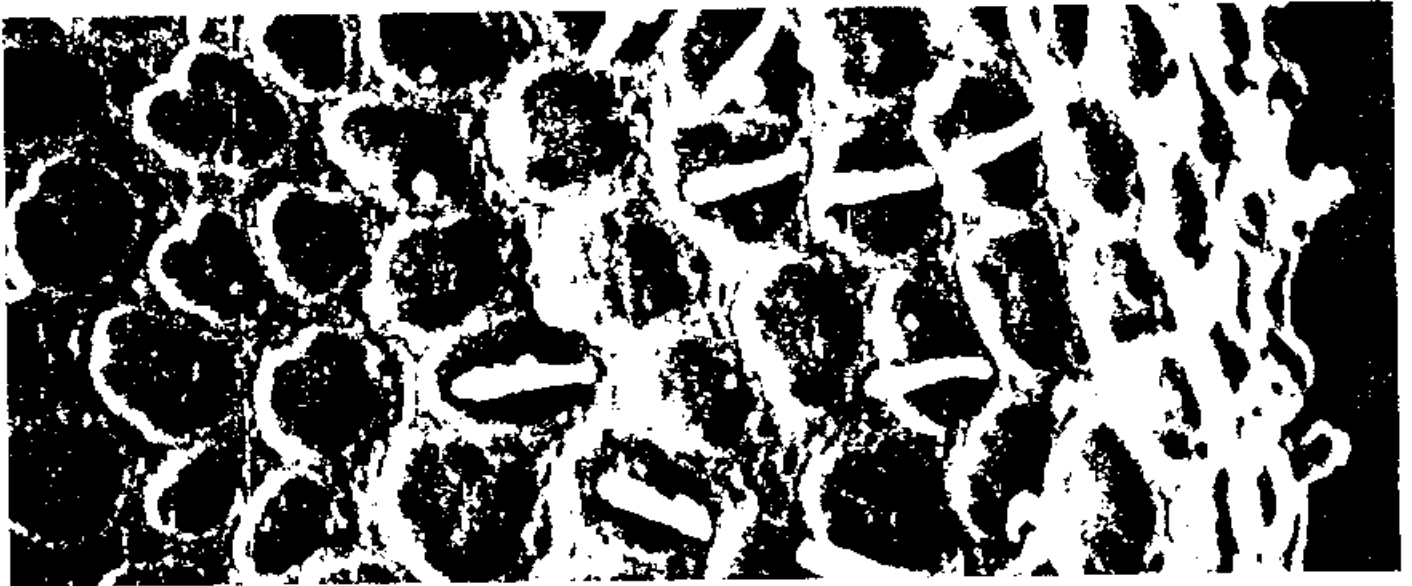
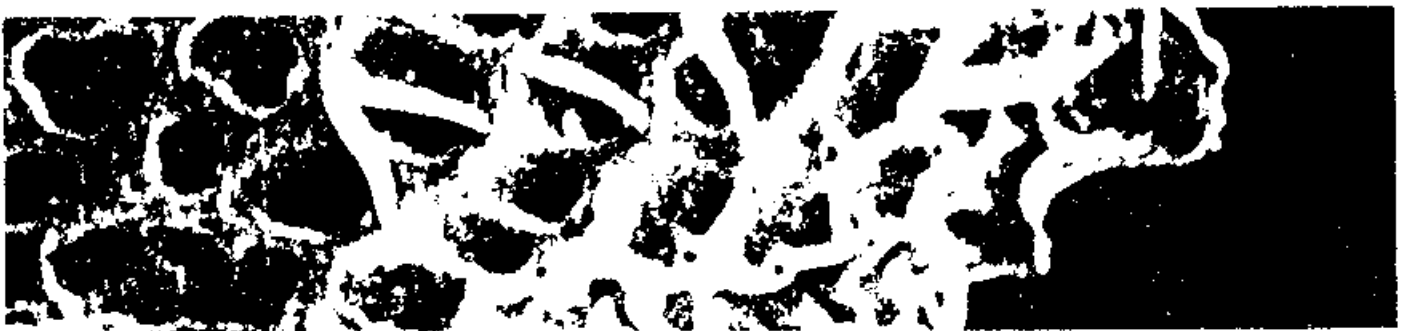


Volume 4 Number 2 (1987)

circaea



The Bulletin of the
Association for
Environmental Archaeology



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AEA

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CIRCAEA

CIRCAEA is the Bulletin of the Association for Environmental Archaeology, and - as from Volume 4 - it is published twice a year. It contains short articles and reviews as well as more substantial papers and notices of forthcoming publications.

The Newsletter of the Association, produced four times a year carries news about conferences and the business of the Association. It is edited by Vanessa Straker and Bruce Levitan, to whom copy should be sent c/o B. M. Levitan, University Museum, Parks Road, Oxford, OX1 3PW.

Editorial policy for Circaea 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, at the University of York. Circaea is distributed free to members of the AEA and available to institutions and non-members at £9.00 per annum. Back-numbers and a limited supply of articles can be purchased at the following rates: back-numbers (vols. 1 and 2, and vol. 3, no. 1) - £2 per part; (vol. 3 no. 2 onwards) - £3 per part; articles - 5p per side, plus postage.

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Front cover: Punctures and hairs on the pronotum of the beetle Monotoma spinicollis Aubé. SEM photograph by H. K. Kenward.

Editorial

To judge by the number of jobs in environmental archaeology advertised in recent months, the membership of the AEA must be spending all its time filling in application forms or supplying references; that must explain the paucity of contributions reaching the editors of the AEA Newsletter and of this organ. Both publications exist for the benefit of the whole membership and it is up to you to maintain their quality and quantity. In the event that members are not sending copy because they are dissatisfied in some way with Circaea, don't lurk in your tent, grumbling; write and tell us or the AEA Committee. We can't amend faults of which we're not aware.

The Editors would like to thank Roberta Gilchrist for (voluntarily) inputting much of this issue of Circaea to the word-processor; we very neglectfully forgot to thank Anne Sutherland (funded to work at the EAU by the Manpower Services Commission) for inputting most of the last issue.

Book Reviews

Hillson, S. W. (1986). Teeth. Cambridge University Press. xiv + 376 pp., £27.50

Most people would instantly, without the aid of dental texts, recognise an isolated human or animal tooth, since their own play such a major part in their lives. However, few would ever realise the quite stunning diversity of information which can potentially be derived from these small off-white objects which are so often abundant in archaeological contexts.

Simon Hillson's first book, entitled simply Teeth, will satisfy those inquisitive souls and tell you everything you ever wanted to know about teeth but were afraid to ask (a better title, I think). The book draws together and reviews the wide and varied avenues of detailed research, both modern and archaeological, towards a greater understanding of past populations of both humans and animals. It falls somewhere between being a laboratory manual, useful for continual practical reference, and a more conventional specialised textbook.

The large practical guide to general mammalian tooth morphology, form and function, and the subsequent variation between 15 mammalian orders, is probably the most useful section in terms of general bone-crunching in the field, or preliminary post-excavation sorting. Obviously, drawings will never replace comparative reference specimens, especially when dealing with poorly preserved and often fragmented archaeological material, but they do provide useful and systematic descriptions of variable tooth forms between genera which, accompanied by axonometric illustrations of the various dentitions, make this a practical guide to use. A few of the drawings do, however, appear too simplified and may be slightly misleading. Confusion may occur where more than, say, six illustrations occur on one page. In these cases, their small scale gives a somewhat crowded appearance to the figures, which is often exaggerated by the angle, position and handwritten nature of the major headings. For example, where the foxes, dhole and racoon dog are shown on page 42, eight similar tooth rows are shown with accompanying headings, sizes, tooth numbers, etc. Also, where the pig dentition is shown on page 91, confusion may arise in the different scales used to depict the permanent and deciduous dentition

where the latter appears larger in real terms. With the addition of supplementary illustrations showing the occlusal views and tooth sections, subtler differences between morphologically similar teeth have, however, been enhanced.

It is frightening to see just how complex the understanding of dental microstructure can be. The very nature of dental tissue histology may be quite mind-boggling to the uninitiated. All of this information is available in any modern dental textbook whence clinical terms such as 'ameloblasts', 'perikymata', 'parazonies', 'brown striae of Retzius', and 'decussation', swim drunkenly through the mind. This often incomprehensible deluge of dental jargon has been well structured here in an attempt to guide the neophyte through what could, for some, be the realms of science fiction. However, necessary detail is not lacking, ensuring that the information could quite well satisfy the requirements of any dental student.

Chapters on ageing, metrical variation and the many pathological conditions which manifest themselves in dental tissues are all clear and concise and, as with the histological information, reflect the broad range of the author's expertise. The modern and archaeological samples are mainly drawn from studies of human material, which is of course not surprising, since this is where most work has been carried out. Fewer studies on other mammals are available for this very reason, but their potential and implications for archaeology, for example in the recording of oral pathological conditions, could have been more fully expounded since these are areas which as yet remain largely unrealised.

An extensive bibliography contains all the major references as well as a host of equally interesting but far less well-known ones. It will save vast amounts of time spent combing the literature for that vital reference, and it is almost worth buying the book on the strength of this alone.

Teeth is a useful and satisfying book, for the general reader and specialist alike.

K. M. Dobney

A. Cohen and D. Serjeantson (1986). A manual for the identification of bird bones from archaeological sites. London: privately published. 99pp. £6.50.

The identification of bird bones from archaeological sites can be difficult for anybody who has little experience and who doesn't have ready access to a reference collection. There are fewer morphological differences between bird families than between mammalian families, a greater total number of bird species than mammals, and a large variety of birds is often encountered in archaeological assemblages. Consequently a guide for the identification of bird bones has been needed for a long time.

This manual is stated to be a preliminary guide only, to be used to indicate which families or species of reference specimens should be consulted, therefore saving time during a visit to a reference collection.

In the introduction, a brief description of the avian skeleton is given. The only complaint I have about this section is the paragraph on sex determination where size distinctions are mentioned as a method of sexing individual bones. Given that the manual is intended for archaeologists and students with varying degrees of ornithological knowledge, it ought to have been stated which of the sexes tends to be the larger in

different groups of birds. The sex of bones can be determined with a fair degree of certainty for some species, particularly for the Galliformes (where males are much the larger), and the Accipitridae (where the opposite is true). Also regarding sex determination, it would have been useful to have had an illustration of a section through a bone containing medullary bone.

The major post-cranial bones of 27 species from 14 families are illustrated, these consisting of species recorded in the British Isles during the post-Glacial period. A quibble here is that in the list of species used, domestic fowl is given as belonging to the Gallidae, when in fact it should be Phasianidae.

The drawings are at 1:1, which is useful, and partly for this reason, no species smaller than the snipe Gallinago gallinago is included. As is pointed out in the manual, the larger species were usually of the greatest economic importance, and on sites where sieving has not been carried out, bones of larger species generally predominate. The standard of illustration is generally good and diagnostic features which help in the identification of particular families or species are indicated and brief notes given. Some of the drawings of the tarsometatarsus, in particular, would have benefitted from the use of a finer pen, as some of the features are obliterated by the thickness of the lines. I personally found it slightly confusing that where two views of a particular bone are given, one view is of the left element, the other view of the right.

The authors state that they have aimed to illustrate at least one example of each family for the species which are most commonly found in archaeological assemblages, but there is a bias towards the sort of species present in assemblages from Scottish coastal sites. Three species of auks are illustrated, for example, whereas members of other families which frequently occur on inland and urban sites are omitted. The Charadriidae are not represented at all, even though lapwing Vanellus vanellus and golden plover Pluvialis apricaria are commonly present in archaeological assemblages. Woodcock Scolopax rusticola was also an important game bird from Roman times through to the post-medieval period and should have been included. Bones of crane Grus grus are also commonly found in archaeological deposits, as are those of red kite Milvus milvus and buzzard Buteo buteo. Goshawk Accipiter gentilis and sparrowhawk A. nisus were widely used for hawking during the medieval period. Perhaps one of these species should have been illustrated. Barn owl Tyto alba would also have been a useful addition: belonging to a separate family, its bones are rather different from those of the rest of the owls.

On the other hand, red-legged partridge Alectoris rufa is included in the guide. Until the 17th century, the only part of Great Britain which this species inhabited was the Channel Islands. The first specimens are thought to have been introduced to the mainland by Charles II. After many subsequent introductions in the 18th and 19th centuries, they eventually became established in some parts of the country (Lever 1977, 356-67).

Returning to omissions, I think that the use of measurements as an aid to the identification of some species should have been mentioned somewhere. The limb bones of closely-related species often show few morphological differences except in size. The series of dissertations on the morphology of several groups of birds, which have been produced by the Institut für Paläoanatomie, Domestikationsforschung und Geschichte der Tiermedizin at the University of Munich (e.g. Erbersdobler 1968) all emphasise the importance of measurements for identification.

Finally, I'm somewhat concerned about the statement in this manual that its use will indicate which bones should be referred to a specialist, i.e. probably those which occur less commonly than others, and which are not easily identified because they are unfamiliar. I feel that it would be more sensible to refer the most commonly occurring bones, which are usually of domestic species on urban sites, to a specialist in their study. The most commonly occurring species are obviously of greater economic importance than those which are represented by only a few bones each. Much information can be obtained from the study of domestic bird bones. Biological studies can be carried out and intensive comparisons made. Evidence of selective or differential breeding practices might be obtained, or something could be deduced about husbandry techniques. Identification is only the first step in the study of bird bones from archaeological sites.

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Enid Allison

Summary and Review

Hochdorf I by Hansjörg Küster and Udelgard Körber-Grohne (with contributions by Jörg Biel, Klaus Haas, Günther Vorwohl & Roland Wurster).

Part 1: H. Küster, Die neolithische Siedlung von Hochdorf, Gemeinde Eberdingen (Kreis Ludwigsburg).

Part 2: U. Körber-Grohne, Die biologischen Reste aus dem hallstattzeitlichen Fürstengrab von Hochdorf, Gemeinde Eberdingen (Kreis Ludwigsburg).

Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg, Vol. 19. Published for the Landesdenkmalamt Baden-Württemberg by Konrad Theiss Verlag, Stuttgart. ISBN 3-8062-0771-2. 265 pp. incl. 60 Pls. Hardback. Price at 2.12.85 DM 95,-- (approx. £36 at January 1987 exchange rate).

The excavation of an Iron Age burial mound at Hochdorf has, arguably, been one of the most important archaeological studies of recent years; it took place in 1978-9 and the first publications are beginning to appear - the catalogue of the museum exhibition and now this 'environmental' volume. The latter is a handsomely-produced hardback, in convenient A4 format, and comprises two parts - first the results from the study of the charred plant remains from the Early Neolithic settlement underlying the Iron Age mound (Küster), and second the report on plant remains and animal hair which were preserved in various ways in the mound itself (Körber-Grohne). Both reports are important from the point of view of the methods used and the results obtained, and the book should be made available in all libraries of institutions where environmental archaeology is taught or practised.

I shall give a fairly detailed review-cum-summary, since many Britons read German with difficulty, or not at all; it should be said, however, that there are English summaries, and the English captions to the figures and plates.

Part 1: H. Küster. Die neolithische Siedlung von Hochdorf, Gemeinde Eberdingen (Kreis Ludwigsburg).

The Neolithic part of the site was protected to some extent by the overlying burial mound, which was originally eight metres high. Hansjörg Küster worked on the plant remains from these levels, his samples coming from the exposed sections rather than from features exposed by open-area excavation. He took almost all the samples himself, thus becoming closely involved with the site. Samples were taken from some trenches to find out whether the material was homogeneous or not. The layers with more obvious signs of charred material, and which were originally thought to be the most useful, proved to contain mostly wood charcoal. The grey ashy layers, in contrast, contained more charred seeds and other identifiable remains and so provided him with most of the 82,000 or so remains listed. Apart from charcoal and grey ash, the sediments were loess and burnt clay (Huttenlehm). The samples were of 5-10 litres, based on the capacity of a bucket. Most samples were dealt with immediately by being stood in water for a few hours, which proved enough to break them down, and then washed on sieves of 2.5, 1.0 and 0.315 mm. The charred remains were separated by a kind of washover technique and were sorted wet in the field, except for the finest fractions, which were examined in the laboratory. Archaeobotanical remains were rich and there were only two samples out of a total of 142 which did not contain any remains at all, and this suggested that charred remains were widely distributed over the 4,000 m² site.

Triticum monococcum (einkorn wheat) and Hordeum vulgare var. nudum (naked barley) were the most numerous and widespread cultivated taxa, followed by Triticum dicoccum (emmer wheat), T. aestivum s. l. (bread wheat), and a trace of Linum usitatissimum (flax) and Setaria italica (a kind of millet). Other cultivated plants included Brassica/Sinapis (perhaps some kind of cabbage or mustard), Papaver somniferum (opium poppy), Petroselinum crispum (parsley) and Pisum sativum (pea). There were also remains of plants that would have been gathered from the wild, such as Malus sylvestris (apple) and Fragaria vesca (wild strawberry), and of plants that would today be regarded as cornfield weeds, ruderals and grassland taxa. The remains were probably the result of grain cleaning and food preparation. In addition to the charred material, there were some mineralised remains, and the flora is very large for an Early Neolithic site.

The objects identified are all described, with the criteria used in identification, measurements, and often drawings given in the 23 pages of text. The plant lists themselves have been set in small, neat type and, as mentioned earlier, captions both to illustrations and tables appear in English as well as German. There are also 10 plates of photographs, so no stone has been left unturned in an effort to provide the reader with everything that might be required. This thorough approach to the publication of data is very much the norm for reports by continental workers, and very helpful to all those involved in the practical work of archaeobotany. In Britain, much of this kind of material would probably go straight into microfiche; details about the identification of specimens is nowadays almost unknown on this side of the Channel. It was this discrepancy, and the importance of publishing results in full, that were emphasised by Prof. Karl-Ernst Behre in his concluding address at the 1986 International Workgroup for Palaeoethnobotany.

The discussion section poses seven main questions with regard to the importance of the individual cultivated crops in the general context of arable farming at Neolithic Hochdorf: whether the crops were grown separately or in mixtures; the general state of the fields; how the land was tilled; whether cereal crops were harvested with the straw or whether just the ears were collected; crop-processing methods; and the way in which remains were deposited on the site.

Despite the problems of interpreting charred plant remains with the inevitable bias in favour of cereals, the presence of some nearly pure finds of einkorn and of naked barley at this site seemed to show that these crops were grown separately, and the weed floras seemed a little different, too. Emmer may also have been grown as a separate crop, though strangely it was not abundant here. The samples of mixed crops seemed to indicate secondary mixing, after harvest. The ecological requirements of the weed flora show something of the general conditions in the fields; for this, Ellenberg's 'Indicator Values' provide an objective assessment. The results show that the weeds were mostly taxa demanding open conditions with little shading, moderate to warm climate, and a range of other conditions in respect of soil moisture, pH and nitrogen content.

Some idea of the harvesting method could be gleaned from an examination of the various heights to which the weeds would have grown in comparison with the cereal crops. The presence of weeds ranging in habit from prostrate to quite tall-growing suggests that the crop, or at least the straw, was harvested at ground level. There was also some information on crop processing methods to be had from the proportions of grain, chaff, and weed seeds that were found - an idea that has become more popular in Britain with the work of, for example, Gordon Hillman and Glynis Jones. In Germany, the work of Hansjörg Küster and others must be having the same effect, linking the remains found with particular stages of crop-processing. At Hochdorf, the cereal remains were all from crops that had been threshed, but they represented various stages of winnowing, sieving, parching and pounding. This is represented diagrammatically in pie diagrams. There follows a section on the reconstruction of a kiln of the kind thought to have been in use at Hochdorf in the Neolithic - an excellent example to us of much-needed experimental environmental archaeology. Küster parched grain, then ground it lightly in a saddle quern so that the chaff could be blown away from the grain, and found this process efficient. Experiments with other possible methods were unsuccessful. He considered that the charring of the remains was the result of accidents in heating the kiln, as well as from the burning of waste chaff, weed seeds, etc. I personally wonder whether straw and weeds were not also used as fuel for the kiln, the waste from one sheaf being used in the parching of the grain from the next.

After dealing with all these questions relating to the cereals, there are still some other things to be discussed, such as the role of parsley and opium poppy as 'other crops', and the nature of ruderal and grassland vegetation (the last being represented in part by taxa indicative of soils with a low nitrogen status, perhaps the result of the use of dung on the arable rather than grazing land). The role of collected wild plant foods, like apples and hazelnuts, is not much further discussed, although the concentration of apple remains in the kiln suggests that they were being dried there - so the 'Müslī-Kultur' is not confined to modern affluent suburbs after all!

This is an impressive piece of work, especially when one remembers that it was Küster's first project. He has dealt with the subject in such a thorough and thoughtful manner that this must stand as a good example of how to treat such an important site.

Part 2: U. Körber-Grohne. Die biologischen Reste aus dem hallstattzeitlichen Fürstengrab von Hochdorf, Gemeinde Eberdingen (Kreis Ludwigsburg).

The Iron Age chieftain's burial was the main discovery at this site and the biological remains presented some special problems. The organic remains had been preserved by the exclusion of air, by copper corrosion products, or as impressions, and all were in imminent danger of further decay as soon as they were excavated. The materials preserved were also decidedly difficult to work on, since they included wood, twigs, fibres, leaf impressions, pollen and animal hairs, as well as seeds. Furthermore, some of the material was undergoing conservation for the museum, and identifications had to be made to fit in with other workers' schedules.

The report starts off with a reconstruction of the surroundings of the site at the time the burial mound was built. The evidence for this came from the brown soil layer of the old ground surface underneath the mound. Although this looked organic, it only had impressions in the loessic sediment. The plants which were lying on the ground at Hochdorf, together with evidence from pollen analysis of kettle-hole sediments in the region, allowed the author to map out something of the likely woodlands on the Schwabian hills during the Iron Age - which comprised a mixture of oak, beech, spruce and fir.

The burial chamber itself had a covering made of wood, thoroughly rotten by the time of the excavation, but it was possible to tell that had mainly been made of oak, with a little lime. Inside the chamber, under the bronze bier, were remains of twigs and other plant parts which, together with the evidence of pollen, gave an indication of the time of year of the burial.

An enormous bronze cauldron of about 500 litres (100 gallons) capacity in the grave contained an organic crust which was mostly pollen, preserved there by copper salts. A seven-page section in the report describes the honey that is thought to have been in the cauldron, in terms of the pollen composition, the time of year the plants that produced this pollen would have been in flower, their habitats (where discernible), and the amount of honey, together with a study of the beeswax.

The bier itself had a bronze frame, and it was the copper salts from this, and from other bronze objects in the grave, that had preserved much of the organic material that was recovered. The preservation was very local in effect, with fragments only surviving from what must originally have been a large amount of material. There are sections dealing with the striped hempen fabric under the corpse, a grass pillow, linen cloth fragments, and other plant parts such as leaves and seeds. The animal hairs are discussed, as is the position of all these fragments on the bier. The hair and wool, also preserved by copper salts, were often in a fragmentary state, and sometimes it was only the decayed inner layers of the hairs that were identified, the characteristic surface features having disappeared. Badger hair was the commonest, but there was also weasel/martin fur, horse hair and sheeps' wool.

There follows a section on the special finds, such as a wood and leather quiver which had been smashed when the chamber was opened. The pieces, however, showed that it had been made from black poplar (Populus nigra) root, a very light and rigid material. The arrows themselves were made of hazel, spindle (Euonymus europaeus) and other shrub woods; there was also a birch-bark hat.

The fourth section in this report is a series of specialist reports on various aspects of the material, and Prof. Körber-Grohne's descriptions and notes giving the

characters used for identification of the remains where these were in any way unusual or otherwise noteworthy. Finally, there is a two-page English summary, a sample list, a bibliography, a complete list of species, and 50 pages of plates, some of them in colour and all, except the scanning electron micrographs, by the author herself.

Naturally this is not a book to be read like a novel - nor was it intended as such. The individual sections cover various aspects of the material with great thoroughness and they all need to be read to absorb the details. One cannot really compare this report with others, since the material excavated was so unusual, but my impression is that every effort was made to study all relevant aspects of the material, much of which was extremely difficult to deal with, and to present the results as clearly as possible. It is noteworthy that these are the first specialist reports on Hochdorf to appear, particularly as I understand that Prof. Kürber-Grohne has a full teaching load on top of labour-intensive research such as this. A pity, then, that there is so little else to read about Hochdorf - to put the corpse, the grave goods and the stratigraphy into context with the plant and other organic remains.

It may be worth mentioning here that it may be possible to see some of the identification techniques described in the Hochdorf report at the conference to be organised by Prof. Kürber-Grohne at Stuttgart-Hohenheim in 1988.

James Greig

Conference Report I - A tale of two conferences

(and a certain amount of woe)

ICAZ and WAC

The International Congress of Archaeozoologists celebrated its 20th birthday by returning to the country where its first conference was held (at Nice). However, the subjects under discussion and the participants participating have undergone a radical change in 20 years, with taphonomy and hunter-gatherer sites very much to the fore. Unfortunately no participants from Eastern Europe arrived, although they received financial support, a matter of considerable regret to the old stagers amongst us, who had very pleasant memories of meetings in Hungary and Poland. The next ICAZ meeting will be in four years time in Washington, DC, the Smithsonian Institute being host, and I doubt whether there will ever be another European meeting.

The 1986 ICAZ meeting took place at the University of Bordeaux, August 25-30th, and was organized by Pierre Ducos. In fact the proceedings were marred, almost from the first, on a day-to-day basis by lack of coordination both centrally and by individual chairpersons of sessions. About 25% of prospective speakers did not turn up and as soon as the conference divided between two lecture theatres, things got out of phase and many of us missed papers we wished to hear. Senior workers from France and Germany were conspicuous by their absence, and many of the younger speakers spoiled their presentations by incoherent gabble and/or illegible slides. Some of these papers may prove to be interesting in print. Several French speakers made heroic and sometimes successful attempts to speak in English, for which I am most grateful.

Good papers were few. Louis Chaix and Annie Grant are collaborating on the study of a collection of mummified sheep originating from the Sudan and dating from 2000 BC. Elizabeth Voigt discussed the introduction of domesticated ruminants to Southern Africa. H. J. Greenfield delivered a very convincing paper on the subject of secondary products and transhumance. G. F. Izereef gave a delightful presentation of some eighteenth-century material from documented households in Amsterdam (one of which seemed to live on butcher's waste). Full marks to Hiroko Koike for an impeccably argued and beautifully presented paper on the hunting of Cervus nippon in prehistoric Japan. Brian Gardiner deduced Palaeolithic reindeer calving grounds in France similar to those now found in Alaska (I actually heard this paper in Southampton). Nanna Noe-Nygaard became somewhat Wagnerian when the timing of her presentation was changed for a third time. My own little offering was made in somewhat of a coma, far too soon after I had arrived by overnight bus, and was embarrassingly well received; the basic ruminant physiology I learned as a student 30 years ago should not have come as a revelation to professional archaeozoologists.

The domestic arrangements at Bordeaux did not contribute to the social success of the conference. The University campus is huge, and the hostel, which contained no Common Room or Bar was 20 minutes walk from the lecture theatre and refectory (which closed soon after 8 pm). The food it served was cheap but haute cuisine it was not, and the mode of presentation seemed to have been modelled on a prison canteen. Excursions to the Dordogne were most enjoyable, as was the conference dinner at Toulouse Lautrec's chateau (and so it should have been at £20). There was also the Bordeaux 'flu'-type virus, from which I was just about clear six weeks later; this may have soured my judgement.

So to Southampton, complete with a very sore throat on another overnight bus in a French style traffic jam. I have now learned the hard way why this mode of transport is about half the cost of air travel. Upon arrival, I had my wallet and chequebook stolen. Consequently I contemplated the World Archaeological Congress in a somewhat jaundiced manner.

The row between WAC and the World Prehistoric Society re the 'disinviting' of South African archaeologists is probably familiar to everybody by now. It is thought to have reduced participation by about 60%. The whole wretched matter was well aired at a plenary session held on the final day of the meeting. Apart from an overwhelming vote to support the motion that the breach with the International society should be healed as soon as possible, only about 10% of those present showed any interest in the various issues raised - such as women in archaeology. The anti-racialists were fairly effectively disarmed by placing this meeting under the chairmanship of Prof. Agrawal of India. I attended this meeting with a Polish friend, who summed up the opinion of the majority when he said 'How naïve can they get?'

As to the non-political or academic part of the conference, archaeology it was not, or at least not very often, except for the Palaeolithic period. The major themes to be discussed were Cultural Attitudes to Animals including Birds, Fish and Invertebrates (wot, no Reptiles?; it's about time the word 'animals' was not equated with 'mammals'); The Pleistocene Perspective, Archaeological Objectivity in Interpretation; and Comparative Studies in the Development of Complex Societies - in other words a large dose of sociology and hot air from those who do not like getting their hands dirty. One of the animal sessions was devoted to pastoralism and some good papers were presented. Otherwise, there was 'What is an animal', at which one speaker insisted that plants were animals because they had emotions, or so I was told (I did not attend). 'Semantics of animal

symbolism' included 'The meaning of the snake: cross-disciplinary perspectives, menstruation and the rainbow snake'. Another session on animals in Palaeolithic and later art sounded more promising, but I met its embattled chairman, Mark Maltby, outside the theatre taking a breather and he complained of mind-bending boredom. Someone at this session was overheard to say he was so glad they had got rid of those archaeozoologists with their tedious bones. Quite so.

There were sessions, however, where the participants had actually dug or carried out scientific investigations. Plant domestication and early agriculture had a decidedly Pacific bias and went like a bomb to judge from conversations overheard at mealtimes. The precirculated papers for Communal Land Mammal Hunting and Butchery sold out early on, but when I tried to find this session I met Philip Rahtz carrying a TV set out of the anticipated venue, so I desisted. I spent most of my time perspecting the Pleistocene, which was most consistently interesting, not least because it was in the hands of experienced and firm chairmen. Here, too, there was a decidedly Eastern bias, and one of the best sessions was a genuine hour-long discussion mainly between Australian and Chinese workers meeting each other for the first time, with the aid of a Japanese interpreter; the audience was as likely to answer the questions as ask them. Another Australian, losing patience with a faulty projector produced some enormous stone tools from a large holdall with which to illustrate his talk. Here, also, I heard one of the most succinct replies ever given to a question. The talk had been on the subject of a nomadic hunting family in Thailand, and the speaker, anticipating a request to describe the dispersal pattern of bone, regretted he could not do so, saying 'No. Because. Why. Him.' and projected a slide of a dog on the screen.

I also made brief excursions to the European Neolithic (dreary standard stuff) and African Neolithic to hear my Polish friend describe his Sudanese site which has produced the earliest Sub-Saharan sheep yet found. This was another genuine session with most of the participants well known to each other and seated round a table.

A little outdoor relief was supplied by excursions to Stonehenge, Danebury and the English Heritage excavations at Maiden Castle. There was an exhibition at the Southampton Art Gallery of sculptures from the intriguing Mesolithic site on the Danube, Lepinski Vir. The Mayor of Southampton also laid on a splendid nosh-up at the Art Gallery, where Andrew Selkirk was able at least partly to drown his sorrows at the lack of what he calls real archaeology. The catering at Southampton was a welcome contrast to Bordeaux.

Were these conferences worth the cost and effort? Well, it's nice to talk to one's old friends again, and it was a pity there were not more of them at Bordeaux. Southampton was an experience worth having, particularly in the company of my old friend from Poland. Neither conference had the level of interest that the AEA raised at Norwich, however, and wetlands are not exactly my subject.

Barbara Noddle

Which leads very nicely into....

Conference Report II - Norwich, 12-15th September 1986

Very flat, Norfolk, and quite the right place for the AEA to turn its corporate mind to the subject of wetlands. Fifty-nine participants attended seventeen papers (to say

nothing of an AGM and Professor Coles' concluding remarks), nobody was lost on the field trip to the Fens, and the University of East Anglia's catering failed to starve or to poison anyone. In short, the conference was a success.

Friday evening was, as usual, mostly fun. 'Hunt the Conference Office' was the first game, as this repository of room keys and information appears to be the only building not marked on the curious isometric map which the UEA sends to conference delegates. Wizard jape, that one. Eventually everyone found the sherry and began the rounds of annual/biannual greetings, followed by dinner in a refectory which could at best be described as brutally functional. The air of expectant levity was well served by rounding off the evening with Dr Francis Pryor's splendid survey of archaeology in the Fens, with its stress on teamwork. The idea that an environmental specialist should not only work on site, but actually run the excavation as well seems both excellent in principle and effective in practice.

Saturday morning brought half-a-dozen papers on techniques and interpretation of results, most of them deliberately narrow in their scope, though it was good to see the subject of remote sensing given an airing, as one feels that this is a neglected tool with considerable potential in studies of ancient landscapes. Ruth Morgan's paper on wattling was also an overdue attempt to glean useful information from some frankly unpromising material.

After lunch the conference turned to the subject of resources, and Janneke Buurmann demonstrated once again that our Dutch colleagues not only run splendid multi-disciplinary projects, in this case at the Bronze Age site at Bovenkarspel, but can lecture about it in fluent English which puts some of us native speakers to shame. No less impressive was Maisie Taylor's soggy wood problem, and her approach to coping with an awful lot of Neolithic timber. Of Andrew Jones' lecture on fish from York, what can one say? An opportune tea-break allowed the reverberations to die away, then followed two papers dealing with case-studies of the human impact on Hoveton Great Broad and the Upper Thames, respectively.

On Saturday evening a small party was treated to a selection of short films from the East Anglian Film Archive. There is something quite delightful about archive film of rural communities, not least because they are almost invariably full of useful bits of information and curious hats.

Sunday's five lectures were fairly site-specific, ranging from Somerset to North Holland, by way of Scotland. Particularly gripping was Tony Wilkinson's presentation of the evidence for Flandrian sea-level changes along the Essex coast. Surely there can be no worse fate for an environmental archaeologist than having to work in a sludgy estuary, in winter, usually at some unearthly hour dictated by tides? Does Tony's co-worker, Peter Murphy, have webbed feet? The formal part of the conference was rounded off by Professor Coles' concluding remarks. One felt that we were being admonished for something, though without quite knowing what...

Anyone who thought that Norwich was a small provincial town was disabused of this error on Sunday afternoon, when Brian Ayers of the Norfolk Archaeological Unit led a lengthy walk around the city. A Spitfire flew over at one point: probably Barbara Noddle off to her fourth conference in quick succession...

Monday was field excursion day, though only the real diehards braved a particularly chill wind [funny, it was just the same at the IWGP meeting in April! Another Ed.]. It was

a long drive to Flag Fen, as it is to anywhere in East Anglia, but the spectacle of what is already uncovered, coupled with the potential of what remains below ground, more than compensated for the journey. Regrettably, the timing of trains and planes allowed only a quick visit to Etton, though Pryor's Whirlwind Tour of this fascinating site contained a remarkable amount of information for subsequent digestion. Gradually the conference melted away by sundry means of transport, everybody seeming to have enjoyed themselves.

Staying at the UEA recalled the AEA's first conference at Lancaster: nice conference, pity about the architecture. Rooms were too hot, corridors too narrow, and enough has already been said about the refectory. Nonetheless, the programme was well balanced and ran smoothly, a tribute to Peter Murphy's excellent organization. The AGM was its usual pleasant self, steered to everyone's satisfaction by Mark Robinson, despite the vocal and mischievous Nick Balaam, whom absolute power hath evidently corrupted absolutely. Although the AEA has grown into a substantial organization, it is still possible to conduct its affairs in a friendly and informal way, and the annual conference still serves a function as much social as academic. There is always the danger that such amicability may become exclusive and introverted, but the various conference organizers over the years have managed to bring in speakers from outside environmental archaeology, and Circaea encourages a diversity of viewpoints and specialisms. On balance, it seems to me that AEA is more fun run as an informal organization, and on the evidence of the 1986 Norwich Conference, the association looks set to continue in much its present form.

In conclusion, then, it was both an enjoyable conference and an informative one. Much depends on the quality of the advance planning of meetings like these, and one suspects that Peter Murphy could give the UEA Conference Office a few lessons in efficiency. Speakers were given a categorical deadline for the submission of manuscripts, and a veteran of the Blackwater Estuary is not to be argued with!

Terry O'Connor

Miscellany

All of us are (or should be) concerned about the possibility of contamination of samples by modern materials. The following piece is a light-hearted illustration of some recent examples of modern contaminants that have come under the contributor's microscope.

Elementary, my dear Watson or The Case of the Mystifying Archaeologists

Chapter 13

That evening a dense yellow fog settled on London. The good Dr Holmes stretched himself by the fire and lit his pipe, blowing the wreaths of smoke gently up to the ceiling.

'...so you see Watson, it all happened when they discovered the mineralised wallaby turd; the chap jumped up and down with delight and the plank he was standing on broke, sending wood splinters flying [Figure 1], and he fell into the trench.'

'Did he hurt himself Holmes?'

'No, but he burnt his thumb on his cigarette as he climbed out, and dropped it very quickly [Figure 2].'

'How did you know it was a windy day - after all it was thirty years ago?'

'They were wrapping the funerary urn in plaster of Paris and cotton wool. Some of the cotton wool [Figure 3] was blown across the site and into the ditch.'

'So they weren't ancient textile fibres after all? But what was the clue from the bone pins?'

'They cleaned the site by sweeping with yard brushes. One of the pins was not bone at all, but a bristle of "kitul fibre", from a palm tree and commonly used in brooms [Figure 4] - you might know it better as the "toddy palm", the source of palm wine.'

'By the way, I meant to tell you,' chuckled Holmes 'the funerary urn had an unusual ritual feature, which would interest you. The neck was wound round with long, thin fibres - an ingenious post-burial rite caused by the growth of grass roots, long after the cemetery was abandoned [Figure 5].'

'What about the theories of the rare insect larvae which turned out to be a curl of plastic scraped from a black bucket, and the plastic string which was thought to be hemp, Holmes?'

'They melted, when a little heat was applied'

'However did you get the impression that many dignitaries visited the excavation?'

'They had smartened the area with tubs of evergreen shrubs, the leaves of which [Figure 6] blew onto the site and were nearly mistaken for an unusual imported dyeplant. The fragments had a distinct smell of almond fruit-cake.'

Watson paced the room, a furrow on his brow. He peered out at the swirls of fog drifting in the street below and condensing in oily drops upon the window panes.

'What I cannot understand, Holmes, is how they knew it was a wallaby.'

'Macropus rufogriseus??..'

Holmes poured himself another glass of port.. 'That, my good Fellow, is a story for which the world is not yet ready.'

(With apologies to the late Sir Arthur Conan Doyle.)

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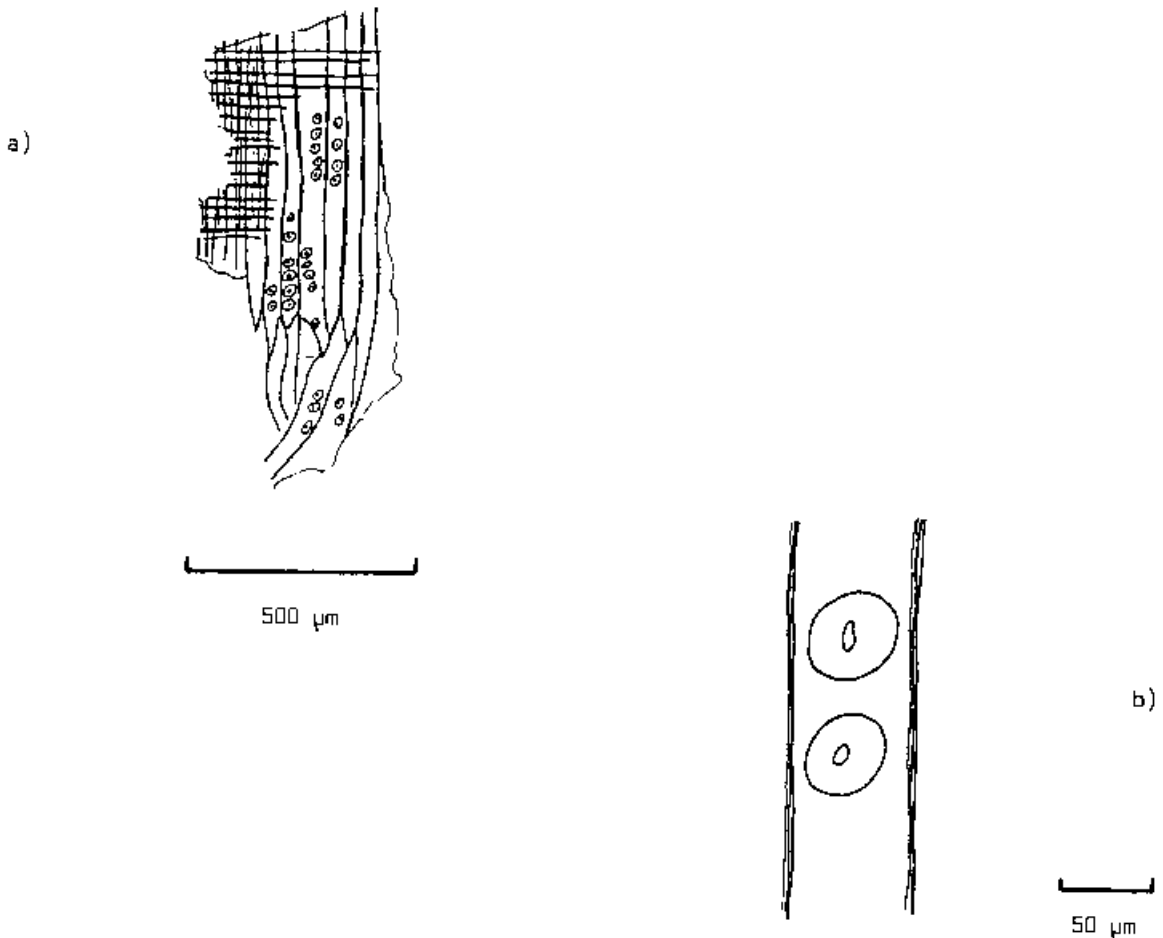
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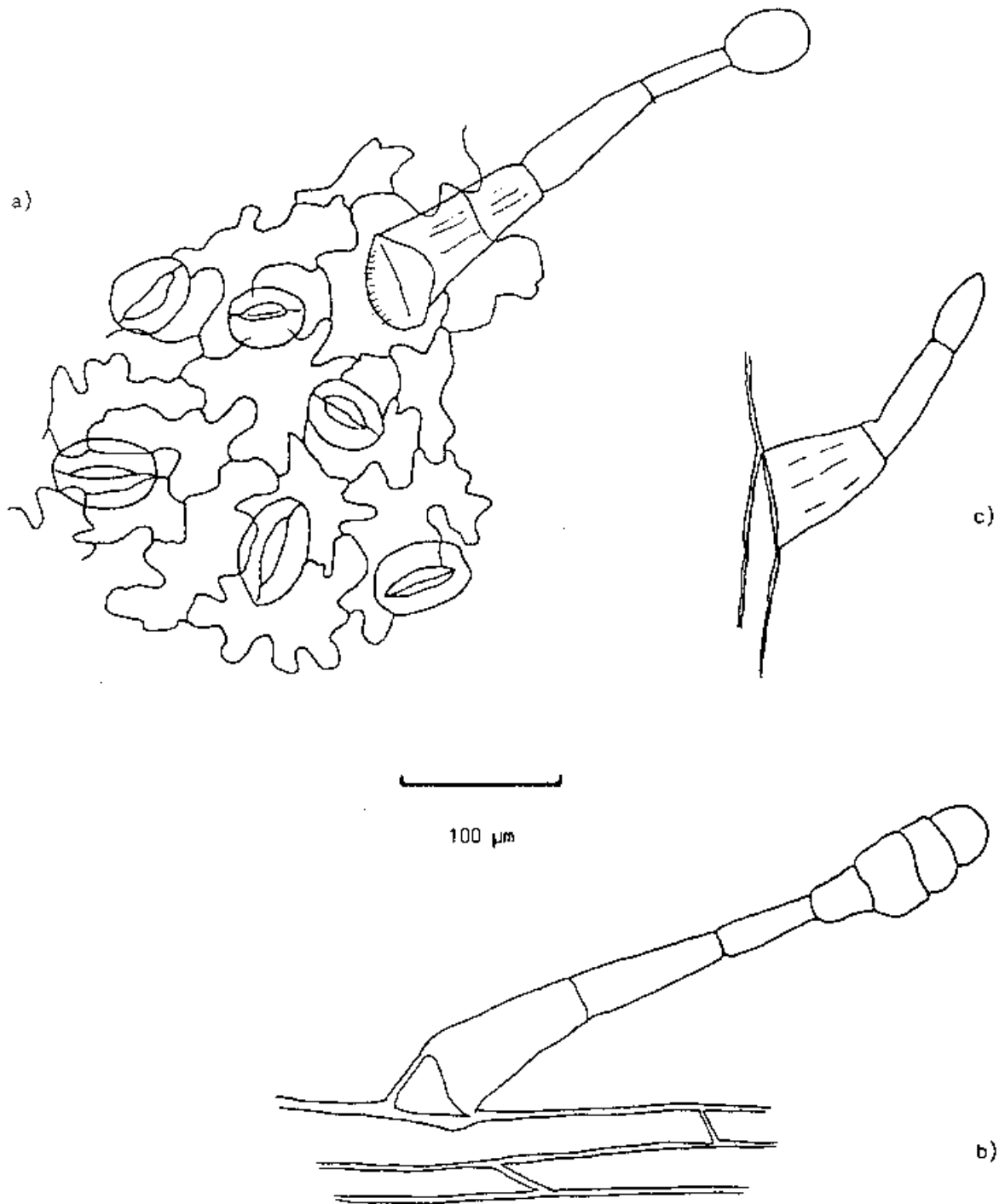
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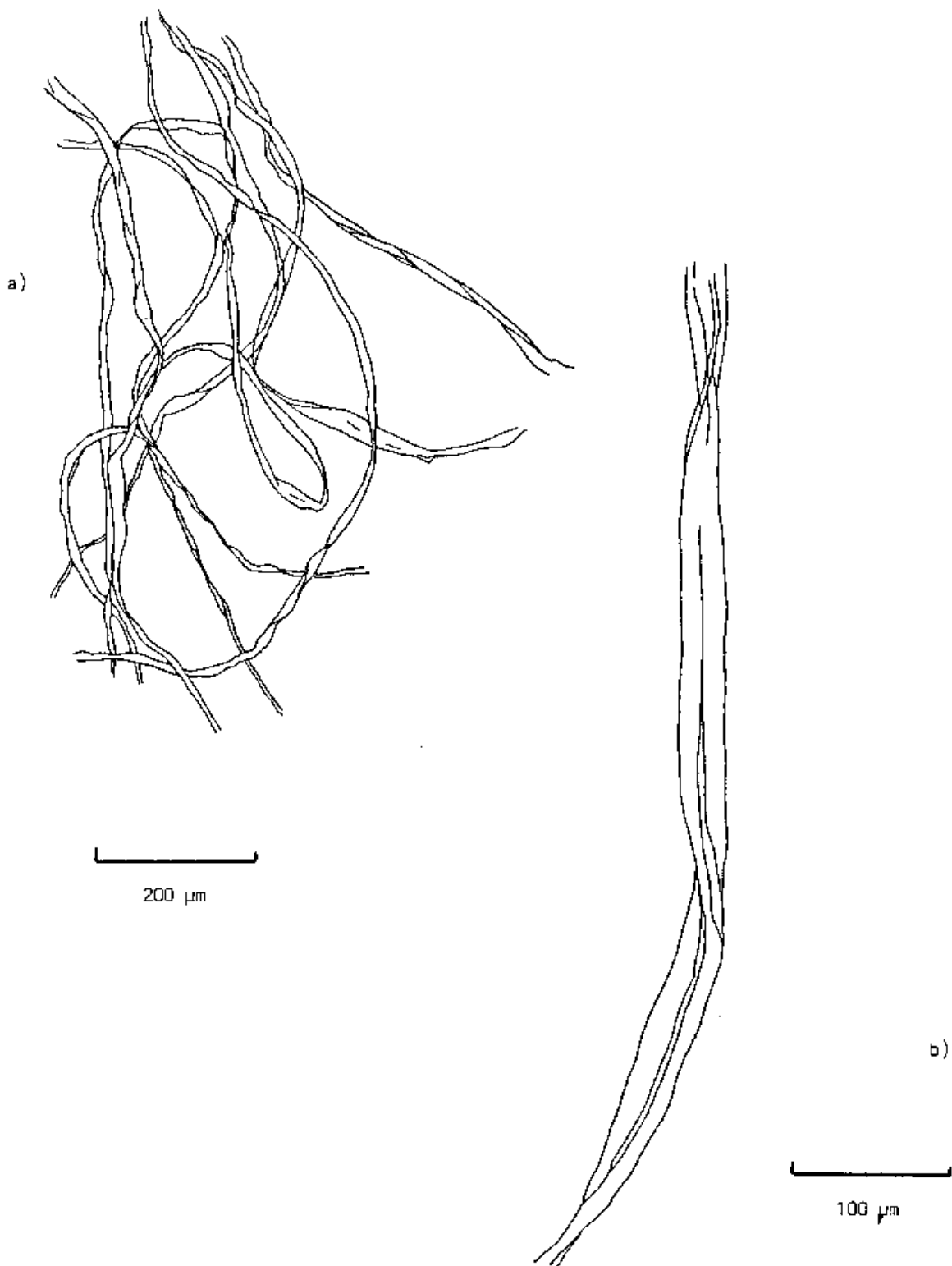
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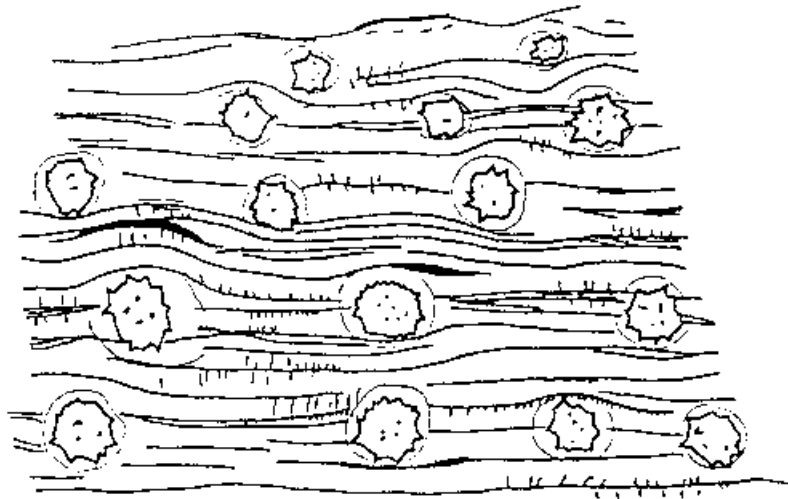
1: Small splinters of coniferous wood (probably Pinus) may be identified by the rows of large bordered pits (cf. Schweingruber 1978). Note also the crossing pattern created by the rays.



2: The leaves of tobacco (*Nicotiana tabacum*) have very characteristic glandular trichomes, with multicellular heads. The stomata and cell pattern (a) are shown with some of the glandular trichomes (b), but note that not all the trichomes are glandular (c). For a more detailed description of tobacco leaves see Moeller (1928). Cigarette paper, like most paper, is composed of wood pulp (usually softwood). The fibres are short and irregular (Anon 1975). Bordered pits may sometimes be preserved. Modern cigarette filters are composed of synthetic material (with several different layers and a paper covering). It is unlikely that a filter tip would be mistaken for plant material, if preserved. Drawing from reference material of 'Old Holborn' tobacco, courtesy of EAU smokers' league.

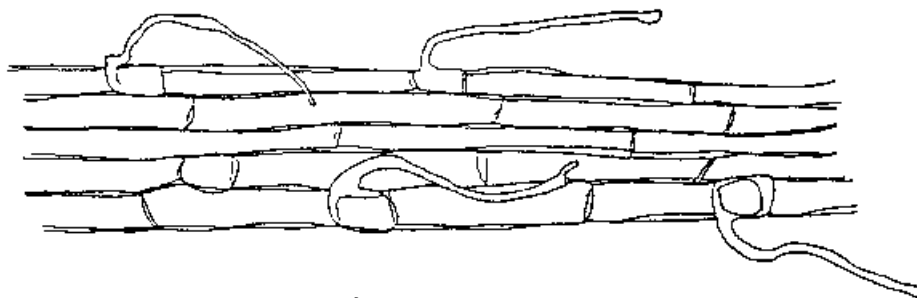


3: Cotton wool fibres are composed of the seed hairs of Gossypium spp., although modern cotton wool may also contain a proportion of man-made fibres such as viscose. Cotton fibres are distinctive because of repeated alterations in the direction of the twists (a), and the thick walls and the fairly narrow lumen of the individual fibres (b) (Schoch 1985; Anon 1975). The width of the fibres varies from about 14 μm to 25 μm (Tomlinson 1987).



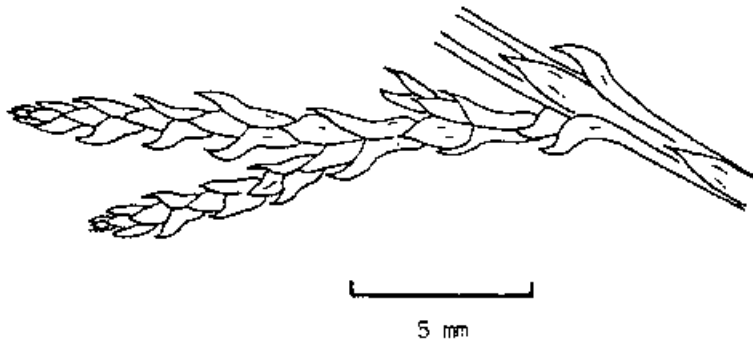
100 μ m

4: Kitul fibre (*Caryota urens*) bristles are from the leaf bases; they have a smooth, shiny surface with a slight furrow down one side. The surface cells have thick, pitted walls and there are frequent large druse or cluster crystals. The drawing shows the arrangement of the crystals. Note the very thick cell walls virtually obscuring the actual cell pattern. This is not epidermis, as these fibres occur within the leaf base.



100 μ m

5: Most rootlets are characterised by two types of cells: rectangular to oblong ones and scattered short ones, which mostly develop into root-hair forming cells (trichoblasts). Not all plant roots show this two-fold division, but many Gramineae do (Esau 1965). The cell walls are generally fairly thin. Cell shape and root-hair density vary as the root grows. Grass roots are particularly fibrous and could be mistaken for textile fibres.



6: Several species of Thuja and Chamaecyparis, planted for ornamental purposes in parks and gardens and sometimes grown in tubs, have characteristic overlapping scale-like leaves covering their stems. In some species, the stems are flattened. Species of Thuja might be identified using Mitchell's Olfactory key (Mitchell 1974, 7a); if they are modern contaminants, they are likely to retain their fragrance.

Continuing the less than serious theme, Prof. Geoff Dimbleby has sent us the following cautionary tale:

The Medicine Chest

For no particular reason (I haven't even been reading Circaea recently), the following scenario floated subconsciously into my mind the other day. Suppose that long after our nuclear war a new breed of environmentalists was exploring the deposits left by the devastation and came across an intact medicine chest from an ordinary house. On the basis of its contents their deductions could go something like this:

Antiseptics and bandages bulked large in the assemblage, so it seems that these people suffered from extensive purulent skin conditions. The discovery of a thermometer and fever-reducing drugs suggests that advanced sepsis could have been common. Perhaps it is a reflection of the climate in which they lived that they were apparently plagued by infections of the nose and throat, and even of the ears and eyes. They had severe internal disorders, as shown by the variety of antacids used to correct trouble at one end of their digestive tract, and a similar variety of laxatives and other treatments to alleviate problems at the other end. We found an assortment of devices apparently for the correction of foot deformities, from which it seems that

they may have had restricted mobility. There was a miscellaneous collection of drugs for the alleviation of pain, especially headaches and toothache. In fact there was clear evidence of mouth disorders, particularly of the teeth; from some of the evidence, it seems that some individuals had no natural teeth left. It is not surprising that they also had potions to remove unpleasant odours from the mouth.

Further investigation will no doubt add to this remarkably consistent picture of the degenerate physical condition of these people. Every day their lives must have been a complete misery of pain and discomfort as the evidence testifies. It has been suggested that the human race of that time almost seemed to have a death wish. Perhaps this analysis provides an explanation of why this population apparently wiped itself out in the way it did.

I draw no conclusion from this caricature, but I confess that I prefer not to look back at some of my own misinterpretational masterpieces.

**Report on the first meeting of the
Organic Residues Research Group
Edinburgh 14th March 1987**

A small group of archaeologists and archaeological scientists met at the Artefact Research Unit, Royal Museum of Scotland, at the invitation of Gordon Barclay (Historic Buildings and Monuments, Scottish Development Department, 20 Brandon Street, Edinburgh). The group was convened in order to discuss approaches and techniques which might be used in the study of organic residues.

The discussion centred on chemical and microscopic (pollen) analyses of organic encrustations, mostly charred, found on the inner surface of ancient pottery. In addition, recent developments in the study of waterlogged organic deposits, principally with regard to evidence of faeces and dyeplant residues, were expounded.

One objective of the meeting was to agree a set of standard procedures for the examination of pottery encrustations. However, it was decided that the range of techniques was not sufficiently well established or understood to achieve this. Until some preliminary research involving experimentation and detailed study of vessels with known contents has been completed, the available resources may not be used to best advantage. Clearly, the various people who are working on different aspects of this field need to keep in contact. The aims of ORRG should therefore be brought to the attention of conservators and perhaps also forensic scientists.

A strong feeling was expressed that a directory of active researchers and their specialisms should be produced and widely circulated to archaeologists and other archaeological scientists. Perhaps the AEA Newsletter and Conservation News should be asked to collect relevant information on other workers not represented at Edinburgh?

Andrew Jones & Philippa Tomlinson

The identification of cereals from ancient bran fragments

Camilla Dickson *

Summary

Criteria are presented for the identification of cereal (Triticum, Hordeum, Avena and Secale) 'bran' from waterlogged archaeological deposits, together with a methodology for preparing modern reference material into a form suitable for comparative purposes.

Introduction

Entire, flattened cereal grains consisting of the uncarbonised bran coats have occasionally been identified from waterlogged deposits by, for example, Körber-Grohne (1967, pls. 13, 20) and Körber-Grohne *et al.* (1983, pl. 5). In addition bran fragments have been recovered, usually from cess deposits (e.g. Dickson *et al.* (1979, pl. 1b) and Hall *et al.* (1983)), but also from rare finds of bog bodies (Helbaek 1958; Holden 1986) and calcified human coprolites. The delicate bran is, however, readily destroyed by strong reagents and drying out. For the most part the bran has not been further identified because of the difficulty in preparing reference grains and in identifying the layers present in the fragments, which usually measure less than 3 mm across. Bran fragments can be initially distinguished by the thickened, long, dark hilum seen on some fragments (Fig. 15(a)). The identification of bran from human excreta is the only certain way of knowing which cereals were used for human food as against those used for brewing or animal food. This paper indicates the possibilities and limitations of bran identification for Avena (oats), Hordeum (barley), Secale (rye) and Triticum (wheat) and also the frequently found Bromus (brome, lop-grass). Not all layers are here illustrated, only those most commonly encountered in the fossil state.

The cell layers represented in bran are illustrated by Winton (1916) and in more detail by Winton and Winton (1932). Bran layers are also illustrated in Fielding and Parkinson (1929) and Morris (1917). Useful photographs of some of the bran layers found in fossil grains are given by Körber-Grohne (1964, pl. 2). Descriptions and illustrations of the transverse (cross) and longitudinal cells of recent grains of Triticum spp. and Secale, together with transverse cells and glumes of Hordeum, are given by Körber-Grohne and Piening (1980).

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Preparation of reference grains

It is essential to prepare reference slides of cereal grains and the following method is suitable for both cereal and wild grass grains. The objective is to remove starch and aleurone and degrade the pericarp to resemble processed, cooked and digested grain. Grains are split open down the dorsal face and heated in a water bath for about an hour to soften the starch. Most of the starch can then be removed with forceps as can the outermost grain wall (the outer epidermis of the pericarp), and also, for barley, the adherent glumes. It is useful to keep small pieces of these layers as they are sometimes found fossil. The grains are then heated with 5% hydrochloric or sulphuric acid for a few minutes in a simmering water bath to loosen the aleurone. After rinsing, the aleurone and remaining starch cells are carefully brushed away.

For wheat and rye this treatment leaves the diagnostic transverse cells of the pericarp well-preserved and the testa retains its pigment. The transverse cells are frequently degraded in the fossil state; to simulate this, the acid treatment may be prolonged for about thirty minutes. This removes the cell wall thickening to varying degrees (longitudinal cells of the outer pericarp inadvertently retained will protect the cells as they do in the fossils) and may leave only faint traces of the inner walls of the transverse cells, or completely remove them as frequently occurs in the fossils. Pounding or grinding the grain, which is then simmered in water to simulate the preparation and cooking of porridge, also degrades the transverse cells of Triticum and Secale. A more drastic degradation is effected with cold concentrated sulphuric acid for two or three minutes; this also separates the two testa layers of wheat and rye. The transparent outer testa cells may superficially resemble the transverse cells of these two genera.

Uncarbonised barley grains are usually found without the transverse cells; to remove these from reference grains about fifteen minutes heating with dilute acid is necessary. The transverse cells can then be gently teased away to reveal the testa, the cell layer of barley which is most frequently preserved fossil.

Gurr's Aquamount is a suitable water-soluble mountant for material of this kind.

Figure 14. Top row, left to right: (a) Avena sativa: longitudinal cells of pericarp with hair bases (recent digested grain), x215; (b) A. sativa: testa over tube cells (recent grain), x85; (c) A. sativa: testa over tube cells (detail of recent grain), x215.

Middle row, left to right: (d) Hordeum: testa, x85; (e) Hordeum: testa cells over perisperm, x215; (f) Hordeum: perisperm and degraded testa, x215.

Bottom row, left to right: (g) Hordeum: transverse cells of pericarp, x215; (h) Bromus: top of grain with part of hilum, x21; (i) Triticum: glume bases, x3.5.

N.B. All material fossil unless otherwise indicated.

Avena (oats)

The transparent cell layers of oat bran fragments are easily overlooked but can be distinguished when the narrow hilum, 40-100(-150) μm wide, is also preserved. Fragments of the outer pericarp with longitudinal oblong cells bearing long hairs or their basal cells (Fig. 14(a)) may be preserved over the oblong, thin-walled testa cells which are arranged in groups, sometimes in a modified herring-bone pattern (Fig. 14(b, c)). However, where the pericarp has gone, the testa may degrade to show more clearly the branching hyphae-like cells of the hypoderm which are just visible above the testa (ibid.). The testa may be confused with the transparent testa layers of Secale and Triticum (which can become detached) or the perisperm of much degraded Hordeum. However, the branching tubes of Avena appear to be diagnostic for the genus and remain attached to the testa; both are figured in Winton and Winton (1932, fig. 78). The tube layer from fossil material is illustrated in Dickson and Dickson (forthcoming).

Hordeum (barley)

The testa is often darker than that of Secale or Triticum and so can often be distinguished when sorting at about 10 magnifications. The testa frequently appears to be a double cell layer (Fig. 14(e)) of sub-rectangular to oblong cells. Those close to the hilum are arranged irregularly in groups (Körber-Grohne 1964, 46, fig. 42a), becoming subrectangular especially at the ends, and oblong at the sides and back of the grain. They measure about 35-90 x 15-35 μm . Fragments which include the hilum may show a line of darker pigment parallel to the hilum on either side; similar lines can be seen on the dorsal face (Fig. 15(a)). These lines, left by the adjoining glumes, are seen on hulled barley grains; they have not been seen on naked grains. The tube cells forming the endocarp could be preserved (Winton 1916, fig. 50) between the testa and transverse cell layers described below.

Other Hordeum grain fragments may be present, each consisting of a more or less intact hilum up to 7 mm long and about 100-130 μm wide, with the testa extending from 1 to 3 mm on either side of the hilum. The very delicate cell wall is mainly of the transparent perisperm (nucellar epidermis); the degraded testa may remain as faint darker lines where the cells are irregularly thickened. Fig. 14(f) shows the perisperm cells with degraded testa underneath; most fossils are less well-preserved than this one. Exceptionally, the transverse cells may be preserved; they measure about 30-70 x 10-20 μm , in two or more layers (Fig. 14(g)).

Figure 15. Top row, left to right: (a) Fossil bran fragments from left: Bromus, Triticum/Secale, Hordeum, x5; (b) Triticum/Secale: testa with part of hilum, x215.

Middle row, left to right: (c) Triticum: transverse cells of pericarp, some cell walls replaced with fungal hyphae, x85; (d) Triticum: transverse cells with degraded pits, x215; (e) Triticum: transverse cells with pitted side and end walls over testa cells, x215.

Bottom row, left to right: (f) Secale: transverse cells, x85; (g) Secale: transverse cells showing thickened end walls over tube cells, x215; (h) Secale: transverse cells over testa layers, x215.

N.B. All material fossil

Similar transparent fragments were obtained by adding water to reference grains of hulled barley in a mortar, dehusking with a pestle, and floating off the chaff. The process was adapted from the traditional Scottish method of processing barley to thicken broth or soup described by Fenton (1978, 396). The resultant whole grain, with somewhat abraded tissues on the dorsal and ventral faces, was simmered in water for three or four hours. After subsequent heating with 5% acid in a water bath for at least five minutes, the pericarp, starch and aleurone layers were removed, leaving the hilum and now transparent testa. Pearl barley, when similarly cooked, produces rather similar testa fragments but with only about 1 mm preserved on either side of the hilum; this reflects the more thorough rounding of the barley kernel resulting from modern processing methods. Prolonged cooking seems necessary before the testa cell contents disappear and the cell walls break down into the degraded state seen in the fossils.

Secale (rye)

Unfortunately the light brown testa cells of Secale do not seem to be readily distinguishable from those of Triticum (q.v.) and bran of these genera can only be separated when the transverse cells of the pericarp are preserved. Secale transverse cells are usually shorter and deeper (70-100(-125) μm long and (15-)18-45 μm deep), and have frequent half- and smaller cells as noted by Körber-Grohne and Piening (1980). The dorsal side of the wheat grain can have small cells but these are confined to groups and short longitudinal rows. The long side walls of the cross cells occasionally retain fragments of pitting (Fig. 15(g)). The diagnostic character is the thickening which persists on many of the unpitted end walls (Fig. 15(f-h)). The cross cells are more robust than those of Triticum and dark cytoplasm is often seen especially at either end of the cells. Very degraded cells may lose their thickened end walls and both side and end walls may become thin and discontinuous before finally disintegrating completely. However, the originally thickened end walls can still be distinguished since they do not contain cytoplasm. The tube cells may be preserved (Fig. 15(g)).

Triticum (wheat)

As already stated, the testa cells of Triticum are very similar to those of Secale and the infrequently preserved transverse cells are needed to establish the definite presence of wheat. In both Triticum and Secale the upper testa layer is of transparent elongate cells, broad or narrow depending on their position on the grain, with variable end walls; the cross walls are parallel. These are arranged side by side in groups and some may superficially resemble the transverse cells of the pericarp (Fig. 15(b)). The cells of the lower testa are more or less at right angles and consist of very long cells with parallel sides and oblique or pointed ends. These cells show varying amounts of brown pigment and sometimes the remains of cork cells.

The diagnostic transverse cells of the pericarp are occasionally preserved; generally the best preserved fragments are those in which the cell walls have largely been replaced by fungal hyphae (Fig. 15(c, d)) or protected by the longitudinally elongated outer cells of the pericarp; these cells, and those of Secale, may bear hairs. The long side walls of the transverse cells usually retain fragments of pitting; the end walls may be pitted but are not usually thickened, although overlying cells may appear superficially so. The cells are mostly proportionally longer and narrower across the grain than those of Secale (70-280 x (10-)12-18 μm). The diagnostic fragments of Secale and Triticum can, with

experience, be recognised when sorting a sample, using a stereo-microscope of about x10 magnifications upwards: they are usually thicker and may have adherent aleurone cells visible. Initial sorting may be speeded by examining each thicker or darker fragment on a cavity slide. At x100 and x400 magnifications the differences will become apparent, and the identifiable fragments can then be permanently mounted in Aquamount or a similar medium. Tube cells may also be preserved between the transverse and testa cells, usually confined to the dorsal area and ends of the grain. Ubiquitous narrow tube cells are diagnostic of Triticum monococcum L. (einkorn) and are illustrated by Körber-Grohne and Piening (1980).

The transverse cells vary in length and depth depending on their position on the grain and vary to some extent between the species. As pointed out by Holden (1986), those at the apex become shorter and fatter and Triticum cells from this area may appear similar to those of Secale. If only a few problematical transverse cells are preserved it may not be possible to identify such individual fragments.

It does not usually seem feasible to distinguish the different wheat species on bran fragments alone. However, the glume bases of hulled wheats (Fig. 14(i)) may be present and the epidermal cells may be visible on otherwise poorly preserved glumes; those of T. dicoccum Schübl. (emmer) and T. spelta L. (spelt) are shown by Körber-Grohne *et al.* (1983, pl. 6), who also illustrate the transverse cells of T. spelta (*ibid.*, pl. 7).

Bromus (brome or lop-grass)

Bromus is a frequent weed of cornfields and usually present with cereal bran. The grains are dark brown and the cells usually mottled. Grains tend to split lengthwise, giving oblong bran fragments (Fig. 15(a)). Apical fragments can readily be distinguished by their radiating cells (Fig. 14(h)). Grains are illustrated by Körber-Grohne (1964, pl. 19) who includes photographs of the outer and inner cell layers.

Conclusions

It is possible to distinguish cereals on their bran fragments, with certain limitations. Triticum and Secale only seem separable when the transverse cells are preserved; since those of Secale seem to preserve more frequently than those of Triticum, the impression may be gained that rye was a crop when it was in fact just a weed. Conversely, Avena may be underestimated because of the difficulty in distinguishing the transparent fragments. Prolonged cooking of pearled barley for broth may be apparent from the delicate condition of the grain, which can be distinguished from barley prepared in other ways.

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A simple technique for sampling archaeological bone tissue

S. E. Antoine *

Summary

A simple technique for sampling archaeological bones without causing structural damage is described. This technique involves using unmodified cork borers for soft bones and a modified steel boring saw fitted to a drill for tougher ones. Samples obtained can be used for chemical analysis, dating, and diet reconstruction.

Introduction

The sampling of bone tissue by means of hacksaws or hammers usually leads to serious damage (Fig. 16, below) which may render the bone irreparable and unsuitable for museum exhibition or for other purposes. Furthermore, bones damaged by the taking of samples are susceptible to microbial attack. This short note gives an account of a simple, effective, inexpensive and time-saving technique for sampling all types of archaeological bones without causing any structural deformation.

Methodology

The technique described here involves the use of cork borers (Fig. 16, centre) and/or modified, stainless steel borers (Fig. 16, left and right) fitted to a multispeed drill. A battery-operated drill is quite suitable for use in the field. Bone samples can then be used for chemical analysis, e.g. calcium and strontium ratio estimation, dating, and diet reconstruction of ancient communities.

For soft or fragile bones, particularly long ones, a cork borer of about 8 mm diameter bore is recommended. By applying gentle pressure and simultaneous twisting, the borer is pushed slowly into the bone material in order to take the sample. This should then be transferred to a labelled plastic bag to await further analysis.

For tougher bones, a modified, stainless steel boring saw is used. An 8 mm wide and 100 mm long stainless steel tube is converted into a boring saw by serrating one end, using a small file. The other end of the tube is fitted into the drill. By applying the

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minimum rotational speed, a neat cut is made into the outer, tough compact bone material. Sampling can be continued deeper into the bone using this device if it is felt that the whole bone material is tough (Fig. 16, below). An unmodified cork borer can be used to finish the sampling if the internal bone material is spongy or soft.

This simple technique can also be used to obtain small samples from pieces of archaeological wood without visible damage.

Holes made into bones can be sealed with an appropriate filler to strengthen them or to avoid microbial invasion. Epoxy resin AY103 and hardener HY956 with an inert filler such as marble powder is a suitable filler which has minimal shrinkage and can be removed by mechanical means. This mixture is not soluble in any solvent. The resin is workable for about five hours and sets in 24 hours. Powder pigments can also be added to the mixture to match the colour of the bone.

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Why bother looking at archaeological wild mammal assemblages?

T. P. O'Connor *

Summary

Hitherto unpublished records of wild mammals from a number of archaeological sites are presented so as to make results generally available. Attention is drawn to records of species of restricted present-day distribution.

Introduction

This short paper is an unashamed 'dump' of data accumulated over the last decade and not heretofore published. Identifications of non-domestic mammals from archaeological deposits tend to be sparsely dispersed in the literature and often evade publication altogether. The potential value of such data has been stressed by Yalden (1982, 30), amongst others. In the present instance, the records described range from identifications made by the author in the course of working through bone assemblages which have not yet been published, to identifications made for colleagues who have passed on small vertebrate remains encountered during their own work. Given the difficulty of surveying the literature on non-domestic mammals from archaeological deposits, it is felt that by depositing these results, albeit in summarised form, attention will at least be drawn to their existence. In short, this paper presents some small skeletons from one person's cupboard.

A number of colleagues have been involved with the assemblages described in this paper. I am particularly grateful to Barbara Noddle and Jennie Coy for allowing me a free hand with the results.

Recovery

Specimens from two sites in York (16-22 Coppergate, Yorkshire Museum Site Code 1976-81.7, and General Accident Extension, 24-30 Tanner Row, Site Code 1983-4.32) were recovered in the course of a systematic programme of bulk-sieving (sensu Jones 1983).

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Other assemblages were gathered by fortuitous hand-collection in a range of differing excavation conditions. This should be borne in mind when comparing assemblages from different sites, and is one reason why only limited quantification of the species present on each site has been given.

Results

The summary for each assemblage comprises a list of the taxa identified, including all wild mammals except deer species, and a brief discussion. No apology is made for the exclusive use of Latin names: a systematic list with some of the commoner English vernacular synonyms is given in Table 12.

1) Wroxeter, Shropshire

Specimens from military (mainly 2nd century) and late Roman (4th-5th century) deposits, identified for Barbara Noddle. The numbers given are the minimum number of individuals, based on counts of left and right side elements without pairing.

a) Military period	MNI		MNI
<u>Sorex araneus</u>	3	<u>Apodemus</u> sp.	3
<u>Lepus europaeus</u>	1	<u>Rattus rattus</u>	2
<u>Microtus agrestis</u>	4	<u>Mustela nivalis</u>	1
<u>Arvicola terrestris</u>	1	<u>Felis silvestris</u>	2

The main interest in this list lies in the presence of Rattus rattus, indicating that this species was associated with the Roman settlement from its earliest years. Initially surprising, this early date for R. rattus is now supported by some early Roman records from York (see 4a, below; also Rackham 1979). The specimens attributed to Felis silvestris were all post-cranial, but of such size as to leave no possibility that they were domestic cat (Kirk 1936; Kratochvil 1973).

b) Late Roman deposits	MNI		MNI
<u>Talpa europaea</u>	1	<u>Martes martes</u>	1
<u>Lepus europaeus</u>	1	<u>Mustela erminea</u>	1
<u>Arvicola terrestris</u>	4	<u>M. nivalis</u>	1
<u>Rattus rattus</u>	1	<u>Felis silvestris</u>	1

A single specimen of Martes martes perhaps confirms a formerly wider range for this scarce and handsome animal. It seems likely that the Welsh border country in which Wroxeter lies was more densely wooded in Roman times, providing suitable habitats for M. martes. This species was also present in Mesolithic levels at Star Carr, N. Yorkshire (Fraser and King 1954) and Thatcham, Berkshire (Wymer 1962), at Neolithic Durrington Walls, Wiltshire (Harcourt 1971), and at the Iron Age settlement of Gussage All Saints, Dorset (Harcourt 1979).

2) Kingscote, Gloucestershire

Specimens from late Roman (perhaps abandonment) deposits in a building in the Kingscote complex, identified for Barbara Noddle. A minimum number of individuals is given for shrews and myomorphs only, based on counts of hemimandibles.

	MNI		MNI
<u>Talpa europaea</u>		<u>Microtus agrestis</u>	27
<u>Sorex araneus</u>	14	<u>Arvicola terrestris</u>	5
<u>Sorex minutus</u>	1	<u>Apodemus sylvaticus</u>	9
<u>Neomys fodiens</u>	3	<u>Mus musculus</u>	1

Chiroptera: cf. Barbastella barbastellus

The size and diversity of this assemblage, together with the absence of mustelids or Felis silvestris, suggests that this deposit represents an accumulation of owl pellets. Sorex araneus, Microtus agrestis and Arvicola terrestris were particularly numerous, so it could be argued that the owl or owls were hunting over pasture rather than woodland. In many respects, the assemblage resembles that from Caerleon, Gwent, which was attributed to barn owl Tyto alba (Scopoli) (O'Connor 1983; 1986a). A single bat humerus, probably attributable to Barbastella barbastellus, was an unexpected find.

3) Kilton Castle, North Yorkshire

Specimens from 15th-16th century levels in a well at Kilton Castle. Cranial material sorted and largely identified by Jennie Coy, post-cranial identifications and biometrical data recorded by the present author. This list gives minimum numbers of individuals based on counts of mandibles. To date, about 1200 elements have been identified.

	MNI		MNI
<u>Erinaceus europaeus</u>	1	<u>Apodemus sylvaticus</u>	17
<u>Talpa europaea</u>	2	<u>Mus musculus</u>	44
<u>Sorex araneus</u>	7	<u>Rattus rattus</u>	21
<u>S. minutus</u>	1	<u>Mustela erminea</u>	1
<u>Neomys fodiens</u>	2	<u>M. putorius/M. furo</u>	1
<u>Clethrionomys glareolus</u>	10	<u>Felis silvestris</u>	2
<u>Microtus agrestis</u>	15		

This assemblage is notable more for its size than for any unusual characteristics. Measurements of confidently identified Apodemus and Mus mandibles confirmed the greater average size of Apodemus mandibles postulated by O'Connor (1986a, 246-7), but showed appreciable overlap of the size ranges of the two taxa. It would thus be unwise to use measurements of single, toothless murid mandibles as the sole basis for identification, not least until the degree of size variation exhibited by ancient mouse populations is better understood.

4) York, North Yorkshire

Unlike the other assemblages, these records have been accumulated by the examination of small numbers of bones from each of many soil samples. To give a measure of abundance could thus be misleading. Instead, a count is given of the number of samples in which the taxon was recorded, thus giving a measure of frequency. Specimens from the General Accident Extension (24-30 Tanner Row) and 16-22 Coppergate sites will be included in forthcoming publications by the present author in volume 15 ('The Animal Bones') in the series The Archaeology of York. Specimens from deposits excavated in Bishophill/Skeldergate (site code 1973-5.14) were collected by P. J. Spencer and P. Veilleux.

- a) General Accident Extension site, Roman (2nd-early 3rd century)
(74 samples yielded identifiable bone)

	frequency		frequency
<u>Sorex araneus</u>	1	<u>Arvicola terrestris</u>	1
<u>Neomys fodiens</u>	2	<u>Apodemus sylvaticus</u>	3
<u>Lepus europaeus</u>	2	<u>Mus musculus</u>	39
<u>Clethrionomys glareolus</u>	3	<u>Rattus rattus</u>	8
<u>Microtus agrestis</u>	2	<u>Eliomys quercinus</u>	3

The presence of Rattus rattus in these deposits confirms the association of this species with quite early Roman settlement in England. Quite unexpected was the garden dormouse Eliomys quercinus. Specimens attributed to this species include four mandibles, three maxillae, and several post-cranial elements. This occurrence, apparently the first in an archaeological deposit in Britain, is described at greater length elsewhere (O'Connor 1986b). It is thought most likely that E. quercinus was imported as a culinary delicacy, being more readily available in north-west Europe than the larger Glis glis.

- b) 16-22 Coppergate, Anglo-Scandinavian (late 9th-mid 11th century)
(234 samples yielded identifiable bone)

	frequency		frequency
<u>Sorex araneus</u>	7	<u>Apodemus sylvaticus</u>	7
<u>Neomys fodiens</u>	2	<u>Mus musculus</u>	64
<u>Oryctolagus cuniculus</u>	1	<u>Rattus rattus</u>	19
<u>Lepus europaeus</u>	3	<u>Vulpes vulpes</u>	1
<u>Sciurus vulgaris</u>	3	<u>Ursus arctos</u>	1
<u>Clethrionomys glareolus</u>	1	<u>Mustela putorius</u>	1
<u>Microtus agrestis</u>	5	<u>Lutra lutra</u>	1
<u>Arvicola terrestris</u>	3		

It would be easy to dismiss the single bone of O. cuniculus as intrusive from overlying medieval deposits, though the state of preservation of the specimen and its burial context give no reason to suspect that it is intrusive. Sheail (1971) presents

evidence that the species is of post-Norman introduction to Britain, though this does not exclude the possibility of earlier importation of small numbers of individuals. The status of this one specimen must thus remain uncertain.

Sciurus vulgaris and Ursus arctos are only represented by bones of the foot: third phalanges in the case of U. arctos, phalanges and metapodials of S. vulgaris. It would appear that these bones have derived from skins brought onto the site with feet or claws still appending. The source of the U. arctos skins is debatable, since such an eminently tradeable item as a bearskin could have been imported from a considerable distance, such as from Scandinavia or elsewhere in Northern Europe. Rattus rattus seems to have been a common pest around the Viking settlement, though whether this demonstrates continuity with Roman rat populations in York or re-introduction in the 9th century remains uncertain.

c) General Accident Extension site, medieval (12th-13th century)
(57 samples yielded identifiable bone)

	frequency		frequency
<u>Talpa europaea</u>	2	<u>Apodemus sylvaticus</u>	2
<u>Sorex araneus</u>	3	<u>Mus musculus</u>	14
<u>Sciurus vulgaris</u>	1	<u>Rattus rattus</u>	9
<u>Microtus agrestis</u>	5	<u>Mustela erminea</u>	1
<u>Arvicola terrestris</u>	4		

Although the list of species is similar to that from Roman levels at the same site (4a, above), examination of relative frequency shows a change from a predominance of murids in Roman deposits to a higher frequency of Arvicola terrestris in medieval levels. This correlates with other evidence for a change in use from quite intensive urban occupation to waste ground used for refuse disposal.

d) Bishophill/Skeldergate, late medieval to early modern
(Unquantified records from Spencer and Veilleux's work)

<u>Erinaceus europaeus</u>	<u>Rattus rattus</u>
<u>Dryctolagus cuniculus</u>	<u>R. norvegicus</u>
<u>Lepus europaeus</u>	<u>Mustela putorius/M. furo</u>

This group of deposits completes the sequence for Rattus species in York by showing the replacement of R. rattus by R. norvegicus in 18th and 19th century levels.

Discussion

The main purpose of this paper is to present the results summarised above, both to inform and to stimulate colleagues to give more thought to the recovery and identification of the smaller and less abundant mammal species. A few points merit discussion, however. The record of Eliomys quercinus from York raises the whole subject of importation, and stresses the importance of keeping an open mind, and not making identifications on the

<u>Erinaceus europaeus</u> L.	3,4d	hedgehog, hedgepig, urchin
<u>Talpa europaea</u> L.	1b,2,3,4c	mole, moldwarp
<u>Sorex araneus</u> L.	1a,2,3,4a-c	common shrew, shrew mouse
<u>S. minutus</u> L.	2,3	pygmy shrew, lesser shrew
<u>Neomys fodiens</u> (Pennant)	2,3,4a,b	water shrew
<u>Barbastella barbastellus</u> (Schreb.)	2	barbastelle bat
<u>Oryctolagus cuniculus</u> (L.)	4b,d	rabbit, coney
<u>Lepus europaeus</u> Pallas	1a,b,4a,b,d	brown hare
<u>Sciurus vulgaris</u> L.	4b,c	red squirrel
<u>Clethrionomys glareolus</u> (Schreb.)	3,4a,b	bank vole, red-backed vole
<u>Microtus agrestis</u> (L.)	1a,2,3,4a-c	field vole, short-tailed vole
<u>Microtus arvalis</u> (Pallas)	(text)	Orkney vole, common vole
<u>Arvicola terrestris</u> (L.)	1a,b,2,4a-c	water vole, water rat
<u>Apodemus sylvaticus</u> (L.)	2,3,4a-c	wood mouse, long-tailed field mouse
<u>Mus musculus</u> L.	2,3,4a-c	house mouse
<u>Rattus rattus</u> (L.)	1a,b,3,4a-d	black rat, ship rat, roof rat
<u>R. norvegicus</u> (Berkenhout)	4d	brown rat, common rat, Norway rat
<u>Eliomys quercinus</u> (L.)	4a	garden dormouse
<u>Glis glis</u> (L.)	(text)	edible dormouse, fat dormouse
<u>Vulpes vulpes</u> (L.)	4b	fox, tod
<u>Ursus arctos</u> L.	4b	brown bear
<u>Martes martes</u> L.	1b	pine marten, marten cat, sweet mart
<u>Mustela erminea</u> L.	1b,3,4c	stoat, hob, ermine
<u>M. nivalis</u> L.	1a,b	weasel, rassel
<u>M. putorius</u> L.	3,4b,d	polecat, fountart
<u>M. furo</u> L.	3,4d	ferret
<u>Lutra lutra</u> (L.)	4b	otter
<u>Felis silvestris</u> Schreber	1a,b,3	wild cat

Table 12. Systematic list of species referred to in text, with key to the assemblages in which they occurred and vernacular names.

basis of what species might be expected in an assemblage. E. quercinus appears to have been imported deliberately, but small numbers of rodents or shrews could have arrived in this country accidentally at almost any period. If, for example, Microtus arvalis is not expected in Roman samples, then it will probably not be found. Not that E. quercinus was expected - prior to consulting reference collections at the British Museum (Natural History) these specimens had been pigeon-holed as 'large dormouse, must be Glis'. Mea culpa!

A second point to consider is whether the implicit assumption that species have not greatly changed their environmental preferences over recent millenia may in some cases be erroneous. The presence of Arvicola terrestris on sites far removed from watersides is well-known, and Armitage (1985, 70) has drawn attention to the surprising occurrence of Talpa europaea in urban settlements. Occasional records of abundant Clethrionomys glareolus in medieval towns such as London (Armitage 1985, 69-70) and Beverley (S. Scott, pers. comm.) also give rise to suspicions that this species may formerly have co-existed more readily with man. Perhaps medieval towns provided more of the vegetational cover which C. glareolus requires.

The field of small mammal biometry in archaeology is under-exploited, so that, for example, it is not possible to assess the likely variation in body size within and between Roman populations of Mus musculus. To attempt to measure rodent bones in the detail to which those of larger mammals are subject would be time-consuming, if not foolhardy. However, limited publication of, for example, lengths of mandibular tooth-rows in even modest samples of mice and voles would provide useful data for relatively little effort. A good example of this is Yalden's (1984) study of Apodemus specimens from Roman Manchester. Biometrical data from modern samples of a wide range of species are given by Miller (1912).

As sieving of archaeological deposits for biological and cultural finds becomes commonplace, more recoveries of the smaller wild mammals will be made. It is to be hoped that the near future will see the mice and mustelids fully integrated within bone reports as a matter of course, and not described as just an interesting footnote.

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