AARGnews 3

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Editorial

I am pleased.

One of my hopes for AARGnews was that its six-monthly publication might be frequent enough to encourage discussion - and we have just that in two contributions to this issue. It also makes me realise, as one of the 'victims' of the return arguments, that maybe six months is not quite long enough to prepare a short paper which says, unambiguously, what you intended. The discussion (?of course) concerns MORPH and I do not intend to over-abuse Editorial privilege to strike back. I will, however, make two comments: the first is to suggest that MORPH be tested against a sample of excavated sites in an attempt to highlight features, or combinations of features which might serve to provide the all-important dating keys which can then be applied to unexcavated sites (which will then need minor excavation to check...and so on); the second to ask whether MORPH can produce anything as concise and informative as the Bokerley Inventory (see Reviews this issue) has done for enclosures and settlements? If the replies to both are positive I will be delighted and, indeed, the comments of Horne and MacLeod following their useful analysis of The Classification Game suggest such an answer to my second comment. Training, as they note, is essential if we are all to provide comparable MORPHing of the aerial evidence - but do I detect an element of subjectivity in the weighting they are obviously giving to their breakdown of shapes of the test sites? Are straight lines to be 'seen' before curved lines...? As Bewley writes, the more open discussion on MORPH (and classification) the better, so may it be suggested from the Editorial seat that AARG 92 could include a workshop session offering elementary training and then another game?

The note by Bewley on his airship experience reminded me of the comment which I think appeared in the Antiquity 'reminiscing' article by Stuart Piggott, one time research assistant(?) to Alexander Keiller. Keiller was enthusing about his own airship experience along the lines of, 'There's enough space to spread out six-inch maps, it's slow enough to think about the sites before you photograph them and it's big enough to include a bar.'. Almost enough to make me want to take up aerial photography!

In this issue there is a requested contribution on crop circles. I imagine many flying AARG members have seen them in recent years as I did this summer when two were spotted by Roger Featherstone and led us to archaeological sites in adjacent fields. One of the crop circles (or 'pictograms' following Martin Hempstead's glossary) was in a field adjoining an agricultural college.... Hempstead's comments on human motivation reminded me of an enjoyable bout of secretive planning and work when I was an apprentice at RAE Farnborough. As is normal at many educational establishments we too had our annual Rag Week with its tradition of national publicity seeking. Our schemes became more and more elaborate and grew from taking coach parties to London to refill the moat of the Tower of London to a successful (ie two days' press coverage) dropping in the Thames of a home-made Mercury space capsule.

By far the greatest amount of work in planning, reconnaissance and manufacture came a couple of years later and went into the production and laying of six 'flying saucers' which were found one morning in a line, equally spaced, from Clevedon to the Isle of Sheppey. We certainly got our publicity from that - I even have a press cutting from Australia - all, in theory, to help raise money for charity. But was that the reason for our motivation..? Of course not. When else can you do, and get away with, a stunt like that except as a student?

AARGnews includes three contributions of a mixed technical-user service kind. Two notes detail the latest offerings from John Haigh which, I hope, will be of interest to many users of air photographs and will back up the demonstrations that he plans to give at AARG 91. Despite the almost magic demonstrations by Helmut Becker at past AARG meetings I retain doubts about the usefulness of image processing in photo interpretation but it will be of interest to see what can be achieved using equipment which is almost within reach of many of us. The note on NLAP's Photonet covers an additional asset to their computer retrieval system and one which may benefit those of us who need to focus occasionally on small areas instead of the odd million acres.

Bob Bewley's summary of aerial reconnaissance has, I know, been a struggle to compile and necessitated a late delivery of copy to the printers. The overall results look impressive, especially if the year was not 'especially good'. We hope that by next year more than five of you will have replied to the post reconnaissance questionnaire and that we can include a similar summary of that work.

A final question which I'll put to AARG members: Is English Heritage keeping a library of air photos? Julian Richards' Stonehenge (in EH's superb series of popular books published by Batsford) uses a snowy Stonehenge as its cover. There is another inside and both are credited to English Heritage. Does anyone know the range of EH's photographic cover and its availability?

Chairman's Piece: who's next for the hot-seat?

by Chris Musson

All good things come to an end, and I suppose being Chairman of AARG falls into that category. At our Glasgow meeting I shall step down after three years (or is it four?) in the hot-seat. Hopefully (inevitably?) I shall hand over to a younger successor, with fresh ideas about aerial archaeology and the development of the Group. *Plus ca change*, and so it should.

We have indeed changed since the early years of free(ish) discussion under Rowan Whimster's founding guidance. In particular, in the past three years we have worked our way, slowly, to a formal constitution, though with a deliberate decision to retain our original title, in preference to rebirth as the Aerial Archaeology Association or the Society for the Promotion of .....

There was more than nostalgia in this. Members were saying - I hope! - that they did not wish (at least not yet) to become a 'period society' or a 'political' pressure group, but rather to remain as a discussion group devoted to the exploration (and hence promotion) of the aerial perspective in the search for overall understanding in archaeology at large. We should not, in my view, hang too much on that word 'research' - it tends to behave rather like one of Sir Humphrey's irregular verbs ("I do research, you record, he merely photographs" etc). At root, we all seek that broader understanding, whether in the local, regional or national context, though our jobs (or lack of them) give us varying opportunities for overt 'research' as against parallel activities like recording, conservation, presentation or education.

If AARG helps members to renew/revive/reaffirm/redirect this underlying commitment it will will continue to meet its original aspirations. But can it, as John Hampton suggests in his contribution to *AARGNews* 2, go beyond that personal and intellectual influence and play a role in establishing the specific frameworks or opportunities for 'higher level' research? Perhaps discussion at Glasgow will show what members feel on this very important issue.

In other ways, the last three years have been ones of 'consolidation' within a group that had become too large (= too successful) to continue with its original informality of organization and discussion. We now have a formal - but hopefully minimal - committee structure, and our annual conferences have developed a pattern of major and minor 'themes' (not to everyone's pleasure, it has to be said). To balance this formalization, however, we have the beginnings of *ad hoc* discussion groups or meetings to cover specific topics - 'cropmarkology' (already) and perhaps industrial and garden aspects of aerial archaeology in the coming year.

More significantly, the news-sheet first put together by Adrian Olivier and Vikki Fenner has transformed itself under Rog Palmer's impetus into an increasingly important means of bringing argument and ideas to members outside the formal structure of meetings. The development of *AARGNews* in the coming years will require wisdom and finesse, to tread an effective path between the competing (but reconcilable?) attractions of argumentative informality and worthy reportage.

Finally, in the last three years, we have been joined by an increasing number of Continental colleagues. Our view - very properly as we approach 1992 - is not just Britain but the whole of Europe, however it may redefine itself. In three year's time maybe we will have become a truly European discussion group. AARGEU, perhaps, or AARGUE?

The classification of sites discovered through aerial photography: Why bother?

Bill Startin

Two articles in AARGnews 2 dealt with the issue of classification and made particular reference to the joint RCHME/EH project and the use of 'MORPH'. That by Richard Hingley included misunderstandings I can let pass but I found that by Rog Palmer to be both confused and misleading with respect to the project work. To quote: "MPP is making fresh, but in my opinion valueless, demands on the aerial record" and "Without some elementary classification beyond the ubiquitous 'cropmarks' any useful assembly or retrieval of a county's aerial information is an impossible task". Is this not exactly why the MPP is making 'demands'?

From the outset of the MPP we recognised that sites discovered through aerial photography but not identified to known monument classes presented a problem. This problem was acute in the major river valleys which have seen the most concentrated settlement through time and, accordingly, now exhibit much less impressive earthwork survival than the archaeologically more limited uplands. Indeed, it was clear that the cropmark sites often combined to form landscapes and that archaeologists had (and have) no satisfactory conceptual framework for discussing this topic, despite the liberal use of such terms as 'contemporary landscapes' (cf. John Hampton in the same issue).

In addition, we recognised two other problems. Firstly, our task was not simply to identify for protection those sites which people are currently interested in (problem-oriented research) but to attempt to identify a representative sample of the overall archaeological resource in order to provide for what people will become interested in. And, if we couldn't identify it, at least to say so explicitly to promote and feed future initiatives. Secondly, given the size of the task, we would need to delegate a lot of the work whilst attempting to maintain consistent standards. Given time, I dare say the collection of "Rog Palmers" and "Collin Bowens" could reinterpret the resource for us but the MPP and myself will be long gone. The classification project does not seek to replace them, simply to model one part of the process they undertake to convert data into information in a way which allows us to explain the process to others, and thus to delegate the work, even if the penalty is a more pedestrian approach.

But how do we convert data into information? It doesn't matter if the question concerns archaeological sites, Neolithic flints, Roman pottery, or why I drink most on Friday nights, we group like items together on the assumption that the apparent similarities, the patterning in the data, will tell us something. As far as the sites discovered from aerial photography are concerned, have we undertaken this classification work throughout England for all known sites to a consistent standard? To misquote John Wayne: "The hell we have!" - we are nowhere near.

Is 'MORPH' the answer the this particular problem? Well, at least it's along the right lines. More to the point, I challenge you (anyone) to do better. And we already know that MORPH does at least do two useful things:

a) It allows entry of the data into an SMR in a sensible form, thus enabling its combination with information from other sources (cf. Richard Hingley's article) and its subsequent systematic retrieval.

b) Quality control: It identifies failures in what we've been doing up to now. A principal attribute of the evidence from aerial photography is the data on the morphological characteristics of the sites in question. It now appears that much plotted data may not be of sufficiently high quality to support morphological classification - if so, this is a situation which must not be perpetuated.

The output from the current project work is likely to group sites into three categories: those which belong to currently recognised monument classes, those which are so ill-defined or fragmentary that current aerial recording allows little use of the data, and a middle group of unclassified (or poorly classified) sites where groupings (normally local or regional) can be defined. It is this middle group, which includes many of the forms of enclosures, which the MPP is seeking to identify. 'MORPH' will help us do so consistently.

The project will also produce plotted information which can be reduced to 1:25,000 scale and amalgamated to give an overview of the landscape. This overview must also be studied for 'patterning' to discover, for example, the sorts of multiple settlements which Richard Hingley talks about in his article. The advantage of 'MORPH', or a MORPH-enhanced SMR, will then be as a database of components which can be used both to back-up the arguments of the larger-scale analysis and to search for possible examples of key components identifying other occurences of the pattern. However, this map-based approach does not replace the study of individual site types but is complementary to it - the assertion by Rog Palmer that "Individual 'sites' become of minimal significance and the overall shape of an enclosure of little importance by itself" surely begs the question of how we identify associations without some interpretation of what we are associating.

Underlying much of the above is a consideration of how we convert data into useful blocks of information. Classification - identifying possible patterns in the data - is an important step. However, archaeological data are often poorly defined - there can be no once and for all classification - and we need therefore to document the work we undertake in sorting it in a way which allows others to reconsider our conclusions, without having to repeat all of our work. Accordingly, we need to recognise and document how we reach our conclusions through a cycle of identification, recording, analysis and synthesis and to avoid the temptation, as experts sometimes fail to do, of simply boasting how much better we can do it if left to our own intuitive approaches.

REAL ARCHAEOLOGY OR MISUNDERSTANDING 'MORPH'?

Robert Bewley

In AAARGnews 2 there were two articles about classification of aerial photographs (Palmer 1991 and Hingley 1991). Reading them made me realise that much of what has been communicated about recent classifications or systematic description systems, MORPH for brevity's sake, (Edis et al. 1989) has either not been read properly OR the arguments for classification have not been presented properly . In this note I will deal with Palmer's points first and move on to Hingley in attempt to clarify misunderstandings and misconceptions, from a purely personal viewpoint.

On Palmer 1991

From Palmer's paper it is clear that he is mis-using his title; he is talking about Approaches to Archaeology and not Classification. In terms of his approach to archaeology I could not agree more - as archaeologists we are attempting to understand past human societies as his Figure 1 shows. This diagram shows 'preliminary classification' within 'data sorting'; MORPH therefore does fit into his 'approach'. Palmer argues that much of the aerial evidence is not classifiable and that the unclassifiable bits should be studied 'by association' (Palmer 1991, 32). I would argue that if one can study an area or features by association then one must have classified first.

The common ground between Palmer and MORPH is that they both use 'aerial photography to provide evidence for past settlement and land use.' (Palmer 1991, 32); unlike Palmer I would argue that MORPH is part of a broad approach. MORPH does not just allow a simple categorisation of features; it involves this but it also forces the interpreter to understand relationships of features within sites or 'complexes' as well as providing the data for analysis which leads to an understanding of associations between sites and features.

The point that all our classifications are 'relative classifications' is taken to mean that interpretations and knowledge will change. This is accepted, I hope, by all in air-photo archaeology. Palmer (1991, 34) states, 'Implicit behind the reasoning of 'MORPH' users might be the thought that if we can classify our data there will be no problems left to deal with.' This is an assumed implication which has no factual basis. I would argue that having systematically described features/sites/complexes the problems about their interpretation and understanding are only just beginning; the descriptions are a basis for future work.

Any system, such as MORPH, is a means to an end and not an end in itself; the data will however, be in a usable form for further analysis and understanding. Indeed Palmer's questions on 'fashion' might well be answerable having used MORPH; this would fulfil the Doran and Hodson (1975, 158) second function of classification - that of generating hypotheses.

To attempt to understand an area, or landscape more than one archaeological source (in this case aerial photographs) has to be used and the analyses have to be viewed at a number of different scales. Aerial photographs, maps derived from aerial photographs and the records accompanying the maps are but a but one small part of the gamut of sources which are available for the study of the past; within that small part MORPH is also a part. MORPH, i.e. systematic description, can be used to help achieve Palmer's aim, that of understanding past settlement and land-use; obviously additional information is necessary to obtain a deeper understanding. If the objective is the incorporation of records into an SMR or the NAR for better protection by the local planning authority or scheduling, then MORPH will also be an important tool.

On Hingley 1991.

Hingley (1991, 40) states that MORPH is based on two assumptions; the first that 'basic types' (enclosures etc.) are more fundamental than elements of the basic types. I do not fully understand what he is driving at except that he would like to see equal weight given to each pit in a pit alignment rather than looking at the alignment; if so then I think he is wrong because we have to look at features and their juxtaposition and association with other features. If he is saying that archaeologically more credence is given to "square enclosures" than to "bits of square enclosures" then I cannot disagree; but that is as a result of the inadequacy of the data more than the system describing them. MORPH does however allow for recording parts of an enclosure or any feature. His second implied assumption that basic types are 'somehow more basic than groups of types' (p.40) is also a misunderstanding. The purpose of defining 'types' has been to group them so that a 'type or class' (for example all enclosures of a certain shape and size) might be analysed. Thus his statements of assumptions about the system are wrong. He admits that his words are not criticisms but highlight the fact that MORPH is not 'objective'. Anything involving human interpretation and description is subjective and MORPH is no exception; the point of MORPH is that it is systematic. He then concludes that we should use the right tool for the right job and classify according to the scale of the problem. This is a very important point and the development of MORPH, which is still under way, is addressing this; does 1:10560 (6") sketch plotting warrant systematic description or should we only apply MORPH to more detailed (1:2500) computer rectified plots? In my view MORPH is applicable to both forms of mapping and it is its application that it is important as much as its format. Future debates should concentrate on its application, not only in terms of scale but also in terms of the detail of description which one uses for any particular level of survey.

The 'alternative analytical framework' presented by Hingley is not an alternative at all; it is a statement that to understand settlements one has to look at their 'landscape setting' and use more than aerial photographs.

Few would disagree with this, but before that goal is possible one has to know a) where the sites are, and b) how many are thought to be neolithic, bronze age, iron age etc. Aerial photography, map making and recording of sites (a la MORPH) will provide this database for researchers to do the analysis Hingley urges us to do. So few areas have been tackled in Britain to the detail we need, that a systematic programme of improving the basic record is to my mind a worthwhile task and MORPH is part of that.

Hingley argues for a 'different approach to analysis' (p.42); here his misunderstanding of MORPH is apparent. MORPH is a tool which will allow data to be analysed. It is not analysis in itself although interpretation and analysis of aerial photographs are an integral part of it.

Conclusions

In terms of the approach to classifications in these two papers I would offer one comment (a) and one question (b);

a) MORPH is still under development and will be for a short while longer; therefore the more debates and discussions we can have NOW the better the product will be for the future as long as they address relevant facts and not implied assumptions. It is obviously good for our subject that people have doubts about new ideas, or systems, but until more people have actually used MORPH and seen its products then criticisms of it are borne out of a lack of understanding, even ignorance. Use it, criticise it and maybe it will be better.

b) If we accept that it is good practice to make maps from photographs and that a record of that interpretative process should be made, a MORPH type system fulfils our needs; if we scrap it, what are we to use? My reason for getting involved in classification (in the early 80's) was to get away from personal, even emotive, labels such as 'native site', or 'settlement nucleus'; unless we are systematic, as well as interpretative, we will regress to our unfounded personal opinions. Classifications give some justifications to personal opinions so that they become professional judgements!

(This note is written from the author's personal viewpoint and is not in any way to be taken as an official statement on behalf of my employers.)

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Edis J., Macleod D., and Bewley R.H. 1989 An Archaeologists Guide to Classification of cropmarks and soilmarks. Antiquity 63, 112-26

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The Classification Game

Pete Horne & Dave MacLeod

At the 1990 meeting of AARG the APU organised a "test" of Morph2 - the system currently being used by RCHME to provide morphological descriptions of archaeological sites mapped from air photographs. This paper provides the results of that exercise and is intended as a discussion document for those already familiar with the "classification" debate. The rationale and methodology of the first Morph system is described in some detail in Edis et al (1989).

The "Classification Game" was devised and run at AARG 1990 to test the consistency that might be attained when the Morph system was used by archaeologists who had not been specifically trained in the use of the system. Volunteers were asked to describe each of ten sites using only Morph flow diagrams with their restricted terminology. A detailed glossary was available with definitions of the parameters for each of the available terms, but in practice very few people referred to it. The sites were selected from various well-known AP publications and were carefully chosen to highlight probable problem areas in the Morph system. The volunteers were also asked to attach a short label to each description giving their interpretation of the site (Table 1). The results presented here are for the first five sites only, the pressures of time during the game and the draw of liquid refreshment meant that only four volunteers described as far as the sixth site. (There was closer agreement on the description of these later sites).

None of the descriptions used in the following analysis were from trained users of the system. The diagrams show the number of people choosing each option with our preferred description marked by a heavy line. The diagrams only display those parts of the description where there were variations; almost all descriptions tallied on such features as form, internal features and entrances.

TABLE 1 "Interpretations" of sites (The number in brackets indicates the number choosing each term)

Figure 1	Enclosure (9), D-shaped enclosure (5), Settlement (3), Burial enclosure (1)
Figure 2a	Mortuary structure/enclosure (7), Long Barrow (3), Ceremonial (1), Ovoid enclosure (1), Settlement (1), Enclosure (1)
Figure 2b	Mortuary House/building/structure (8), Settlement (1)
Figure 3	Enclosure (7), Settlement (2), D-shaped enclosure (1), Farmstead (1)
Figure 4	Enclosure Complex (4), Enclosure Group (3), Simple Complex (1), Field System (1), Linear System (1), Farmstead & Annexes (1)
Figure 5	Settlement (2), Stock Enclosure (2), Enclosure (1)

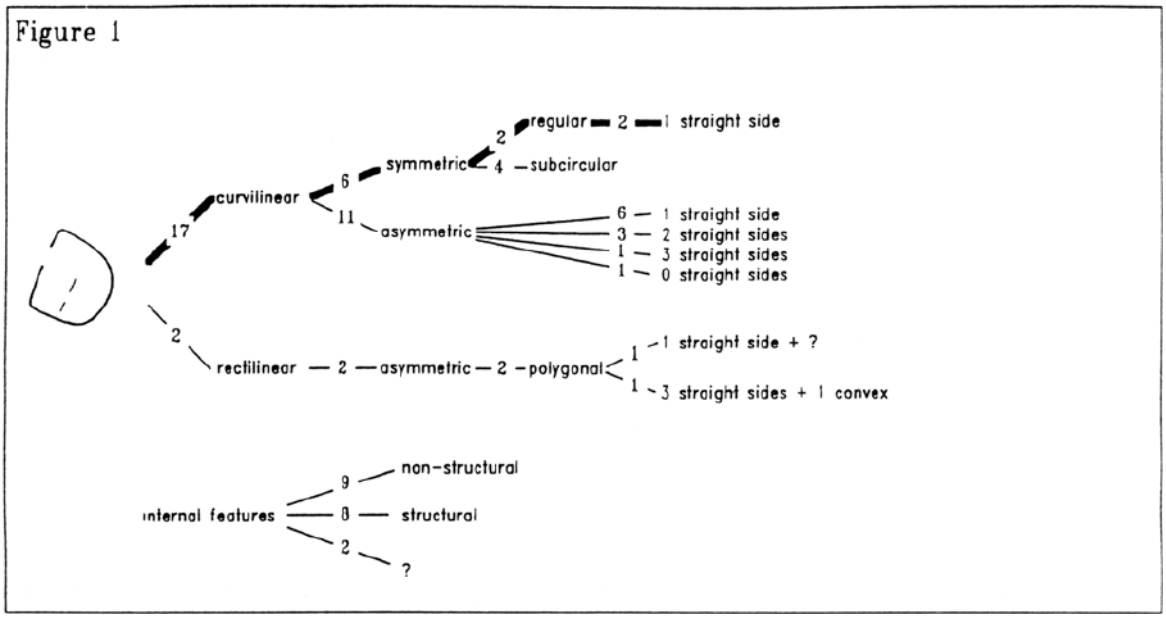


Figure 1

Note we choose "symmetric" rather than the more popular "asymmetric", as we feel the shape of the enclosure (not including the entrance position or the internal feature) is approximately symmetric about an axis perpendicular to the straight side. It is hard to judge why so many people chose the "asymmetric" option but perhaps the single axis of symmetry perpendicular to the straight side was not immediately apparent or was not accepted as sufficient - one person added a note - "depends on axis".

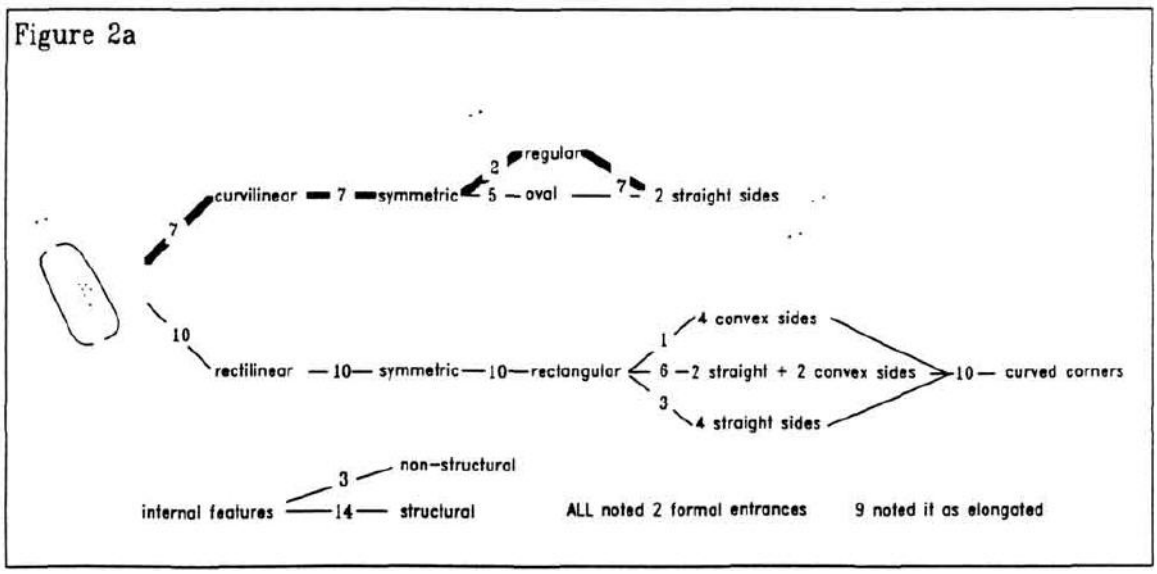
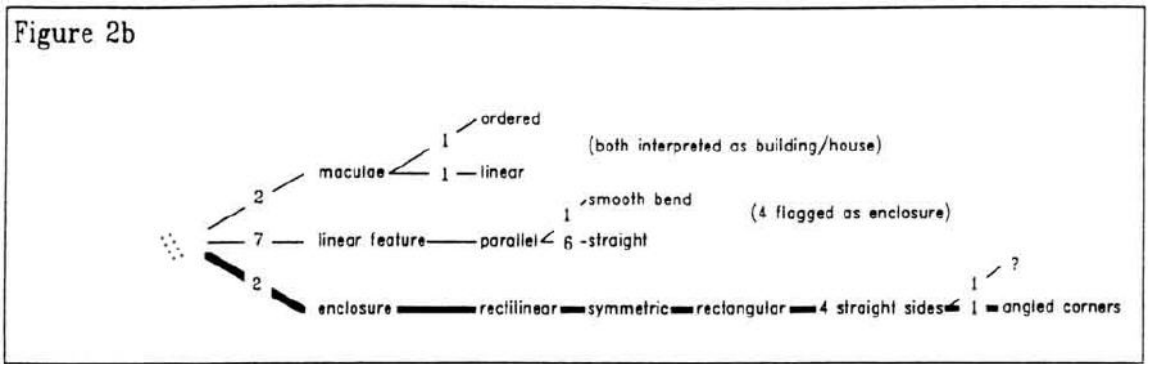


Figure 2a

We prefer the "curvilinear" option because the ends appeared as continuous curves rather than as sides with corners, but the "rectilinear" option chosen by the largest single group is understandable. The "regular" rather than "oval" option seems better as the two straight sides are such a dominant feature.



Fiqure 2b

Our definition of "enclosures" includes buildings, and therefore the two people choosing the "macula" option should have chosen "enclosure" as they also interpreted the structure as a building. Similarly the four choosing "linear feature" and "flagged as an enclosure" might have reconsidered if they had been told that "linear feature" should usually only be chosen for enclosures where it is not possible to give one or more dimensions.

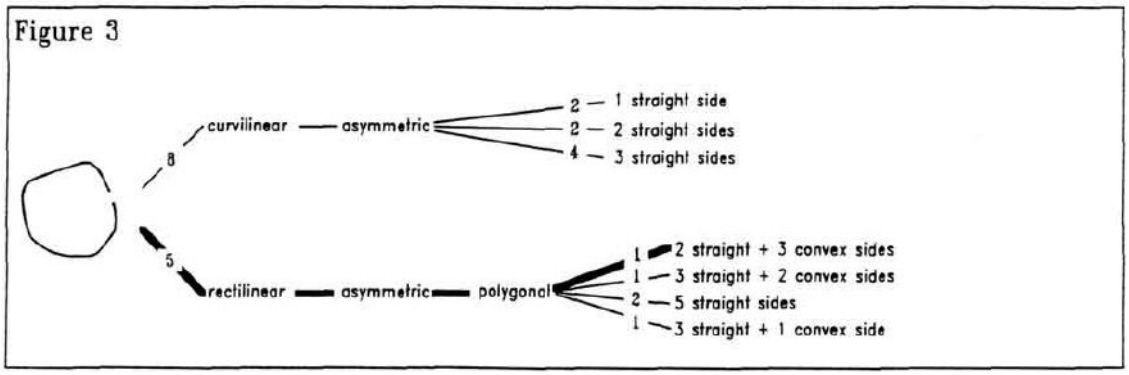


Figure 3

The results show that this was perceived as borderline between "curvilinear" and "rectilinear" but we argue that the site has (at least) 2 straight sides, four or five clear corners, and only slight curvature on the remaining sides and therefore should have been put into the "rectilinear" category. Of those choosing "curvilinear", four thought there were three straight sides (i.e. the major part of the circuit) and therefore should have chosen "rectilinear". The question of "how straight does a side have to be to be called straight?" is left to personal judgement and is obviously also dependent on whether the site is described as "rectilinear" or "curvilinear" in the first place.

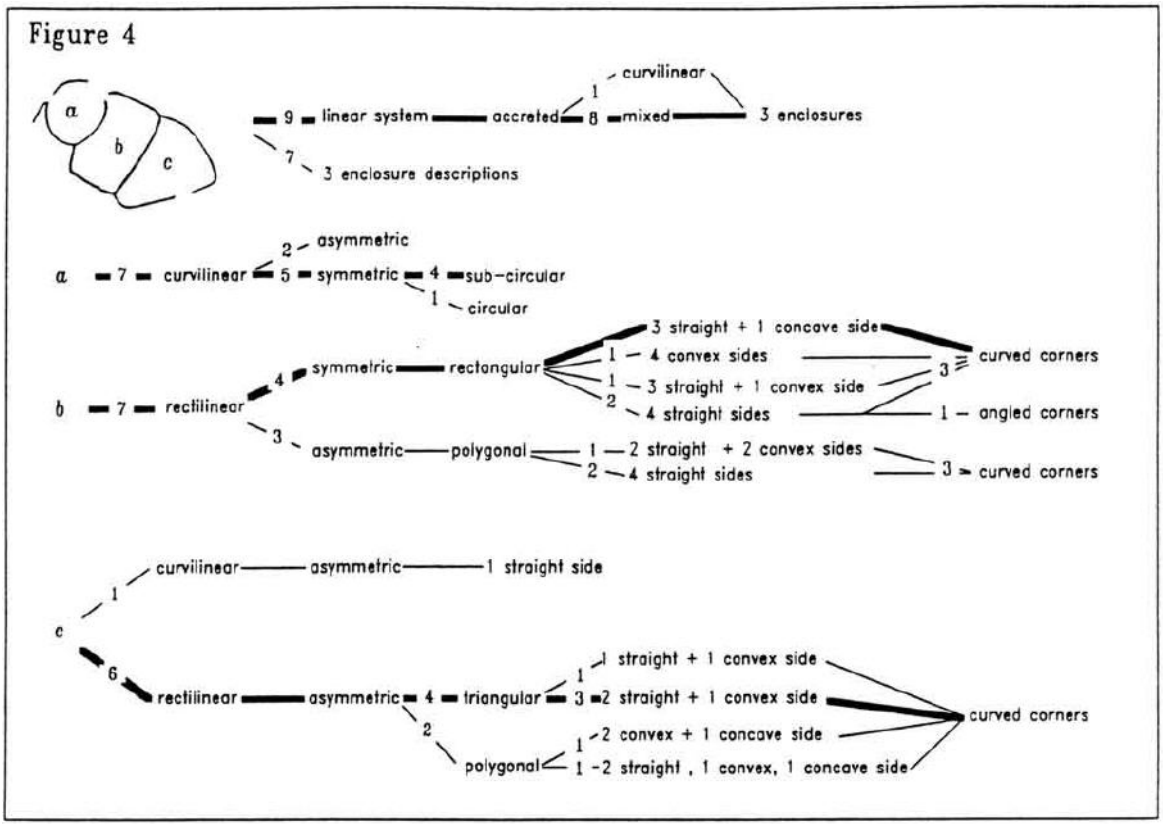


Figure 4

There was an even split between those describing this as three "enclosures" and those describing this as a "linear system" consisting of three enclosures. Our preference is as a "linear system", however, we feel that there is a good case to be made for describing A as an "enclosure" in its own right and then describing the other two enclosures as a "linear system". This allows the core nature of A to be identified allowing for direct comparison with other sites which perhaps did not develop into linear systems. The problems encountered in describing B and C were probably because they were attached to existing structures and not free-standing enclosures in their own right; this was one of the reasons for having a "linear system" option for describing conjoined enclosures. (We have also shown our preferred options for the individual enclosures as a matter of interest).

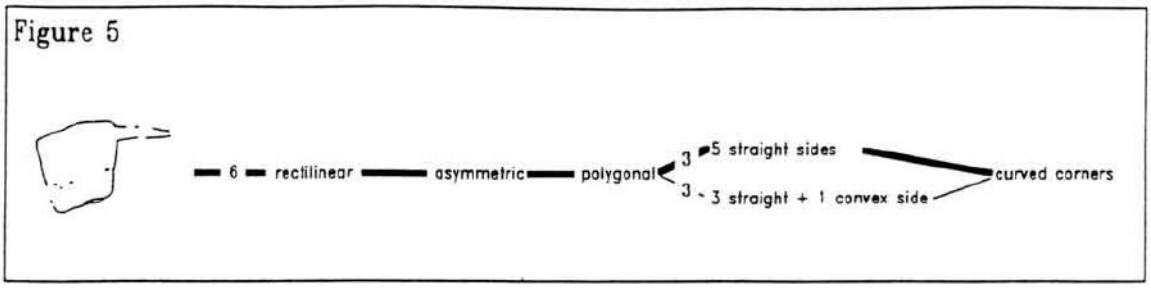


Figure 5
The only problem is whether the north side is one "convex" side or two "straight" ! sides. It is interesting that no-one called this a "banjo" enclosure - perhaps a new term is needed "balalaika enclosure".

General discussion

Believe it or not, we were encouraged by the results of this rather small-scale experiment and felt that with a minimum amount of training it would be possible to achieve our aim of a greater level of uniformity of description for the majority of sites. This would result in rather more useful information than the currently ubiquitous terms, like "enclosure" and "settlement", which have little subsequent value, either for internal analysis, or as an aid to subsequent research for comparative sites.
The variety of "interpretations" provided by our test users of the system (see Table 1), show how little use such terms are unless they are closely defined, readily identifiable and known to the user. No doubt many users would have liked to have further described the site in a free-text field in the traditional way. Whilst it may be possible to produce a better description of an individual site in this manner, the absence of any control over the vocabulary, type and scope of information provided would mean that it would be impossible to maintain the consistency of approach needed to provide a data set which could then be interrogated or analyzed in any meaningful way.

The aim of Morph is to have a reasonably comprehensive structured descriptive system that is not dependent on the user being aware of all existing classes of monument and their exact definition. This system would allow analysis of both the internal patterns within the database, and the distributions of different types of site. Potentially meaningful patterns so recognized could be the basis for defining new "classes" of monument. Furthermore users with an interest in a "class" of monument recognized from other research would be able to use the known structure of the Morph type database to reduce the number of records needing to be manually searched. No system can hope to cater for all contingencies, but Morph will allow the mass of archaeological data derived from aerial photographs to be broken down into manageable chunks for comparison even if it is only at the level of "enclosures covering between 300 and 500 m2". For example if someone were to define a "D-shaped" enclosure as a type of site of

some relevance then these could be searched forby requesting all "curvilinear enclosures with one straight side". Alternatively parallels for the site described in example 2 could be searched for using the query "symmetrical elongated curvilinear enclosures with two straight sides and symmetrical elongated rectilinear enclosures having 2 convex sides". These searches would provide lists of sites which would then need visual comparison for verification. These lists would be a lot shorter than one based on the broad term "enclosure" and a lot more complete than one based on purely interpretative terms such as "mortuary enclosure" or "cursus". Furthermore, analysis of the variability of other data recorded for each site within the Morph system (e.g. dimensions) could provide improved definition of "classes" of monument and provide indicators to possible "sub-classes".

Acknowledgement

We would like to acknowledge Dr R.H. Bewley for his encouragement in running the "Classification Game" and for his comments on the draft versions of this paper.

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CRAWSHAW'S NEWS

OTTO DROPS LEICA!

Is this a report of an expensive piece of turbulence? Or a strong incentive to take up field-walking in Germany? In fact it's neither, merely noting that Otto Braasch has switched from using Leicas to the Contax RTS III. Features of this new camera include an integral motor-drive, auto-bracketting and a vacuum back. This last is designed to ensure the film is held flat at the moment the picture is taken. And the price? If you have to ask...! More than the Leica is the answer. To continue with the optical excellence of the Leica, Otto has had two of the Leica lenses adapted to fit the Contax. We await a user report on the new camera with interest.

CAN YOU READ NEWSPRINT WITH A SPY SATELLITE?

And if so, is this relevant to aerial archaeology? If you have ever dreamt of beaming down crystal-clear pictures to your armchair from some of the hard-ware made redundant by the peace dividend, read on.

The theoretical maximum resolution of a telescope, called the Nayleigh limit, is controlled by the aperture of the telescope and the wavelenght of the light only. For green light, the minimum angular seperation of two points that will just be resolvable is $\frac{5.45}{D}$ seconds of arc. If your telescope has a 20" aperture and is 100,000 feet high, this out to be about 1.5 inches. Since satellites operate at about 500,000 feet and above, this means that the best that can be done from orbit is about 7.5 inches. In addition this assumes perfect optics and perfect seeing, so the achievable resolution is likely to be worse than 7.5 inches. Still impressive, but not enough to read newsprint unless it's a real banner headline. This resolution might be of use in archaeology, but I suspect that the images would be very expensive due to the computer processing needed. In addition, you would need to sort through a lot of useless material. In summary, I doubt if this particular technical fix will come to our aid.

Anthony Crawshaw.

SPEAK SOFTLY AND CARRY A BIG ROLLER: CROP CIRCLE NOTES

Martin Hempstead

Most people in England must by now know a lot about crop circles. For over a decade, these intriguing patterns have been popping up all around the Wessex region, surrounded by a miasma of confused theories of which many have a strong paranormal flavour. In this article, I will restrict myself to describing the investigations of crop circles in which my colleagues and I have been engaged, and assume that you all have some acquaintance with the basic phenomenon, at least through the mass media.

We are all members of the Wessex Skeptics, which we formed in November 1989 in a modest attempt to follow the lead of CSICOP (Committee for the Scientific Investigation of Claims of the Paranormal) in the USA. Our aims are to investigate putatively paranormal phenomena in an objective fashion and act as a source of information for the media to counter the frequent sensational claims that they more or less ignorantly promote.

A group of such name and aims really couldn't hide from crop circles. When we originally started active investigation, in the summer of 1990, we expected to accept the meteorological theory of formation and find the other theories inadequate or unnecessary to account for the evidence. In fact, we found ourselves driven from the meteorological model towards the theory that all the circles may be the work of human beings (I will try to limit my use of the word "hoax", since that unnecessarily implies something about the motivation of the creators). On our first visit to Wiltshire we were confronted with the breathtaking pictograms, and found our credulity stretched so far by the claim that they were formed by natural agency that the difficulties of a hypothesis of deliberate manufacture seemed trivial by comparison. Combining this with the claim made by all the experts that the details of the crop damage were much the same in the simple circles and the complex pictograms, we saw no need for any hypothesis beyond that of human fabrication.

Since then, we have been busy trying to understand whether or not crop circles are indeed a natural phenomenon, and whether we can simulate their structure. Until it is established that crop circles cannot be artificial, it seems premature to invoke unusual physical or paranormal processes to explain them! Of the many theories around, most seem to have little positive evidence in their favour, and are selected according to taste once the hoax hypothesis is discounted.

Historical Occurrence of Crop Circles

If they are indeed the result of natural forces, then it seems reasonable to expect that crop circles have been occurring for a very long time, certainly predating the present public interest. Dr. Meaden and his assistants, in promoting the theory that some form of charged spinning mass of air (a so-called plasma vortex) causes crop circles and other patterns, have sought historical examples to demonstrate that the phenomenon has a good pedigree. They point to dozens of accounts which they claim back up the theory. Many are old UFO reports, and the most famous is the "mowing devil" story which was featured in Meaden's *New Scientist* article[1]. We believe these stories have been shoehorned into the plasma vortex mould, and really have little value as evidence.

Our approach has been to turn to aerial surveys, to see if crop circles did indeed occur much earlier than 1980.

At this point, let me thank the readers of this journal who responded to a request for information that we published in a previous issue. We received half a dozen letters, unanimously supporting the conclusion that the crop circles are a phenomenon of the eighties and nineties. These correspondents maintain that they have not been seen in earlier decades and would not have been missed.

We would also like to carry out an exhaustive check of the existing data base for possible crop circles. Unfortunately, we are limited by money and particularly time, and have not yet been able to organise a thorough search of photo libraries for old crop circles. Such research is potentially quite powerful. 1990 saw hundreds of crop patterns in Wiltshire alone. Twenty years' coverage of the county photographing only 1 % of its area each August (when almost all that season's patterns would be visible) would, if revealing no patterns at all, rule out an average annual frequency in Wiltshire of more than 2 at the 90% confidence level. Such coverage extended across the country could effectively prove the novelty of crop circles. On the other hand, discovery of unsuspected crop circles in old photos would provide exciting support for those who claim the circles are not of human origin.

To date, we have inspected a few hundred photographs of Cheesefoot in Hampshire and Bratton-Westbury in Swindon, looking at oblique shots in the Swindon collection and verticals in East Acton, with the kind assistance of the Royal Commission. Both areas have seen intense crop circle activity in the past decade, but nothing appeared on the photos we saw, apart from one circular feature which was in fact a barrow. The photos were mostly taken between 1940 and 1970, from April to September, so the statistics are rather complicated and uncertain, but very roughly this might set an upper limit, at the 90% confidence level, of less than 1 crop circle annually in 250 square miles.

Proving the absence of old crop circles would not be conclusive, unfortunately. The competing theories are all qualitative, even Meaden's plasma vortex, so *ad hoc* hypotheses are easily introduced to paper over the cracks. Meaden admits that the numbers and complexity of crop patterns has grown over the past decade, although he attributes more than we would to increased reporting. Changing agricultural patterns have been suggested as an explanation for the circles' sudden abundance. It is, however, implausible that this would cause an enormous change in the frequency of the phenomenon since the patterns presently occur in many different materials - corn, barley, oats, rape, sand, snow, grass - and under a range of conditions, notably varying levels of maturity in the crops. Meaden has also invoked the record solar maximum as an explanation for 1990's record circles activity, which is impossible to quantify but would again surely not turn the phenomenon completely on or off.

In our opinion, the breathtaking increase in number and complexity of the patterns has the stamp of a cultural phenomenon, rather than a natural one. We feel that the vast library of

aerial photography that people like yourselves have accumulated could - if thoroughly examined - really pin the phenomenon down, making it possible to make very confident statements about its prevalence prior to the eighties. We would expect no occurrences prior to, say, about 1970.

Artificial Fabrication of Crop Circles

It has long been a tenet of most investigators that the features of crop circles cannot be reproduced artificially. Depending upon the particular investigator, features cited may include some or all of the following:

Unbroken crop
Absence of tracks or footprints
Absence of evidence for trampling
Complex layering of the crop
Clean edges
Departure from perfect circularity
Existence of a dowsing response

The claim that these features are impossible to reproduce seems to rest on little firm evidence, and we know of no published investigations. Recently Dr. Meaden has told us that he has never tried to simulate the patterns.

We have tried over the past few months to produce our own crop circles. Our methods have included trampling by a line of people, laying of the crop by hand, use of a large plastic garden roller and body rolling. Each approach produces an appearance of the corn which at least superficially resembles the damage seen in crop circles. Layering is produced to some extent automatically and may be enhanced by flattening the area in a piecemeal fashion with intermeshing spirals. Neat edges may be finished by hand. With the roller, one person can lay about 1 square metre every 10 seconds. The alphabet of forms, circles, rings and straight trenches, presents no particular difficulties. A ring or circle is easily defined by two people, one holding a string at the centre and the other stretching it taut and walking around the edge. If the central person moves slightly, the circle will be imperfect. When the circle is filled in, the origin of any spiral pattern may be offset from the centre of the circular outline. Trenches can be done by lining up markers, which is particularly easy when the feature runs from the centre of one circle to the centre of another.

We have made patterns by night and by day, in some cases with and in some without discovery. One of our attempts was enthusiastically endorsed by Meaden as the genuine article. Another "expert" was convinced by its imperfect circular form. Dowsers[2] got strong responses, and at least one medium picked up strong psychic vibes. This proves that the last four listed features, which are not likely to be masked by the disturbance caused by sightseers, are replicable.

In one case, we made a pictogram in broad daylight, with no attempt at concealment, just to

practice the techniques. One group of circle enthusiasts became convinced that a ring had been added mysteriously some days later around our main circle. Moreover, this ring was said to be too narrow to be made by people. I am not sure even now whether we have convinced them of the truth, which is that it was made quite simply by trampling, and only minutes after the main circle.

Avoiding footprints seems to be simply a matter of picking a dry period - reasonably firm ground will not retain traces detectable by the untrained eye (mine, anyway!). We have found that one can, with care, walk through the corn without disturbing it. This is especially easy following the seed lines, which are frequently as much as seven inches apart. Parting the corn reveals a narrow pathway, and although the corn is disentangled during passage, it may be reentangled by sweeping the tops to and fro with a stick. In windy conditions, it is possible that even this repair is unnecessary.

With all the methods we used, most of the corn was unbroken, and each stalk was bent near the ground or was straight, the soil itself having loosened around the roots sufficiently to allow the plant to lie near the ground. However, an occasional stalk was bent again a foot or more higher on the stem, and some were bent, perhaps even bruised, underfoot as we walked around the circle. Such collateral damage, to borrow a useful phrase, can be minimised by a careful gait and use of a roller. Furthermore, some of the bent stems are in that state in the standing corn before they are ever touched by the circle artisan.

Although not for lack of trying, none of us has managed to visit a fresh circle, one that has had no sightseers. We are thus unable to corroborate or deny the claim that they are devoid of the damage that we have certainly not avoided completely in our attempts. We have been told by one farmer that one of the circles on his land appeared in soft soil without tracks, probably not something that we could have made with our present techniques. If freshly-made circles are in such a truly pristine state, of which we are far from convinced, then we could not be sure of reproducing them. This does not, of course, prove that they are not artificial. It may simply indicate the limitations of our own techniques. It must be confessed here that tight organisation is not the strong point of the Wessex Skeptics - in one of our pieces we left 100 yards of string which was fortunately recovered before it gave the game away!

The fact that our fakes and others have convinced most major players in the controversy when they were unaware of their true nature lends support to our suspicion that "authentification" of crop patterns is a subjective exercise with a high - perhaps overwhelming - degree of uncertainty. Our present feeling is that there are no proven structural properties of crop circles that rule out human fabrication.

Who and Why?

Proponents of non-human origin for circles frequently deny the possibility that human beings, even if they possessed the technical skill, could have the motivation to carry out such an extensive program and the luck to evade detection. I certainly would not personally be

inclined to go to the effort to make these patterns, but like most people I am completely unqualified to make exhaustive general statements about human motivation. One can speculate on possible rewards - the artistic achievement, the thrill of fooling prominent experts, perhaps even financial gain. Since we find these things are rather easy to make, the creators do not have to be possessed of unusual levels of dexterity and organisation (with the exception, I suspect, of at least some of the pictogram makers).

With respect to discovery, it is true that we have - to date - met only one person who has claimed to have faked a circle, and that was made several years ago. Several points may be made, however. First, and most obvious, the deliberate trampling of corn is, if done without the farmer's permission, a criminal act, and not one people can safely confess to with impunity. Secondly, people have been discovered making crop circles. Third, as I was told dismissively by a TV producer, it is becoming "chic" to claim to know someone who has made a circle. However true this may be, such an attitude may tend to suppress the spread of confessions. Finally, it must be pointed out that most people investigating crop circles insist that many hoaxes have been made, with figures as high as 40% this year. If motivation, technique and luck can be found for 40%, why not for 100%?

Other Evidence Against Human Fabrication

If we discount the contention that some subset of crop circles have a structure impossible to fabricate, what remains that is inconsistent with a hypothesis of 100% human fabrication? The major residual evidence is eye-witness accounts, of which a striking example appeared in the *Mail on Sunday* recently. The problem with eye-witness accounts is that human beings are very unreliable instruments of record, with errors that run the gamut from simple mistakes through confabulation to outright lies. It is difficult even for skilled lawyers to assess the value of eyewitness testimony, and these difficulties are at least as great for reports of crop circle formation by plasma vortices or UFOs. They may be true, they may be false. It is practically impossible to tell.

Is the hypothesis of 100% hoaxing unscientific then, in that I appear to leave no possibility of its disproof? I think not, for a good video or other positive instrumental recording of a crop circle in formation could weaken incredulity. A demonstration of plasma vortex behaviour - on the required scale and in appropriate conditions - in the known equations of magnetohydrodynamics would lend strong support to Meaden's model, and might go further in making possible quantitative understanding of their characteristics and the limitations on their behaviour. Experiments currently being done in Japanese and American laboratories are generating vortices which show behaviour qualitatively like that required of Meaden's theory, but under enormously different conditions. Perhaps in future they will be shown to be highly relevant, and guide development of a mathematical model. Evidence that the patterns have been occurring for decades would also support the idea of a natural cause. As for the other theories, those who believe in the intervention of UFOs or mysterious intelligences have only to put them on national TV - there are, after all, easier ways of sending messages than buzzing

rural Wiltshire. At the moment, however, we feel the onus is on those who claim a new phenomenon to demonstrate why it is needed. Until then, we are justified in cutting through the *ad hoc* verbiage with Occam's chainsaw and settling upon human agency as the simplest hypothesis consistent with the known facts.

Glossary

Crop circle, crop pattern - crisp geometrical areas of laid corn or other crop, originally circular, but now in many complex patterns, to which the term has been extended.
Pictogram - particularly complicated crop circle which may combine circles, rings, straight lines etc.
Tram line - parallel tracks devoid of crop along which agricultural machinery moves.

Appendix - VECA

Last summer and this, a French group calling themselves VECA (Voyage d'Etudes des Cercles Anglais) have devoted a month of their holidays to investigating crop circles in Wiltshire. They wrote up last year's work in *Science et Vie*[4], including a description of their attempt - in France - to duplicate a crop circle, using a garden roller. They have carried out much painstaking and detailed inspection of crop circles, and have in many cases been rewarded with clear and positive evidence of human activity.

1. Terence Meaden, "Circles in the Corn," *New Scientist*, 23 June 1990, pp. 47-49.
2. Many tests of dowsing have been carried out. Those that were double-blind and for which the chance performance was calculable have revealed that dowsed information is no different from that obtained by random guessing. Despite this, many crop circle enthusiasts appear to believe that dowsing can give them real information about crop circles. The subjective nature of dowsing is attested to by our finding that our faked circles can produce dowsing reactions.
3. *Mail on Sunday*, August 25, 1991.
4. Thierry Pinvidic, *Science et Vie*, no. 878, November 1990, pp. 28-42.

For more information on crop circles, and for alternative views, see any of the following:
Periodicals:
The Cerealogist, editor John Michell, 11 Powis Gardens, London W11 1JG

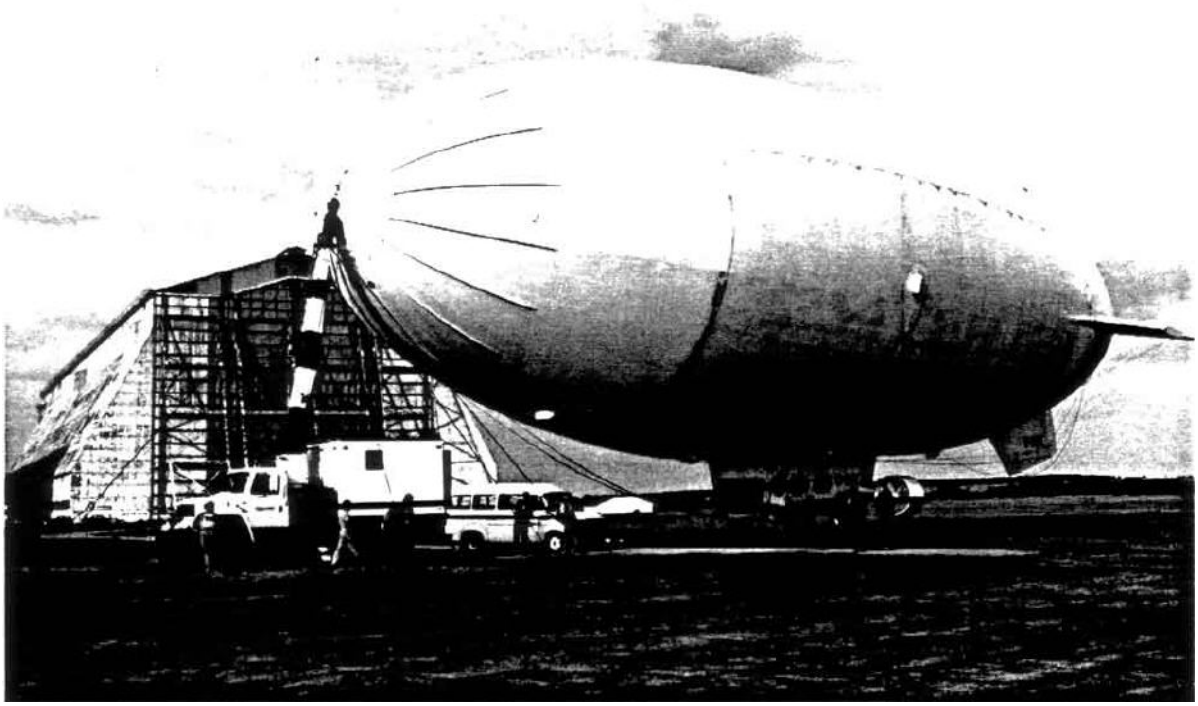
The Crop Watcher, editor Paul Fuller, 3 Selbourne Court, Tavistock Close, Romsey, Hampshire SO51 7TY
Journal of Meteorology, editor Terence Meaden, 54 Frome Road, Bradford-on-Avon, Wiltshire, BA15 1LD
Books:
"Circles from the Sky," report on Proceedings of the First International Conference on the Circles Effect, Oxford Polytechnic, 23 June 1990, available from editor Terence Meaden, £14.99.
"Crop circles, a Mystery Solved," Jenny Randles and Paul Fuller, Robert Hale Ltd., Clerkenwell House, London EC1R OHT, paperback £5.99.

AN AIRSHIP TRIP

Robert Bewley

In the first week of July 1990 the County Archaeologist for Bedfordshire, David Baker, rang me to see if I was interested in a trip in an Airship to evaluate its potential for aerial photography for archaeology. Potential or not I was interested, but at £650.00 per hour I knew that the (archaeological) potential might be limited. The real reason for asking me was for sprat to catch mackerel; if RCHME could offer to assist in funding a flight then other potential sponsors might pay for the rest of the flight. Given that it was a good crop-mark season and a rare opportunity to fly in an Airship, RCHME agreed to help towards the cost and the other sponsors duly signed up.

The Airship (see photo) can take eleven passengers, with two crew. We were scheduled for an evening flight of one and half hours around Bedford and the Ouse gravels.



The whole experience was memorable, especially the take-off which was more akin to a rocket launch than the usual rumble along a runway and gentle lift. The two Porsche Turbo engines, which produce 230 bhp each, were wound up to full speed and the bevy of hangers-on (literally) let go of the ropes and we shot up at an almost vertical angle. Having reached 1000 ft in no time the ship levelled off and floated calmly, and quietly, at a leisurely 30-40 knots. The maximum speed is 50 knots, and as we were in a 25 knot headwind the crew were concerned about keeping both engines going, as one engine would only just have held us against the wind.

This cruising speed is ideal for archaeological and architectural aerial photography. The airship provides a steady platform on which to walk about; the gondola hanging beneath the ship has a corridor between the seats and opening windows on sboth sides. The airship can stay airborne for 8-10 hours, which at 50 knots means a large area can be surveyed. No refreshments were available but there was a toilet. One particular advantage for reconnaissance was the time available for really looking at what was being photographed; at 40 knots it was possible to obtain a clear appreciation of the subject. Turning and orbiting the airship was no problem, even if the turns were slightly wider than the more usual Cessna 150/172 turns.

The disadvantages stem from the cost for the airship itself, the Airship 600, costs about 5.5 million dollars! The company which operated it, Airship Industrie, has ceased flying, and probably ceased trading. The operating costs are very low once airborne as the engines use very little fuel but the launching and landing are expensive as there has to be about 10 people on hand to grab the ropes and steady the ship.

In terms of any future potential for archaeology there are three which I can suggest:

i) As a training vehicle for all those involved in or interested in aerial

photography. The advantage of having 10 students at a time being taught what the landscape, urban and rural, looks like from 1500 ft, taking photographs and map-reading would be a boost for archaeological education.

ii) As a means of recording buildings and urban landscapes for projects like that on mills which RCHME has recently completed. It could even be used to show interested parties the devastated urban and rural industrial landscapes of Britain.

iii) Archaeological tourism is known to be a threat to sites so why not put tourists in an airship to view the prehistoric areas of Stonehenge and Avebury, or to travel along Hadrian's Wall to name but a few possibilities out of hundreds of areas?

Any potential has yet to be realised and until these wonderful flying machines are airborne again it is all fairly academic. However if you do stumble across a chance to have a go, have a go! We went from Cardington, near Bedford, where the hangars alone are worth visiting as monuments from the First World War and the beginning of airship development. I am eternally grateful to David Baker for his phone call and arranging the flight and to RCHME for providing a contribution towards getting this small project off the ground.

Levels of Technology for Digitised Images in Aerial Archaeology

John G. B. Haigh

At the recent meeting of the Aerial Archaeology Research Group (25 & 26 September 1990), there were several contributions concerned with the possible use of digitised images in Aerial Archaeology. It seems reasonable to assume that digitisation techniques are likely to have some influence on the future development of the subject. In this paper I hope to discuss how digitisation should be introduced for the benefit of aerial archaeologists in general, rather than for the advancement of the wealthy few.

The basic reason for the success of my AERIAL software over the past decade seems to be that it introduces aerial archaeologists to a level of technology with which they feel quite readily able to cope and which they find useful in their regular work. To introduce too high a technological level could arouse suspicions, not only because of the expense involved, but also because users sometimes feel that they do not have the necessary skills properly to exploit it. It is therefore important to discuss an appropriate technology for the introduction of digitised images into the mainstream of aerial archaeology.

There are two principal means by which an aerial photograph may be obtained in digitised form: either it may be captured as a digitised image, using an electronic camera in the survey aircraft; or it may be captured with a conventional photographic camera, and then digitised at some convenient time once the film has been developed. Among the contributors to the AARG meeting, the former method was favoured by Nick Efford, who was principally concerned with satellite imagery, and Ian Macneill, who was demonstrating an electronic camera; the latter method was favoured by Helmut Becker, who has developed his own system for combining aerial archaeology with geophysical survey.

For the purposes of general aerial survey, it is probably better to follow Helmut Becker's strategy and continue to use conventional cameras in the aircraft. To record the sort of detail regularly used in aerial archaeology, a resolution of around 3000 by 3000 pixels would be required in the digitised image. Although resolutions of this order are achieved in satellite imaging systems, the cameras would be far too complex and expensive to be installed in the types of aircraft used for archaeological survey. The electronic camera demonstrated by Ian Macneill operates at a resolution far lower than the required specification. Although electronic cameras would be advantageous when images are obtained at wavelengths well outside the visible region of the spectrum, for the foreseeable future conventional photography is likely to rename the best means of capturing the bulk of images for aerial archaeology.

When the archaeological image has been produced in the form of a photographic negative, there remains the question of how it should be digitised. Helmut Becker favours taking the photographic process one step further and producing the image in the form of a print, which can then be mounted on a stage in front of a high-quality TV camera with direct input to the computer. This seems to be introducing an unnecessary step into the procedure, for it would surely be much more convenient to digitise directly from the negative, giving the final user control over intensity and contrast.

The advantages of digitising the image direct from the negative, or from a positive transparency, are: Any form of printing is bound to reduce the information content of the image,

in terms of intensity range and contrast, but with direct digitisation all the information remains available; Storage of negatives is a much smaller archival problem than storage of prints. The disadvantages of digitising from the negative are: The camera stage needs to be smaller than for a print, and hence more difficult to set up with equal precision; There is a problem in providing suitable illumination; The primary record of the scene, the negative itself, must be exposed to damage. Clearly Helmut Becker must have weighed up these advantages and disadvantages. It appears, however, that all the disadvantages could be overcome, and that the idea of digitisation direct from the negative is worthy of consideration. In any case, the choice between the two methods is not critical, and could be revised at any time.

With regard to the capture and storage of the digitised image, many alternative methods and types of equipment are currently offered on the commercial market. It is possible to define three distinctive approaches to the problem:

1. To achieve minimum cost, the video card of the computer could be used for the storage and display of the image. The standard VGA card offers a reasonable resolution of 640 by 480 pixels, but only sixteen grey levels, which is not really acceptable for the purposes of image processing. The newer Super VGA cards offer the same resolution, but with 256 colours, of which only 64 can be used as grey levels. Although this may be regarded as an acceptable standard, the Super VGA is not yet defined as a recognised specification, and hence problems may be encountered through variations between manufacturers. The VGA card is really intended for the straightforward display of data, rather than for their manipulation, and consequently some image processing operations may be very slow. Furthermore, the regular display of computing information for the user and the image currently under analysis must both appear on the same screen; at certain times this could lead to an awkward dash of intentions.
2. An intermediate level of technology and expense is provided by a passive framestore. A wide range of such devices are available as boards which may be fitted into the expansion slots of standard PC computers. A typical example is the Matrox PIP1024B board, which is able to store a single image of 1024 by 1024 pixels with 256 grey levels, or four images of 512 by 512 pixels; provision is made for the capture of images from a standard TV camera, and for the swift manipulation of images under the control of the computer's main processor; the images are displayed on a separate screen from the computer's normal monitor.
3. At an advanced technological level, it is possible to consider active framestores which are capable of manipulating images of 3000 by 3000 pixels at high speed. This was the route originally chosen by Irwin Scollar, using massively expensive equipment. Nowadays equivalent equipment may be purchased at much less expense; Jurg Leckebusch of the Zurich Kantonarchaeologie, who was present but did not present a paper at the AARG meeting, is currently adapting Irwin Scollar s software to modern hardware. The total equipment cost is around £25000, and the time to create an orthophotograph from an aerial image is estimated to be five minutes.

The feeling among my colleagues at Bradford is that, although the first route is very attractive in so far as the only equipment required is a good PC computer fitted with a Super VGA card, certain essential operations may prove to be extremely slow and the problems of having to display all information on a single screen may be prohibitively difficult. At the same time, the third route is likely to be beyond the means of the majority of aerial archaeologists, and may present them with a level of technical complexity with which they feel ill-equipped to deal.

We therefore consider that the second route provides a very good prospective compromise, offering technical flexibility at moderate expense. Some of my colleagues already have considerable experience of the Matrox PIP1024B board, and we propose to set up an image processing outfit based on it, specifically directed towards the analysis of archaeological aerial photographs. The hardware for the system will consist of: a PC computer with 386SX processor, 387 coprocessor, VGA card, and memory extended to 4 Mbytes; the Matrox PIPl024B framestore, with a Philips colour monitor; a CCD TV camera with microscope attachment, mounted on a stage to view negatives or transparencies. Although the framestore is basically intended to hold images of 512 by 512 pixels, the stage will be designed to allow sections of the image to be digitised in greater detail, while retaining accurate location within the image; this technique is already used by Helmut Becker. The camera stage will be developed in the laboratory at Bradford.

The system hardware will be supported by a wide range of matching software, allowing images to be sharpened and enhanced and to be transformed into map coordinates. Transformations may be applied to the raster image, or to certain boundaries selected from within the image; the latter will provide a mapping facility which is compatible with my existing AERIAL software. Much of the image enhancement software has already been developed by my colleagues in Bradford, and many of the transformation routines already exist within my AERIAL program, although applied to vectorised outlines, rather than to raster images. Hence software development will consist largely of the integration and adaptation of routines already available to us.

The approximate costs of the complete system of hardware and software are as follows:

PC-386SX computer with colour VGA, 387 coprocessor, 4 Mbytes RAM, 100 Mbytes hard disc	£ 1800.00
Matrox PIP1024B framestore	1800.00
Colour monitor for image display	400.00
CCD camera for image capture	1000.00
Camera stand & lens (estimated cost)	1000.00
Software (estimated cost)	2000.00
Total (exclusive of VAT)	**£ 8000.00**

The cost of hardware may vary with precise specification, and is subject to any discount schemes (education, local government, etc.) which may be available. The computer specification is for the minimum configuration which is capable of doing the task; speed and versatility would improve if a superior configuration were available for the task.

My colleagues and I feel that the system specified in the last paragraph can be afforded by any group who are seriously interested in the analysis of aerial photographs. It takes advantage of recent advances in electronics and in the theory of image processing, without involving the user in undue expense or technical complication. Since it is largely based on our current practice within the University of Bradford, we hope to develop it quite quickly, making it readily accessible to the general user. We look forward to discussing its development at the next few meetings of the Aerial Archaeology Research Group.

The AERIAL program, Version 4.1

John G. B. Haigh

The aims of the AERIAL program

The AERIAL program is the main software component of the Bradford Aerial Photograph System (BAPS). It allows vectorised information to be extracted from an aerial photograph by means of a standard digitising tablet, and then to be converted into grid coordinates from which a map or plan can be plotted. The aim is to provide a flexible and reliable operation, while demanding the minimum of specialist knowledge from the user.

The conversion into grid coordinates may be achieved on the basis of either of two assumptions:

EITHER (a) the ground in the photograph may be assumed to be effectively level, so that a plane-to-plane projection (or plane projective transformation) can be applied;

OR (b) a contour map of the area is available, from which a digital terrain model (DTM) may be constructed, allowing corrections to be made for the variations in ground height.

Recent versions of AERIAL do not send the hardcopy version of the final plan direct to the pen plotter, but instead arrange for the output to be stored in an ASCII file. The file can subsequently be output to a plotter by means of the DOS utility PRINT. The principal advantages of this arrangement are that it avoids wasting paper and plotter time on unsatisfactory plots, and that multiple copies can be obtained simply by repeating the PRINT command. Unfortunately the PRINT utility demands a very precise form of serial cable between the computer and the plotter, and some users have encountered difficulty in getting it to operate. I have now produced a program PLOTAER which can be used as an alternative to PRINT, but which works with the majority of serial cables.

Hardware requirements

In order to run the AERIAL program, the following items of equipment are required:

(a) a PC-compatible computer, running under DOS3 or DOS4, with around 500 kilobytes of available program memory;

(b) a digitising tablet, with at least four separate cursor buttons, and giving a clear form of ASCII output.

The precise specification of the computer is not critical; a high-resolution colour system (EGA or VGA) allows the user to take full advantage of the display offered by AERIAL, and a fast processor, preferably with floating-point coprocessor, is distinctly useful when using a DTM to correct for variations in ground height. Digitising tablets manufactured by Graphtec and Cherry have proved to be economical and reliable, but the BAPS system has been successfully adapted to many other makes.

Because different manufacturers use a wide range of formats for the output from the digitising tablet, I normally supply a copy of a small program COMIN to prospective purchasers of AERIAL. Using essentially the same routines as AERIAL, COMIN reads the digitiser output and displays it on the screen. Hence the output produced by the four designated cursor buttons may be checked exactly, and AERIAL may be supplied in a version which has been correctly modified.

In order to obtain hardcopy of the results, the user will require access to a third item of equipment:

(c) an HPGL-compatible multipen plotter, accommodating A3 paper.

Since plotting information is directed off-line into an output file, however, the plotter need not be connected directly to the same system as the digitiser. The output file may be transferred to any PC system with a suitable plotter, when hardcopy may be obtained through the PRINT or PLOTAER commands.

New features of Version 4.1

A important new feature of AERIAL Version 4.1 is an alternative form of output file. This consists of a stream of three-dimensional coordinates, together with a numerical flag which indicates how the current coordinates are to be interpreted. The three coordinates are eastings and northings in metres from the British numerical grid origin (just SW of the Isles of Scilly) and height above mean sea level. Different values of the flag indicate the start of a new outline, or the continuation of an outline in a particular colour, or the presence of a conventional symbol, or the insertion of a caption or message. This form of output is designed to allow information from AERIAL to be transferred into a CAD package; all that is required is a relatively simple program in the CAD package's own user language. It is then possible to integrate AERIAL information into the other facilities of the package.

I have also made provision for the CAD output to be fed back into the AERIAL program. This is particularly useful when working with DTMs, when each transformation may take a considerable amount of user effort and of computer time. Once a transformation has been stored as a CAD file, it can be recalled almost instantaneously for comparison with other information. Information from small CAD files can be combined into larger CAD files, until a satisfactory record of the entire site has been obtained. The final record can then be converted into a plotting file ready for hardcopy output, or alternatively it may be combined with information from other sites, in order to build up a map of a landscape. The ability to re-cycle CAD files greatly enhances the flexibility of the BAPS system, and substantially reduces the need ever to repeat any time-consuming operation.

A less conspicuous new feature is that I have adopted a new technique for calculating DTMs. Although this does not affect the external operation of the system, from the user's point of view, it makes the construction of DTMs appreciably more flexible and reliable. Unfortunately it also increases the program size, and demands considerably more processor time, further emphasising the point I have already made about the need for fast processors.

Calculation times are usually quite acceptable when a 20 Mhz processor and coprocessor are available. I hope that a detailed description of the new method of calculating DTMs will appear in the next Proceedings of Computer Applications in Archaeology.

There are also a number of detailed changes, which I trust users will see as improvements. I have tested the new version extensively, and the experience has led to some of the changes. The manual has been updated and checked against the operation of Version 4.1.

The cost of the system

My current charge for the AERIAL program is £300,00 plus VAT. Included are the following:

(a) Customisation of the program to operate with any digitising tablet which conforms to the hardware specifications given above;

(b) An extensive manual which includes an introduction to the system, and detailed instructions on how to run it;

(c) A reasonable amount of consultation time to ensure that the system operates correctly when first set up;

(d) A copy of the PLOTAER program, to ensure easy communication with the plotter.

The licence is assumed to be granted to any archaeological unit or department of typical size; I have no objection to multiple copies of AERIAL being used written a single office. I should expect to make an additional charge if various customised versions were required for different digitisers.

Existing clients are invited to upgrade to Version 4.1 on payment of an appropriate supplementary charge. Any client who is already running a version with off-line output to the plotter (Version 3.3 onwards) is welcome to have a copy of PLOTAER.

RECENT ENHANCEMENTS TO PHOTONET

Roger Harris

Photonet is the National Library of Air Photographs computer based geographical information system which enables graphic retrieval of information pertaining to aerial photography.

Regular visitors to AARG will already have had an introduction to the original facilities available from Photonet, so it is not my intention to go over old ground.

However, any readers to whom Photonet is still an alien term may bring themselves up to date by speaking to me or any member of the NLAP staff either at AARG or by contacting the Swindon office.

The aim of this particular article is to inform readers of new and radical enhancements to the system which took place earlier this year.

Members may remember that the 'old' Photonet was designed to handle vertical photography. The primary objective of the recent enhancements was however to provide comparable facilities for the NLAP's specialist photography.

This primary objective was developed to achieve two further sub objectives.

1. In the area of customer services, the enhanced system now provides the operator with a more efficient and more flexible methodology for setting up the geographical parameters of the search. It incorporates all the options available for geographical searching of vertical photography including irregular polygons, linear areas, and pre defined areas such as County boundaries or National Parks and the facility to highlight and display the direction of view of those photographs which are recorded as panoramic.

It also allows for much greater flexibility in setting up non geographical parameters and for running sub queries on the original to further refine the results.

On the output side, the end user now has the option to have the results displayed in graphic form with hard copy output up to AO size. A number of different styles of presentation are available which I shall detail later.

2. Effective and welcome as they are in the area of customer services, the enhancements have a potential for providing even greater benefits in the area of monitoring reconnaissance programs and their success or lack of it, and the identification of gaps in the NLAP specialist collection.

For the first time, the facility is available to interrogate the specialist database in ways which previously had been impossible and with the added benefit of graphical output.

Knowing what is available for a given area is one thing, but to be able to dissect that information into more meaningful subsets is a facility that up to now has not been easily achieved.

NLAF staff are at the time of writing still in the stages of identifying and eradicating bugs and in learning how best to interrogate the system to achieve the most meaningful data sets and styles of output.

However, certain predefined queries will fairly readily allow the following evaluations to be made.

1. The identification of locations that have been recorded in less than a specified number of years. This has the potential to allow identification of areas which have not been methodically photographed and are thus potentially good candidates for new information.

2. The identification of locations recorded within a specified period but not previously known has the potential for identification of new sites.

3. The identification of recorded locations which have no record after a specified date, is a useful mechanism for ensuring regular cyclic recording of those sites which are particularly vulnerable to erosion over time and with earthworks for example could lead to early recognition of erosion through visitor pressure.

Regardless of the type of search, the search selection criteria will in due course be further refined by the facility to incorporate basic classification parameters which the NLAF has recently started to introduce to the database.

In interpreting the results from these predefined searches however, it has to be understood that in some instances they may only be a pointer to fact rather than absolute fact.

For example, in option 3 above the results will list photography whose 6 figure NGR is not recorded after the specified date. However sites in very close proximity may have been photographed at a later date and in many cases will encompass those sites listed in the results

In conjunction with the more straightforward searches, the system will enable more detailed forward planning of future reconnaissance, though once again those responsible for reconnaissance have first to 'learn' what the system has to offer and what kind of questions to ask.

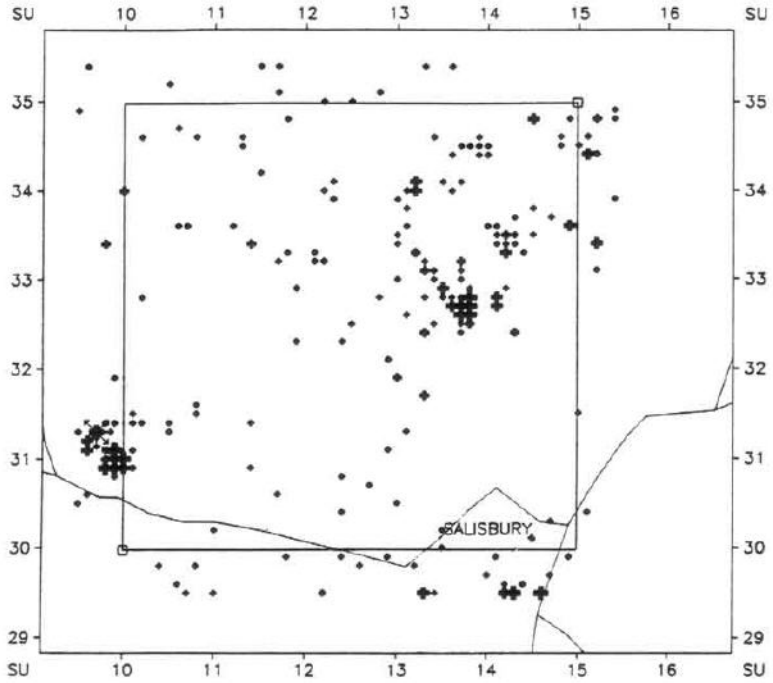
Graphical output from the 'new' Photonet is impressively flexible.

Two main styles of output can be achieved ie. distribution maps utilising symbols and choropleth maps using graduated shading of user defined NGR based areas.

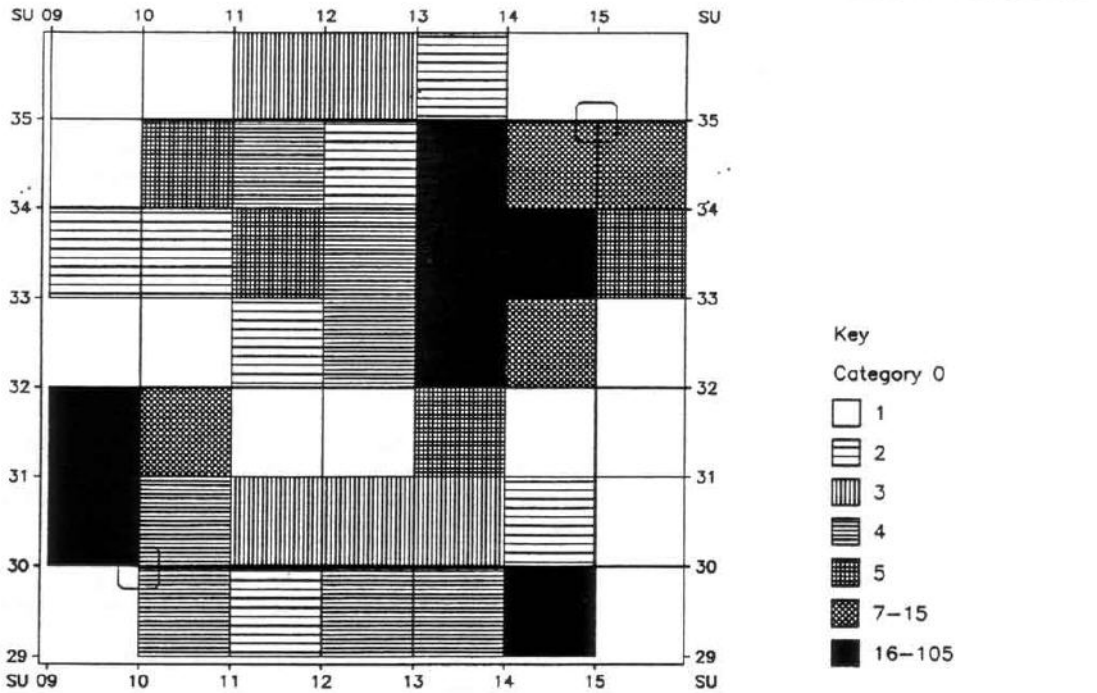
Users requiring distribution type output have the benefit of chosing up to seven symbols in any one of seven colours and to display and plot within a range of one to nine user defined levels of density, ie. no. of photographs represented by different symbols.

Panoramic photography is depicted by means of an arrow attached to the appropriate symbols, though this is a switchable option and can be suppressed.

Users of the choropleth option have similar facilities but instead of symbols have the choice of seven infill shadings to represent average values for the geographical areas represented.



Scale 1:50000



Areas with a side of of 1, 2, 5, 10, 20 and 50 kms. may be selected for the unit values.

Output from both mapping styles can be in colour or black and white, the latter being particularly useful where multiple copies are required for circulation.

Whilst the system is still throwing up the occasional bug, it is largely functioning well, although it is planned to make a number of aesthetic modifications to the content of some forms and the design of the symbols and shadings in the near future.

It is difficult to do justice to the system in writing and I would urge anyone with more than a passing interest to endeavour to see a live demonstration either at AARG if it can be set up or by arranging to visit the NLAP in Swindon.

I have prepared a few illustrations to accompany this paper which I feel work more than adequately even though they are of necessity in black and white. Larger coloured and black and white examples will however be brought to this year's meeting and space permitting will be on display.

Opposite. Photonet output showing specialist photography of all dates and scales as (upper) a distribution map using ranked symbols and (lower) a chorophleth map using graded shading.

REPORT ON THE AERIAL RECONNAISSANCE FOR ENGLAND, SCOTLAND, WALES, NORTHERN IRELAND AND EIRE in 1990/91.

compiled by Robert Bewley

Introduction

One of the many purposes of AARGnews is to disseminate information as rapidly as possible so that readers and AARG members can know what is currently happening in 'aerial archaeology'. This report has been compiled with this aim in mind; in the fullness of time the relevant photographers will produce considered reports on their work; this summary, accompanied by a map, was compiled as a preliminary note to say that 'x' person was operating in 'y' area for a certain length of time. It is hoped that this sort of report can become a regular feature of AARGnews.

A reconnaissance questionnaire was circulated to all AARG members and 19 forms (15.8$) were returned (probably a good % of returns). These 19 showed a wide geographical spread but were by no means comprehensive. Further information was obtained from all Royal Commission grant recipients and regional photographers in England, Scotland and Wales (I am grateful to these organisations and individuals for their co-operation).

Aerial Reconnaissance 1990/91.

This summary refers to aerial reconnaissance for archaeology using oblique as opposed to vertical photography (only one report of a vertical survey done by the O. S. in Northern Ireland was received). After the very encouraging crop-mark summer of 1989, the summer of 1990 was not as good in all areas; it was still a good year for most operators and particularly those in the south of England. One point worth bearing in mind is that aerial photography for archaeology is not just about crop-marks, though these do tend to occupy the majority of the flying; it is becoming more and more concerned with recording earthworks, buildings and industrial landscapes in the autumn, winter and spring. The reporting period for these projects was from the lst April 1990 to the 31st March 1991 and therefore detailed analysis of the results cannot yet be expected; it is interesting to note that over a thousand hours of archaeological aerial photography was carried out during the year.

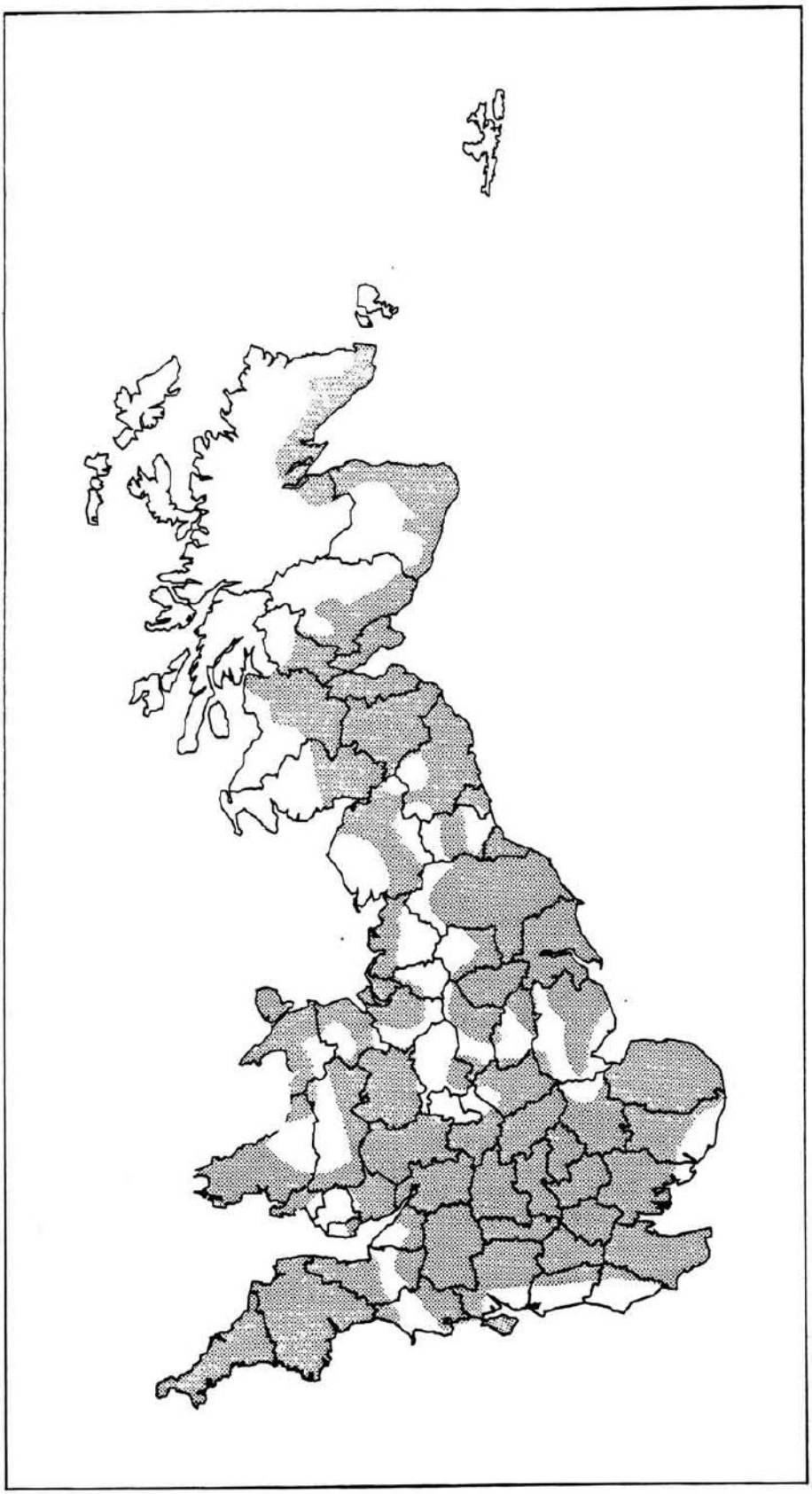
One report was submitted from France by Francois Baffou who annually carries out 20 hours of crop-mark reconnaissance in the area between Poitiers, Angouleme and La Rochelle. In future years we should be looking to having a European Map for AARGnews.

RECONNAISSANCE REPORT FOR UK and Eire 1990/91

The asterisk denotes a grant from one of the Royal Commissions.

NAME OF PHOTOGRAPHER	AREA SURVEYED	HOURS FLOWN 1990/91
ADKINS P.*	North east Essex and south east Suffolk	15.0
ARIS M.	Lleyn Peninsula and Anglesey	6.0
BARRETT G.	Eire	31.5
BARRETT G. & ROBERTS M.*	900 sq kms in north-east Shropshire	10.5
BEWLEY R.H. (RCHME)	Northern England	120.0
CANHAM R.	80 sq kms of Bristol/Avon valley in Wiltshire	3.0
CHAMBERS R. A.	30 sq kms in Oxfordshire and Gloucestershire	6.0
COLLENS J. & PHILLPOT R.*	Parts of Cheshire, Merseyside and East Lancs.	10.0
COX C.*	1000 sq kms in north-west England	25.0
CRAWSHAW A.J.	700 sq kms in North Yorkshire	16.5
DENNISON E.*	Humberside	10.0
DENT J.*	Borders	6.0
EDWARDS D.**	Norfolk and parts of Northern Suffolk.	42.0
FEATHERSTONE R. (RCHME)	Thames Gravels and Cotswold Limestone	175.0
FOARD G.*	5,000 sq kms of Northamptonshire and adjoining areas	36.5
GATES T. *	Northumberland including Millfield basin.	10.0
GILMAN P.*	1350 sq kms in Stansted area in north west Essex	8.0
GOURLAY R. & HARDEN J.*	20 sq kms in east Highlands and Moray Firth	3.0

NAME OF PHOTOGRAPHER	AREA SURVEYED	HOURS FLOWN 1990/91
GRIFFITH F.M. *	South west half Somerset	19.0
GRIFFITH F.M.*	Whole of Devon	29.0
HANSON W.*	Lanarkshire and Dumfrieshire	3.0
HARTGROVES S.*	Whole of Cornwall	8.0
HARTLEY R.F.*	1200 sq kms of Leicestershire	8.5
MACMASTER I.*	2,223 sq kms in north east Essex	10.0
MOORE M.	800 sq kms in County Wexford	10.0
MOTKIN D.*	Isle of Wight (381 sq kms)	6.0
MUSSON C.*	1300 sq kms of Shropshire and west Hereford	17.0
MUSSON C.(RCAHMW & Regional Trusts)	13,000 sq kms of Wales	88.0
PALMER R.	1000 sq kms on Cambridgeshire Fens (with RCHME)	6.0
PICKERING J.	Parts of 12 Counties from Midlands to Yorkshire	100.0
RCAFIIMS (BROWN M. & MAXWELL G.)	Areas of Scotland on map except Grampian	104.0
RILEY D.N.*	North Nottinghamshire and South Yorkshire	7.0
SHEPHERD I.*	Grampian	15.6
SIMCO A. & BAKER D.*	Bedfordshire Gravels (Airship)	1.5
THOMPSON D.*	Anglesey and Lleyn peninsula	10.0
VYNER B.*	Lower Tees Valley in Durham and Cleveland	12.0
WHITE R.*	470 sq kms in Yorkshire Dales National Park	8.5
WILSON D.R.	Parts of East Anglia as far west as Bedfordshire	5.0
YEOMAN P. & MARTIN C.*	Central Fife	12.0
*** Total ***		1010.1



AERIAL RECONNAISSANCE IN BRITAIN 1990/91

REVIEWS

The Lake District From The Air. Aerofilms. London: Barrie and Jenkins, 1990. £18.99

The Lake District From The Air contains some of the most spectacular, moving, and technically excellent illustrative APs I have seen in a long time. The book flies the Lake District from North East to South West, informing the reader through an appropriate and effective combination of words and pictures, about all aspects of this diverse landscape.

Many volumes of this nature are a somewhat boring and repetitious collection of similar and seemingly endless aerial views, but not this one. By intelligent arrangement of the order of photographic plates, accompanied by a concise, sensitive and informative text, Aerofilms have managed to capture the very essence of the Lake District as a whole, without over concentration upon the more well known areas. From Penrith to Sellafield, the geology, geography, archaeology, settlement history and modern landscape are described in excellent pictures and very few words. The plates alternate frequently between the spectacular wild mountain scenery and the contrasting close up details, placing the villages, towns and archaeological sites into their context. Often the mood of the photo is matched by a relevant textual reference to the people and events linked to the depicted location. Coniston Water (page 93) shimmers in a dark landscape under a lowering grey sky, accompanied by a short textual reference to the late Donald Campbell.

The text is particularly good, presenting some obscure and interesting observations among the usual Lakeland history. Page 35 shows Helvelyn mountain, along with an interesting note that in 1926 a light aircraft landed on its flat grassy 3118 foot summit. There are tasteful references to the Lakeland poets and writers - Daffodils and Peter Rabbits keep a sensible low profile.

The quality and technical excellence of the photos is very good, full use being made of dramatic lighting, (Castle Crag, Borrowdale, page 137), and well composed viewpoints (Piel Island, page 85). There was only one disappointing view, that of the M6 in the Tebay Gorge, which I felt did not adequately reflect the spectacular character of both landscape and motorway.

The photography spans all seasons, and the crisp, almost steely, winter photos contrast well with the softer focus on autumn woods and bracken.

The contents of Lake District from the Air are very good, but two important points, which could easily have been improved, make this a difficult volume to follow closely or use for reference.

The index is totally useless. It is a simple list of aerial photos in order of appearance, making reference to an individual place or site an impossibly exasperating operation. This may be perfectly alright for a volume which is intended to be scanned once, then left on the coffee table, but is inadequate for this volume, as I found when I wanted to refer to and discuss individual memorable photos.

The introductory map is pretty, but the contour shading (which is not explained in the key) tends to obscure the placenames, rendering it about as useful as the index. There is also no link with the National Grid, and no indication of which bit of Britain is being depicted.

Apart from the above points, the book is very well presented and pleasingly laid out, and will be of great value to anyone who is seriously interested in illustrative oblique aerial photography. It probably also presents the only opportunity you will get to see the Lake District when it isn't raining.

Chris Cox

The National Monuments Record: a guide to the archive. Anon. London: RCHME, 1991. £5.50 (plus p&p)

The bulk of this Guide is concerned with three collections: The National Archaeological Record (NAR), The National Buildings Record (NBR) and The National Library of Air Photographs (NLAP). The collections are separately described (and colour coded) and, says the Guide, '...practical advice on using the archive provided.'.

The NLAP is my main concern here, and its collections are described under the main headings of 'oblique' and 'vertical' with each further subdivided by source (eg for obliques, RCHME and Non-RCHME). A final few hundred words deal with 'access and facilities' and list the factors through which the index(es) can be interrogated.

The *Guide* appears to have been written for the new or potential user of the NLAP and, I imagine, contains little which will be unknown to frequent archaeological users although it will serve to remind them of the scope of the collection. For the potential user the Guide will be informative but may lead to confusion as it lumps together collections which are not yet physically together (ie are currently in Swindon - obliques - and Acton - verticals) and gives no warning of the inevitable delay between enquiry and availability of some of the photographs. In fact there is no mention that at present the NLAP lies in two one hundred mile distant collections despite the loose-leaf format of the *Guide* which would allow exchange of such an information sheet once the move to Swindon is finally achieved.

Design and production of the *Guide* are excellent and present a showcase document to the NMR holdings. Somebody deserves promotion for thinking of the use of different coloured pages for each collection and for discovering that it is possible to print titles on plastic comb binding rather than leaving the reader to shelve them anonymously or covered with tatty adhesive paper labels. As a working guide the 'Contents' and page numbering and column-side headings make it easy to use and, in these days of minority-priority considerations, it gives me pleasure to discover that the *Guide* has a distinctly left-handed bias!

Rog Palmer

The Archaeology of Bokerley Dyke: Inventory. By H C Bowen. London: RCHME, 1991. £5.00 (plus p&p)

This A4 (very un-Commission!) comb-bound *Inventory* is essentially a 35 page listing which complements the more selective inventory published as Part V *of The Archaeology of Bokerley Dyke* (Bowen 1990: reviewed in AARGnews 2, 48-49). In tabulated form it describes monuments of the Bokerley area in Hampshire plus new ones (ie post RCHME *Inventories*) in Dorset. Following the order within *Bokerley* the *Inventory* begins with linears then moves, in more or less chronological sequence, through long barrows, round barrows (Hampshire only) and ring ditches, small square enclosures (?IA barrows), and a 12 page section on enclosures and settlements. The lack of a main heading for 'Celtic' fields is probably more due to the bittiness of their preservation and recording (see *Bokerley* figure 1) than to any decrease in interest by the author. The volume is completed by a bibliography which, but for the addition of four entries, repeats that in *Bokerley*.

Linears in Dorset and Hampshire are treated differently, with the former including useful columns for 'relationship' and 'comment'. For such details of Hampshire linears the reader needs to refer (as is indicated) to the main *Bokerley* volume. Similar reference to other Commission volumes is made in other sections of the *Inventory*: to find the sizes of many of the long barrows you will need *Long Barrows in Hampshire and the Isle of Wight* (RCHME 1979) and for other details, volumes 4 and 5 of the *Dorset Inventories* (RCHME 1972; 1975) are required. Such things annoy and make for curious omissions, especially in cases where such sites (as in the *Inventory* 'enclosures and settlements' listing) appeared, sub-divided by type, as plans in *Bokerley*. It would have made a much more valuable single document if these few cases could have been included for completeness and, more importantly, for standardisation of descriptive terms. These descriptions, especially of the 'enclosures and settlements', follow those given in *Bokerley* and are refreshingly easy to understand to us pre-MORPHites.

Cross referencing appears efficient and accurate; with access from *Bokerley* to the *Inventory* via parish, NGR and/or site number while the *Inventory* carries a column throughout referring to a figure, plate, or page in *Bokerley*. Of particular interest, and strengthening my own comments on *Bokerley* as an application of aerial photography, is the inclusion of an AP reference (presumably the 'best' AP) where this was a relevant source.

I was told that the original intention was to publish the *Inventory* as an integral part of *Bokerley* and that is surely where it belongs although the advantage of having the *Inventory* and the illustrations in (at least!) two separate volumes makes comparative work that much more simple. The *Inventory* is of little use by itself, unless as a guide to sites worthy of plundering, but for those with a copy of *Bokerley* and interested in pursuing details of some of the sites therein discussed it makes a most useful addition - even though adding a third format to what is essentially a single publication.

Rog Palmer

Archaeology: Theories, Methods and Practice. By Colin Renfrew and Paul Bahn. London: Thames and Hudson, 1991. £18.95

As one who tends to keep my archaeological interests within the relatively narrow band which I think is relevant to my aerial centred speciality, this book appears useful as a single volume which provides a recent overview of the discipline. It is obviously intended as an undergraduate textbook and the spelling and examples indicate that it is aimed at a North American readership. The spelling annoys me but the text otherwise reads extremely easily and - often for the first time - allows me to begin to understand of some of the theoretical aspects which I first struggled with during David Clarke's lectures, as well as those which have since become fashionable.

Within such a guide of 'theories, methods and practice' (especially if taken in that order of importance) it is of little surprise to find that 'aerial reconnaissance' occupies five pages, some one percent of the book. Two of these pages comprise a 'box feature' of which, the blurb says, the book contains 87 on key topics, while the remaining three pages attempt to cover the history, use and recent developments of aerial photography plus (for the Americans) remote sensing from high altitudes. It was an optimistic task and it hasn't quite succeeded. I was pleased by the authors' understanding that air photographs need interpreting and combining into map form even if they didn't quite grasp why we use obliques.

The box feature deals with the photographic side of the business - 'site discovery by aerial photography' - and is, to put it politely, wrong, although this may be more the fault of the picture researchers than the authors. Some of the most informative air photos of the Wessex chalk have been taken in past springtimes when there is a blend of well weathered ploughsoil which remains visible through young cereal which itself tends to highlight cut features via more vigorous growth - the so-called germination marks. May 1953 was obviously such a spring as the illustration headed 'Cropmarks' clearly shows. My first impression was, 'What a good winter shot', I then read the caption and followed it up with a trip to CUCAP to check the date (LS 8: 2 May 1953). In a similarly misleading manner the winter shot, one of Agache's battered Roman villas, is captioned as a frost mark when the features in such photographs are more usually credited to the plough bashing the tops off the foundations.

The three pages of text also show misunderstanding of the books cited as reference. My own Danebury survey is quoted as covering 453 sq km (it was 450 - ie 18 1:10560 quarter sheets) and amazingly credits me with the discovery of '8 other hillforts' (unnamed, but which must include Quarley, Figsbury, Bury Hill and Balksbury - all published as excavations!).

Do we judge the rest of the book's contents by the section which we best understand, or do we credit the authors with knowledge in their own spheres and allow them a few, perhaps trivial, mistakes in other areas? Tony Pope, when he was chief illustrator with RCHME once said to me that if a drawing looks good it is unlikely to be questioned. The text of Archaeology is undoubtedly lucid, design is excellent and illustrations (usually) clear - but does this mean it is correct...?

Rog Palmer

BOOKS OF INTEREST?

Image Interpretation in Geology. By S A Drury. London: Allen and Unwin, 1987. Remaindered price about £5.00

This book deals with most of the image collecting process which archaeologists do not use. In so doing, it provides reasonably up to date coverage of the technicalities and results of non-photographic imaging systems, digital image processing and an introduction to GIS. Examples are geological although it is interesting to note that the one instance in which archaeological sites are mentioned it was to provide a date (some 6000BP) for a natural drainage pattern first recorded on an SAR image below the Sudanese Sahara.

Copies of the book may still be found in remaindered booksellers - ours was discovered in June 1991.

The Changing Face of Britain - from the air. L and A Gardiner. London: Michael Joseph, 1989. Remaindered price about £6.00

Slightly more than just a picture book containing some 160 'then and now' shots by Aerofilms. When first published in 1989 I wrote a review for Aerial Archaeology (?forthcoming...) which ended, 'Bloody good: buy it!'. Now (August 1991), with £10 off it's an even better buy.

Natural Landscapes of Britain from the Air. N Stevens (ed). Cambridge: University Press, 1990. £19.50

Britain's Changing Environment from the Air. T Bayliss-Smith and S Owens (ed). Cambridge: University Press, 1990. £25.00

Two volumes from the Cambridge Air Surveys series which I have only seen lurking on a desk at CUCAP. Judging by past volumes these two ought to be of interest to many AARG members although neither are strictly archaeological in content (which may be why CUP have proved reluctant to send us review copies?). I have not yet found them in any of the Cambridge bookshops so await their appearance on the remaindered lists.

Rog Palmer

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