
SESSION 9: Virtual Archaeological Reconstruction;
SESSION 10: Landscapes, CRM and Ethics: POSTER SESSIONS.
So, the book is a great unknown to me but for the Doneus-Briese paper, parts of which may be familiar to those of you who heard Michael Doneus at AARG 2006. Their project was to ‘…explore the potential of ALS for archaeological reconnaissance in a densely forested area…’ and was funded by the Austrian Science Fund. All of us by are familiar with how ALS (or LiDAR) works and lengthy descriptions are sensibly avoided in this paper although there is technical detail and discussion about the choice of sensor, data acquisition and post-processing which are (or seem to be) relevant to the levels of perception attainable from the final terrain model. The resulting model, which provides excellent detail of archaeological and other features, is discussed (with illustrations) to evaluate various ways of lighting or slope mapping and to identify any problems these may cause with interpretation.

This is the most informative paper I have read that examines the role of ALS in archaeological prospection rather than just using it to find sites or make terrain models.

[pdf copies of this paper can be obtained from michael.doneus@univie.ac.at]

Rog Palmer


This is of minimal interest but worth a mention to show the way that image ‘interpretation’ seems to now be accepted by the GISers as something that only can be done by a computer and needs no specialist or skilled input. The authors, as did the woman who spoke endlessly at AARG in Leuven, used edge-detection algorithms to find ‘marks of archaeological interest’. Their test case seems to be a very obvious stone-built structure (a defended homestead?) that showed quite clearly on the published image extracts and of which they had ground knowledge. OK, this is no bad thing for a test case but I wonder (and here there are shades of Leuven) how well their edge detection may be useful for identifying ‘sites’ where there are no enclosures to signal an initial interest. You could, of course, say the same thing about airborne observation and conventional photo interpretation but these present-day preferences for machine-dependency (maybe this is ‘unbiased interpretation’?) brings us closer to the day when real image analysis is in danger of becoming a thing of the past and archaeologists are happy to let their computers generate lists of ‘anomalies’, ‘marks’, and ‘lines’ – not that some of them don’t do that already!

Perhaps the most useful inclusion in this short paper is the comparison of the lengths of ‘line’ that the computer was able to detect using single spectral bands (PAN at 0.61m resolution and Near IR at 2.44m) and then the two combined (which – if I’m not wrong – would provide the ‘pan-sharpened’ image that apparently would increase the resolution of the NIR band). The published table of results is curious and perhaps raises more questions than the simple answer deduced by the authors, which is that the combined bands provided more information. But much more interesting would be to ask why some ‘marks’ were detected only in the PAN band, some only in NIR and the rest only in the combined image.

Rog Palmer

*Shortly before AARGnews went to press Chris Musson sneaked a pre-publication view of Toby Driver’s new book on Pembrokeshire from the air. He writes as follows:*

To judge by the PDF page-layouts this will be a handsome hard-cover volume, presenting almost 400 splendid air photographs, the vast majority in colour, spread over nearly 300 pages of beautifully-presented text, pictures, maps and diagrams. Although aimed mainly at the general public, and especially those who live in or love the county of Pembrokeshire, it has much to offer all classes of readership, with a lively linking text and informative captions to pictures of the landscapes, townscapes, industry, buildings and archaeological sites of this far western peninsula of Wales.

Toby writes with economy and flair, readily communicating the excitement and complexities of aerial survey over one of the most beautiful and varied regions of the British Isles. Attention is paid to the procedures involved before, during and after flight, and to the techniques and timing which make oblique air photography such a powerful tool in discovering, recording, mapping and interpreting the evidence of the past. LIDAR and vertical photography make a number of appearances and a linking refrain lies in the contribution that aerial survey can make to conservation and to public appreciation of traces of the past encapsulated in the present-day landscape.

After the usual preliminaries the first chapter addresses the basic techniques of aerial survey, and describes the geology, topography and land-use of the county. Then comes a vivid and economical summary of the area’s archaeology and history, from earliest times to the World Wars and the industrial development of recent years. In the following chapters various topographical regions are described and illustrated, each sequence of images having its short introduction as well as extended and always relevant captions.

A number of individual sites or groups of sites are picked out for special attention, and the book ends with some valedictory thoughts and a miscellany of images that (like the whole of the book) will gladden the hearts of those who value aesthetics as well as information in their photographs. (One or two are even totally devoid of control-points – sorry, Ed.!) There is a comprehensive index and a useful list of bibliographical references.

The book can be obtained from the Royal Commission (www.rcahmw.gov.uk) from the beginning of April. Price: about £30, including postage. And worth every penny of it!


Although generally discussing the problems of explaining the origin and development of villages, the book is primarily a report and discussion of the Whittlewood Project, a successor to the work of the Deserted Medieval Village Research Group (DMVRG) at Wharram Percy, Yorks. The Wharram project excavated a small nucleated settlement and the DMVRG, in 1987, revamped as the Medieval Settlement Research Group, wished to gather information on dispersed settlement. A study of Beds, Bucks, Leics and Northants provided information about
which areas in those counties might be suitable for study, in terms of well preserved remains and good historical records (Lewis et al. 1997). The area finally selected covered 12 parishes straddling the borders of Bucks and Northants, lying around the medieval Whittlewood Forest, which provides a mixture of dispersed and small nucleated settlements. It was anticipated that there would be identifiable pottery of the Saxon period. If this were the main criterion, Cambridgeshire might have been a better choice, where Ipswich Ware would have distinguished between Early and Middle Saxon phases. The Whittlewood geology is predominantly Till (boulder clay) with the main villages sitting on exposed limestone or later gravel deposits. The medieval woodland occupied the highest parts of the clay ground.

The Project was interdisciplinary. Techniques consisted of fieldwalking in 15m intervals with 20m stints to collect flints and pottery sherds of all periods. An extensive series of test pits (1 metre square) was also made in village gardens and other places where ‘field walking’ or excavation would not be possible. The objective was to discover at what date the villages were first settled and what settlement or other activity could be found out in the fields.

GIS-generated maps present the data for all periods. One of the exciting discoveries, in which I participated when trying explain to students the mysteries of mapping medieval headlands, was to find a headland next to Whittlebury church that curved round unexpectedly to make a miror image plan of the present curved road system, so completing an oval of a hill-fort type structure. It was proved to be Iron Age by test-pitting, and a subsequent magnetometer survey revealed 12 round-houses huddling against the rampart. Roman occupation sites were spread over all the area on the clay, but Saxon pottery of the period 400-850 AD was mainly confined to the better soils and primarily lay under the present villages, as found elsewhere in the county. Pollen taken from cores proved that woodland expanded during the Saxon period.

In terms of settlement development, the results were different from the model endorsed by Lewis et al, and others, who have suggested that Saxon settlement was dispersed and that medieval villages did not exist on their present sites much before about 1000. The book discusses many other themes (e.g. the forest, settlement decline and desertion etc) and had the expertise of historian Mark Page to study the documentary record.

Medieval field systems were not much studied and no plans are provided. It was concluded that piecemeal expansion occurred according to the distribution of pottery presumed to be deposited by manuring. It is stated that there were no strip alignments more than 200m in length, yet in Wicken there are three areas with three furlongs laid out in an alignment 600m long. Had the fields been planned, a more accurate view of the extent of Wicken Park would have been obtained, and it would have been realised that Shrob Lawn, mapped in 1608, was not of medieval origin but a later feature taking in the open fields of Puxley (Figs. 48, 51). There is nothing in the book for the aerial archaeologist, the heavy clay not yielding much information. It is not possible, therefore, to comment whether early field systems around the Roman sites have any interaction with those of the Middle Ages, although two excavated headlands had earlier ditches apparently related to them.

The authors are to be congratulated on their work and its presentation, and also for inspiring much local interest and gaining access to so many gardens for the test-pit sampling. It is extremely refreshing to learn that at Whittlewood there are English villages that have been in existence in the same locations for more than 1500 years.

David Hall

In summary, eight chapters providing an authoritative, well illustrated and up-to-date account of some key landscape studies in the South West. Harold Fox sets the scene in his foreword – the subject has taken huge strides since the groundbreaking work of W. G. Hoskins in the 1950s. This book doesn’t offer a synthesis, but a series of valuable chapters on recent and current research.

Central in the volume are two substantial papers by Peter Herring presenting the results of study over three decades. His chapter on Cornish strip fields demonstrates their ubiquity across Cornwall and explores their pre-Norman origins, the character of the farming regime and later reorganisation, and the tensions between individualism and communalism, as well as how the medieval field patterns can be interpreted from historic maps and the present landscape. Some of these ideas are developed further in his analysis of Brown Willy (chapter 5), an extremely well-preserved settlement and field system on Bodmin Moor. Early strips are regular, reflecting manorial allotment. The later irregular strips suggest a change to communal shareholding. The ridging, he thinks, is largely spade dug.

Ralph Fyfe picks up the theme of pre-Norman origins (chapter 2). Through his study of pollen on Exmoor and, most importantly, on lower ground to the south, he puts the origins of medieval patterns of enclosure and land use – convertible husbandry – back into the 8th century. No evidence was found for post-Roman contraction of settlement, at least in the lower lying areas.

In his introductory chapter Sam Turner emphasises this theme, namely the creation of the medieval landscape in the 7th to 9th centuries, following a period when the region was part of the ‘late Antique’ culture of Atlantic Europe.

Other chapters look at castles, industries and the church. Oliver Creighton and J. P. Freeman provide a concise summary and update of past work on castles and discuss their landscape context, considering their setting and the manipulation of their surroundings. Setting is fundamental, not a background issue.

Phil Newman reports on work in progress on the very extensive and well preserved tinworking on Dartmoor, with examples of detailed terrestrial surveys of some major complexes. Sam Turner gives us a handy summary of the early medieval church and an outline of the way stone crosses were used, suggesting that this was established early on and continued throughout the medieval period.

Finally, Lucy Franklin reminds us that the landscape would have had meaning to medieval folk not just through economic and social arrangements but through an overlay of associations, stories and myth.

Peter Rose (Historic Environment Service, Cornwall County Council)

[Chapters that may interest the aerial minded among you are those about field systems and tin working: Rog]
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