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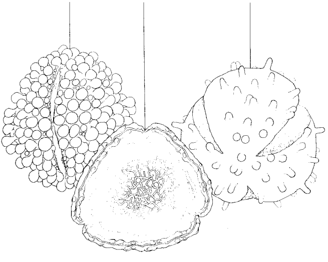

This Issue: Robinson on charcoal estimation - Cundill on Hoscar Moss - West and tooth wear - Tomlinson and ultrasonic pollen - Mantle et al. wet sieving in Wales and Phipps' flies

The Bulletin of the Association for Environmental Archaeology

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 and assembled by Allan Hall, Harry Kenward and Terry O'Connor, and is printed at the Printing Unit of the University of York. **Circaea is distributed free to members of the AEA and available to institutions and non-members at £6.00 per annum.** At present, copyright resides with individual authors. Circaea is published by the Association for Environmental Archaeology, c/o Environmental Archaeology Unit, University of York, Heslington, York, YO1 5DD. Enquiries concerning membership of the AEA should be sent to Bruce Levitan, City Museum and Art Gallery, Queen's Road, Bristol.

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. Authorities must be given to Latin names, either at their first mention or in a comprehensive list, and species lists should follow a named check-list. 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 The Royal Society's 'General Notes on the Preparation of Scientific Papers' (3rd ed. 1974, The Royal Society). Text proofs of papers will be provided and should be returned within three days of receipt. **Ten free reprints will normally be supplied to the authors of scientific articles: further copies will be available, if requested at the time proofs are returned, at a charge of 3p per side plus postage.**

Back-numbers and a limited supply of articles can be purchased at the following rates: back-numbers - £2 per part; articles - 5p per side, plus postage.

Copy dates: Spring issue - 15th November; Summer issue - 15th March; Autumn issue - 1st July.

The Editors, CIRCAEA, c/o Environmental Archaeology Unit, University of York, York YO1 5DD, U.K.

CIRCAEA VOLUME 2 NUMBER 3, DECEMBER 1984 (PAGES 109 TO 146)

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Papers

AEA circaea

Editorial

Apart from the select few who were able to attend the AEA's AGM held during the joint AEA/BSBI Conference held at St Anne's College, Oxford in late September this year, most members will probably be unaware of a major change in the running mechanism of the Association. Nick Balaam, who, since the inception of the AEA (he was one of the notorious 'gang of four') has been holding the reins as Secretary-cum-Treasurer, has retired. His efforts for the Association must be gratefully acknowledged for, not only has he 'kept the books' and grappled with Membership problems (mostly unpaid subs!), but he has organised several AEA 1-day meetings at the Institute of Archaeology in London over the past 5 years, and has been in unfailing attendance at every other meeting. His unfussy, not-to-say relaxed but competent approach to the tedious but necessary behind-the-scenes work of running a group like the AEA will be greatly missed, but we wish his successors, Vanessa Straker (Bristol University, Geography Department) and Bruce Levitan (City Museum, Bristol) well in assuming the mantle that Nick has worn for so long.

Miscellany

Erratum

In Philippa Tomlinson's paper (Circaea **2**(2), pp. 97-101) there is an error in the caption to Table 12 for which we apologise. In line 3 of the caption, for: 'works less well' read: 'alternative mount to view silica bodies'.

Conference Notice

Environmental Archaeology in South-West England

Saturday, 9th February, 1985.
Penguin Room, 1st Floor, Wills Memorial Building, Queen's Road, Clifton, Bristol.

Chairman: Mick Aston BA, FSA, MIFA

10.30	Coffee
11.00	Recent molluscan studies in the South-West Dr Martin Bell
11.30	Archaeological investigations at Ilchester and environs: environmental potential Pete Leach
12.00	Dozmary Pool: pollen analysis Julia Rand
12.30	Recent survey work on Exmoor Richard McDonnell

Front cover:

Seasonal pollen: *Ilex*, *Hedera* and *Viscum*. Drawing: Alan Robertson.

13.00	Lunch
14.00	Biological and sediment analyses from Dundas Wharf, Bristol Julie Jones, Nick Watson, Julie Douglass
14.30	Medieval animal husbandry and the urban meat market Bruce Levitan
15.00	Livestock in the Cotswolds from the prehistoric to the Roman period Barbara Noddle
15.30	Palaeoenvironments in the Mendip region Dave Gordon
16.00	Tea
16.30	Hazleton Long Cairn: carbonised cereals and charcoal as evidence of agriculture and vegetation Vanessa Straker
17.00	Recent investigations at Westward Ho! Nick Balaam
17.30	Conclusion Professor Charles Thomas
18.00	Conference disperses

Application form and further details from Mick Aston, Department of Extra Mural Studies, University of Bristol, Wills Hall Building, Queen's Road, Bristol.

Book Notices and Reviews

The following two publications by the Booth Museum of Natural History may be of interest to botanical and entomological members of AEA:

P. C. Hall (1980). Sussex plant atlas. An atlas of the distribution of wild plants in Sussex. 179 pp. £7.95

C. Pratt (1981). A history of the butterflies and moths of Sussex. 356 pp. £9.95

Postage and packing is extra on both volumes, and orders should be addressed to The Booth Museum of Natural History, Dyke Road, Brighton. Further information from Dr. Philip Armitage at that address.

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And from English Heritage, notice of another vade mecum for your shelves:

Environmental Archaeology: A Regional Review, edited by Helen C. M. Keeley.

The first volume of surveys has now been published by the Historic Buildings and Monuments Commission for England (DAMBH Occasional Paper No. 6, 1984), covering East Anglia, South-West England, Northern England and York. It provides a retrospective/prospective review of environmental archaeology in these regions, including detailed bibliographies and recommendations for future work. It is intended that this book and the second volume, soon to be published, will provide an invaluable tool for archaeological scientists attempting to set priorities at a time when resources are limited.

An order form for Volume 1 is enclosed - buy now to avoid disappointment.

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The Editors have also received notice of the publication of Middleton Stoney. Excavation and Survey in a North Oxfordshire Parish 1970-1982 by Sebastian Rahtz and Trevor Rowley. It contains a full account by Bruce Levitan of a large collection of animal bones, including an assemblage from a latrine shaft in the castle. This A4 format publication is obtainable, price £7.00 (including post and packing) from: Archaeology and Local History Secretary, Oxford University Department for Extra Mural Studies, Rewley House, 3-7 Wellington Square, Oxford, OX1 2JA.

Reviews

Ryder, M. L. (1983). Sheep and Man. Duckworth, London. 846 pages, £55.

Think again about the sheep. Those fragmented bones are not only the result of Sunday dinner or ritual beanfeast. They are the remains of one of the most versatile of man's domestic animals which in a world-wide or historical context is the dominant dairy animal, a major source of clothing and to a lesser extent skin, horn, and even labour (Tibetan pack sheep, load 14.5 kg per head). The lamb chop is insignificant in comparison with the tallow candle and the parchment of the cleric, the vital dung, the cheese and the wool blanket.

How all this came about is the subject of Ryder's monumental but mostly very readable account of the domestic sheep, from the wild forms to the over-developed Vermont merino that looks like a bloodhound with wool. Wool biologist, archaeozoologist, traveller and straight historian, Ryder is uniquely qualified to write this book. He has also been very thorough; the literature of the classical civilisations, early farming books, colonial archives - all have been mined. There cannot be many biologists capable of producing a catalogue of historical representations of the sheep, complete with museum location.

The vital statistics of this at first sight expensive volume are 846 pages, including 27 pages of bibliography (83 of Ryder's own papers), and 17 pages of index in very small type. At 6.4p per page, this is not too bad.

Much of the book is of direct interest to British archaeozoologists. Ryder has worked with the primitive breeds as well as 'doing' his own share of the bones. Continental archaeozoology is somewhat lacking, but he has observed primitive husbandry particularly in eastern Europe, and gives a good idea of the sort of production which might be expected in an historical context. Of general interest is a good account of the sheep in the earliest civilisations.

Straight archaeologists might read the book, particularly part III which deals with sheep products, with profit. They might then better appreciate the significance of the combs and the spindle whorls, the loom weights and the washing places, and realise what an amount of perishable material, from felt boots to hard cheese, these might represent.

There are also a lot of fascinating tit-bits. The Mongolians credited the sheep with a soul but nevertheless killed it in a revolting manner. There is a Bedouin recipe using black wool whereby one can render one's husband impotent as far as his junior wives are concerned. Nineteenth-century Americans took a concoction of sheep's dung known as sheep nanny tea for the measles. And Boswell employed a part of the sheep's caecum as a French Letter, presumably to protect himself from the pox.

Reviewers must find faults, and there are a few. Sheep evolution is not too well dealt with, and sheep as a hunted species not at all. The writing flags from time to time into a rather dreary resumé of the literature, in particular the African section. I also found four references in the text that were not in the bibliography, and I was not checking very hard. However, all in all this is a very good environmental read and one should try to persuade one's impoverished institutional library to get it.

A paperback edition doesn't seem likely.

Barbara Noddle

Keeley, H. C. M. and MacPhail, R. I. (1984). A soil handbook for archaeologists. Reprinted from Bulletin No. 18 of the Institute of Archaeology, London.

This handbook is divided into two parts titled 'Soil Description' and 'Soil Problems', which cover different areas and need to be discussed separately.

The 'Soil Description' part is an attempt to introduce a simple standard soil description system based on the 'Soil Survey Field Handbook' by J. M. Hodgson (Soil Survey Technical Monograph No. 5, 1976) and is not dissimilar to a number of other handbooks which deal with this topic (cf. York Archaeological Trust's 'The recording of archaeological stratigraphy' and the Museum of London's 'Site Manual Part 1: The Written Record').

The present handbook treats matrix colour, consistency and coarse components in much the same way as its predecessors. However, it differs from the others in that it briefly explains how one can distinguish quickly in the field between sand, silt and clay. It also gives a definition for the often misused term 'loam'. These are undoubtedly aids to standardisation and consistency but do not resolve the problem that a quick on-site test cannot determine precise particle sizes and each site supervisor will therefore soon develop their own descriptive formula which will undoubtedly differ from that used by others. Descriptions based on these guidelines should only be relied upon when differentiating between soil deposits found during the course of the same excavation and should not be used (without considerable caution) to compare soils from different sites or to resolve specific problems such as whether or not a deposit has been water-laid. In such cases more accurate records should be made based on the Soil Survey Field Handbook.

The suggestion in this new handbook that a separate card should be used in the field for the recording of soil descriptions is not something which is likely to catch on as most field archaeologists now use a context card or sheet for the recording of all data relating to a particular deposit. The use of a two-tier system would prove cumbersome and unworkable in most cases.

The main failing of this handbook's treatment of soil description is that, although it is an attempt to standardise the description of soils found on archaeological sites, it concerns itself primarily with the naturally-occurring components of the soil, and only touches briefly on the problem of how one should describe inclusions of materials originating in human activity or indeed deposits that are entirely man-made. These are by definition vital to the understanding of archaeological deposits and need more detailed consideration. The York Archaeological Trust's manual has attempted to resolve this problem by including a thesaurus of approved terms which may be used to describe soil inclusions originating in human activity.

The second part of the present manual, 'Soil Problems' deals with deposits which might appear to be derived from the actions of humans, but which equally well could be of natural origin. Features of such deposits can include the colour of the matrix, the colour of the stones within it, concretions, and a number of other miscellaneous features. This section is clearly of importance to all field archaeologists, who need to be aware of naturally occurring soil characteristics which could be take to impply the action of man. The simple chemical tests mentioned in this manual, which may be carried out on site to distinguish between natural and man-made characteristics, are obviously of value if there is no access to a pedologist.

However, I personally would not feel confident to make judgements which are possibly of major importance to the understanding of a site on the basis of tests such as these and the information contained in this manual. Whilst it is valid to make archaeologists aware of naturally-occurring soil features, so that they can recognise when there may be two possible causes for the presence of a particular characteristic, it is perhaps dangerous to advise them to determine the solution themselves. It would be preferable to call on the services of a qualified pedologist, or to become acquainted with the techniques of soil sampling so that material could be collected for analysis in the laboratory by specialists.

Nick Pearson
York Archaeological Trust

Harde, K. W. (Edited and with additional introductory material by P. M. Hammond, illustrated by F. Severa) (1984). A Field-Guide in Colour to Beetles. Octopus Books, London. 334 pages, 1080 colour illustrations and many line drawings. £3.95.

This delightful book is an absolute gem. In a well-made cloth binding with gold blocking and on good paper, it provides an excellent short introduction to the beetles of Central and Northern Europe, written by two of Europe's finest coleopterists. It is idealogically sound, in that while it describes collecting methods it also prints the 'Code for Insect Collecting' produced by the Joint Committee for the Conservation of British Insects and in that the Introduction leaves the reader with the feeling that beetles are for studying and not just for pinning in rows.

There are eight pages of outline drawings of beetles, providing a quick survey of characteristic types for the families, but the meat (240 pages) consists of what can only be described as superb paintings reproduced in subtle and accurate colour on matt paper. The paintings themselves are astoundingly correct in terms of outline and the representation of three-dimensional shape - something most unusual in my experience. Hardly any of the illustrations can be faulted - perhaps the worst case is Tachinus signatus, whose thorax is shown badly out of proportion.

Another unusual (I think unique among popular works) feature is the representation of all families, the small and the dull as well as the spectacular. True, there is a bias in favour of the longhorns - 13 of the 120 plates being devoted to these admittedly very beautiful beasts - but groups like the Ptiliidae, Omaliinae, and (astonishingly) the Aleocharinae, get their fair share. The book is not a complete identification manual, providing in most cases an illustation of a single species for each genus. Only for a few large genera (for example Bembidion and Chrysolina) are several species shown. However, the book gives a much better chance of the amateur being able to get near to a genus than any other popular work I know.

From the professional's point of view, the book provides a splendid set of illustrations to accompany the standard (but dull) identification manual for Central European Coleoptera - Freude, Harde and Lohse's 'Die Käfer Mitteleuropas'. It serves as a useful memory jog as well as a jumping off point in the search for an identification of unfamiliar material.

Why review this book in these pages? Well, first of all it deserves to be bought because it is so good and so cheap (barely more than 1p per page - compare that with the rate for sheep and men!), and the publishers deserve to be encouraged. However, every environmental archaeologist should have a copy to remind them of the infinite diversity and richness of the beetle fauna.

There are, inevitably, a few misprints, and interpretative disagreement as to habitats is likely, but these would not matter even if the book cost ten times as much, which it might well have done.

If Octopus can do it, why can't anyone else?

Harry Kenward

Clutton-Brock, J. and Grigson, C. (eds.) 1984. Animals and Archaeology: 3. Early herders and their flocks. British Archaeological Reports International Series **202**. ISBN 0 86054 259 9, 410 pp., £20.

Scarcely has the imprint of one Animals and Archaeology volume faded from the retina than another takes its place. This third opus is the longest so far, both in terms of pages and number of papers (27), and is well up to the standard of the first two. The theme of this volume is pastoralism, interpreted with sufficient flexibility to admit contributions which explore methodologies and model-building as well as more straightforward accounts of recent work on various herding communities. The geographical sweep is wide, despite the inevitable concentration on South-West Asia, although a paper up-dating our knowledge on the Lapps and their reindeer would have been a useful contrast. As is usually the case with collections of conference papers, several are very stimulating and well-argued, a few decidedly disappointing, and the rest at least well worth reading.

To start with a few of the most notable contributions, Chow Ben-Shun has attempted to summarise animal exploitation in Neolithic China in very few pages, and, to be honest, the result looks over-condensed. The information which is provided is fascinating, however, underlining yet again that by the 7th millenium b.c., a pastoral Neolithic was in full swing in many parts of the world thousands of miles from the Fertile Crescent. This same theme is explored with reference to Baluchistan in a lengthy but absorbing paper by Richard Meadow. Elizabeth Voigt's description of her work in Northern Transvaal is dealing with more recent times, and she delves into the historical implications of her results with positive relish. Her paper was also notable for skimming over the methodologies involved and getting to the heart of the subject. One can have just too much agonising over quantification methods, especially when the subject of the paper is something else altogether.

Several papers impressed by being neat, well-organised and lucidly argued. Andrew Garrard provides a sensible analysis of why certain Middle Eastern mammals were chosen for domestication and not others. He concludes that man selected the right species, which is just as well. Simon Davies presents evidence for the advent of wool and dairy exploitation in Western Iran: there is nothing dramatically new and exciting in this paper, just a clear presentation of convincing evidence. A paper one or two steps removed from the early flocks is Eitan Tchernov's discussion of the place of commensal species, and their use as indicators of the intensity of human settlement. Tchernov's results show the synanthropic propensity of house mouse to be identifiable on Mousterian sites, and provide a valuable extension to Brothwell's (1981) summary of the archaeology if this now almost ubiquitous creature.

To turn to the less impressive papers, Helmer and Ducos both seem to suffer from an ignorance of the English language literature. Helmer presents a clever, though not wholly convincing, argument to equate high proportions of shed sheep deciduous teeth with the practice of holding sheep in folds. This requires discussion of the use of dental attrition data for the age-attribution of sheep mandibles, and one might expect at least passing reference to Payne (1973) or Grant (1982), to say nothing of Silver (1969) or Carter (1975). Mais non! Helmer has used a method given in Ducos (1968) and mentions no other. As to Ducos, lui même, his paper on killed population estimation appears on a naive reading to derive a useful algorithm for calculating the likely population size represented by a given distribution of paired skeletal elements. However, once certain abbreviations have been translated into English, this algorithm is identical to that published by Fieller and Turner (1980 and 1982), and which they derived from Seber (1973), who in turn was reworking Petersen (1896). It would be enough of a criticism of this duplication of ideas to blame it on the author's lack of knowledge of English, but two out of Ducos' scant three references are in English. At the very least, this shows a wholly inadequate search of the literature. Incidentally, there is a third paper in French in this volume, by Jean-Denis Vigne, and it is thorough, informative and well-referenced.

Complaints about other papers are confined to minor nit-picks. Buitenhuis contributes an interesting use of factor analysis to measure increasing diversity in early Neolithic cattle, but really shouldn't use the term 'breed' in the context of ancient livestock. Presumably Clutton-Brock's recent paper on this topic (Clutton-Brock 1979), which only became available in Western Europe during 1984, arrived too late to provide Buitenhuis with a more correct alternative. Brian Hesse uses biometrical data from sheep and goats as part of his discussion of early herding in West Central Iran. His histograms of the length of the first phalanx show convincing bimodality, although he seems not to have considered the possibility that this could just be showing a morphological difference between the bones of fore and hind feet.

Overall, this collection of papers will be well-used and repeatedly referred to. The cosmopolitan mixture of contributors has occasioned a greater diversity of subject matter than the volume title might suggest. Such a book could all too easily dwell on the caprines, but three out of these 27 papers discuss camels, a fourth attempts, perhaps unwisely, to understand the South American camelids, and two papers concerned with early farming in India bring into consideration such homely livestock as buffalo and elephants. This is by no means a series of bone reports from Neolithic sites in the Zagros Mountains, which perhaps goes to show how far the subject has advanced in the last few years.

References

Brothwell, D. R. (1981). 'The Pleistocene and Holocene archaeology of the house mouse and related species', pp. 1-13 in R. J. Berry (ed.) Biology of the House Mouse. Symposium of the Zoological Society of London **47**. London: Academic Press.

Carter, H. H. (1975). A guide to the rates of tooth wear in English lowland sheep. Journal of Archaeological Science **2**, 231-3.

Clutton-Brock, J. (1979). 'The definition of a breed', pp. 35-44 in M. Kubasiewicz (ed.) Archaeozoology 1. Agricultural Academy, Szczecin.

Ducos, P. (1968). L'Origine des animaux domestiques en Palestine. Bordeaux: Institut de préhistoire de l'université.

Fieller, N. R. J., and Turner, A. (1980). Number estimation in vertebrate samples. Manchester-Sheffield School of Probability and Statistics Research Report 215.

Fieller, N. R. J. and Turner, A. (1982). Number estimation in vertebrate samples. Journal of Archaeological Science **9**, 49-62.

Grant, A. (1982). 'The use of tooth wear as a guide to the age of domestic ungulates', pp. 91-107 in B. Wilson, C. Grigson and S. Payne (eds.) Ageing and sexing animal bones from archaeological sites. British Archaeological Reports British Series **109**, Oxford.

Payne, S. (1973). Kill-off patterns in sheep and goats: the mandibles from Asvan Kale. Anatolian Studies **23**, 281-303.

Petersen, C. G. J. (1896). Report of the Danish Biological Station. **6**, 5-48.

Seber, G. A. F. (1973). The estimation of animal abundance and related parameters. London: Griffin.

Silver, I. A. (1969). 'The ageing of domestic animals', pp. 283-302 in D. Brothwell and E.S Higgs (eds.) Science in Archaeology. London: Thames and Hudson.

Terry O'Connor

Circaea volume 2 number 3, December 1984, pages 121-8

The estimation of the charcoal content of sediments: a comparison of methods on peat sections from the Island of Arran

David Robinson *

Summary

The charcoal content of sediments can give valuable information about past levels of human activity, particularly when combined with detailed pollen analysis. It is important, therefore, to have a reliable method of measuring charcoal content.

Three methods were employed to measure the charcoal content of blanket peat and fen peat sections from the Island of Arran.

1. Visual estimation of charcoal abundance on a seven point scale, based on low-power examination of the sieve washings produced during the preparation of pollen slides.

2. A microscope method involving the use of pollen slides 'spiked' with a known concentration of exotic pollen or spores for the purpose of 'absolute' pollen counting. This method gives values for the concentration of charcoal per unit volume of sediment and also allows influx values to be calculated.

3. A chemical method whereby all the non-charred organic material is removed using concentrated nitric acid and the dry weight of the material which remains, charcoal, is expressed as a percentage of the original dry weight of the sample.

Introduction

Charcoal fragments are recovered from many lake and peat deposits in the course of routine pollen and plant macrofossil analysis. They arise from the incomplete combustion of both woody and herbaceous material and fragments vary in size from a few microns to several millimetres in length. In general, larger charcoal fragments are likely to represent local fires, whereas smaller, dust-sized particles arise from more distant sources. Further fragmentation during analysis may obscure this distinction.

The connection between the presence of charcoal in sediments and prehistoric human activity was recognised by Iversen (1941; 1952). Later, charcoal in basal peat layers and in sub-peat layers was one of the main lines of evidence used to link prehistoric farming practices

* Dr David Robinson, Department of Botany, University of Glasgow, Glasgow G12 8QQ, U.K.

with the initiation of blanket peat (Moore 1975). The charcoal content of freshwater sediments has also been used to study natural fire history in many areas of the world including North America (Swain 1973; 1978), Canada (Cwynar 1978) and Australia (Singh et al. 1981). Marine sediments have been examined by Smith et al. (1973).

Methods of recording and reporting the presence of charcoal in deposits vary considerably. Some authors have recorded presence or absence of charcoal (Durno and McVean 1959; Pilcher and Smith 1979), others have plotted a visual estimation of the charcoal abundance as seen in the pollen sieve washings or on the pollen slides (Tallis 1975). There have also been several attempts to make quantitative estimates of charcoal abundance by both microscopical and non-microscopical means. Microscopical techniques include variations on point counting methods employed by Iversen (1941; 1952; 1964; 1969) and by Singh et al. (1981), described in detail by Clark (1982). Fragments have also been scored on a size basis using a microscope fitted with an eyepiece graticule. Specially prepared slides involving the use of concentrated nitric acid are required by one method (Waddington 1969; Swain 1973) although pollen slides prepared for absolute pollen counting have also been successfully employed (Maher 1972; Swain 1978).

Non-microscopical methods have been investigated by Tallis (1975) and by G. L. Jacobson (pers. comm.). The latter adapted techniques developed for marine sediments by Smith et al. (1973) and both met with only limited success.

Experimental

In the course of pollen and plant macrofossil analyses of peat sections from the Island of Arran, Scotland (Robinson 1981), charcoal fragments were regularly encountered. The investigations were primarily concerned with the history of land use and as the charcoal was almost certainly the result of human activity, it was important to be able to trace accurately the fluctuations in its abundance.

Two peat sections formed the basis of the study: TM1 - a monolith section from 1.85 m of well-humified blanket peat sampled in close proximity to a Bronze Age settlement site (NR896312) and MML80 - a set of cores from 4.5 m of fibrous fen peat from a valley bog (sensu Ratcliffe 1977, 250) in the Machrie Moor basin (NR905315). The latter section was largely composed of the remains of Carex spp., Phragmites australis (Cav.) Trin. ex Steudel and Myrica gale L. Three techniques were employed on sections TM1 and MML80, one qualitative and two quantitative.

Qualitative

1. A visual method - charcoal abundance was estimated on a seven point scale on the basis of low-power examinations of the pollen sieve washings produced in the course of pollen slide preparation. A score of 0 corresponds to the absence of charcoal whereas a score of 5 indicates that charcoal was very abundant. Charcoal present in very small amounts was denoted by '+'.

Quantitative

2. A microscopical 'absolute' method - this was based on the method of Maher (1972) later used by Swain (1978). In the course of the pollen analysis of MML80 and the basal 200 mm of TM1, slides for 'absolute' pollen counting were prepared using tablets containing known concentrations of Lycopodium clavatum spores (Stockmarr 1971). Following pollen analysis the slides were used to estimate charcoal concentration. Five evenly-spaced traverses were made across each slide and the exotic spores and charcoal fragments were scored on the basis of their area using an eyepiece graticule. The results were expressed as area of charcoal per unit volume of sediment (um^2 cm^{-3}).

3. A chemical method - this was broadly based on the technique used by Tallis (1975). Peat samples (c. 10 g) were oven-dried and weighed before being broken up in 10% sodium hydroxide (NaOH). After washing they were treated with hot, concentrated nitric acid (HNO_3) for one hour, to remove non-charred organic material. The residues were then dried and weighed. Following this they were combusted at 500° C for five hours, then weighed again. This enabled the mineral content to be calculated. Subtracting the mineral content from the residue gave a value for the amount of charred material (i.e. charcoal) in the sample which was then expressed as a percentage of the initial dry weight. Artificially prepared samples using known quantities of laboratory grade charcoal gave encouraging results. The average recovery rate was 90%. The 10% loss was probably due to some charcoal seen floating on the surface of the water during the washing stage. It would not have been collected in the pellet during subsequent centrifugation. The problem of the charcoal floating arises from difficulties in rewetting the charcoal after the initial dry weight determination. It could be avoided by using an undried sample in the charcoal analysis and calculating the percentage dry weight of the sediment from a duplicate sample.

Results

The results of the analyses are presented in Figures 20-2.

1. Visual estimation

This is a quick, simple method which gave a general indication of the fluctuations in charcoal abundance. These were broadly consistent with changes in human activity as revealed by pollen analysis. However, it does have several limitations:

(i) It takes no account of small charcoal fragments which pass through the pollen sieves. It is, therefore, biased in favour of identifying local events from which a high proportion of large charcoal fragments reach the site. More distant fires, from which only finely comminuted charcoal is transported, will tend to be very much under-represented. Obviously pollen slides need to be examined in conjunction with the pollen sievings in order to compensate for this.

(ii) A seven-point scale is adequate for representing general trends in charcoal abundance but it is inadequate for expressing the very wide range of abundance which is often encountered.

(iii) It is difficult to be consistent in the estimations of charcoal abundance particularly when all the samples are not examined at the same time, as is often the case.

(iv) It is difficult to compare the data with those from other sites because the estimates are subjective and great variation is bound to occur between estimaters.

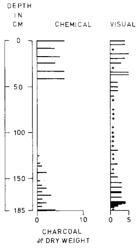

Figure 20. Chemical and visual estimations of the charcoal content of peat section TM1.

2. Microscopical method

The concentration curves produced by this technique broadly followed the trends recorded by the visual estimation of abundance. However, a much greater range of abundance was evident than it had been possible to express by the latter technique. The only major deviation from the picture produced by visual estimation occurs at the base of TM1. High concentrations of charcoal are recorded using the microscopical method, whereas charcoal is virtually absent from the pollen washings. This is almost certainly due to the high proportion of fine charcoal in the samples passing through the pollen sieves and therefore not being present in the sieve washings.

This microscopical method appears to be capable of detecting very low concentrations of charcoal and there is no reason to suspect that the concentration values produced by it do not reflect accurately the fluctuations in charcoal content as represented on the pollen slides.

There are two major disadvantages, however:

(i) The method takes no account of larger pieces of charcoal removed at the pollen sieving stage.

(ii) It is labour intensive and rather tedious.

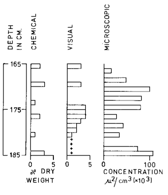

Figure 21. Chemical, visual and microscopical estimation of the charcoal content of the basal 200 mm of peat section TM1.

3. Chemical method

Use of this technique on artifically prepared samples had produced encouraging results. Unfortunately this success did not extend to fossil samples, perhaps because of the very small proportions of charcoal present. Charcoal made up 10-20% of the artificially prepared samples in contrast to less than 1% found in the fossil samples. When used on the blanket peat of TM1 (Figures 20-1) this technique detected the general trends of charcoal abundance but lacked the resolution achieved even with low-power examination of the pollen sieve washings. In particular, a 'smoothing' of fluctuations in charcoal concentration is apparent and low concentrations of charcoal were not detected at all. The results of analysing peat from MML80 were even less encouraging. A preliminary analysis failed to distinguish between those samples which were obviously charcoal-rich and those which were devoid of charcoal. It was obvious that the errors in the technique were such that it was impossible to detect the low concentrations of charcoal in the fibrous peat of MML80. It was in the light of these preliminary results that the further analysis of MML80 by this technique was abandoned as being unlikely to produce reliable or useful data.

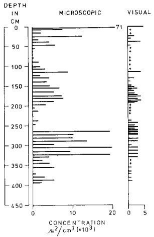

Figure 22. Visual and microscopical estimations of the charcoal content of peat section MML80.

Conclusions

Visual estimation of charcoal content in the pollen sieve washings is a good general guide to charcoal abundance in peat. However, the resolution of the method is low and where estimations are carried out over a period of time the consistency of the estimates is brought into question.

Microscopical examination of charcoal on pollen slides prepared for absolute pollen counting produces apparently reliable results with a high degree of resolution. The data are good estimates of the concentration of fine charcoal in the peat. The method takes no account of larger charcoal fragments, however, and some way of quantifying the charcoal content of the pollen sieve washings is needed to complete the analysis.

On the basis of the work outlined in this paper, chemical methods are not recommended even as a rough guide to trends in charcoal abundance. They appear to be time-consuming, unreliable and of low sensitivity and resolution.

The results obtained by the three methods outlined above are all subject to changes in peat accumulation rate. Slow-forming and compressed peat such as is found at the base of sections is almost certain to have a disproportionately higher charcoal content than the rest of the section. It is essential, therefore, that regularly-spaced radiocarbon dates are obtained from each section under investigation. These permit the drawing of a time/depth curve for the section and enable charcoal influx values to be calculated from the quantitative results. The charcoal curve produced then bears comparison within itself and with similarly constructed curves from other sites.

Acknowledgments

The work described in this paper was carried out during the tenure of a Research Studentship funded by the Scottish Development Department (Ancient Monuments). I would like express my thanks to Dr G. L. Jacobson for access to an unpublished manuscript.

References

Clark, R. L. (1982). Point count estimation of charcoal in pollen preparations and thin sections of sediments. Pollen et Spores **24**, 523-35.

Cwynar, L. C. (1978). Recent history of fire and vegetation from laminated sediment of Greenleaf Lake, Algonquin Park, Ontario. Canadian Journal of Botany **56**, 10-21.

Durno, S. E. and McVean, D. (1959). Forest history of the Beinn Eighe Nature Reserve. New Phytologist **58**, 228-36.

Iversen, J. (1941). Land occupation in Denmark's Stone Age. Danmarks Geologiske Undersøgelse, Raekke 2 **66**, 68pp.

Iversen, J. (1952). Origin of the flora of western Greenland in the light of pollen analysis. Oikos **4**, 85-103.

Iversen, J. (1964). Retrogressive vegetation succession in the post-glacial. Journal of Ecology **52**, 59-70.

Iversen, J. (1969). Retrogressive development of a forest ecosystem demonstrated by pollen diagrams from fossil mor. Oikos Supplement **12**, 35-49.

Maher, L. J. (1972). Absolute pollen diagram of Red Rock Lake, Boulder County, Colorado. Quaternary Research **2**, 531-53.

Moore, P. D. (1975). Origin of blanket mires. Nature, London **256**, 267-9.

Pilcher, J. and Smith, A. G. (1979). Palaeoecological investigations at Ballynagilly, a Neolithic and Bronze Age settlement in Co. Tyrone, N. Ireland. Philosophical Transactions of the Royal Society of London (B), **286**, 345-69.

Ratcliffe, D. A. (1977). A Nature Conservancy Review. Cambridge University Press, London.

Robinson, D. E. (1981). The vegetational and land-use history of the west of Arran, Scotland. Unpublished Ph.D. Thesis, University of Glasgow.

Singh, G., Kershaw, A. P. and Clark, R. L. (1981). 'Quaternary vegetation and fire history in Australia', pp. 23-54 in A. M. Gill, R. H. Groves, and I. R. Noble (eds.) Fire and the Australian Biota. Australian Academy of Science, Canberra.

Smith, D. M., Griffin, J. J., and Goldberg, E. D. (1973). Elemental carbon in marine sediments: a baseline for burning. Nature, London **241**, 268-70.

Stockmarr, J. (1971). Tablets with spores used in absolute pollen analysis. Pollen et Spores **13**, 615-21.

Swain, A. M. (1973). A history of fire and vegetation in north-eastern Minnesota as recorded in lake sediments. Quaternary Research **3**, 383-96.

Swain, A. M. (1978). Environmental changes during the past 2000 years in north-central Wisconsin: analysis of pollen, charcoal and seeds from varved lake sediments. Quaternary Research **10**, 55-68.

Tallis, J. H. (1975). Tree remains in southern Pennine peats. Nature, London **256**, 482-4.

Waddington, J. C. B. (1969). A stratigraphic record of the pollen influx to a lake in the Big Woods of Minnesota. Geological Society of America Special Papers **123**, 263-82.

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Circaea volume 2 number 3, December 1984, pages 129-31

Palaeobotany and archaeology on Merseyside:

additional evidence

Peter Cundill *

In a recent article, Innes and Tomlinson (1983) discuss the pollen analysis of peat with a charcoal layer at Simonswood Moss. They compare their results with those obtained by Tooley (1978) from a site at Starr Hills, Lytham. A further instance of charcoal in the lowland peat bogs of Lancashire has been discovered at Hoscar Moss, north of Ormskirk (NGR SD470130). Hoscar Moss is different from the other two sites because it has two charcoal layers. Part of the pollen diagram from Hoscar Moss is shown in Figure 23 and it can be zoned and relatively dated as follows:

Zone A: dominated by Pinus and Coryloid (probably Corylus) suggesting a late Boreal date

Zone B: high values of Quercus and Alnus together with some Ulmus which would indicate an Atlantic date for the zone. Ulmus pollen shows a sharp decline at 3.4 m

Zone C: a mixed oak forest containing much less Ulmus than Zone B and dated as Sub-Boreal

The two layers of charcoal are located close to pollen assemblage zone boundaries, but each layer is associated with different responses in the pollen record.

The lower layer of charcoal is linked with a general diminution of tree and shrub pollen and an increase in Gramineae, Cyperaceae and Compositae (Tubuliflorae) (together with a little Artemisia and Ranunculaceae). It is dated to the time of the Boreal-Atlantic transition. The pollen changes are similar in character to those associated with the charcoal layer at Simonswood Moss, although dated to a slightly earlier period. It is not possible to trace the vegetation changes at Hoscar Moss in quite as much detail as those at Simonswood Moss, as the pollen samples were not taken at such close intervals. Nevertheless it may be possible to identify a regeneration phase in the Hoscar Moss diagram after the fire as there is a peak of Betula before Quercus and Alnus dominate the scene.

The dating of the charcoal layer would place it within the mesolithic and, as at Simonswood Moss, there are mesolithic flint remains on the higher ground around Hoscar Moss (Cumbria and Lancashire Archaeological Unit: personal communication). Innes and Tomlinson (1983) discuss the general interpretation of fire in a mesolithic context and

* Dr Peter Cundill, Department of Geography, The University, St Andrews, Fife, Scotland, U.K., KY16 9AL.

many of the points they make may be applied to the situation at Hoscar Moss. However, if more layers of charcoal are found in the peat bogs of lowland Lancashire, it may be possible that we are approaching the kind of situation that Simmons (e.g. 1975; 1979) envisaged for the North York Moors in which the mesolithic peoples lived in the uplands in the summer, the estuary and coast in winter and an intermediate 'cuesta' site in the spring and autumn. In this scenario the Lancashire lowlands would be the winter home of the mesolithic population. However, it may be that the Lancashire lowlands present a completely different situation from north-east Yorkshire. Clearly more sites where charcoal layers can be identified are needed, together with information on the typology of flints from a range of sites at different altitudes before any strong conclusions can be reached.

The upper charcoal layer occurs above the elm decline and is therefore associated with the neolithic. However, it is not directly related to pollen changes at the elm decline and it seems to be linked with only a short and limited phase of woodland decline. From this it seems that the neolithic fire was of less importance than the mesolithic fire.

In general, finds of charcoal in lowland peat bogs are rare and therefore it is interesting that three such sites have come to light in a relatively small area of Lancashire. It is suggested that more information is needed before the full implications of these charcoal layers become clear.

References

Innes, J. and Tomlinson, P. (1983). An approach to palaeobotany and survey archaeology in Merseyside. Circaea **1**, 83-93.

Simmons, I. G. (1975). Towards an ecology of mesolithic man in the uplands of Great Britain. Journal of Archaeological Science **2**, 1-15.

Simmons, I. G. (1979). Late mesolithic societies and the environment of the uplands of England and Wales. Bulletin of the Institute of Archaeology, London University **16**, 111-29.

Tooley, M. J. (1978). Sea level changes: North-West England during the Flandrian stage. Oxford: Clarendon Press.

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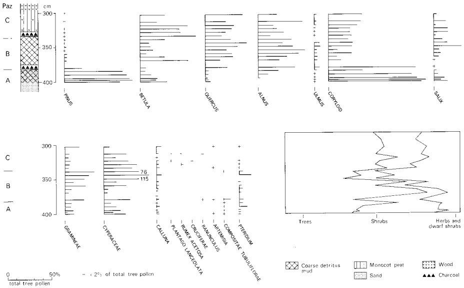
Figure 23 (opposite) Pollen diagram showing relative frequencies of selected pollen and spore taxa from basal sediments at Hoscar Moss. The values in the summary diagram are expressed as percentages of total dry land pollen.

Hoscar Moss: selected pollen and spore taxa



Circaea volume 2 number 3, December 1984, pages 133-4

Puparia - a correction and apology

John Phipps *

After the last issue of Circaea with my note on fly puparia (Phipps 1984) went to press, I became doubtful of the correctness of my determination of the puparia of Haematobosca stimulans (Meigen). I have no doubt that these are puparia of Stomoxydinae (the subfamily to which H. stimulans belongs) but now think it more likely that they are Stomoxys calcitrans (L.). Figure 24 shows the figures given by various authors for the puparia of the two species. Obviously the issue is not clear-cut, but the most recent of them, that of Skidmore (1979) shows that the ratio of the diameter of the spiracular plates to the distance between them is less in H. stimulans than in S. calcitrans. In this respect my specimens resemble S. calcitrans. According to Skidmore (1979), S. calcitrans females oviposit in the superficial cracks in drying heaps of decomposing material. In fact, I have found these puparia in deposits which do not appear to have any connection with cattle, but rather in accumulations of dyeplant and flax stem debris (Phipps forthcoming) and this change avoids some of the difficulties of interpretation that were becoming apparent. The figures of cephalopharyngeal skeletons are included to indicate that this character may be unreliable.

I much regret the error in my last note and apologise to any worker who may have been led astray.

References

Phipps, J. (1984). A further note on archaeological fly puparia. Circaea 2(2), 103-4.

Skidmore, P. (1979). On the immature stages of Palaearctic Muscidae with particular reference to taxonomic and biological aspects. M. Phil. Thesis, University of York.

Thomsen, M. (1935). A comparative study of the development of the Stomoxydinae (especially Haematobia stimulans Meigen) with remarks on other coprophagous muscids. Proceedings of the Zoological Society of London 1935, 531-50.

Thomsen, R. C. M. (1937). Observations on the biology and larvae of the Anthomyiidae. Parasitology 29, 273-358.

Zumpt, F. (1973). The stomoxyine biting flies of the world. Diptera: Muscidae. Taxonomy, biology, economic importance and control measures. Fischer, Stuttgart.

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* Professor John Phipps, Visiting Professor, Environmental Archaeology Unit, University of York, Heslington, York, YO1 5DD, U.K.

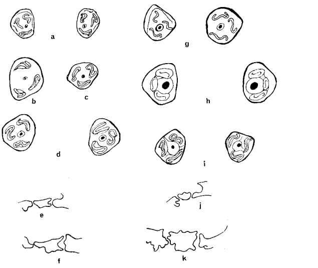

Figure 24. a-f Stomoxys calcitrans: a-d, posterior spiracular plates; e and f, anterior end of cephalopharyngeal skeleton (a, of puparium; b-f of 3rd stage larva). g-k Haematobosca stimulans: g-i, posterior spiracular plates; j and k, anterior end of cephalopharyngeal skeleton; (g, of puparium; h-k of 3rd stage larva). a and g after Skidmore (1979), b, e, h and j after Thomsen (1937), c after Zumpt (1973), d, f, i, and k after Thomsen (1935).

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Ivory towers: tooth wear in three dimensions

Barbara West *

One of the methods for ageing archaeozoological material is by assessing the amount of dental attrition, or tooth wear. Payne's (1973) method for ageing sheep and goats is of great value because it provides absolute age ranges. Although Grant (1975; 1982) devised an excellent method for recording tooth wear on cattle, sheep and pigs, she cautiously refrained from attaching absolute age ranges to her wear stages. She suggested using total numerical values for each mandible to construct histograms; however, because several different combinations of wear for each tooth resulted in the same numerical value, this caused two problems: 1) the individual patterns of mandibles were obscured and 2) a reference framework of dental eruption could not be used.

O'Connor (1983 and forthcoming) solved part of the first problem by a simple plot of each mandible, with the numerical value of M_1 on one axis and that of M_2 on the other; unfortunately, the data for M_3 had to be omitted. Figure 25 is an attempt to solve both problems by extending his idea into the third dimension, simply by using isometric graph paper. Each 'tower' represents the wear pattern of an individual mandible (unless otherwise indicated by numbers). Although the values for M_1, M_2 and M_3 are actually single points in three-dimensional space, the towers are easier to visualise and present in two dimensions. Thus the shorter ones closer to the x-y axis represent young animals, while the taller ones 'at the back' or further from the x-y axis represent older animals.

Though this may be a prettier way of presenting the data, it still does not solve the problem of absolute ageing; however, placing a reference framework of dental eruption on the graph provides a few age parameters by which to judge the mandibles. Using age ranges recommended by various authors (quoted in Silver 1969; Grigson 1982; Payne 1982), the eruption stages for each tooth encompass Grant's stages E (erupting through the bone), 1/2 (half erupted) and U (almost full height but unworn), corresponding to numerical values 3-5. Using Degerbøl's (1970: see Grigson 1982) data for the third cusp of M_3 coming into wear at 5 years, the 5-year mark occurs at stage 10 on the cattle graph (Figure 26). Other authors, of course, may choose different reference frameworks of eruption dates. Data can also be plotted on the graph in one or two dimensions (Figure 26: note the 31 mandibles with M_1 erupting through the bone), and estimated values, as suggested by Grant (1982), could be used if clearly marked as such.

* Barbara West, Department of Urban Archaeology, Museum of London, London Wall, London EC2Y 5HN, U. K.

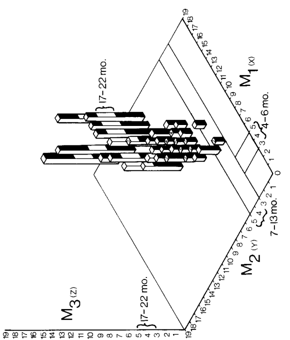

Figure 25. Medieval pig mandibles from Trig Lane, London (West, unpublished). The numerical values for Grant's tooth wear stages are along each axis (x, y, z), with age ranges marked at eruption stages 3-5. The 17-22 month areas on the older mandibles have been left blank for greater emphasis.

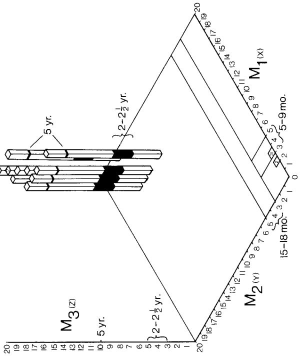

Figure 26. Medieval cattle mandibles from Trig Lane. Note the distinct separation between the juvenile and adult mandibles; the latter appear to come from animals over 5 years old.

This method of analysing the data is not meant as a replacement for O'Connor's two-dimensional graph; in fact, O'Connor's method is easier to plot and more useful for incomplete data, particularly if a reference grid of dental eruption is added. Nevertheless, archaeozoologists may find this method of some value in providing an overall picture of the individual mandibles and the age parameters into which they fall. The data from the fourth premolar must still be left waiting forlornly in the wings, until someone can devise an easy way to represent the fourth dimension!

Acknowledgements

I would like to thank Dr Juliet Clutton-Brock, Dr Terry O'Connor, James Rackham, Miranda Armour-Chelu, Dr Philip Armitage, Dr Glynis Jones, Don Brothwell and Tony Dyson for their comments, and Bryan Alvey for attempting to produce the three-dimensional figures for this paper by computer.

References

Bull, G. and Payne, S. (1982). 'Tooth eruption and epiphysial fusion in pigs and wild boar', pp. 55-71 in B. Wilson, C. Grigson and S. Payne (eds.) Ageing and sexing animal bones from archaeological sites. British Archaeological Reports British Series **109**, Oxford.

Grant, A. (1975). 'The use of tooth wear as a guide to the age of domestic animals: a brief explanation', pp. 378-408 and 437-450 in B. Cunliffe (ed.) Excavations at Porchester Castle Vol.1: Roman. Society of Antiquaries, London.

Grant, A. (1982). 'The use of tooth wear as a guide to the age of domestic ungulates', pp. 91-108 in B. Wilson, C. Grigson and S Payne (eds.) Ageing and sexing animal bones from archaeological sites. British Archaeological Reports British Series **109**, Oxford.

Grigson, C. (1982). 'Sex and age determination of some bones and teeth of domestic cattle: a review of the literature', pp. 7-23 in B. Wilson, C. Grigson and S. Payne (eds.) Ageing and sexing animal bones from archaeological sites. British Archaeological Reports British Series **109**, Oxford.

O'Connor, T. P. (1983). Internal summary report on mammal bones from Viking Age pits at 16-22 Coppergate, York. Ancient Monuments Laboratory Report no. 4036.

O'Connor, T. P. (forthcoming). Bones from late 9th-10th century levels at 16-22 Coppergate. The Archaeology of York **15**.

Payne, S. (1973). Kill-off patterns in sheep and goats: the mandibles from Asvan Kale. Anatolian Studies **23**, 281-303.

Silver, I. A. (1969). 'The ageing of domestic animals', pp. 283-302 in D. Brothwell and E. Higgs (eds.) Science in Archaeology. Thames and Hudson, London.

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Ultrasonic filtration as an aid in pollen analysis of archaeological deposits

Philippa Tomlinson *

Introduction

Pollen from soils and archaeological deposits with a high silt and clay content may be very difficult to extract even with the use of sodium pyrophosphate (Bates et al. 1978) and hydrofluoric acid.

Various new techniques of extracting and concentrating pollen are being tested at the Palynology Laboratory in the Geography Department of the University of Hull; these include ultrasonic filtration (Carotini 1981), which I report here. Dr John Flenley kindly allowed me to use his ultrasonic filter on a number of samples from 10th century urban occupation deposits at 16-22 Coppergate, York and some silty peats from Coddington, Cheshire. Preparation of these samples by conventional methods using hydrofluoric acid and sodium pyrophosphate showed that there was pollen present in all the samples but that counting would have been extremely time consuming, or impossible.

Method

After completing the above mentioned conventional preparation processes, samples are washed with water onto a 5 or 10 micron sieve (approx 8 cm diameter) held in a water bath full of water with a simple suction filter pump apparatus attached to a tap (Figure 27). The water bath contains an ultrasonic shaking device. The combined action of the vibration and the suction, helped by gentle washing with a washbottle jet, work to sieve the material efficiently and quickly. The aim is to retain all the pollen on the sieve, but the material which passes the sieve is checked, in case any grains have escaped. Some very small grains such as Filipendula will pass through the 10um mesh, but rarely though the 5um. The ultrasonic shaking will damage the grains on the sieve if left too long but if only a small amount is sieved at a time this can be avoided. The retent in the sieve is now a much smaller quantity of material and can be washed into a centrifuge tube and then treated in the normal way for dehydrating, staining and mounting. The result, for my samples at least, is a preparation almost entirely consisting of pollen.

* Philippa Tomlinson, Environmental Archaeology Unit, University of York, Heslington, York, YO1 5DD, U.K.

Equipment details

The cost of the ultrasonic water bath adapted for pollen sieving as used at Hull, is about £2,000. The firm who supplies them is: Glen Creston, 16 Carlisle Road, London, NW9 OHL. Biology departments may already have them and Conservation laboratories use baths of this kind for cleaning delicate objects. Sieves cost about £200 each and they have a limited life span. After one year's continuous use the mesh begins to disintegrate. At present they are made of metal; cheaper ones may become available.

I would be grateful for comments or additional information from anyone else who has used this technique.

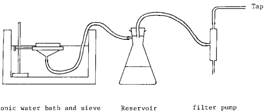

Figure 27. Diagrammatic representation of the ultrasonic pollen sieving apparatus used at Hull University (Drawing: Brian Douglas).

Acknowledgements

I am grateful to Dr John Flenley for allowing me use of the equipment at Hull University and to Mark Bush for telling me about it.

References

Bates, C. D., Coxon, P. and Gibbard, P. L. (1978). A new method for the preparation of clay-rich sediment samples for palynological investigation. New Phytologist **81**, 459-63.

Carotini (1981). Pre-conference abstracts of the 5th International Conference of Palynology. Cambridge.

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Wet sieving at Llawhaden, Dyfed

S. Mantle, R. Ramsey, D. Maynard and G. Williams *

There are two main methods of wet sieving bulk archaeological samples, so called 'showering' methods and variants on the Sīrāf method (Jones 1983 and references therein). The first depends on the removal of fine soil particles by the downflow of water through a sample placed on a sieve and needs a second process of flotation (simply carried out in a bucket) to separate charred plant remains from remaining large soil constituents. The Sīrāf method involves the suspension of the sample on a mesh inside a tank through which is passed a current of water. This carries off charred material which is collected in a sieve outside the tank. Theoretically the Sīrāf method should result in a single operation to collect a 'flot' although van der Veen (1983) has demonstrated that the system can be very inefficient and also requires re-flotation of the residue.

The most efficient method will obviously vary considerably with site and soil type. On predominantly sandy soils in Caithness, Jones has found the Sīrāf method to be more efficient than the showering method, but on intractible fine silt and clay soils in south-west Wales we have found the opposite to be true. With a Sīrāf machine neither fine soil nor charred particles were efficiently mobilised. The problem was made worse by the necessity to use a mesh inside the machine equal in size to the smallest used to collect material passing over the weir (in our case 250 micron) to prevent the loss of material through the holes in the mesh (an important point made by van der Veen). Drying and re-floating the residue was necessary and we found initial showering a more efficient method of obtaining the same result.

The method illustrated (Figure 28) has been used on large-scale sampling programmes on late prehistoric and Romano-British settlements at Llawhaden, Pembrokeshire and Llangynog, Carmarthenshire. It is similar in principle to that described by Jones but a little different in practice. After an initial screening through a 1/4 inch sieve we were using a combination of 1 mm and 250 micron sieves. During the initial screening the operator assisted in the disaggregation of soil both by gentle manipulation and by directing the flow of water. Large stones and gravel were retained in the 1/4 inch sieve as were bone and large pieces of charcoal, and this residue was rapidly sorted by hand. All small charcoal pieces were washed through the 1/4 inch sieve and after sorting the 1/4 inch residue could therefore be safely discarded. The small charcoal fragments together with small stones were retained in the 1 mm sieve and at this stage the 250 micron sieve was used as a control on very small charred particles. Most fine soil particles were eliminated at this stage although the 1 mm sievings required drying and

* Correspondence to: G. Williams, Dyfed Archaeological Trust, Yr Hen Blas, Abergwili, Carmarthen, Dyfed, Wales.

re-floating in a bucket. Some charred material still remained in the residue from the bucket but as this was of greatly reduced volume compared with the parent sample it too was retained for examination. The 250 micron sievings required no further processing before analysis.

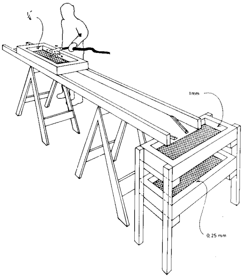

Figure 28. Wet-sieving apparatus used at Llawhaden.

The system produced very clean flots and no charred material left the system except through sieves of controlled size. It was as quick to set up as the Sīrāf machine and simpler and quicker to operate, producing a greater throughput of water. No comparative times were systematically recorded but the Siraf machine took two or three times as long to process the same volume of sample. (Obviously speed of processing will vary greatly according to soil type. On the fine silts and clays at Llawhaden we achieved a rate of about 15 litres an hour for the initial sorting and about half that for the re-floating which was carried out in parallel once a sufficient backlog had dried.) As drying and re-flotation of the products of the initial sieving was necessary using both systems, our showering system had the further advantage of producing a single series of processed samples only and a greatly reduced volume of stony residues.

The reasons for this difference in relative efficiency from that experienced by Jones may be in part the greater efficiency of the specific showering technique used but is more likely to be a reflection of particular soil types. At any site where large scale sieving is to be carried out it may be worthwhile carrying out an initial series of experiments to determine the optimum method for local conditions.

Acknowledgements

Grateful thanks are due to Annie Milles for help and advice during the Llawhaden flotation project.

References

Jones, A.K.G. (1983). A comparison of two on-site methods of wet-sieving large archaeological soil samples. Science and Archaeology **25**, 9-12.

van der Veen, M. (1983). Seeds and seed machines. Circaea **1**(2), 61-2.

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The Inside Back Page

It has been difficult adjusting one's modus vivendi to a world without the familiar ten-bob note, and hearing of the imminent demise of the paper pound, apparently to be replaced by some chocolate-filled half-sovereign, almost prompted a retreat into terminal angst and Bognor Regis. So many old friends, the bushel, peck, pole and drachm, have slipped away under the aegis of self-perpetuating change. Nasty standard metric system units have ousted old, useful ones. Fashionable cosmologists now guess at the age of the Universe in seconds, and trendy cytologists measure cell concentrations in billions per litre. What does a billion look like, or, come to that, a litre? It can only be a matter of time (probably measured in hectaseconds or milliweeks, I dare say) before the New Unitarians start on archaeological science. But we can hold them off!

The units which have emerged unscathed from this purge are the really absurd ones which defy conversion to metres or kilograms. Fishermen still count the day's catch in boxes, oil is still measured by the barrel. And this is whence we should take our example. Let us consider a measure of the concentration of plant macrofossils in a sample. The fickle perfidy of water content dictates that we should use seeds per unit volume, rather than weight. Clearly megaseeds per cubic metre would be undesirable, so let us adopt as a unit the amount of sample which can be held in the palm of one hand, thus giving us seeds per fistfull (sf^{-1}). The hand will probably hold more wet peat than dry sand, thus adjusting for variance in concentration due to sample water content. Variations in fist size can be corrected by standardising on the size of archaeobotanists. Or by surgery.

Some bureaucrats rightly appear to be interested in measuring the rate of progress of osteologists. To use fragments per day (fd^{-1}) invites fraud through deliberate osteoclasis, and the old standard DoE box can hardly be used under the new quangoed regime. Happily, controlled tests in a sanatorium near Milton Keynes have shown that an average osteologist without assistance of wind or computer will record 3.38 cubic feet of bone bits per working day. Now this is not a volume which can readily be metricated, but does happen to be almost exactly one cubic cubit (c^3). Using c^3 as a measure has obvious advantages. Conversions to man-days of work may easily be made, thus obviating rancour over project estimates, and the standard Welsh unit of volume, the vanload (fanlôd, if East of Swansea), is almost exactly 50 c^3. The third great advantage of cubits is that they are quite incomprehensible to anyone born this side of the Fayum Depression.

It is hoped, indeed intended, that these two examples should serve as a spur to the imagination, encouraging environmental archaeologists to take an absurdist stand against creeping metrical conformity. Phi-stricken pedologists, in particular, seem in need of salvation, and even students of the humble ostracod should not be complacent. Remember how the half-crown ended: not with a bang but with a twelve-and-a-half-pee whimper.

Burhinus