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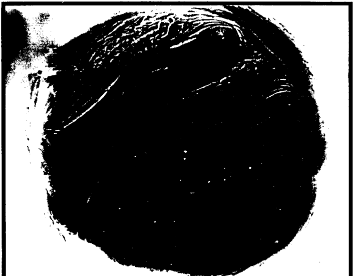

This Issue: Phipps on flies – Levitan on bones
AGM Report – News – Opinion – Book notices – Burhinus

The Bulletin of the Association for Environmental Archaeology

CIRCAEA

CIRCAEA is the Bulletin of the Association for Environmental Archaeology, and is published three times a year. It contains news and short articles as well as more substantial papers and notices of forthcoming publications and conferences. Editorial policy is to include material of a controversial nature where important issues are involved. Although a high standard will be required in scientific contributions, the Editors will be happy to consider material the importance or relevance of which might not be apparent to the editors of scientific and archaeological journals, such as papers which consider in detail methodological problems like the identification of difficult bioarchaeological remains.

Circaea is edited by Allan Hall, Harry Kenward and Terry O'Connor, and is assembled and printed at the University of York.

Circaea is distributed free to members of the AEA and available to institutions and non-members at six pounds sterling per annum.

Notes to contributors

Articles for inclusion in Circaea should be typed double spaced on A4 paper. Line drawings should be in black ink on white paper or drawing film to fit within a frame 165 x 245 mm. Captions should be supplied on a separate sheet of paper, and labelling on figures should either be in Letraset (or an equivalent) or should be in soft pencil. Half-tone photographs can be accommodated, but authors wishing to make extensive use of photographs, or colour, should note that they may be asked to contribute towards the high cost of production. The editors will modify short contributions to fit the layout and convention of Circaea. The same principle will be applied to idiosyncracies of spelling and punctuation. Scientific articles will be submitted to referees: authors may, if they wish, suggest suitable referees for their articles. TWO COPIES of scientific articles should be submitted. References should follow the so-called modified Harvard convention, but with journal titles preferably given in full, not abbreviated. World list abbreviations will, however, be acceptable if the author has a definite preference. For guidance as to the preparation of material for publication, contributors are referred to The British Ecological Society's booklet 'A Guide to Contributors to the Journals of the BES', and 'General Notes on the Preparation of Scientific Papers' (3rd ed. 1974, The Royal Society). Ten free reprints will normally be supplied to the authors of scientific articles: further copies will be available, if requested at the time the article is accepted, at a charge of 5p per page plus postage. Reprints of other contributions can be supplied at the same rate.

Cover photograph - Posterior spiracular plate of *Calliphora vomitoria* (L.), x approx. 700, showing spiracular slits.

EDITORIAL

Percipient readers will have noticed in this issue an even more radical change in format than that to which they may have become accustomed. In ten issues, it was felt that the Newsletter had passed through the stages of birth, juvenilia, and adolescence, and was ready to grow up into something more like the bulletins of other learned bodies. Following repeated pleas in these columns, readers have responded by sending in papers for inclusion, and it seemed only fair to the authors to present their work with the best reproduction which AEA finances could bear. In fact, they couldn't, and this first issue of CIRCAEA has been heavily subsidised through the generosity of the Department of Biology, University of York.

It is intended that future issues should each include some papers, as well as the customary melange of information, wit, wisdom, and frippery. Reprints of papers will be available at an economic rate, with a small allowance of free copies to the authors. By using improved printing techniques, it will be possible to include half-tone photographs. Copies of CIRCAEA will be sent to major libraries, and if the quality of the content can be maintained and improved further, it should be possible to attract subscriptions beyond the AEA membership.

Obviously, the production of such a bulletin involves time and effort on the part of the Editors (and anyone else negligent enough to get sucked into the productive vortex), and for this reason, and in order to reduce the disproportionate costs of postage, it is intended that CIRCAEA will appear three times per year, nominally January, May and September.

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Now, about this name which we've been bandying about ...

CIRCAEA - the genus of Enchanter's Nightshades.

CIRCAEA - a genus of slightly uninteresting mollusc.

CIRCa (Latin = about) + AEA.

CIRC(ular of the)AEA.

The etymology of the name as applied to Enchanter's Nightshade invokes the memory of the legendary Circe, a lady as irresistible as it is hoped this bulletin will become ......

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About the AEA

As it is hoped that Circaea will reach a wider audience than the old Newsletter, this seemed to be a good opportunity to introduce the Association for Envionmental Archaeology to the wider world. The AEA was formed in the Spring of 1979 to provide a forum for the exchange of ideas and information between people working in the general field of the application of the natural sciences to archaeology. The membership is predominantly British, but this is simply a result of the AEA having been conceived and convened in Britain, and a small but growing proportion of the membership is based overseas. At the time of writing, the AEA has about 180 paid-up members. Two meetings are held each year; a one-day gathering in the Spring at which short papers on any topic can be presented, and a weekend thematic conference and annual general meeting in September. The proceedings of the September meetings are published in British Archaeological Reports International Series. Two such volumes have appeared to date, and a third is in preparation. For the last three years, the AEA has also produced a Newsletter, which is subsumed and superceded by Circaea. Further information about the AEA may be obtained from the Editors of Circaea, or from the Honorary Secretary of the AEA (N. D. Balaam, Room 530, Fortress House, Savile Row, London W1X 2AA), to whom applications for membership should be addressed.

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1983 SUBSCRIPTIONS.

At the Annual General Meeting of the Association in Durham, it was decided that we should make much more of the Newsletter and that we should in particular improve its appearance and expand the circulation. The unfortunate consequence of this is an increased cost in production. The Committee have therefore regretfully decided that from 1st January 1983 the subscription, which has remained at 2 quid since 1979, should be increased to 4 quid per annum.

New banker's order forms will be sent out to all those who pay by standing order. Please do not amend your present order.

All payments should be sent to:

N D Balaam, Room 530, Fortress House, 23 Savile Row, London W1.

Cheques should be made payable to 'Association for Environmental Archaeology'.

N D Balaam.

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MISCELLANY

International Soil Museum

The Editors of Conservation News have brought to notice the existence of the International Soil Museum at Wageningen, The Netherlands. The museum was established in 1966 with the intention of assembling a collection of the world's major soils to permit study, comparison, and evaluation. Further information regarding the museum may be obtained from:

International Soil Museum, PO Box 353, 6700 AJ Wageningen, The Netherlands; Tel 08370 19063.

Publication News.

Romano-British Cemeteries at Cirencester by Alan McWhirr, Linda Viner, and Calvin Wells. Volume 2 in the series Cirencester Excavations, approx 180 pages, 48 figures, 51 plates and 5 fiche. A4 format, with a limp (sic) cover.

This volume is available for 12 quid (plus p+p) under a pre-publication offer from Cirencester Excavation Committee, Corinium Museum, Park Street, Cirencester, Glos., GL7 2BX, to whom all further enquiries should be addressed.

Mapungubwe: an archaeozoological interpretation of an Iron Age community, by Elizabeth Voigt, Transvaal Museum Monograph no 1.

This volume is due to be published in March 1983, 300 pages and 'numerous line drawings and photographs'. The price will be 25 Rand in hard cover. Further information from:

The Transvaal Museum Bookshop, Transvaal Museum, PO Box 413, Pretoria 0001, South Africa.

Nominees for the AEA Committee.

Part of the business undertaken at September's AGM will be the election of two persons to replace Terry O'Connor and Martin Jones on the AEA Committee. Nominations are now invited: they must be signed by proposer, seconder and nominee, and should be sent by September 12th 1982 to:

Nick Balaam, Room 530, Fortress House, 23 Savile Row, London W1X 2AA.

A core paragraph

I wonder if members have any childhood (or even adult) names for the horny structure (endocarp) that surrounds apple pips. 'Toenails' and 'earwigs' have been mentioned, but there must be lots of odd terms for these interdentary annoyances! No prizes for the most original entry, however...

Allan Hall

One of the other intrepid editors (whom God preserve) offers 'moons' and 'cartilages', the former from childhood, the latter from a recent conversation with a young(ish) person.

Fresh water fish and fisheries in mediaeval Europe

In mediaeval Europe (ca. AD 500-1500) fish were a protein source, an economic commodity, an object of intentional cultivation in fishponds, an indicator of changes in natural environments, an object of sport, and an element in symbolic culture. This subject of considerable importance for understanding the mediaeval economy, society, and relation of men to their natural surroundings has never been the object of comprehensive treatment by historians and rarely has the mediaeval evidence been mentioned by writers on fisheries. The long-term intention of this project, then, is a broad study of the the place of fresh water fish in mediaeval Europe.

One kind of evidence that must be considered is archaeological. Potentially relevant are any published or unpublished data or interpretation of fish remains from excavated sites of mediaeval or 16th century date. Information with respect to remains of fishing equipment and constructions connected with fishponds is also of interest. These sorts of evidence must be placed in a broad context of written and artistic evidence on fish from throughout mediaeval Europe.

Richard C. Hoffmann

Associate Professor, Department of History, York University, 4700 Keele Street, Downsview, Ontario, Canada M3J 1P3.

ENVIRONMENTAL ARCHAEOLOGY IN NORTHERN IRELAND

In response to the challenge thrown out by David Drew to exchange information, departments in Ulster which specialise in life sciences were contacted and asked to make known their research interests in environmental archaeology. The institutions were Queen's University, Belfast, The New Ulster University, The Ulster Polytechnic, all Colleges of Education, the Ulster Museum, the Department of the Environment (Northern Ireland), and the Geological Survey (Northern Ireland). The following list was compiled from their replies.

D. of E. (Northern Ireland)

Contact Mr. Chris Lynn for further details.

Rescue excavations (multi-period) - arrangements with Queen's University Belfast for the analysis of pollen, microfaunas, animal and human bones, radiocarbon assays, dendrochronological analysis and wood identification.

Queen's University of Belfast

Department of Archaeology

Mr. Ronnie Doggert - the analysis of archaeological sediment as a means of interpreting site function with special reference to magnetic susceptibility and phosphate analysis (PhD).

Mr. Finbar McCormick - animal bones from excavations.

Department of Geography

Mr. J. Cruickshank - soil chemical analysis from a range of archaeological sites through a range of time periods.

Mrs. M. Cruickshank - pollen analytical investigations from soils in archaeological deposits.

Mr. K. R. Hirons - the palaeoecological record of lake sediments through analysis of pollen, chemistry, magnetism, etc. with particular reference to East and Central Co. Tyrone. (PhD).

Palaeoecology Centre

Dr. M. G. L. Baillie - dendrochronology and dendroclimatology.

Mrs. E. Francis - palynology in association with archaeological sites, (PhD).

Dr. D. E. Gennard - palaeoecological investigations of archaeological sediments through the use of pollen, seed, and fossil insect analysis. Main interest, interglacial and interstadial studies in Ireland.

Dr. A. Goddard - pollen analysis of samples from the members of D. of E. staff. The sites are varied, ranging from neolithic cairns to medieval wells.

Dr. Martin Munro - pollen analysis as an aid to landscape archaeology. Particular area of research is continental Europe. Other interests include computer applications in archaeology.

Dr. Jon R. Pilcher - dendrochronology, vegetational history and climatic history.

The response seems to indicate that environmental archaeology is one of the strengths of workers in Belfast, although Quaternary research is by no means confined to Queen's University. Ireland has an Irish Quaternary Association which is well supported by workers both North and South of the border who use the techniques of environmental archaeology to investigate other fields of interest.

Perhaps the Welsh dendrochronologist personifies the next stage. Dai Alogue is the order of the day.

(A pun down to our standard, but emphatically not ours - Eds).

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Reducing the work-load: sub-sampling animal bone assemblages.

Bruce Levitan *

Introduction

This paper presents the results of sub-sampling experiments which were carried out on the bone assemblage from West Hill, Uley, Gloucestershire. In view of my recent work on sampling and sieving (Levitan 1982) it may seem somewhat of a contradiction to be talking here of sub-sampling when one has done one's best to recover as much as possible by sieving. This is not really so, however, because the samples obtained by sieving and by sub-sampling are at different levels.

At the first level - bones in the ground - one must aim to recover the complete sample. The reason for this is obvious: unless the sample recovered is representative of the surviving deposits, a bias is introduced which cannot be accurately defined and which affects the validity of the analysis and interpretation. At the second level - bones in the laboratory - the aim is to provide an analysis which is cost-effective in terms of accuracy of results for hours expended. One way of acheiving this where the assemblage is very large could be sub-sampling. (What is 'very large'? Possibly at least 10,000 fragments, pehaps more.) If the sub-sample can be proved to be truly representative of the original sample, then analysis will not be biased. The important point here is that the sampling process can be rigorously controlled; we are dealing with a known population, which is not the case on site.

Sampling at the first level has received a lot of attention over the past ten years or so (eg Payne 1972), and the importance of sieving has been demonstrated at West Hill (Levitan 1982). Sub-sampling has received much less attention, though Gamble, in his review of the subject, discusses its application and even proposes a model for optimising sub-sample size (Gamble 1978).

In order that sub-sampling be acceptable, two factors must be established.

1. The sub-sample must be adequately representative of the population (ie. the original sample) from which it is drawn.

2. The sub-sample size ('sampling fraction') required for particular levels of analysis must be ascertained.

The West Hill assemblage comprised over 233,000 bones. There were eight phases of occupation, ranging from pre-Roman Iron Age to Anglo-Saxon. Most of the bones came from Phase 5, dated to the late 4th

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* Bruce Levitan, Esq., 35 Islington Road, Southville, Bristol.

century, when a Romano-British temple complex was in use. The bones may originally have been piled up in a midden or middens of carcasses somewhere near the temple, but they were recovered from a secondary deposit, within and immediately beneath the demolition layers of the temple and its associated buildings (for a description of the site, see Ellison 1981).

Over 90% of the bones from this phase are from ovicaprids (sheep and goats), of which more than 80% are from goats (Capra hircus L.), and a large minority from domestic fowl (Gallus gallus L.). The association of these bones with certain archaeological finds and features indicates that they are the remains of ritual animals which may have been sacrificed to the god Mercury, whose animal associates are the ram, the goat, the cockerel, and the tortoise (no tortoise at West Hill!). Four contexts from this phase contained nearly 30,000 bones each, and another two contained about 10,000 each. It was in order to deal with these contexts that the sub-sampling experiments were devised.

Sampling method

The sub-sample must be random in order to eliminate selection bias. A method was devised to cut out personal selection bias as much as possible, and proved easy and quick to operate. Two people were involved. The first person counted out the bones one at a time, transferring them into a new box, and the second person selected for the sub-sample only those bones whose number in the count appeared on a random number sheet. This eliminated the selection bias of the first operator, and ensured that the sample was truly random.

After identification of the bones in the sub-sample, the context residue was briefly sorted in order to pick out any species not represented in the sub-sample - this might happen where a species is represented by only a few bones. At the same time, specimens for analyses which did not involve sub-sampling (see below) were also removed.

Experimentation

Two pilot experiments were performed to test the representativeness of the sub-samples at different levels of analysis. Having referred to Gamble's model for sample fractions (Gamble 1978: Table 20.7, p 344), it was decided that questions of the first level (Section A - sensu Gamble op. cit.) may be considered with small samples, and that a 10% random sample of a context with ca. 2000 bones should be sufficient. A context with 2320 bones was selected, and results of the species counts are given in Tables 1 and 2. These results were quoted by Gamble (1978, 341-2), and need not be further considered here, except to point out the good correspondence between sub-sample and whole context.

Table 1. Comparison of the total bone sample from context 70 with a 10% random sample drawn from it (after Gamble 1978): Minimum numbers of individuals (MNI). Chi-squared calculated on three most abundant species, for MNI rather than percentages, with remaining five species summed: Chi-squared = 2.43 (3 degrees of freedom, p = 0.49) Yates correction applied.

Species	whole context	10% sample
Goat	27.9	21.5
Sheep	16.1	21.5
Ovicaprid	45.6	36.7
Cattle	1.5	7.1
Pig	2.9	7.1
Horse	1.5	0.0
Dog	1.5	0.0
Domestic fowl	2.9	7.1
sample size (n)	68	14

Table 2. Comparison of the total bone sample from context 70 with a 10% random sample drawn from it (after Gamble 1978): Number of identified specimens. Chi-squared calculated for four most abundant species, based on specimen counts not percentages, with the remaining four species summed: Chi-squared = 3.46, 4 degrees of freedom, p = 0.48, Yates correction applied.

Species	whole context	10% sample
Goat	4.5	7.0
Sheep	1.3	1.3
Ovicaprid	92.2	89.1
Cattle	0.7	1.3
Pig	0.2	0.4
Horse	<0.1	0.0
Dog	0.2	0.0
Domestic fowl	0.8	0.9
sample size (n)	2320	230

A sample of this size is not sufficient to consider higher levels of analysis. This is borne out by the results of ageing and sexing specimens which proved the subsample to have very little resemblance to the whole context. The butchery and pathology results corresponded well (Table 3), but this may be a fluke!

The pay-off in terms of time saving is clearly demonstrated: it took three and a half hours to extract, identify and analyse the sub-sample; identification and analysis of the whole context took eight and a half hours.

Table 3. Comparison of the total bone sample from context 70 with a 10% random sample drawn from it: Comparison of butchery and pathology results. (Number of specimens).

	whole context	10% sample
Butchery markings	1	1
Pathological anomalies	1	1

The second experiment considered analysis at Gamble's second level of analysis (his Section B6). Here a much larger sample or a proportionately larger sub-sample is necessary, and a 10% sub-sample of a context with 27,000 bones was taken. Results from ageing mandibles were to be tested, so all mandibles not recovered by sub-sampling were also extracted and analysed. The ageing data for the sub-sample and for the whole context were quantified using the method of Grant (1975); an initial more superficial comparison had shown that the correspondence between subsample and whole context was good (Levitan forthcoming). Cumulative percentage curves (Figure 1) were plotted for the right, left, and all mandibles. Visually, there is a close similarity between the curves for sub-sample and whole context in each case, and chi-squared tests on the cumulative percentages bear this out. In all cases there was no significant difference at the p = 0.01 level (Table 4). A further test of these results was carried out: the class-interval percentages of the data were compared by means of chi-squared tests (Table 4). Here all sub-samples were significantly different at the p = 0.05 level.

Table 4. Results of chi-squared tests for ageing data illustrated in Figure 1.

		left	right	both
cumulative percentages	X2	0.768	5.676	2.294
	df	8	5	9
	p	0.999	0.399	0.986
actual percentages	X2	17.254	128.045	68.468
	df	7	5	9
	p	0.016	0.000	0.000

Discussion

These two experiments indicated that random sub-samples may easily be obtained, and that analyses will provide results which are representative of the original population provided that the samples are large enough and that the levels of analysis are not beyond the resolution of the sub-sample. For such calculations as species percentage estimates, quite small samples may suffice, but for higher levels of analysis - such as ageing - much larger samples are required. Gamble's model provided a good starting point, but the results above indicate that some questions may require much larger samples than he suggests, whilst others can be resolved with small samples. Obviously, much further work is needed before requisite sub-sample sizes can be estimated. The results above indicate that the sample used for ageing analysis was too small, though possibly not by very much given the close resemblance of the cumulative percentages; perhaps a 15% sub-sample would have been large enough in this instance. The results from these experiments led to the wider use of sub-sampling for West Hill, but only to deal with 'low level' analysis (Sections A and part of B in Gamble's model). Higher level analysis was not based on sub-sampling in the light of the results from the ageing comparisons, and because there was no time for further experimentation.

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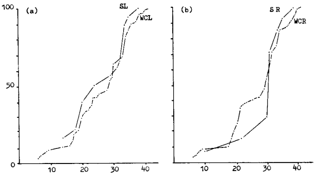

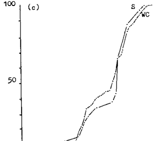

Figure 1. Cumulative frequency plots comparing ageing data from sub-samples.

X axis - tooth wear stage; Y axis - cumulative percentage.

(a) SL - sub-sample, left mandibles; WCL - whole context, left mandibles.

(b) SR - sub-sample, right mandibles; WCR - whole context, right mandibles.

(c) S - sub-sample, all mandibles; WC - whole context, all mandibles.

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Looking at puparia

John Phipps *

Puparia of Diptera - flies in the true sense - occur in such numbers in archaeological deposits that determination to species would obviously provide useful information on the nature of the sites. I have been looking at these intriguing objects for a few years and, though progress has not been impressive, some of my observations may help to demystify the subject.

As not all environmental archaeologists are entomologists, it may help to start with some basic entomological information. Insects pass through a series of stages as they grow, called instars, each terminated by a moult in which the skin is shed after a new one has been formed beneath it. The larvae of Diptera are legless and pass through a number of instars, finally moulting to a pupa which is often immobile and from which the adult emerges at the final moult.

The Order Diptera may be divided into three suborders. The suborder Nematocera includes mosquitos, crane flies, and many others which are often called midges. Their larvae live in water or damp earth, have distinguishable heads but have not often been found in archaeological deposits. An exception is the family Psychodidae, pupae of which have been recognised in Scandinavian deposits by Dr Boy Overgaard of Aarhus University. I am particularly grateful to Dr B. Noe-Nygaard of Odense University for this information, as I now realise that we too have found these fragments, notably from the Church Street Sewer, York, where they were accompanied by wings of adult flies (Buckland 1976, 13), so determinaton to genus or even species may be possible. Larvae of some species of this family live in sewage filter beds and other kinds of liquid organic matter, so their occurrence on archaeological sites is not surprising.

The suborder Brachycera includes horse flies, robber flies and bee flies, amongst others, the larvae of which have heads that can be retracted into the body and which live mainly in damp soil, rot holes in trees, etc., and which have not, as far as I know, been found in archaeological deposits.

The suborder Cyclorrapha includes all the 'higher' flies, with larvae living in an enormous variety of habitats, many of them decomposing materials, and the familiar puparia belong to this group.

Puparia are the skin of the last larval instar which, instead of being shed, is retained and encloses the pupa proper. It becomes heavily tanned in life, resulting in hardening and darkening, and is so resistant to chemical attack as to be almost indestructible. I suppose some fungi, which will certainly appear on puparia kept damp, may be able to break it down, but very slowly, and, as far as I know, only under aerobic conditions. This indestructibility accounts of course for

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the survival of large numbers, and in fact puparia are often the last biological remains left in deposits where preservation is poor.

Since the puparium is the last larval skin it has the identification features of the last stage larva which are, unfortunately, not numerous. Larvae of Cyclorrapha, called maggots, are headless and segmented, with a flexible skin bearing groups of minute spines which can be used to grip the substratum. Such groups of spines are sometimes large and associated with cuticular thickenings, when they are called ambulatory welts. The feeding organs are a pair of mouth hooks (Fig. 2), which are used to scrape and tear food and which are left in the puparium, where they persist. They can be valuable in determining larvae and puparia, but they are very fragile. I have not yet succeeded in making a useful preparation for examination under the compound microscope.

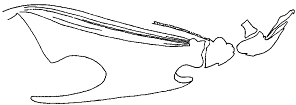

Figure 2. Mouth hooks of Polietes lardaria (F.). After Skidmore (1979).

Larvae have respiratory organs at both ends. The anterior ones are a pair of more or less branched structures attached to the first segment. They are often broken off and it is often difficult to decide whether they are really short, or have been broken. The posterior ones are obvious, consisting, in several families, of a pair of D-shaped plates, each with three slits (the spiracles) and a dark area, the scar or button, which is the remains of the spiracular plate of the preceeding instar (Fig. 3). The shapes and dispositions of these slits are very useful. The widths of the spiracular plates (D) and their distances apart (I) are also useful, especially the ratio of I to D, for which Skidmore (1979) often gives values, eg. 0.5 - 0.7 for Musca domestica L.

On the ventral side of the penultimate segment there is a plate surrounding the anus, the anal plate or sclerite. Its shape varies considerably, and it is certainly useful.

Figure 3. Diagram showing typical spiracular plate.

Before considering the features of the puparia in more detail, it may be useful to describe suitable treatments. The puparia are, to repeat, hard, dark and brittle and need to be made soft and flexible and also more translucent. This may be done by soaking them for 24 hours in cold 20% caustic alkali (KOH or NaOH), or 20% HCl, or by boiling for 30-60 minutes in the caustic alkali. They are then washed. These treatments can be prolonged or repeated without danger to the specimen.

After this the puparium still may require more softening and/or lightening in colour, and this can be done by immersion in hydrogen peroxide (H2O2) for 24 hours. If it is left too long in peroxide it may be completely decolorised, but all is not lost; it can be stained with a chitin stain such as Orange G. I have tried preliminary soaking in dimethyl sulphoxide, which softens dried, hard insect specimens, but cannot really claim that it has made any difference.

After this treatment the spiracular slits and anal plate will be much clearer, though the exact shape of the anal plate can often be better seen from inside the puparium, especially if it bears groups of spines or is much wrinkled. I usually find it helpful to cut off the last three to four segments of the softened puparium, which can then with care and luck be stood on the cut end giving a good view of the spiracular plates, or turned over to give an internal view of the anal sclerite.

Work on cyclorrhaphous larvae up to the late 1940 has been summarised by Hennig (1952). His parts 1 and 2 deal with Nematocera and are less likely to be useful than part 3, which includes Brachycera and Cyclorrhapha. Remember, however, that the formation of the puparium involves shrinkage and wrinkling and that descriptions of larvae, especially proportions, should be used cautiously on puparia.

The puparia I have seen from archaeological deposits belong mainly to four families: Muscidae, Drosophilidae, Sphaeroceridae, and Sepsidae. Those of Muscidae have been described most fully by Skidmore (1979) in a University of York M.Phil. thesis. This huge thesis is not easily available, as it is difficult to photocopy; I managed to make one fairly satisfactory copy, but the University Library is unwilling to undertake this onerous task. I shall therefore try to present some of the basic information here.

The shapes and dispositions of the spiracular slits are illustrated in Fig. 4, using Skidmore's terminology.

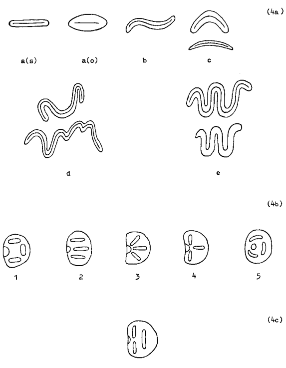

Figure 4. Shapes and dispositions of spiracular slits.

(4a) Shapes: a(s) - straight; a(o) - oval; b - sinuate; c - bowed; d - serpentine; e - tortuous.

(4b) Dispositions: 1 - vertical; 2 - parallel; 3 - convergent; 4 - radiate; 5 - peripheral.

(4c) <u>Helina laetifica</u> (Robineau-Desvoidy).

There are 25 possible combinations of shape and disposition, not all of which have yet been found in nature. I have also come upon shapes intermediate between, for example, a(o) and a(s) or b and c, and it may not always be easy to decide between dispositions 3 and 4. In Table 5 the muscid species dealt with by Skidmore are listed under the shape/disposition of the posterior spiracular plates.

To make this classification usable, I have adopted the following definitions: b, sinuate, is used whenever a double curve can be seen; c, bowed, whenever a curve, even a shallow one, is visible in at least one of the slits; d, serpentine, for a series of open curves, and e, tortuous, when there is close coiling. Disposition 5 occurs only when the scar is displaced inwards and appears to be found mainly in Stomoxydinae.

The shape of the anal plate is certainly valuable, used in conjunction with the posterior spiracles. To facilitate relevant comparisons, outlines of anal plates are shown in Fig. 5 with the species in the same order as that in which they appear in Table 1. All drawings are orientated with the anterior side above. Most of them are taken from Skidmore's thesis where, in 60 plates, they are shown to a number of different scales. For this reason, I have indicated the outlines of the posterior segments so that it is apparent how much of the visible area is occupied by the anal plate. For a few, where the segment margins are not shown in the original, the width of the plate is given. Fig. 5 also includes a few original drawings of anal plates of material from York. As regards Musca domestica, Thomson (1937) gives a figure for the anal plate exactly like mine drawn from the inside, and states that this shape distinguishes puparia of this species from those of all other dung-inhabiting Muscidae. The value of an inside view and the extent to which external ornamentation (ridges, spines) may obscure the outline of the plate is further emphasised by the drawings of my Musca sp. from within and without.

Discrepancies between Thomson (1937) and Skidmore (1979) in the shape of the anal plates of some species, even when both authors figure puparia, suggest a need for a large amount of known material to determine the limits of variation. That variation can occur even in the posterior spiracles is shown by a specimen of mine that would be classed as c5, though the anal plate resembles that of Muscina.

Before leaving the Muscidae for the present, it may be interesting to reflect on one observation on a sub-sample (5kg) from 16-22 Coppergate, York. The hand-sorted muscid puparia included the posterior ends of 49 Muscina sp. and two whole puparia (ie. puparia from which the fly had not emerged), together with 27 posterior ends of Musca domestica puparia and six whole ones. If it were known that the two species had pupated together, the apparently different success rates might perhaps tell us something about the conditions obtaining. But there is at present too much uncertainty to come to any conclusion. Conditions for successful development in the puparium may be critical; I have had very low emergence rates from puparia kept singly.

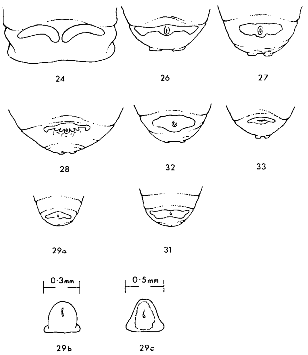

Figure 5. Anal sclerites of muscid fly puparia. Mostly drawn from photographs given by Skidmore (1979). For key see Table 5. 29a Musca domestica from Skidmore (1979). 29b, c internal and external views of anal plate of Musca domestica from York showing variation.

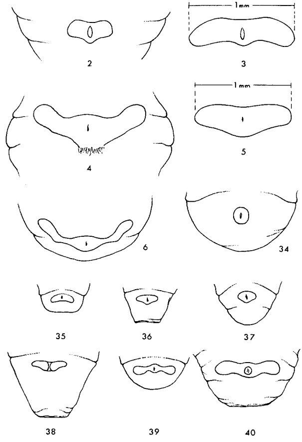

Figure 5 (continued).

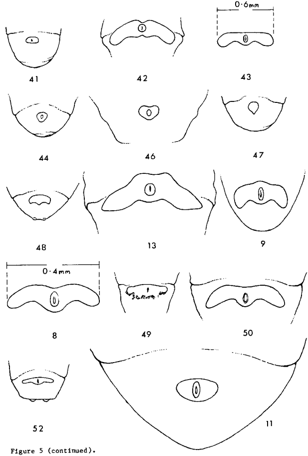

Figure 5 (continued).

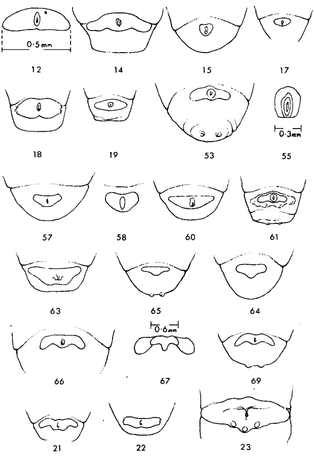

Figure 5 (continued).

Puparia of Calliphoridae (which includes the blow flies) are similar to those of Muscidae. I have not yet found any in archaeological material, but from specimens I have reared and from figures in Hennig (1952) the posterior spiracles are straight and convergent, but the hind end bears a ring of papillae surrounding both spiracular plates, which may well be useful in identification. Fig. 6 shows a posterior view of a calliphorid puparium, probably Calliphora vomitoria (L.).

Figure 6. Posterior spiracular plates of Calliphora vomitoria (L.).

Puparia of most Sarcophagidae (flesh flies) have, according to Brauns (1954), the posterior spiracular plates sunk in a pit. I have one such puparium from Coppergate (Fig. 7). The spiracular slits are straight and parallel and the anal plate bears a pair of papillae whilst others surround the pit. Brauns (1954) also says that having the posterior spiracles sunk in a pit is characteristic of puparia of Phaonia erratica Fln., a muscid. Perhaps fortunately, this species is not on the British list, nor is it dealt with by Skidmore (1979).

Figure 7. Posterior view of a sarcophagid puparium. Note the sunken spiracular plates and papillae surrounding the pit and on the anal plate.

The family Fanniidae includes the small house fly, Fannia canicularis (L.), which is one of the flies which circle below hanging light fittings in houses. Their puparia are distinctive (Fig. 8), bearing a number of branched structures along the sides and a group of six bordering the last segment. Lyneborg (1970) deals with the larvae of this family, but his keys depend largely on the development of the structures which he calls dorsolaterals, laterodorsals, and dorsomedians - which have been broken off in all the archaeological specimens which I have found (Fig. 8). I have also found many soft, greyish pieces bearing similar branched structures, which are obviously fragments of fanniid puparia or even larval skins, and of which some use may be made one day.

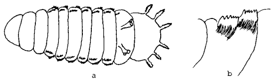

Figure 8. a - fanniid puparium. b - enlarged view of part of a segment margin.

Puparia of Sphaeroceridae (Fig. 9) are fairly easy to recognise, being small (up to 4mm long), ovoid and mostly not darker than light brown. There are three British genera, Sphaerocera, Copromyza and Leptocera. The last two have terminal posterior spiracular projections which bear the spiracular slits; in Sphaerocera these projections are lacking. In Leptocera they are long, in Copromyza they are very short. These puparia also have anterior spiracular processes which may be very short or quite long and branched. Unfortunately, they are often or even usually broken off, so Okeley's (1974) keys, which make much use of the papillae, are less useful than they might at first appear. I have used scanning electron micrographs to try to determine whether some processes are really short or have been broken, but have not found that they settle the matter. Material of this group from York determined by Dr Y. Z. Erzinclioglou of Durham University includes Leptocera heteroneura (Hal.), L. claviventris (Strobl) and possibly L. zosterae (Hal.), together with some Copromyza species.

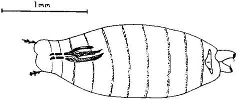

Figure 9. Sphaerocerid puparium from 16-22 Coppergate, York.

The Drosophilidae are one of the families of fruit flies, small, mostly pale-coloured, insects that hover around or walk over fruit, especially when it is over-ripe. They are often to be found in houses and even more frequently in laboratories where genetics is taught, so people with access to biology departments should have no trouble in obtaining puparia of at least one species, usually Drosophila melanogaster Mg. (Fig. 10), though other species are also used for teaching. I do not know of any available publications on the puparia of this group. Okada (1968) deals largely with Japanese species, according to the author, but this book appears not to be available for loan in Britain and is out of print. The posterior spiracles in this family are borne on processes which have a common base arising from the extended last segment - this distinguishes them from Sphaeroceridae.

I have found a number of puparia of Sepsidae in archaeological material from York and was puzzled by them for a long time, until I chanced upon a figure in Pont (1979). The structure of the posterior end is distinctive, though some other families are rather similar (Fig. 11). These puparia are small, up to 10mm in length, hard and dark brown or black. The three thoracic segments, anterior, are rather flattened, but posteriorly there is a pair of rather long spiracular processes, often with lateral branches. According to Hennig (1949) the 8th abdominal segment of the larva is swollen, especially in preserved material, but this swelling is not apparent in puparia. An anal sclerite is visible in these puparia and may well prove to be useful in specific determination.

A 5 kg sample from 10th century layers at 16-22 Coppergate, York, has been referred to above. This was disaggregated and passed through a tower of sieves from 2mm to 300 micrometres. Large puparia were sorted by hand and the smaller fractions subjected to paraffin flotation, and floated twice (using the methods of Kenward et al. 1980).

Not all the material collected has yet been invesigated. It included, in addition to the 40 puparia of Muscina sp. and 27 of Musca domestica, one Sarcophagid, one possible Calliphorid, and about 500 small puparia. Of these last, all those so far examined are of Sphaeroceridae, probably of three species. Some others may well be Drosophilidae, but I cannot yet be sure of this.

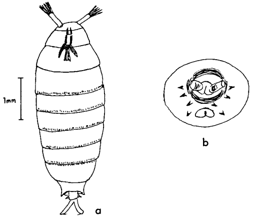

Figure 10. a - Drosophilid puparium (original). b - posterior view of puparium of Drosophila melanogaster Mg. (from Okada, 1968).

For further progress with this fascinating material the main requirements would appear to be a large collection of puparia identified to species. These can be obtained by rearing larvae or by finding puparia and keeping them until the adults emerge, then getting the flies determined by a specialist Dipterist. Obtaining material in this way demands space for rearing cages somewhere where the accompanying odours will not make you too unpopular with colleagues.

As regards the extraction of puparia from archaeological deposits, great care with disaggregation may minimise damage to the anterior spiracular processes of Sphaeroceridae and Drosophilidae, making specific determination more nearly feasible.

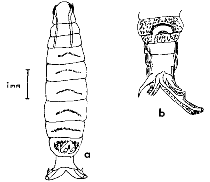

Figure 11. a - Sepsid puparium from 16-22 Coppergate, York. b - Posterior end of a second species, also from Coppergate.

Identification of puparia from archaeological deposits in York and elsewhere, mainly by P. Skidmore and Y. Z. Erzinclioglu, has shown the considerable potential of their study. What is needed now is systematic quantitative work, and a better understanding of the modern biology of the flies.

I am grateful to Alan Robertson for re-drawing figures 2 to 5.

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Table 5. Muscid fly puparia listed according to shape and disposition of posterior spiracular slits. See text for explanation of group headings. The nomenclature follows Kloet and Hincks (1975). Helina laetifica evades this classification; the slits are straight and disposed as in Fig. 4c. The numbers refer to figure 5.

a(o)2	
Phaonia crinipes	
P. populi	2
P. zugmeyeri	3
Graphomya maculata	4
Mydaea tincta	5
M. urbana	6
a(o)4	
Trichopticoides decolor	
Phaonia rufipalpis	8
Helina pubiseta	9
H. vicina	
a(s)3	
Phaonia cincta	11
P. palpata	12
Spilogona contractifrons	13
S. surda	14
Pseudocoenosia abnormis	15
Schoenomyza litorella	
Allognota agromyzina	17
b1	
Dendrophaonia querceti	18
Polietes hirtcrura	19
c1	
Phaonia viarum	
d1	
Polietes albolineata	21
P. lardaria	22
Mesembrina meridiana	23
Morellia aenescens	24
M. hortorum	
Orthellia viridis	26
Dasyphora cyanella	27
D. cyanicolor	28
e1	
Musca domestica	29
M. vitripennis	
M. autumnalis	31
d5	
Stomoxys calcitrans	32
Haematobia irritans	33
a(o)3	
Achanthiptera rohrelliformis	34
Azelia cilipes	35
Thricops nigrifrons	36
T. semicinerea	37
T. rostrata	38
Alloeostylus diaphanus	39
Drymeia hamata	40
Phaonia exoleta	41
P. errans	42
P. pallida	43
P. gobertii	44
P. trimaculata	
Helina impuncta	46
Spilogona biseriata	47
Myospila meditabunda	48
a(s)2	
Hydrotaea dentipes	49
Lispe tentaculata	50
L. litorea	
L. loewi	52
a(s)4	
Dialytina atriceps	53
Phaonia mystica	
P. trigonalis	55
Helina punctata	
H. pertusa	57
H. duplicata	58
H. ?setiventris	
b5	
Haematobosca stimulans	60
c3	
Azelia macquarti	61
Thricops longipes	
Hydrotaea ?meteorica	63
H. irritans	64
H. militaris	65
H. albipuncta	66
Muscina assimilis	67
M. pabulorum	
M. stabulans	69
Phaonia signata	
P. basalis	

A DIRTY WORD?

It seems strange that one word, widely used on archaeological excavations, has yet to find its way into that fount of knowledge, the Oxford English Dictionary. Search as hard as you can, the four lettered word 'cess' does not appear with the meaning understood by most archaeologists.

My interest in this simple and evocative term was first kindled at school, for the headmaster was a certain Mr Cecil M. Owens B. A. (Hons.). This august gent was universally known as 'Cess'. My fellow school-persons no doubt christened him thus in order to associate the poor old soul with matter excremental.

Back in the heady days of the late 1960's, during the excavations at North Elmham Park, Norfolk, the term 'cess' naturally leapt to my young brain when asked to describe fills which had a greenish hue and dug from shallow dug pits interpreted as latrines. This term was generally used to describe pit fills which appeared to have been a mixture of organic and mineral materials and that were, in all probability, rather wet and very unpleasant during use. While it is likely that human faeces formed part of the fills of such pits, other domestic refuse was added.

The word 'cesspit' appears to share a common etymology with 'cesspool', according to the OED. Considerable doubt exists over the origin of the element 'cess' and a number of possible derivations are given. Perhaps the most credible seeks to link the element 'cess' with the word 'soss'. This little word, like most english words, has a number of meanings depending on which part of the country and in which century it is used. Its most common usage has been as a general term to describe almost anything wet muddy and dirty. May I therefore propose that the word 'cess' be formally adopted as a term to describe archaeological deposits comprising human faeces (whether or not including other domestic rubbish), usually found in pits.

I would be interested to learn of publications which use the word 'cess' as a single word. The North Elmham Park report talks of 'cess pits' (N.B. no hyphen) and I have used the sub-heading 'Cess deposits' in the recently published account of the C. B. A. conference 'Environmental Archaeology in the Urban Context'. Any additions to my rather thin file, or views on the use of this term would be gratefully received.

Andrew (Bone) Jones

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With an ordinary delling spade ...

...Pones, or thin oval strips of green turf were cut and laid over the roofing timbers. In the seventeenth century the houses in Shetland were said to have been covered with a kind of divot called 'flais'. Such flaws ... appear to have been frequently torn up by hand from the surface of dry moss land. It was only certain kinds of heathy ground that you could 'rive flaas from, and then it has to be done with flowing water, then you can rive flaas 10 feet (3.1 m), otherwise you could get them no size at all'. The mark left in the ground by cutting or riving flaas was called a gruvi ... Flaws and pones were always used for roofing purposes, never for dyke building.

Pones were cut on the scattald, preferably on shallow, dry, clay ground. At many townships an area of poor grazing ground was set apart to be scalped for pones.

They were cut with an ordinary delling-spade ...

(Fenton, A. (1978). The Northern Isles: Orkney and Shetland. Edinburgh)

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The 1982 AEA Annual General Meeting.

This year, the AEA autumn meeting was held at St. Aidan's College, University of Durham, through the consummate organisational skills of Martin Jones. The chosen title was 'Integrating the Subsistence Economy', a theme which was wrung for every last nuance of ambiguity by seventeen very assorted speakers. Nearly sixty people attended, and the tenor of the lectures and ensuing discussions was generally lively and informative. One unfortunate damper on the proceedings was the provision of a rather small room, which rapidly heated up during Saturday's sunny periods and became unpleasantly like a recently-used shower cubicle. The memory of the White Hole of St. Aidan's will linger for many people.

For a pleasant change, the Conference was launched by a paper concerning beetles, and which included one truly sordid photograph of Mark Robinson's weedy allotment. The man clearly has no shame. Saturday morning started off with a three-handed lecture about the Dartmoor reeve project, during which David Maguire waxed quite philosophical about the methodological problems of using pollen analysis. After coffee, Jim Dickson described a perfectly disgusting deposit from a Roman fort at Bearsden which he and Camilla Dickson have been deeply involved with for several years, followed by David Robinson's account of how he managed to squeeze some useful information out of a barely extant henge monument. We were taken up to lunch time by a typically ebullient Frank Chambers presenting evidence for past arable activities at Cefn Graeanog, in Gwynedd.

Following a lunch of meat pie and jam sponge (the latter the subject of much culinary, and other, speculation), the ever more suntanned Ken Thomas delivered a most enjoyable account of recent work reconstructing early patterns of agriculture in the Bannu Basin, NW Pakistan. Ken's attempts to corner the world market in melanin are evidently succeeding. Peter Murphy (who is less brown) somehow managed to follow that with a curiously similar lecture about his work in the Breckland of East Anglia, and the geographical range of the afternoon was then stretched a little further by Enid Allison's presentation of results from a midden and associated buildings at Freswick, in Caithness.

The tea interval was marked by a rush of sweaty bodies into the fresh air, following which our three visiting speakers from the Netherlands took the floor. Willy Groenman van Waateringe and Jan Peter Paals described their painstaking work reconstructing past landscape history and settlement patterns on Assendelver polder, using virtually every research weapon in the environmental archaeologist's arsenal. Norbert Paap then talked about his work on the economy of old Amsterdam, and included some photographs of the soggy Waterlooplein site which brought a frisson of recognition to the British urban contingent.

Saturday evening's business meeting somehow came to a number of important decisions, sanity being maintained largely as a consequence of Jenny Coy's firm chairing of proceedings. It was decided to expand the Gang of Four (or Committee as it is occasionally known) to six people by the simple expedient of re-electing the two retiring members (Martin Jones and Terry O'Connor) and electing two new people (Ian Simmons and Ken Thomas, neither of whom bore any scars from having earlier been persuaded to stand). These four therefore join Nick Ralph and Jenny Coy on the Committee. The dates and locales of the 1983 and 1984 meetings were discussed, and Sue Limbrey read out a letter from Geoffrey Dimbleby thanking the membership for presenting the 1981 proceedings to him in honour of his 65th birthday. In line with AEA tradition, it was agreed that the Newsletter should be expanded to include articles. (Circumspice!! - Eds.).

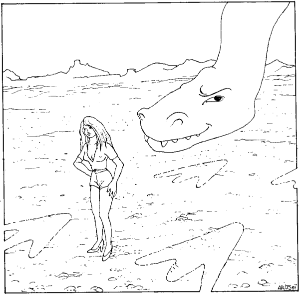
The bone people took over Sunday morning, starting with Barbara Noddle's tour of the complex field of establishing phylogenetic relationships in archaeological bone samples. Terry O'Connor then stretched a little data from 11th century Lincoln well beyond all reasonable limits, and James Rackham succinctly described why that should never be done, and why bones are a dead loss for investigating subsistence economies. Coffee was appropriately followed by a fascinating account by Michael Ryder of the part which various milk products play in pastoral societies. The conference was then brought to a close, with Jenny Coy thanking Martin Jones and the other organising personnel. After lunch, a brave (or possibly just demented) minority departed into the low cloud and drizzle for a field visit to Weardale and Teesdale: wellington boots and formless PVC garments were much in evidence.

In summary, this was a successful conference, although the stifling internal microclimate of Saturday often made concentration impossible, and respiration quite a feat. Most of those present will have gone away with some new information or ideas. Some will remember the two great quotes of the weekend, both of which deserve a wider audience. The first comes from James Rackham, who was clearly heard to say 'There are various metrical ways of doing sex', a comment on which he did not enlarge. The second observation was by Jim Dickson, and could well serve as an epitaph for environmental archaeology:

'I would like to think that our work stimulated the archaeologist into looking for the latrines.'

Or, indeed, into running into them.

Terry O'Connor



An attractive hypothesis about to be overwhelmed by an unpleasant fact...
(With apologies to Thomas Huxley)

Opinion

This column is for letting off steam, preferably with a constructive aim. At great risk of damaging his own glass-house, one of the editors starts things off with a tirade concerning a pet hate.

Who blows the whistle?

Refereeing and editing of publications in environmental archaeology

The past year has seen the publication in archaeological journals and site reports of a barely abated flow of unrefereed and badly edited 'specialist' reports on environmental archaeology. This sort of thing has, of course, been hallowed by decades of tradition. In the very early days of scientific archaeology a few words were often quoted verbatim from handwritten letters from specialists, contacted on the old boy network and unpaid. With some honorable exceptions the content rarely mattered in the context of the archaeological report as a whole, being usually a purely factual list of a few seeds or insects, which were regarded primarily as novelties.

However, the world has not remained static; biological and pedological studies related to archaeological sites are now normally more scientific, more accurate, more thorough, on a larger scale, and interpretative - and thus crucial to the archaeological report. They are usually carried out by professionals of varying experience, whose future employment and status may be affected by the quality and presentation of the consequent report. Yet the system of publication is in many cases unchanged.

The disease of academically uncontrolled publication is rife in minor archaeological publications and those collated by inexperienced people. 'Can we leave out all these long Latin names - surely there are English ones?' is a question which has fallen from the lips of the director of one national archaeological institution as well as from dozens of archaeological compilers. 'Can't we leave out the data tables, surely they won't tell our readers anything?' is quite normal.

Eccentric systems of referencing and reference abbreviation have to be fought. References from a contribution are often thrown to the back of the whole site report and not circulated with offprints, should such be available. It is apparently still fair game to take a contributor's notes, hack them about from the glorious standpoint of complete ignorance and even publish them without sending revised copy or proofs for approval. Alternatively, supposedly camera-ready copy is sent and moral blackmail (even financial threats) applied to persuade the author NOT to make changes, even where factual errors are involved. It appears that it is just not thought worthwhile to bother to do the job of publishing properly, and one is tempted to see this as part of a general lack of belief in their subject on the part of some archaeologists.

Alas, the failure to referee and to edit fully can even be seen in leading archaeological journals and series, and, incredibly, in scientific archaeology publications. One of the latter does, I know, have a refereeing system but still has allowed some alarming things through. The recent misrepresentation of the biology of two archaeologically important organisms in the face of abundant published information provided an example. This case arose, I am sure, because the report containing the error - doubtless just a momentary abberration on the part of the author, for whom I have much admiration - was sent to referees acquainted with the subject matter of the main paper, not with the included contributions.

I know that it can seem hard to find people of sufficient breadth of experience to referee or to edit complex multi-disciplinary papers. They do, however, exist, and will help out, especially if asked the right questions and not just left to give a general 'good', 'bad' or 'passable'. I can also think of plenty of workers in the younger generation who can say something useful about their own field, and many of whom, if asked for detailed reading, could offer constructive and intelligent comments on papers on any branch of our subject. I know this because they have read lots of manuscripts of mine, which would have produced even worse publications without their help. Referees can add much to a paper, and authors' interests are best served by stringent refereeing and editing.

I must emphasise that I am not attacking individuals for producing flawed drafts, nor am I more than passingly cross with the archaeological perpetrators - it is up to US to tell them how science is done. What I am attacking is the system which lacks the quality control and advisory service present in other scientific disciplines.

Clearly something must be changed, to avoid the publication of nonsenses, to protect the archaeologist, and to avoid unfair treatment of authors and contributors. We can all play a part by sticking up for ourselves - providing we also insist on all our work being adequately refereed. I offer the following more detailed suggestions:

Individuals preparing contributions in archaeological science should:

1. Not get involved in work on badly recorded material, material which is of doubtful date or provenance, silly little bits of unproductive work, and archaeologists with an established bad reputation.

2. Make sure that their work is good, relevant and co-ordinated as far as possible with the archaeological information and with other specialists' data.

3. Contribute well-organised, tightly-written, accurate reports in the first place (oh, that I could be such a paragon!).

4. Insist loudly on seeing revisions by collators or editors.

5. Ask to see the archaeological and other specialist drafts and revise the manuscript to take account of them. Try to produce reports which are fully integrated with others workers' material whenever possible.

6. Send manuscripts to experienced colleagues for comment, especially if they suspect that the publication will not provide adequate

refereeing. Most people are flattered to be asked for advice in this way.

7. If submitting to an archaeological publication, specifically ask for the contribution to be sent to a suitable specialist referee, if only to make the point.

8. Insist that manuscripts are returned for revision if they are to be published long after they were written. We all have hideous skeletons buried in archaeological reports 'forthcoming'.

9. Insist on a decent system of text referencing; try to stop the footnote system, with all its flabby thinking and inadequate bibliographic data. Individuals may get nowhere on this point, but if everyone brings it up ... well, one national archaeological institution has already given way to pressure on this point.

10. Insist that sources are cited in full; author, initials, year, title, reference using standard abbreviations (or better still, in full). It is all too commonly impossible to trace papers tantalisingly referred to as 'Abt Z III 12' or 'Bull H H A N H Soc 7(1:15)(ser 3a)', and some libraries will not be very co-operative even if a single detail is missing. And how many scientists will know what 'Cal Rolls', for example, means?

11. Insist that they see galley and page proofs and make a fuss in public if there is any difficulty getting them. Circaea would, I am sure, be glad to publicise bad cases.

12. Ask for reprints and look surprised if they are not given!

Archaeologists preparing reports containing specialist contributions in science should:

1. Not be let loose by their parent organisations if they are not competent to carry out editoral work.

2. Not believe that they know more about a specialist's field than the specialist.

3. Not assume that the specialist knows very much about his field either, but send texts to referees of stature in the world of environmental archaeology.

4. Make sure names of organisms are presented correctly, according to a cited check list or catalogue; that tables are consistent, that sums are done right. This may mean finding a statistician was well as an environmental archaeologist to referee.

5. Not re-interpret the specialists' evidence in the archaeological text and fail to consult the authors.

6. Show (after giving permission) the various specialists each others' contributions; even prompt them to produce integrated texts if possible.

7. If possible, allow scientists to use 'Modified Harvard' referencing, and get full and proper bibliographic references.

Journal and series editors must:

1. Make sure every specialist contribution in a report receives detailed attention from an expert in the appropriate field. Sending a wide-ranging set of reports to, say, a palynologist or an entomologist alone may avoid general biological boobs, but won't necessarily find the inaccuracies of detail or reasoning which may add up to a nonsensical interpretation.

2. Be prepared to be firm and refuse to publish material which impartial refereeing shows to be poor. The pressure against this is strong, for example in the case of DoE-supported archaeological reports, but must be resisted.

3. Not refuse a paper with evasive complements, but say what is wrong so that the author can improve it or at least learn from the experience.

We must all:

1. Be prepared to take our full part in the publication process, as authors, readers, referees or editors, according to our abilities.

2. Be prepared to offer guidance or even discipline to collators, editors and contributors.

3. Be courageous enough to say that a report stinks, or needs changes, if it does. It is not very kind or brave to let someone publish a bad one.

4. Be careful to distinguish between factual reporting, reasoned intepretation and subjective speculation. This last can be valuable in its place, providing there is no danger of misleading the innocent.

5. Avoid the use of fiche as a way of 'publishing' badly prepared work.

So, who should blow the whistle on bad publications in environmental archaeology? All of us - as individuals, and collectively as the AEA. Can you think of a better New Year's Resolution?

Harry Kenward

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The Inside Back page

This week sees the 25th anniversary of the death of Dr Nathaniel Scrope, one of the founding fathers of environmental archaeology, and offers us an opportunity to review the career of this remarkable scientist.

Scrope was born in Piddletrenthide, Devon, in 1890, the son of Victoria Scrope, spinster of that parish, and a passing antiquarian whose name posterity has recorded but not in this context. Young Nathaniel showed a keen interest in palaeoecology from an early age, whether by accumulating dead rats in the outside privvy, the better to observe the early stages of taphonomic loss, or by his endearing habit of keeping in his school cap an innoculum of hedgehog external parasites. He was a diligent schoolboy, and few were surprised when this ruddy-faced village lad went up to Cambridge to study for joint honours in medieval French literature with embryology.

By the outbreak of the Great War, Scrope was installed as the head of Biology at Trottiscliffe Academy for Young Gentlemen, and was saved from conscription to the trenches by chronic athletes' foot and his oft-whispered claim that his father might not have been British. Scrope spent the war years conducting a series of excavations of round barrows on the North and South Downs, scrupulously destroying palaeosols as he went and thus ensuring that today's interpreters of Downland history need not be trammelled by such tedious restrictions as evidence.

In 1930, by now a middle-aged man with a growing reputation for eccentricity, Scrope was appointed to Senior Lecturer in Environmental Archaeology at the University of Winchester. This brought him into a small research team of brilliant minds, and it was surely cross-fertilisation with such contemporaries as Klapthout, McFlannail, and Mekon that led Scrope to his pioneering work on the extraction, identification and socio-economic interpretation of Collembola droppings from archaeological deposits. Under his guidance a new generation of environmental archaeologists arose, and those who survived the Second World War went on to teach many of todays practicioners of the palaeobiological arts.

During the 1940s, Scrope's revolutionary hypothesis that human culture has to obey the laws of entropy, and that time must therefore progress backwards and not as we perceive it, brought him into conflict with many of his contemporaries. However, when the University of Lowestoft founded its chair in Retrochronology in 1951 (or possibly during the Miocene as some would have it), it was inevitable that Scrope would be appointed to the post. The last six years of his life saw the production of such seminal treatises as 'The Tertiary in retrospect and prospect', 'The Caledonian Orogeny - the way forward', and perhaps his greatest work 'Predictive modelling in palaeocephalopodology', this last the winner of the 1956 Cuttle Prize for Science Books. Scrope never retired, but was found dead in harness, as it were, having suffered a cerebral haemorrhage whilst attempting to calculate the polydimensional correlation coefficient in his head. The coefficient was renamed 'Scrope's omega' in his honour.

Burhinus.