INTERPRETING STRATIGRAPHY 8

PAPERS PRESENTED TO THE EIGHTH STRATIGRAPHY CONFERENCE AT YORK
# INTERPRETING STRATIGRAPHY 8

Proceedings of a conference held at the Department of Archaeology, University of York on 15th February, 1996

Edited by Steve Roskams

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword and Acknowledgements</td>
<td>(i)</td>
</tr>
<tr>
<td>List of Contributors</td>
<td>(ii)</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td>1</td>
</tr>
<tr>
<td>Steve Roskams with Philip Rahtz</td>
<td></td>
</tr>
<tr>
<td><strong>As in Life, so in Death</strong></td>
<td>9</td>
</tr>
<tr>
<td>Philip Kiberd</td>
<td></td>
</tr>
<tr>
<td><strong>Death by Computer</strong></td>
<td>14</td>
</tr>
<tr>
<td>Michael Luke, Sean Steadman and Michael Dawson</td>
<td></td>
</tr>
<tr>
<td><strong>Inhumations and the Matrix: the value of stratigraphic sequences in ancient burial sites</strong></td>
<td>25</td>
</tr>
<tr>
<td>Peter Clark</td>
<td></td>
</tr>
<tr>
<td><strong>Charnel and What to Do with It</strong></td>
<td>28</td>
</tr>
<tr>
<td>Mark Whyman</td>
<td></td>
</tr>
<tr>
<td><strong>Reconstructing Stratigraphy Within Burials: the use of the planum method</strong></td>
<td>36</td>
</tr>
<tr>
<td>Philip Rahtz</td>
<td></td>
</tr>
<tr>
<td><strong>Sutton Hoo Burials: reconstructing the sequence</strong></td>
<td>39</td>
</tr>
<tr>
<td>Madeleine Hummler and Annette Roe</td>
<td></td>
</tr>
<tr>
<td><strong>“How did all these bones get in here?”</strong></td>
<td>54</td>
</tr>
<tr>
<td>Sue Stallibrass</td>
<td></td>
</tr>
<tr>
<td><strong>Dealing with Vague Date Ranges: a chronology for a Roman cemetery</strong></td>
<td>66</td>
</tr>
<tr>
<td>Peter Hinge</td>
<td></td>
</tr>
</tbody>
</table>
Foreword and Acknowledgements

These papers are, in essence, those presented to the Stratigraphy Conference held at York on February 15th, 1996. This was the eighth meeting of the conference, following its inaugural session in Lincoln in June 1992, and took as its focus the stratigraphy of burials: the fact that over 75 people attended suggests that interest in the art of stratigraphic interpretation is alive and kicking. The proceedings from the first, second and fifth conferences have been published and it is hoped to catch up with the other four sets of papers within the next six months. It was decided to proceed with the publication of this particular meeting “out of order” in an attempt to set a future trend in more immediate dissemination of results. The discussions at Stratigraphy Conferences, both formally during the meetings and, more usefully, in informal groups afterwards, have proved both dynamic and lively. However, if we are to maintain that momentum, and to ensure that the arguments and issues are taken up by a wider audience, we need to ensure prompt, and inexpensive, publication of our ideas. This work is offered as a contribution to that process.

I would like to thank all those who contributed to the success of the day, whether speakers listed overleaf, Don Brothwell who chaired the afternoon session, or Clare Angus, Bazlee Basrah Bee and Liz Muldowney, MA students in Field Archaeology, who shouldered much of the responsibility for domestic arrangements. Thanks also to colleagues Jane Grenville, Julian Richards and Kate Steane for taking the time to comment on various parts of the text.
List of Contributors

Peter Clark
Deputy Director
Canterbury Archaeological Trust
92a Broad Street
CANTERBURY CT1 2LU

Philip Rahtz
Professor Emeritus
Dept. Of Archaeology
University of York
King’s Manor
YORK YO1 2EP

Peter Hinge
Computing Section
Museum of London Archaeology Service
Walker House
87 Queen Victoria Street
LONDON EC4V 4AB

Steve Roskams
Dept. Of Archaeology
University of York
King’s Manor
YORK YO1 2EP

Madeleine Hummler and Annette Roe
Sutton Hoo Research Trust
Dept. Of Archaeology
University of York
King’s Manor
YORK YO1 2EP

Sue Stallibrass
Dept. Of Archaeology
University of Durham
Science Laboratories
South Road
DURHAM DH1 3LE

Phillip Kiberd
Assistant Manager, Field Services
Tempus Reparatum
29 Beaumont Street
OXFORD OX1 2NP

Mark Whyman
York Archaeological Trust
Piccadilly House
55 Piccadilly
YORK Y01 1PL

Michael Luke, Sean Steadman, Michael Dawson
Beds. County Archaeological Service
St Mary’s Church Archaeology Centre
St Mary’s Street
BEDFORD MK42 0AS
Introduction

by Steve Roskams with Philip Rahtz

"We can burn her, bury her, or dump her" (Monty Python, n.d.)

"What could be more universal than death? Yet what an incredible variety of responses it evokes. Corpses are burned or buried, with or without animal or human sacrifice; they are preserved by smoking, embalming or pickling; they are eaten - raw, cooked or rotten; they are ritually exposed as carrion or simply abandoned; or they are dismembered and treated in a variety of ways. Funerals are the occasions for avoiding people or holding parties, for fighting or having sexual orgies, for weeping or laughter, in a thousand different combinations. The diversity of cultural reaction is a measure of the universal impact of death; always it is meaningful and expressive." (Huntington and Metcalf 1991, 1)

Human behaviour surrounding death has been prominent in archaeological research since the earliest days, so aspects of the stratigraphy of burials seemed an obvious focus for the latest Interpreting Stratigraphy conference, held at York in February 1996. The manifestations in the burial record which we study represent the residues of a long sequence of social activity, beginning with death and extending through and beyond the disposal of the corpse, via processes of decay and other natural and cultural transformations, to the uncovering of a body, either as a skeleton or a cremation deposit, in our fieldwork.

Our aim as field workers should be to use stratigraphic study to reconstruct all aspects of the burial process, together with any subsequent activities in and around the grave. The papers presented at York, most of which are published herein, discuss important new developments. But they also urge some cautions: in showing that we have come some way, they reveal that we still have far to go. Recent changes in government policy have had important, indeed traumatic, effects on the general organisation of the fieldwork profession, and one might wonder whether this will help or hinder further progress: here, only time will tell.

This piece is meant to act as an introduction to the papers given on the day. In the process, it incorporates the views of Philip Rahtz on some aspects of the history of stratigraphic analysis of cemetery data (the latter were presented as a short, introductory talk at the conference and Philip made his notes available to me subsequently: hence the authorship). In addition, I have tried to mould the various contributions into a wider, though still brief, commentary on certain aspects of mortuary studies in general, and the rôle of burial stratigraphy in particular. On reflection, the resulting bibliography has a rather parochial feel and the works mentioned will probably be well known to many. However, I do not pretend a full coverage and a British bias is, perhaps, inevitable, given the areas of interest of most readers. Thus, even as a personal view of some topics which might deserve further attention, I hope it introduces an important, indeed vital, sub-discipline of archaeology.

Archaeologists have become interested in the process of human burial because it elucidates
economic, social and religious forces within the community. Indeed, for certain periods of the past, burial practices are the sole evidence of such structures. As a result of this interest, we have some understanding of mortuary practices for many stages of human development in Britain. Hence evidence from prehistoric periods, though variable in extent and quality, has elucidated the political and symbolic significance of burial monuments in Neolithic and Bronze Ages (Darvill 1987 provides a convenient summary, Bradley 1984 a more demanding, interpretative synthesis). Equally, the relative paucity of Iron Age evidence (Whimster 1981 notwithstanding) is a reminder of the problems of negative evidence, here as elsewhere in archaeology. For the Ancient World, our understanding can be augmented by documentary evidence. Hence Toynbee 1971 shows what is known of death and burial in the Roman Empire as a whole, a topic given a more regional, archaeological face by the recent studies of Britannia by Philpott (1991) and others.

Early medieval cemetery studies (Halsall 1995) are the main, and in some centuries the only, source of evidence for many post-Roman societies in Western Europe. When placed beside research into later periods, these can also help us to understand a series of related topics: changing belief systems and the impact of Christianity; the control of high medieval burial practice represented by growth of graveyards around churches; the increasing importance of more esoteric, but equally vital, theological concepts such as the so-called ‘Birth of Purgatory’ (LeGoff 1984) in later medieval society; and, later still, the growth of religious distinctions within Christianity such as non-conformism, reflecting the growth of new class divisions under capitalism (Basset 1992 provides insights into some recent archaeological work up to 1600, Harvey 1993 a résumé of the 12th to 16th centuries, and Litten 1990 a highly “individual” account of the 15th century and later). The conference paper given by Graham Keevil discussing “Stratigraphy and Phasing in Medieval Cemeteries”, which it was not possible to reproduce here, showed how stratigraphic excavation of Christian and other medieval burials has made a vibrant contribution to these debates, a process which the investigation of post-medieval cemeteries such as Spitalfields (Reeve and Adams 1993, Molleson and Cox 1993) elaborates further.

In all of the periods mentioned above, the archaeology of mortuary practices has benefitted considerably from the application of paradigms developed within adjacent disciplines, notably sociology and anthropology (as demonstrated in the (non-Pythonesque) reference quoted at the start). The paper by Phil Kiberd, “As in Life, So in Death”, is a reminder of how important anthropology remains to various areas of archaeological interest (even if I am, personally, less enthusiastic about his post-processualist notion that human society is merely the sum of its individual, human parts. Equally I am unconvinced by the increasingly frequent trend in archaeology to see ideological dynamics as a force in their own right. Some societies had a belief in an afterlife, and this no doubt often influenced their burial practices. However, such beliefs are by no means universal and, when interpreting archaeological evidence, it is important to take note of the material conditions which engendered a need for them: people invent god(s), not vice versa, and do so in particular circumstances! However, cf Kiberd’s post-script: I am, no doubt, one of the “western cynics” mentioned there).

As a result of such inter-disciplinary work, a whole series of theoretically-informed case studies have been generated, for instance those presented in the volume edited by
Chapman, Kinnes and Randsborg (1981). The levels of analysis adopted range from the micro- (grave goods and their positions, for example: Pader 1982) to the macro-scale (the distribution of high-status graves in the landscape and their implications for chiefdom territories in early medieval Norway: Myrhe 1987).

However, such studies have in turn demanded not only a greater volume and range of data from the fieldworker, but also much more contextual and stratigraphic information. At the same time, the general professionalisation of archaeological fieldwork within Britain in the last 25 years has increased the need to blend the activities of different excavators into a coherent process of work, to record systematically, and to integrate different forms of evidence from different types of site. Thus demands for increased intellectual rigour, derived in part from detailed case studies in anthropology, and organisational changes within archaeological fieldwork have interacted to demand an end to haphazard recording methods (an excellent example of the symbiotic relationship between theory and practice).

It is clear that the field profession has been successful, at a general level, in meeting this demand for greater rigour, as evidenced by the manuals on field methods published by many archaeological units (Hammer 1991). In addition, because of the sheer volume of data involved and the tripartite need to manipulate it efficiently, to test the statistical significance of any resulting patterns, and to present interpretations visually as well as textually, there has been an impetus to adopt computer storage of information, including its spatial characteristics. The paper “Death by Computer”, by Michael Luke, Sean Steadman and Michael Dawson, demonstrates the continuing process of development here. Yet it would also be fair to say that, in mortuary studies, the main impact of this more systematic approach has been seen in the technical spheres of recording skeletons or church monuments, rather than in the stratigraphic analysis of burials.

Thus there are books on how to dig up and analyse skeletal remains (Brothwell 1981) and on the archaeology of disease (Manchester and Roberts 1995), plus papers on decay processes (Boddington et al. 1987) which lead to a concern with forensic archaeology (Hunter et al. 1996). However, the implications of the work on skeletal remains are mainly confined, for all the wrong reasons, to the activities of the environmental scientist, rather than related to wider social and economic developments. Further, the note reproduced here by Pete Clark on “Inhumations and the Matrix” shows how difficult it can be to take this next step towards wider interpretation. He questions whether palaeopathological analysis merits the resources it sometimes receives, though the really important lesson of that experience might be his final one: where fieldwork takes place without an explicit, and sufficiently focussed, research agenda, we are always likely to be disappointed.

Equally, others have attempted to systematise the recording of graveyards (Jones 1985), and advocated the pursuit of a “Church Archaeology” (Rodwell 1989). Yet the discussion of graveyard monuments and church buildings, though providing important architectural and structural interpretations, too often shows limited concern with associated burials per se. Thus very little has been published on the recording and study of stratification of individual graves, even in major textbooks such as those of Harris (1989) or Barker (1993). Rodwell (1989, Ch.9) is an honourable exception, though the experience of Mark Whyman, expressed
in his “Charnel and What to Do with It”, would advocate more careful recording of disarticulated bone than Rodwell recommends there.

What we have seen is the exposition of grave recording, notably by drawing, photography, and pro-forma analysis. This has engendered the production of pre-printed burial forms for specialist use, to set beside the deposit, cut, masonry and timber forms used in many organisations today. Though welcome in themselves, such additions do not lead, in some inevitable way, to increased attention to stratigraphic relationships between burials or within individual graves. Thus simply having a specialised recording form may be necessary, but is certainly not sufficient, to provide solutions to all of the problems which study of human burials throw up when trying to designate appropriate descriptive criteria or to record grave stratification.

In the past, where work on burials has created an interest in stratigraphy, this has revolved around attempts to interpret the meaning of what is called, rather misleadingly, horizontal stratification (really the analysis of the spatial development of cemeteries), coupled with such general stratigraphic relationships as may be apparent. Thus at Cannington, the remains of a cemetery which may have had upwards of 1000 graves, there was only a very small number of intercutting graves in what is predominantly a row-grave cemetery of the 4th-8th centuries. There were, however, stratigraphic relationships between graves and buildings, between graves and craft residues and, most importantly, a nuclear slab-marked grave mound and a path leading to it. It is perhaps worth pointing out, as this cemetery is still in the final stages of analysis (Rahtz, Hirst and Wright, in prep.) that in the 1960s the Inspectorate of Ancient Monuments, the then equivalent of English Heritage, was very reluctant to finance the excavation of Cannington in advance of quarrying, since there were so few grave-goods. It was only through the personal intervention of Don Brothwell that it was dug, because he emphasized the importance of recovering a large sample of human skeletal material from this area and of this period.

When it comes to the identification of stratigraphic relationships as conventionally defined, that is in terms of vertical relationships, the vast majority of graves excavated in the past have been either associated with structural remains, such as barrows or mausolea, or defined as cuts in other strata, especially undisturbed natural deposits. It has usually been assumed, until recent decades, that the fill of a grave, whether a homogeneous deposit or a mixed one, is that which came out when the grave was dug, replaced after a varying interval of time (in modern burial this is one or two days).

Hence stratification of the grave fill was not normally the subject of study. Excavation, at varying speed, had as its object simply the defining of the burial itself - a skeleton or a cremation, a container or artefacts. Even in Denmark, where digging intact stratification is regarded as the equivalent of destroying a document, graves in churches are partially emptied to provide a section allowing study of the layers through which the grave was cut. Yet little serious attention was given to any stratification within those very grave fills removed to provide this preview.

At one time even relationships between individual graves, crucial to the establishment of cemetery and artefactual seriation, were only recorded when one grave was seen clearly to be secondary to another at the level of the natural. In the late 1950s, however, Brian Hope-Taylor sought to develop excavation of burials further. One of the
most skilful archaeologists this country has produced but one of the least known to the present generation, he was, for a brief spell, a lecturer at Cambridge and two of his pupils were the young Peter Addyman and Martin Biddle. Hope-Taylor pointed out that, in certain circumstances, the intercutting of upper grave fills could be recognised, and thus that relationships could be demonstrated, above the level of the natural.

Furthermore, though allowing that this intersection might be recorded in vertical section if a baulk or trench edge happened to be in the right place, he suggested that such relationships could be worked out more consistently by drawing successive plans of soil patterns in a horizontal plane and reconstructing the stratification in three dimensions. Even today, it might be accepted that the most rigorous definition of deposits in the single context method might not succeed in distinguishing primary from secondary grave fills, especially where graves are dug through similar deposits. Although Hope-Taylor made a big impression with his lectures, he did not publish them. Even his famous Yeavering monograph (1977) gives little detail on the hundreds of graves excavated there, nor any exposition of the principles involved.

The stratigraphic study of relationships between graves, and of the deposits above interments, are two facets of the history of mortuary method. A third concerns the stratigraphic residues of the burial itself, together with any container such as a coffin. Advances here also date from the 1950s. Dutch archaeologists had long studied the stratification well-displayed in clayey soils under heath-land barrows, and have defined anthropomorphic and other silhouettes where no bone had survived (Clark 1960, 118-19). A British example from 1953, at Bishop's Waltham, is provided by Ashbee (1960, 90, fig 27), using horizontal excavation. This technique was also attempted in 1958 at Little Ouseburn, Yorkshire (Rahtz 1989) and described more fully here by Philip Rahtz in "Reconstructing Stratigraphy within Burials: the use of the planum method".

More recently, the approach has been brought to a fine art at Sutton Hoo, in dealing with both `sandpersons' and soil-marks of associated artefacts, as discussed by Annette Roe and Madeleine Hummler in "Sutton Hoo Burials: reconstructing the sequence of events". This paper also includes an account of the highly individual approach to remote sensing used on the site, particularly that which allowed the initial identification of Mound 17. If more projects were prepared to report such experiences, we would be a fairway to putting scientific advances to the "Fore!".

Over the last three decades, thousands of Christian graves have been dug, notably by Warwick Rodwell (probably top scorer with over 3,000) and the Biddles (see the seminal work by Kjøblye-Biddle 1975). The earlier publications of large Roman cemeteries in York (Trentholme Drive: Wenham 1968), Winchester (Lankhills: Clarke 1979) and Cirencester (McWhirr et al. 1982) can now be set beside recent studies of Roman Poundbury (Farwell and Molleson 1993), early medieval cremations at Spong Hill (Hills 1977ff - though precious little was said about cremations at our meeting, despite the fact that there was considerable debate at the time of excavation about whether these cremations should be dissected stratigraphically) and the recent, fine study of Jewbury (Lilley et al. 1994), again in the City of York. The last example also raised a series of vexed ethical issues which often occur when dealing with human burials in the context of complex political processes. Hence these matters have also surfaced further afield, for example in Israel and even on the other side of the Atlantic (Kaufman
The publications just mentioned represent substantial achievements, and major, more general advances in mortuary studies have meant a move away from artefact-dominated approaches towards a holistic appraisal of such behaviour, paralleled by the rapid development of the associated physical anthropology. Yet there are still relatively few publications of cemetery data to the standards needed today, even for such basic things as the precise location of artifacts in relationship to body, container or structure (Hirst 1980). More often, detailed finds studies stand in isolation from each other. Here, to stretch the theme somewhat, the question tackled by Sue Stallibrass - "How did all these Bones Get in Here?" is an excellent example of how useful it can be to relate such specialist studies to each other, in this case concerning animal bones in relation to pottery, glass and leather. Clearly, fuller contextual analysis is the only way to come to grips with complex formation processes.

By the same token, the paper by Peter Hinge "Dealing with Vague Date Ranges: a chronology for a Roman cemetery" demonstrates the importance of taking a more sophisticated approach to integrating dating derived from finds, here Roman ceramics, with complex sequences of grave digging. Indeed, the techniques developed there could be usefully extended to other spheres. An obvious case in point concerns data on skeletal ages where, for technical reasons, the age ranges come in one form, with particular cut-off points. Whereas we may know that the society which we are studying classified the ages of its population very differently. Applying Hinge's methods here may allow manipulation of data in a more meaningful way.

Recently, as we are all aware, the government has moved from funding organisations and people to funding archaeological projects. Whatever their intention in doing so, one of the few good things to come out of this is that projects facilitate meetings of team members, and thus allow greater discussion between specialists. Perhaps we can look forward to more integrated, contextual analysis of sites than was thought feasible previously.

The study of grave stratification, allied to other data, has brought about a transformation in our understanding of death in all centuries, and the surprising diversity of mortuary behaviour has been revealed, especially in recent large excavations. Our aim is to reconstruct the whole sequence from the status of the ground before the death occurs, through the planning process of authorization of the grave-digging and the reasons that determined its orientation, character and form, the preparation of the grave for its inhabitant(s), then the act of interment of body and container, with any special rites or offerings, followed by the filling-up or sealing of the grave and the ensuing post-depositional processes. All this we may hope, usually in vain, to reconstruct from stratigraphic study. The papers presented below provide some ways forward, but show clearly that there is also much to do.
Bibliography

Ashbee, P (1960) *The Bronze Age Round Barrow in Britain* (Phoenix, London)
Clark, J (1960) *Archaeology and Society: reconstructing the prehistoric past* (3rd ed), (Methuen, London)
Clarke, G (1979) *The Roman Cemetery at Lankhills, Winchester* (Winchester Studs. 3, O.U.P.)
Halsall, G (1995) *Early Medieval Cemeteries: an introduction to burial archaeology in the post-Roman west* (Cruithne Press, Glasgow)
Hills, C (1977+) Various monographs on Spong Hill in *East Anglian Archaeol.* Vol.6ff
Hope-Taylor, B (1977) *Yeavering, an Anglo-British centre of Early Northumbria* (DoE Report No.7) (HMSO)


Myhre, B (1987) "Chieftains' graves and chieftdom territories in South Norway in the Migration Period" in *Studien zur Sachsenforschung* Band 6, 169-87


Rahtz, P, Hirst, S and Wright, S (in prep.) *Cannington Cemetery*


Toynbee, J (1971) *Death and Burial in the Roman World* (Thames and Hudson, London)

Wenham, L (1968) *The Romano-British Cemetery at Trentholme Drive, York* (HMSO, London)

In Life, So in Death

by Phil Kiberd

Introduction

The overall aim of this paper is to raise ideas which examine why people are buried as and where they were. It will therefore explore a range of issues and is not intended as an exhaustive list but rather as a prompt towards a broader view of cemetery studies. Being an attempt to look beyond the purely physical contents of burials, it tries, as Iain Macleod and Trevor Cowie write in the February newsletter of the Society of Antiquaries of Scotland, "to think further about the people behind the artefacts" (Macleod and Cowie, 1996).

It has been the trend in recent years to view burial and funeral rites as directed by the living for the living, with the dead person being increasingly forgotten (Henig 1980, Philpott 1991). However, once a person dies, they do not become neutral, either in physical or psychological terms. Indeed, in many, if not most, societies, the transition of the deceased to his/her soul state was likely to have been the prime reason for burial, with or without political manoeuvrings behind the scenes. Both today and in the past there were clearly two worlds, that of the living and that of the dead (Frazer 1951, Hole 1995, Morris 1989) and it is the dead as much as the living who direct and directed the burial act. Hence much of the activity seen around the grave was to placate the dead and their spirits and all of these acts created the later stratigraphies which we see as archaeologists.

There are three broad stratigraphic themes which I wish to explore: the stratigraphies visible within the human skeleton; the grave goods and the individual; and, briefly, the grave/tomb itself and its effect on subsequent stratigraphy. All three elements rest on the premise that stratigraphy is not purely the study of superposition, but ultimately the determination of those processes, events and actions in the past which led to the assemblages which we uncover: it represents an attempt to see the thought processes behind the actions.

Skeletal Information

The most notable thing about most burials is the presence of a skeleton. Immediate stratigraphies can reveal how and in which order the body, grave goods, coffin and so forth were placed in the ground and what happened to them taphonomically. Osteological analysis after excavation can take stratigraphy a step further by revealing clues about the environment and conditions in which each individual, and consequently a population, lived.

The presence of disease in a skeleton can provide information on the society and what events occurred to individuals and cemetery populations. This in turn can have a bearing on associated settlement patterns and spatial and structural organisation (Cohen 1989). At an individual level it may be possible to see classes/ranks of people via their teeth wear, general health, and differences in disease types which suggest differential access to resources. The knowledge that there were clearly different classes can help to assess settlement organisation (Manchester 1983, Manchester and Roberts 1995). The bone evidence can also tell something about behaviour. Palaeolithic Hominid studies, for example, which
compare skeletons from Neanderthal and Modern Human specimens can elucidate different behaviours in each group and consequently suggest which site types are likely to be associated with which hominid (Stringer and Gamble 1993, Tattersall 1995). In multi-layered cave sites where both species co-existed over time, this can be very useful in separating out stratigraphies.

Some diseases are visible on human bone, others are not (Manchester 1983, Manchester and Roberts 1995) but the recognition of disease may help in understanding sudden changes in burial or settlement. Severe infectious diseases will kill a person before any bony changes occur, and hence remain invisible osteologically. However, they may be inferred from sudden changes in the burial record - increases in numbers of individuals of the same age or sex, sudden gaps or mass burials. When first introduced into a community, disease can have a devastating effect on a population, both physically and emotionally. Where high levels of death are prevalent, communities may fragment or radically change and burial patterns may also reflect this.

A good example in recent times is the effect of smallpox on populations who came into contact with Europeans in the last two centuries. In 1770, in South Africa, the Xhosa people were hit by such an outbreak (Peires 1989), which radically changed their latent fear of death to one of extreme horror. As these responses were mixed with a recent conversion to an adapted-Christianity, they first interred their dead away from their specific burial grounds and ultimately stopped burying them. Equally in America similar disruption to social and economic life occurred because of smallpox. The outcome of such incidents in the archaeological record would be sudden gaps or changes in cemeteries, and confusion in stratigraphy. Another example can be seen in building styles in those areas prone to malaria in South-East Asia, where houses are raised up on stilts, reflecting the need to keep the cause of the disease at bay (Cohen 1989).

Further, disease recognition in individuals may give clues as to how they were treated and thought of in life, and consequently why they were buried where and how they were. A good, if obvious, example concerns those suffering from leprosy. Leprosy is a disease which is not present at birth but which develops steadily through life. It is however very conspicuous in its later stages and thus singles out individuals who may then have been treated differently by society (Manchester 1983, Manchester and Roberts 1995). In Cameroon, for example, three-footed pots for cooking men's meat and the individual's black-burnished eating bowl are smashed on the grave of male lepers (Barley 1991). Consequently a specific stratigraphy for leper graves would be noticed in the archaeological record.

**Grave Goods**

The second theme, that of grave goods, must be understood in the light of fact that attitudes towards those who are different extends to all members of society, not just those who are obviously distinctive physically. Society is a collection of individuals, who react to each other through the cultural interpretation of the society into which they are born. This in turn leads to individual actions, sequential events, which separately create the record we uncover. In human society, the world of the living is also inextricably linked to the world of the dead. People in death do not/ did not simply disappear but carried on their roles in the next or other world.

Variations in grave goods give clues not only to gifts to the dead but to the rôle of the living and the rôle of the dead. As with physical disease, those rôles most visible
through grave goods will relate to individuals who performed specific functions in society. Burials are likely to reflect status in life whether this be determined by rank, from king to slave; by sex, male, female or non-gendered; or in age, from newborn to child, to sub-adult, to adult, to elder. Age in society is not, strictly, a clinical definition but a cultural one. In many societies an adult is someone older than 12-14 years who has undergone initiation. Those who do not partake are considered still to be children and therefore are likely to be buried as such. Equally, different classes or types of people, for example those singled out for shamanism or blood brotherhood, would undergo different initiations, and thus lifestyles or associations which may be reflected later in the grave (Pearce 1985, Vansina 1990).

The status in life may be reflected via the symbols within the grave. Cultural environment effects the clustering of goods and the clustering of people. Equally those with special powers, such as kings or shamans, may be accorded specific burials, often with distinctive goods. In death these individuals become, not neutral bodies, but the temporary resting places of the soul or spirit. People fear the dead more than they fear death and this fear can be observed in burial custom. In South Africa, for example, Zulu warriors are buried resting on their right side so that they cannot reach out and stab passers-by (Werner 1995). In that society warriors carry their assegais in their right hand and their shields in their left, so a left-handed male would be considered unusual or abnormal, and potentially someone to be feared or mistrusted, for example a witch doctor. This distinction may well be recognisable in the grave, if we know what to look for. Also in Zulu graves, pots may be buried which carry bumps and ridges, to represent the scars on the person’s body which reflect status. The pot, in death, expresses the status of the individual in life (Barley 1991).

In Alaska, the shaman was seen amongst the Eskimo as a powerful person, both valuable and dangerous - and perhaps most dangerous in death. Shamans can be detected in the grave by the presence of masks over their skulls, which are part of the burial process and serve to seal off the dangers of the dead from the community (Fagan 1991, Pearce 1985). It is interesting to note that, in many prehistoric societies from Egypt to Central Europe, the mask is often associated with certain individuals suggesting that there was a widespread fear of direct contact with powerful figures in life and death (Hodder 1990).

The stratigraphy of grave goods can be fitted into seen as forming several broad themes. First there is the body itself. People rarely die and become buried as the fell, but are lain out for interment. This body position is therefore important, whether prone or supine, flexed or crouched, complete or decapitated, perhaps in many Roman cemeteries to release the spirit from the shoulders (Philpott 1991 - a tradition which also occurs in New Guinea in the modern day). The arms or legs may also be symbolically positioned - arms across the chest may indicate rank or status, for instance clasped as a symbol of authority, honesty and communication with a higher authority. Secondly the presence of items on the body - clothing, jewellery and so forth - need to be considered. Are they added at burial or do they represent items worn in life? Are they the clothes of the living or of the dead (Glob 1969, 1973)? Grave goods can also occur both in the coffin, and on it, as with the placing of nails, buckles etc. on 19th century black Mississippians (Rose 1985). Even the coffin itself might be considered a mystical object in its own right, as evidenced by the spells or name plaques in later Pharaonic Egyptian burials (Rice 1991).
Finally, once filled, the grave may be a focus for certain ceremonies. Recent pollen analysis at Beaker graves indicates the presence of plants, all of an hallucinogenic nature (Richmond, pers. comm.). Could this evidence the family of the deceased returning to communicate with the dead, a form of prehistoric seance? Equally pots and other items may be used to show off the prowess of the dead or to mark the graves. For example, pottery is impaled on graves of the Tonj Bongo people of Sudan, recalling the heads of animals killed by the man and the pots used to make hunting medicine (Barley 1991).

Alternatively the presence of the tomb or grave can affect later stratigraphy above the ground. As a monument, it is incorporated into the landscape and becomes a factor determining subsequent activity, so long as memory or political expediency allows. How this happens depends on whether the tomb is held in honour or in fear, or some combination of the two. An honoured tomb may attract satellite graves wishing to bask in reflected glory. A feared tomb such as that of a shaman or young child may be avoided, until such time as memory fades. Hence later intrusive activity on such a site might imply either a significant span of time or change in society. Memory of ancestors has been estimated as lasting, on average, for three generations, but areas such as a visibly large tombs associated with fear may continue to be avoided simply because of subsequent folklore. The reuse of prehistoric burial mounds by Anglo-Saxons is a good example of the use of the past landscape to instil status, paralleling the status derived from the underlying passage grave by the original inhabitants.

To sum up, it is perhaps easy to forget, when dealing with archaeological assemblages, that the artefacts which we encounter were made by individuals and that societies were composed of these individuals, who saw and reacted to each other as such. Unlike documentary history, archaeology often sees not the broad strokes of social activity but small-scale, even single episodes. By viewing skeletal populations as the remains of people who fulfilled distinct roles in the past, we may be aided greatly in interpreting that past. The burial act can be a very complex procedure and the examples I have given of what went on and, in some cases, still goes on, were chosen to suggest ideas and as a reminder that in most societies the preparation for death is a life-long occupation. Hence graves are not simple holes or refuse dumps.

Ethnographic evidence of people and their actions can help determine a middle range theory which elucidates the “how and why” of cemetery studies. It is this which will aid us in approaching, and perhaps understanding, physical stratigraphies. Finally, if this paper can have any moral, it would be this: Remember the Dead, But Do Not Forget the Living.

Post-script:

The conference raised two points that I would like to address. Firstly, there is a cynical belief amongst most archaeologists, based, I feel, largely on a western secular background, that is not prepared to see the merits of taking into account the wishes of the dead. This ignores the reality of strong beliefs regarding the spiritworld, both existing and having existed, beliefs which clearly caused the actions which created and amended the archaeological record. A belief in the immortality of the soul and the world of the dead is noted in Caesar and other
Roman writers, in Homer, in Egyptian, Chinese, Amer-Indian tales, amongst the Khoisan, and throughout Europe. The knowledge of an 'after-life' is alluded to in most societies and can be seen in actions ranging from awaiting the bubbling of a dead woman's spirit in a fermenting pot in Zambia, to taking tea with deceased relatives in Highgate cemetery, or to the ghost of Ivy Brennan in Coronation Street (Monday, Wednesday, Friday, 7.30pm Granada TV (ITV) January-February 1996).

Secondly, my paper does not seek to determine every individual in the past. It merely suggests that communities, both now and in the past, are ultimately made up of congregations of individuals, whose separate relationships both economically and politically, physically and emotionally, are the foundations of the archaeological record. Evolutionary biologists are aware that life is the struggle of individuals, not species (or groups), and that populations are made of few or many individuals. Like evolution, archaeological assemblages are not species- or period-generated but the product of many small-scale encounters and struggles, representing the needs of the moment.

Bibliography

Glob, P (1973) *The Mound People. Danish Bronze Age Man Preserved* (Faber, London)
MacLeod, I and Cowie, T (1996) “A face from the Bronze Age” *Society of Antiquaries (Scotland) Newsletter*, No.7.2, February, page 1
Manchester, K (1983) *The Archaeology of Disease* (University of Bradford)
Pearce, S (1985) *Eskimo Carving* (Shire Ethnography, Aylesbury)
Rose, J (1985) *Gone to a Better Land* (Little Rock, Arkansas Archaeological Survey Research Series 2)
Death By Computer

by Michael Luke, Sean Steadman and Michael Dawson

Introduction

This paper presents a review of burial recording in Bedfordshire County Archaeology Service (BCAS) from the late 1980's into the 1990's, followed by a discussion of the impact of computing systems used in post-excavation analysis upon site recording. Bedfordshire, in common with many other counties, has seen a variety of methodologies used in the recording of human burial. Some systems remain to haunt backlog publications, whilst others have been transformed in post-excavation analysis and their origins left obscure in museum archives. Manual recording systems have allowed imprecision to creep into site recording of graves. Thus, prior to 1995, “burial” was treated during excavation as a single sub-group, the “inhumation” or “cremation”, within a larger group, the “cemetery”. Inhumation numbers, issued at the grave side and not as part of the site context sequence, came to be the basis for recording, with the grave cut, fills, skeleton and grave goods all registered under a single number (BCAS 1988 9.5.7ff). Grave goods may have been assigned small finds numbers with three dimensional recording but there was no provision for locational detail in the finds register for other objects.

With the advent of computer-based analysis, a reappraisal of our approach, which was incompatible with the use of relational databases, became essential. So, recently, BCAS has transformed its post-excavation systems and now routinely inputs site records into Access databases, presents information through Excel, digitises site plans in AutoCAD and manipulates databases, CAD drawings and scanned images using Gsys. However, the adoption of computer-based analysis and the definition of sub-groups and groups, founded broadly on systems developed at the Department of Urban Archaeology, Museum of London exposed inadequacies in the existing method of burial recording. In particular, the allocation of inhumation numbers on site pre-empted the definition of sub-groups and groups during analysis. In addition, the variety of contextual types in even the simplest burial made a re-appraisal of the site recording system essential. As a result, a revised system based on the processual interpretation of deposits and artefacts within graves has been adopted (BCAS 1996). Together these developments allow the spatial dimension of individual grave attributes to be integrated within the sub-group, group and landscape-group framework which forms the basis for wider analysis. In the process, they have reinstated the primacy of stratigraphic information in the analysis of burial data. The following account describes the recording system as it now operates, and its implications for the nature of post-excavation and computer analysis.

Site-based recording

On site the fundamental and indivisible unit of recording remains the context. Context numbers are issued for individual events without regard to their relationship to the burial sequences of deposition. Hence these numbers represent units of recording, in addition to being, in the strict sense, units of stratigraphy (Harris 1979). Each is recorded on an individual pro-forma sheet (Figure 1).
Pro-forma Recording Sheet: general context record and skeleton record
When used in burial recording, the simplest inhumation of a skeleton interred without grave goods comprises no more than three contexts: the initial grave cut, the skeleton and the backfill of the grave. Each context is assigned its own number but is associated during fieldwork by allocation to a feature number, that of the grave cut. The more complex the inhumation, the greater the number of contexts. Thus additional numbers may be issued for grave goods, pottery vessels and fills, animal skeletons, stone lining or coffins. A simple un-urned cremation is treated in exactly the same way: the cut, the cremated bone and fill all receive unique numbers and are associated through their shared feature number. With urned cremations, the cremation vessel is simply added to the number of contexts. Complex cremations, like complex inhumations, receive more context numbers, recording different attributes of the burial.

### Post-exavcation analysis

During post-exavcation analysis, one of the first stages is the creation of site databases in Access for contextual, finds, skeletal and environmental information. The contextual database table (Figure 2) currently includes only basic information from the context sheets, including context number, context type, feature number, feature type, and processual interpretation. In this table, for instance, the skeleton would be input as a context number, as context type SK for skeleton, as feature type G for grave, and processually U for use of the grave. The context number provides the link to other database tables containing artefactual, ecofactual and skeletal information. The feature number identifies a cut and its related fills or a layer within the context numbering sequence and provides the link to the digitised drawings to which other contexts relate either as fills or constituent parts.

#### Figure 2

<table>
<thead>
<tr>
<th>CONTEXT NUMBER</th>
<th>CONTEXT TYPE</th>
<th>FEATURE NUMBER</th>
<th>FEATURE TYPE</th>
<th>FORMATION PROCESS</th>
<th>SUBGROUP NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1205</td>
<td>FILL</td>
<td>1234</td>
<td>D</td>
<td>UD</td>
<td></td>
</tr>
<tr>
<td>1206</td>
<td>CUT</td>
<td>1206</td>
<td>S</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>1207</td>
<td>FILL</td>
<td>1206</td>
<td>S</td>
<td>UD</td>
<td></td>
</tr>
<tr>
<td>1208</td>
<td>CUT</td>
<td>1208</td>
<td>G</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>1209</td>
<td>CD</td>
<td>1208</td>
<td>G</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>1210</td>
<td>FILL</td>
<td>1135</td>
<td>P</td>
<td>UD</td>
<td></td>
</tr>
<tr>
<td>1211</td>
<td>FILL</td>
<td>1135</td>
<td>P</td>
<td>UD</td>
<td></td>
</tr>
<tr>
<td>1212</td>
<td>CUT</td>
<td>1212</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1213</td>
<td>FILL</td>
<td>1212</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1214</td>
<td>CUT</td>
<td>1214</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1215</td>
<td>FILL</td>
<td>1214</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1216</td>
<td>CUT</td>
<td>1216</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1217</td>
<td>FILL</td>
<td>1216</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1218</td>
<td>CUT</td>
<td>1218</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1219</td>
<td>FILL</td>
<td>1218</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1220</td>
<td>CUT</td>
<td>1220</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1221</td>
<td>FILL</td>
<td>1220</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1222</td>
<td>CUT</td>
<td>1222</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1223</td>
<td>FILL</td>
<td>1222</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1224</td>
<td>CUT</td>
<td>1224</td>
<td>S</td>
<td>C</td>
<td>4046</td>
</tr>
<tr>
<td>1225</td>
<td>FILL</td>
<td>1224</td>
<td>S</td>
<td>D</td>
<td>4046</td>
</tr>
<tr>
<td>1226</td>
<td>CUT</td>
<td>1226</td>
<td>G</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>1227</td>
<td>FILL</td>
<td>1226</td>
<td>G</td>
<td>UD</td>
<td></td>
</tr>
<tr>
<td>1228</td>
<td>SK</td>
<td>1226</td>
<td>G</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>1229</td>
<td>CUT</td>
<td>1229</td>
<td>P</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>1230</td>
<td>FILL</td>
<td>1229</td>
<td>P</td>
<td>UD</td>
<td></td>
</tr>
</tbody>
</table>

The standard Context Database Table with simple cremation (CD) and inhumation (SK) highlighted
Each database table contains information on attributes specific to that subject table. Thus the skeletal database table (Figure 3) relates to the skeleton and includes details of body position, arm and leg positions, location and position of the head, and any unusual occurrences such as decapitation, plus space for a "comments" section of free text. Sex and age are currently input into this database table when the information is available, although a separate pathology database table may be required in the future. Site plans are routinely digitised using Autocad 12 software and exported into Gsys. Although successful attempts have been made to digitise 1:10 scale skeleton drawings, the amount of time required for a largely aesthetic purpose renders the procedure uneconomic. In future, it is intended that only the basic skeleton outline is drawn on site, supplemented by vertical photographs. The latter will be scanned and geo-referenced within Gsys for display with the site plans and any other desired data. Publication standard drawings of skeletons can also be scanned and geo-referenced for display in Gsys.

**Figure 3**

<table>
<thead>
<tr>
<th>SKELETON NUMBER</th>
<th>SKELETON POSITION</th>
<th>DECAP. Y/N</th>
<th>HEAD POSITION</th>
<th>ARM POSITION</th>
<th>LEG POSITION</th>
<th>FEET POSITION</th>
<th>SEX</th>
<th>AGE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3901</td>
<td>SUPINE</td>
<td>Y</td>
<td>BOTTOM OF FEET</td>
<td>CROSSED</td>
<td>EXTENDED</td>
<td>RIGHT OVER LEFT</td>
<td>ADULT</td>
<td>WITHIN ENCLOSURE</td>
<td></td>
</tr>
<tr>
<td>3902</td>
<td>PRONE</td>
<td>N</td>
<td>LEFT BENT</td>
<td>SLIGHTLY BENT</td>
<td>CROSSED</td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3903</td>
<td>SUPINE</td>
<td>Y</td>
<td>UNDER FEET</td>
<td>CROSSED</td>
<td>EXTENDED</td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3904</td>
<td>SUPINE</td>
<td>N</td>
<td>EXTENDED</td>
<td></td>
<td>EXTENDED</td>
<td>CHILD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3905</td>
<td>SUPINE</td>
<td>Y</td>
<td>BOTTOM OF FEET</td>
<td>CROSSED</td>
<td>EXTENDED</td>
<td>RENT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3906</td>
<td>SUPINE</td>
<td>Y</td>
<td>BOTTOM OF FEET</td>
<td>EXTENDED</td>
<td>RENT</td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3907</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DISARTICULATED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3908</td>
<td>SUPINE</td>
<td>N</td>
<td>LEFT CROSSED</td>
<td>EXTENDED</td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3909</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DISARTICULATED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3910</td>
<td>CROUCH</td>
<td>N</td>
<td>CROSSED</td>
<td>FLEXED</td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3911</td>
<td>SUPINE</td>
<td>N</td>
<td>EXTENDED</td>
<td></td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3912</td>
<td>SUPINE</td>
<td>N</td>
<td>CROSSED</td>
<td>EXTENDED</td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3913</td>
<td>SUPINE</td>
<td>N</td>
<td>EXTENDED</td>
<td></td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3914</td>
<td>SUPINE</td>
<td>Y</td>
<td>BETWEEN LOWER LEG</td>
<td>EXTENDED</td>
<td>EXTENDED</td>
<td>ADULT</td>
<td>WITHIN ENCLOSURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3915</td>
<td>SUPINE</td>
<td>N</td>
<td>RIGHT FLEXED</td>
<td>EXTENDED</td>
<td></td>
<td>ADULT</td>
<td>SLIGHTLY CUT 3/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3916</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DISARTICULATED ABOVE 3/8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3917</td>
<td>SUPINE</td>
<td>N</td>
<td>PARTLY FLEXED</td>
<td>EXTENDED</td>
<td></td>
<td>ADULT</td>
<td>PARTLY DISTURBED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3918</td>
<td>SUPINE</td>
<td>N</td>
<td>CROSSED</td>
<td>CROSSED</td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3919</td>
<td>SIDE</td>
<td>N</td>
<td>PARTLY FLEXED</td>
<td>PARTLY FLEXED</td>
<td></td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3920</td>
<td>SUPINE</td>
<td>Y</td>
<td>BETWEEN KNEES</td>
<td>DISTURBED</td>
<td>EXTENDED</td>
<td>ADULT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Standard Skeleton Database Table*
After the creation of database tables, analysis of the site records allow contexts to be aggregated into sub-groups. These represent contexts that are related both stratigraphically and processually and therefore signify a distinct event or activity. Thus, as analysis progresses, the sub-group, which represents a single activity, becomes the primary unit of analysis from which groups, landscapes and phases are constructed, sub-tables being added to the database for each of these respective fields. At this stage the feature number reverts to being merely a context number which is subsequently assigned to a sub-group. Grave sub-groups may consist of a skeleton, coffin and worn objects, and a separate sub-group for unworn grave goods outside the coffin, or associated grave features, for example, surrounding gully or grave markers. Strict definition of sub-groups is required for effective analysis to proceed, as these replace the context as the basic unit of analysis.

Subsequently, sub-groups are assembled into groups, on the basis of spatial organisation, date or association with diagnostic assemblages of artefacts. Groups could represent buildings, structures, boundaries or individual graves and associated features. During analysis, whereas sub-groups should remain constant once defined, groups could be re-interpreted to contain different sub-groups. A further tier of analysis allocates groups into landscapes and it is at this stage that contemporary graves may be collated as cemetery units.

A good example of the system in operation is provided by the recent excavation of a Welwyn-type burial uncovered at Norton Road, Stotfold (Figure 4). It was located within a sub-rectangular enclosure and the central burial pit 335 contained cremated human bone with associated grave goods, pottery vessels, and one articulated skeleton of a pig. This had been truncated by a medieval plough furrow 333, damaging some of the vessels. A series of secondary inhumations 493, 385, 442 and 444 cut through the infilling of the enclosure ditch.

In creating the context database table the assemblage was defined as follows. The grave pit, 'Context Type C' (Cut), received the feature type 'G' for grave and the processual interpretation ‘C’ for construction. The cremation deposit (CD), received a separate context number 368 but was assigned the feature number and feature type of the grave. The grave goods, a perforated whet stone and an iron disc ‘razor’, which overlay the cremated bone, were recorded as small finds and each was assigned a separate context number. The four pottery vessels and their respective fills, ‘Context Type FD’ (Finds Deposit), each received separate context numbers 5125/5126, 5127/5128, 5129/5130 and 5131/5132, as did the pig skeleton, AS (Animal Skeleton) 367. All vessels and the pig bones were assigned the feature number and feature type of the grave and interpreted processually as ‘Use’ (U), with the fills of the pots as ‘Use/Disuse’ (UD). The backfilling of the burial pit 334 was interpreted processually as ‘Use/Disuse’ (UD), because only one fill was identified.

Stratigraphically, the grave pit represents the earliest event, followed by the deposition of the cremated bone, animal skeleton and pottery vessels, which cannot be separated stratigraphically, and finally the back filling of the pit. As ‘Use’ deposits within a cut, they form a single sub-group for the purposes of analysis. Stray pottery sherds from the plough damaged vessels were assigned to the ‘Disuse’ fill 332 of the later plough furrow ‘F’ and belong in separate sub-groups because damage to the vessels occurred after deposition.
Norton Road, Stotfold: plan of the cemetery showing Welwyn-type burial and associated features
The insertion of the enclosure gully 576 would be recorded processually as a construction (C) and the gully fill 575 as 'Use/Disuse' (UD), both being recorded with separate sub-group numbers. The burials cutting through the enclosure were mainly simple inhumations comprising a grave cut (C), a skeleton (U) and backfill (UD) which form single subgroups. In the second phase of analysis the sub-groups were assigned to a group, in this case coded 'C' for cemetery. Although it would be possible to analyse a small cemetery group like this manually, the system speeds up this analysis and encourages a wider range of questions for the data. Also the site recording and post-excavation system is capable of analysing much larger cemeteries, unlike manual methods.

The nature of computer analysis

The advantages of computer analysis are speed and flexibility in the manipulation of stored information. Assuming information has been recorded in sufficient detail in the field, it is possible to examine the data in a variety of different ways in a matter of seconds. Furthermore, the database tables can be interrogated on several levels. For instance, a simple query may ask for a list of all contexts relating to burials (Figure 5): these would have been allocated the code G in feature type within the context database table. More complex queries could ask for a display of multiple attributes. A query of this type could be broad, such as "list all grave contexts that contained grave goods", or more specific, for example by selecting particular artefact classes such as knives or combs.

<table>
<thead>
<tr>
<th>FEATURE NUMBER</th>
<th>FEATURE TYPE</th>
<th>CONTEXT NUMBER</th>
<th>CONTEXT TYPE</th>
<th>FORMATION PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1016</td>
<td>G</td>
<td>1016</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1016</td>
<td>G</td>
<td>1017</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1016</td>
<td>G</td>
<td>2906</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1018</td>
<td>G</td>
<td>1018</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1018</td>
<td>G</td>
<td>1019</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1018</td>
<td>G</td>
<td>2905</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1151</td>
<td>G</td>
<td>1151</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1151</td>
<td>G</td>
<td>2907</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1151</td>
<td>G</td>
<td>1152</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1177</td>
<td>G</td>
<td>1177</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1177</td>
<td>G</td>
<td>2911</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1177</td>
<td>G</td>
<td>1178</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1226</td>
<td>G</td>
<td>1228</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1226</td>
<td>G</td>
<td>1227</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1226</td>
<td>G</td>
<td>1228</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1243</td>
<td>G</td>
<td>1244</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1243</td>
<td>G</td>
<td>2909</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1243</td>
<td>G</td>
<td>2910</td>
<td>SK</td>
<td>U</td>
</tr>
<tr>
<td>1243</td>
<td>G</td>
<td>1243</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1417</td>
<td>G</td>
<td>1417</td>
<td>CUT</td>
<td>C</td>
</tr>
<tr>
<td>1417</td>
<td>G</td>
<td>1416</td>
<td>FILL</td>
<td>UD</td>
</tr>
<tr>
<td>1417</td>
<td>G</td>
<td>2912</td>
<td>SK</td>
<td>U</td>
</tr>
</tbody>
</table>

Query Table: Graves in Feature Number Order Filtered from the Standard Context Database Table
At the simplest level, graves on a large complex site can be quickly located. In addition, those containing specified artefact types can also be located and the significance of their spatial distribution instantly assessed.

Similarly, queries can be undertaken for any specified criteria from the skeletal database table, for example the location of decapitations (Figure 6).

Figure 6

Ibbotts Field, Kempston: computerised plot of decapitated burial locations, based on data from the Context and Skeletal Tables
More complex queries, using multiple attributes which link skeletal and finds information, can be undertaken solely within Access or through Gsys (Figure 7). Finally, any queries from database tables can be used to control the computer drawing. Instead of symbols representing point data, a plan of features meeting specific requirements can be created automatically. This is commonly used for phasing and group plans, but could be employed to highlight features combining finds and contextual information, for example graves containing grave goods.

Figure 7

Stratton Village: computerised plot of all registered artefacts in graves, based on data from the Standard Context Database and Registered Artefacts Database Table
The number and variety of queries possible within the database tables and Gsys is limited only by the information stored within the computer systems. The flexibility of the current system is that if any information is changed within the database tables, queries are automatically updated and revised drawings can be reproduced immediately on screen. Drawings produced in Gsys can be printed with or without captions, grid lines, or grid labels and produced at any scale. Any digitised drawing can be displayed as an underlay or backdrop with scanned images visible at the same time.

Thus, it is possible create 'rough' drawings prior to formal drafting for publication, and in due course, it will doubtless be possible to create publication illustrations.

**Conclusion**

The current system used for recording burials (Figure 8) has restored the primacy of contexts recorded on site. The computer systems facilitate the recording of each component of burials and enable the sub-grouping and grouping of these contexts. This integrated approach enables all elements of burials to be quickly studied, individually, in association with other elements, and spatially through the use of Gsys.

**Figure 8**

*Diagram to show BCAS integrated recording and analysis system*
Bibliography

BCAS (1988) Procedures Manual (County Planning Department, Conservation and Archaeology Section)


Acknowledgements

The illustrations were prepared by Cecily Marshall and Lisa Padilla.

This paper is based on computing systems which have been adapted from the DUA model by Drew Shotliff and currently managed by David Coombes. The review of BCAS excavation and recording procedures was undertaken in 1995 by Nick Shepherd.
Inhumations And The Matrix: the value of stratigraphic sequence in ancient burial sites

by Peter Clark

This short note will address itself to the perception and recording of stratigraphic units on cemetery sites and to the relationship between osteo-archaeological analysis and the stratigraphic sequence of medieval and later cemeteries. Excavation of such sites can create difficulties for the excavator, particularly when on the usual limited budget and timetable. This is especially the case if cemeteries are intensively used and thus evidence suffers repeated disturbance by intercutting burials, often with high levels of other post-depositional interference.

Most excavation strategies are based on the concept of stratigraphic units and their relative chronology as described by their stratigraphic relationships. Various papers at earlier Interpreting Stratigraphy conferences have explored this concept, discussing the problems such as identification of contexts in the field. Yet, in general, the approach has proved robust and practical.

At Canterbury, we have routinely perceived burials as a sequence of stratigraphic units, that is to say the skeleton is perceived as a deposit, generally the primary fill of a cut. Most cases of simple burial can be dealt with adequately by this approach, even though there can be some difficulties in terms of assigning grave goods to contexts. However, in more intensively used cemeteries the approach is far less effective. A high degree of post-depositional disturbance often means that the cut interface is impossible to see, and articulated and disarticulated human bone often appears to lie in an undifferentiated brown soil. The usual rules do not seem to apply, or at least are very difficult to put in to practice.

A particular problem is to differentiate between in situ burials and disturbed bone: an entire skeleton is one thing, but it is more difficult to recognise fragments of heavily truncated bodies as being in situ. Indeed, "disturbed bone" itself can have different degrees of disturbance, and therefore different degrees of analytical potential. How far has bone been moved away from its place of burial, and can it be closely related to clearly articulated material in close proximity? Even if we do create criteria by which we can identify in situ material, the normal matrix approach of establishing a relative chronological sequence by examining stratigraphic relationships can be extremely time consuming, expensive and frustrating.

An alternative to this approach is to view the skeletal material as inclusions within a deposit: in other words to treat each skeleton as a find. In extreme cases, this might mean that an entire cemetery might be viewed as a single stratigraphic unit, containing various elements of articulated and disarticulated human bone. Analysis would therefore be focused on the study of the depositional history of this deposit, using physical and spatial data without creating arbitrary stratigraphic units. Yet the three-dimensional recording of skeletal material implied by such an approach would be very expensive and time-consuming, both in the field and during analysis. The expense of such endeavours must be carefully weighed against the research potential and analytical destiny of the data set we are retrieving. Is it
really worth the effort?

An excavation, carried out in the 1970's, produced some 400 individuals in a small part of a graveyard associated with the Celtic monastery of Kilrymound, a Culdee foundation eventually absorbed into the later Roman Catholic establishment introduced by King David I of Scotland. The excavators had employed a mixture of the "planum" and "context" methods of recording, and carbon dating suggested that the cemetery was in use between about AD500 and 1000.

The burials were without grave goods, though a few were placed in stone cists and others had large stones flanking the skull. Apart from the uppermost burials, grave cuts could not be identified and most of the burials were disturbed or truncated. There was no clear pattern of changing orientation or spatial layout. A long process of analysis of the site plans resulted in a complex mass of relationships based, where possible, on superposition and truncation. Yet there was little data to phase this sequence beyond its basic statement of relative chronology. Even this approach did not take account of the physical proximity of burials and unarticulated bone.

A detailed study of the skeletal material was undertaken by colleagues from Aberdeen University and, whilst much interesting anecdotal information regarding palaeopathology was recovered, no clear, statistically viable changes in anatomical or pathological attributes could be observed in the sequence of burials. I invited a specialist in human anatomy from Tayside Health Board to read the report and explain to me what the findings of this extensive (and expensive) study implied about past populations: what it meant in terms of "real people". Whilst extremely complimentary about the scientific standards and presentation of the report, he said that the attributes identified lay within the normal range of variation in a modern population. In essence, he felt that there was nothing unusual about these skeletons except that they "worked hard and ate badly", something we might have expected of people living in the second half of the first millennium in Scotland. I was a little disappointed. But was it our data collection procedures that were at fault?

Working with an osteo-archaeologist, we attempted to explore ways in which we could better record human burials, particularly in terms of physical relationships and proximity. Peter Hill kindly allowed us to interfere with his excavations at Whithorn, Dumfries and Galloway, where a complex mass of intercutting graves presented similar problems to those at Kirkhill, exacerbated by the summer sun baking the ground hard as concrete. Working with a professional osteo-archaeologist as part of the excavation team certainly improved data collection and recording, particularly in terms of decisions about the relationship between various skeletal elements and their articulation. However, we concluded that the normal statistical variation of human skeletons limit the inferences that could made about burials in archaeological terms, at least in this medieval period.

Much of the information derived from such data sets really informs the agenda of historical medicine rather than archaeology (yet the medical profession have directed little research funding to archaeological excavation!). In scientific terms our sample sizes are very small, and much work still relies on data collected from a survey of American military personnel in the post war years (Trotter and Gleser 1958).

Where we have clear research objectives that might be addressed by such data, the picture changes somewhat. Questions of ethnicity
and familial grouping may be open to osteo-archaeological analysis, and then the identification of sequence in the cemetery regains its relevance, contributing to the importance of the project. Studies of DNA composition, though still at an early stage, may offer an exciting avenue of research, whilst more traditional examination of non-metric variables may also offer opportunities to address these issues. Whilst the statistical validity of such techniques has yet to be confirmed, the identification of traits which inform an archaeological agenda will clearly benefit from an understanding of relative chronology, best derived from stratigraphic sequence.

In summary, therefore, I suggest that we must look very carefully at the value of spending great amounts of time and money in recording cemeteries and in analysing the populations we retrieve. Does the analytical potential of the material really justify the resources we need to undertake this work? Or are we using a large part of our limited budgets to simply say "they worked hard and ate badly"?

Bibliography

Charnel and What to do with it

by Mark Whyman

Introduction

In cemeteries with long burial sequences, especially where these extend over several centuries, the disturbance of in situ burials by later interments is an archaeological fact of life. Furthermore, the heavily disturbed nature of cemetery deposits (which in any case are often homogeneous soils) means that the detection of grave cuts is frequently a hit-and-miss affair, with excavators finding it expedient to remove soil in arbitrary horizontal spits, cleaning and recording burials as they appear, rather than spend fruitless hours trying to identify individual cuts. This approach to excavation has three consequences:

- the accurate phasing of the cemetery can only be achieved when all burials are illustrated on a single plan, so that instances of intercutting and superposition can be identified, as well as less certain, but still useful, indicators of contemporaneity such as common burial alignment

- material, though in reality coming from within a grave, will not necessarily be recognised as being related to that feature, as it may be retrieved from the arbitrary level above or below that in which the skeleton was found

- where such material consists of disarticulated human bone (hereafter referred to, on occasion, as ‘charnel’), it is unlikely to be thought worthy of 3-dimensional recording, and will usually be attributed to the context number given to the ‘spit’ of soil from which it was retrieved, in effect rendering it unstratified.

This article is intended to offer suggestions as to how charnel groups from excavated cemeteries might be recorded, using as an example the excavation of a cemetery of the seventh-tenth centuries AD on Ailcy Hill, Ripon, North Yorkshire, and to consider the information obtainable from such material in situations where it can be considered stratified.

The Ailcy Hill Excavation

Ailcy Hill comprises a mound of sands and gravels of peri-glacial origin, roughly 11 metres high and 60 metres in diameter at its base, situated some 200 metres to the east of Ripon cathedral. The hill had been heavily quarried in the 18th and 19th centuries and was subsequently ‘landscaped’ in the mid-19th century, apparently to provide a scenic perambulation for Ripon’s clergy. Both of these episodes, but especially the former, inflicted substantial damage on the cemetery horizon, as has the continuing growth of trees and dense undergrowth over the last century or so. The largest excavated areas, 1 and 2, were on the summit of the hill - a total of c.26 m² - where the cemetery soil was never more than c.600 mm deep, and for the most part substantially less than that. Full details of the site are due to be published in the next volume of Medieval Archaeology (volume 40 for 1996).
The excavation was carried out over two three-week summer seasons in 1986 and 1987. When modern topsoil, recent disturbances and a substantial layer of quarrying debris had been removed from the summit, excavation of the cemetery soil began in shallow (< 200 mm) spits. It was intended from the outset to record wholly or partially in situ inhumations by means of vertical rectified photography (Phillips 1976, 59). However, no consideration had been given to the recording of substantial, and clearly deliberately deposited, groups of disarticulated bone which began to appear with disconcerting frequency. The significance of these groups was unclear to the excavators at the time, and how they might be effectively recorded uncertain. Whilst the arrangement of the skeletal components of an in situ burial are consistent and predictable, and can thus be confidently treated as a single context in excavation, the same cannot be said of disarticulated bone assemblages. In the absence of a circumscribed context to which such groups can be attributed - for example the backfill of a single grave - the two extreme strategies appeared to be, on the one hand, the 3-D recording of every individual bone; and, on the other, assigning all disarticulated bone to the number given to the cemetery soil and thus, in effect, rendering it unstratified.

The first of these seemed unworkable in practice, the second wholly unsatisfactory. The compromise solution adopted was to record substantial deposits of charnel in the same way as in situ inhumations using vertical rectified photography, and to draw sketched plans of the lesser groups on the backs of the relevant context cards. These included reference points whose location was fixed by direct measurement from survey points immediately outside the excavation, in order that their positions could be established with tolerable accuracy if this was deemed necessary in the course of post-extraction analysis.

Post- excavation methods

Early in the post-extraction programme all in situ inhumations on the summit were plotted onto two master plans. At this stage the possibility of a close association between intact burials and the groups of disarticulated bone had not been recognised or considered. However, the plotting of the major charnel groups, which had been recorded on rectified photographs, indicated that, in each case, these lay either above or below an in situ burial. The probability that these associations were significant was strengthened by the realisation that the condition of many of the skulls and long bones within the charnel groups meant that they must have been buried shortly after their original disturbance, as any length of time on the ground surface would have led to their rapid fragmentation. It had, in fact, been recognised in the course of the excavation that one burial, 1073, had been “framed” by disarticulated long bones laid around the edge of its grave cut, providing an obvious example of the kind of treatment of disturbed bone which was becoming evident across the site.

Having recognised these probable associations, the sketched plans of the smaller charnel contexts were laboriously copied up at a common scale of 1:10. This was done by using the reduction and enlargement facility on a photocopier, the known distance between the two fixed points on the sketched plans providing the scale. These individual drawings were then transferred to the master plan, which confirmed beyond any doubt the close association between intact burials and charnel groups. Although the sketched plans were recognised as not being 100% accurate, it was felt that any imprecision was within the tolerances required in post-extraction analysis (Figure 1).
Area 1, Phase 2: Burials in solid outline are those attributed to Phase 2, contemporary charnel in solid tone, earlier burials/charnel in broken outline. The dotted lines represent areas known to have been disturbed by later burials.

In the case of one burial, 1048, whose survival was extremely fragmentary, the shape of the grave cut could be recognised, marked by the positioning of small groups of charnel around the edge of that feature, despite the fact that the charnel itself had been excavated in both 1986 and 1987 (Figure 2). The grave cut whose edge they marked had been totally indistinguishable in the course of excavation, and it was only in the course of post-excavation that their significance could have been recognised.

Further, the identification of the outline of the grave of 1048 in this fashion allowed the recognition of a stratigraphic relationship between that inhumation and an earlier burial 1064, which would not otherwise have been possible. Finally it was apparent that, where charnel groups were not closely associated with intact skeletons, later disturbance had almost certainly truncated the burial deposit, particularly in the southern half of Area 1. This suggested that such groups indicated the positions of graves where the contemporary inhumation had not survived.
The grave of partially-intact burial 1048, its extent indicated by 6 separately recorded and plotted groups of charnel, which can be seen to overlie, and thus post-date, earlier burial 1064

The recording procedures employed on site had provided enough information to allow the great majority of the charnel groups to be associated with individual in situ skeletons, and thus to be identified as forming part of the fill of its grave. As the intact skeletons could be ordered into a sequence, based on intercutting, superposition, common alignments and regular spacing, the charnel groups themselves could be integrated into that sequence, being the remains of individuals buried before the in situ inhumation in whose grave they were found. This skeletal material could therefore be regarded as stratified, allowing it to be included in an overall consideration of the demographic structure of the population buried in the cemetery.
Results

Once it had been attributed to particular graves and represented in stratigraphic units which could be ordered into a relative sequence, the distribution of charnel provided some interesting information. The \textit{in situ} burials on the site could be seen to belong to three distinct phases:

- Phase 1, west-east burials whose alignments closely reflect the contour of the hill

- Phase 2, burials on a similar alignment which massively disturbed their predecessors (see Figure 1)

- Phase 3, a group of burials on divergent alignments which deviate by up to 30° from those established in the earlier phases.

Importantly, whereas Phase 2 burials caused a huge amount of disturbance of their Phase 1 predecessors, the majority of the Phase 3 burials appear to have been deliberately located and aligned to avoid disturbing those in Phase 2, although once again paying no heed to the presence of burials of Phase 1. In only one instance does a Phase 3 burial truncate one from Phase 2, and there is a strong case that the Phase 3 burial in question - a triple burial - was part of a restricted and distinct final burial episode (Phase 3b) which may have taken place as much as a century after Phase 2 and the earlier Phase 3 graves. (This is suggested by a radiocarbon date of 780 - 990 cal AD (UB3149) from the only other Phase 3b burial, compared with date spans of 660 - 810 cal AD (UB3150) and 680 - 880 cal AD (UB3153) from the two radiocarbon samples taken from Phase 2 skeletons).

It thus appears that the overwhelming majority of the disarticulated bone recovered from the site derives from Phase 1 burials. Additionally, it is apparent that a number of the burials which can be attributed to Phase 1 with some confidence contained significant quantities of disarticulated bone in their grave backfills, thus implying that there were burials on the site which pre-dated the earliest recognised \textit{in situ} examples. It has been tentatively suggested that pre-Phase 1 inhumations, of which all \textit{in situ} remains must have been removed by subsequent grave digging, may have included burials aligned on a north-south axis, as there are traces of possible graves on this alignment cut into the natural strata of the hill.

As a result of being able to associate the excavated charnel groups with particular graves, it has been possible to demonstrate that, whilst the \textit{depositional} context of most of this material is in Phase 2 or Phase 3, the context in which virtually all of it \textit{originated} was Phase 1. There is therefore a huge amount of skeletal material, albeit disarticulated, which can be used to study the demographic and pathological characteristics of those buried in the earliest phase of the cemetery, in addition to the few surviving \textit{in situ} examples.

Study of this material has suggested a sequence of the greatest significance for the understanding of the development of the pattern of burial on the site. Whilst all of the Phase 2 burials have been identified as adult males, the charnel from graves in Phases 1, 2 and 3 indicates the presence of infants, young children, adolescents, adult women and old people, as well as adult men. This clearly represents a major change in use, and is particularly significant when considered in the context of the important contemporary monastery, founded by St Wilfrid in the mid-seventh century, whose main focus lay c.200 metres to the west. Although the small size
of the excavated areas dictated that only a small number of Phase 2 burials - a total of ten - were recovered, and this may call the significance of the pattern into question, it seems unlikely that no burials of women or children would be found in this area if any had been there in the first place. It is important to note that the Phase 1 burials would not have appeared anything like as diverse on the evidence provided by the in situ burials alone.

Additional insight into the different characteristics of those buried in Phase 1 from those of Phase 2 is provided by the evidence for severely degenerative joints and osteoarthritis in the bones from the charnel deposits, in contrast to their relatively mild occurrence amongst the in situ burials of Phase 2. This would seems likely to indicate different patterns of labour and physical exertion on the part of the individuals in each of the phases.

Applications and Possible Refinement

It is hopefully apparent that, in the case of Aileyc Hill, the ability to provenance charnel groups to particular burials greatly increased the amount of information available about the development and changing role of the cemetery. However, the work required in post-excavation was labourious and time-consuming, and in a number of cases subsequent analysis would have benefited from greater precision in the recording of the charnel deposits. In several cases, for example, a group of disarticulated bone, excavated as a single context when revealed after the removal of an arbitrary spit of soil, proved to comprise two separate deposits in different graves (Figure 3). These could obviously not be separated post-excavation.

Figure 3

Charnel Group 1075, excavated as a single context but clearly deposited in two separate graves
Additionally, many small stray bones were recorded only as being from the ‘cemetery soil’ 1042, and were thus effectively unstratified. In many cases these might have proved useful in determining age, sex or pathological conditions, and it would have been beneficial to be able to attribute them to specific charnel groups.

Refinement of the data retrieval methods employed on this site could include the use of electronic surveying equipment for the more accurate mapping of charnel groups, possibly combined with the individual recording of each bone. This could be particularly useful in cases where it seems likely that a major charnel group represents an earlier burial effectively ‘scrambled’ in situ by a later grave (probably the case in at least two instances at Ailcy Hill). More straightforwardly, attention paid to the varying alignment of bones in groups which appear, when first revealed, to form a single deposit, could help to disentangle separate episodes. Excavation staff with a working knowledge of human skeletal material and their potential significance in determining demographic and palaeopathological characteristics, would obviously improve data recovery and allow selective rather than blanket use of the detailed recording procedures suggested here.

Proposals to make what is already a time-consuming task still more detailed and complex requires justification in terms of the potential significance and utility of the extra information recovered, and thus the methods outlined above might be applied only in certain circumstances. In particular, it is a truism that the early phases of many cemetery sites are the most heavily damaged by later burial, and yet understanding their ‘origins’ is often regarded as one of the primary goals of excavation. Although it is frequently assumed that heavily disturbed cemeteries are a waste of time and effort, it should be noted that disarticulated bone in grave backfills is in fact stratified, as its initial burial must pre-date that of the skeleton in whose grave it is found. When these associations can be linked to a phasing of in situ burials, as here, the original burial context of the charnel may be identifiable, dramatically increasing the amount of information available about the earlier phases of the site. This approach also provides potential time depth to the demographic study of a cemetery, a dimension often lacking in the skeletal reports of cemeteries where intercutting is absent. At Ailcy Hill, it is this aspect which revealed significant changes in the use of the burial ground. There are thus potential advantages to data in this form which may be worth taking the trouble to exploit.

Conclusion

The fact that the data provided by deposits of disarticulated bone is structured in an unfamiliar way, and cannot be studied as an absolute number of distinguishable individuals, should not blind us to the possibilities which it provides to inform about buried populations. If the recovery techniques reported here are to be employed in future, the immediate requirement is for those studying human bone assemblages to consider the constraints imposed by the fact that individuals within charnel deposits are, frequently, recognisable, and to identify appropriate methodologies to remedy this and thus allow fuller study of such material.
Bibliography


Acknowledgements

Figure 1 was drawn by Terry Finnemore of the York Archaeological Trust
Reconstructing Stratigraphy within Burials:  
The use of the planum method

by Philip Rahtz

Introduction

The planum method of excavation has been widely used in Dutch and German excavations, principally in the excavation of open settlement sites where the stratification is mostly, if not wholly, of soil with very few stones or surviving structural remains. It has been successful, at sites such as Feddersen Wierde, Wijster, Hedemy (Haithabu) and Dorestad, in uncovering vast areas of rural and urban settlement at minimum cost. The work is done within units such as 20m x 10m or larger using machines with special blades and trained drivers. They plane the ground off to a horizontal section, which is then hand-cleaned with shovels and drawn in colour. Another layer of 10 or 20 cm is then removed and the process repeated.

The advantages are that a flat surface can be maintained which does not collect water; the cost of the operation can be precisely predicted; and each unit can be covered by a tunnel of canvas or metal, heated by hot air. Work can therefore proceed all the year round, and the trained work-force kept in continuous employment. The successive horizontal sections are then studied, a coarse stratification established and phase plans built up.

This approach does not, of course, produce the detail of data that we are used to in Britain, but what is found is regarded as an adequate sample, and the aim is not so much to maximise data recovery, as to get reasonable answers to bigger questions, such as the plan of Carolingian Dorestad. Where structures do turn up, they have to be dug by hand, while keeping the site as level as possible. More relevant to the York conference, where graves do turn up, they too are dealt with in a conventional manner.

Yet this planum method has not been found acceptable in this country, and has in fact been soundly castigated by British archaeologists, notably by Martin Biddle (pers. comm.). It does, of course, run absolutely counter to the developing British tradition of 3-dimensional definition of contexts, culminating in single-context planning. The only case I remember in Britain of an attempt to get an overall plan of a settlement by horizontal section was in the 1960's by Brian Davison at Thetford (1967, especially Fig. 40). Otherwise its principal use has been the subject of this paper, the excavation of the fill of graves. Sometimes this is an equivalent to the `spit' method of lowering the surface: in cave or other prehistoric excavation, the purpose of defined vertical intervals of 5 cm or more has been not so much the recording of horizontal sections as the precise quantification of artifacts and ecofacts - the basic data, for instance, of early Australian prehistory.
The Little Ouseburn Experience

The point of this paper is to examine the suitability of the planum method in the excavation of graves, using the case study of the undisturbed barrow at Little Ouseburn, near Harrogate, dug in 1958 (Rahtz 1989). The outer cover of the barrow was a turf stack, under which was a magnificent boulder cairn. Inside this was an inner turf stack which, with some boulders from the cairn, had partly collapsed into the upper fill of its grave pit due to post-depositional processes. The body had been interred in a tree-trunk coffin and, when the pit was dug for its insertion, the red clay upcast was piled around the pit. The surface of this clay had been much trodden by the burial party in their efforts to get the coffin into the pit and this trodden surface had been well-preserved by the turf piled on it, shod footprints being distinguishable in it.

Our problem was how to excavate and record the grave fill. It was realised that, in this sandy, clayey soil, there was little chance of bone or wood survival, so the best thing that could be hoped for was an anthropomorphic silhouette. Straight away, however, there arose the problem not only at what level this was likely to be encountered, but whether it would be all more or less at the same level: suppose the body had been buried sitting up! (the problem is familiar to the Sutton Hoo team). We therefore decided to use the planum method, removing the fill in a series of horizontal slices at 3" (7.5 cm) intervals, with a 3" baulk across the middle to give us one genuine cross-section.

Since the dig was being carried out in the month of November, each slice had to be done in a day, to enable a colour photograph to be taken in the middle of the day when sufficient daylight was available. So the slice was dug in the mornings, photographed at midday, and a coloured drawing made in the afternoon. Patterns were visible at each level, the different textures and colours representing the mixture of materials which resulted from grave fill and collapse. A thin black line, representing the edge of the tree-trunk coffin, became visible around the edges of the grave, gradually coming inwards until the whole of a rather more continuous grained black mass was uncovered - the base of the coffin. No humanoid silhouette was ever seen and the only find was a piece of what was probably an adult tibia in a mineralised state.

Later examination of the successive drawings or photographs failed to reveal any further meaningful patterns. What we were left with was a series of horizontal sections of the grave fill, from which we could at least suggest the dimensions of the tree-trunk coffin. In some ways, this was rather analogous to a method used on barrow stratification by Cyril Fox and others, of cutting vertical slices right across the mound from side to side (Ashbee 1960, 184-8 with refs.).

My theoretical point is, however, that the crude technique of thin horizontal slices defined in the planum method of grave excavation and recording is akin to tomography, such as that done on the eighth century York helmet (Spriggs 1992, 897ff). The difference is of course that, with tomography, the computerised analysis of the slices results in a three-dimensional projection, which allows accurate reconstruction. Little Ouseburn was dug nearly 40 years ago, so computer storage and manipulation was not considered. Yet it would be theoretically possible to digitise the coloured drawings and photographs and computerise the slices into such a 3-dimensional reconstruction.
Conclusion

Might the approach used at Little Ouseburn also have been appropriate for recording the Sutton Hoo sandpersons? The mechanics of their exposure is discussed elsewhere in this volume but my own view of that work, during my visits to the site, was that it was left to the individual, very uncomfortable, excavator to follow 3-D shapes of different colour and texture to arrive at some semblance of a humanoid, often of a bizarre appearance. While the process was skilfully carried out, and closely observed by Martin Carver, Madeleine Hummler or other senior staff, I could not help feeling that the final result was subjective, if spectacular.

It is possible that the planum technique would have provided more objective data, which could have been processed subsequently and then interrogated to provide alternative interpretations of the humanoid forms and related artefacts. No-one is more aware of the problems of these sandpersons and their definition than Carver, and I know that the team were satisfied that they had arrived at the best of all possible humanoids. But was there a planum alternative?

Bibliography

Ashbee, P (1960) *The Bronze Age Round Barrow in Britain* (Pheonix, London)
SUTTON HOO BURIALS: reconstructing the sequence of events

by Madeleine Hummler and Annette Roe

Introduction (Figure 1)

In 1983, Dr. R. Bruce-Mitford published the third and last volume of the Sutton Hoo Ship Burial, bringing to a close the scholarly research on the excavation of the Mound 1 ship burial in the summer of 1939. 1983 was also the first year of a new research programme on the seventh century royal burial site and its environs, sponsored (then) by the Society of Antiquaries, the British Museum, the National Maritime Museum and the BBC. This became the basis of the newly-formed Sutton Hoo Research Trust whose aim was to examine the context (local, regional and international) for the discoveries made in 1939. Research designs were submitted in competition and that proposed by Martin Carver was accepted (later published as Bulletin of the Sutton Hoo Research Committee 4: Carver 1993). The main tenet of this new research design was that excavation should only take place on the results of an exhaustive evaluation campaign, using all possible methods of remote sensing then available (this was carried out between 1983 and 1986) and that the size of the excavation should be that of the minimum viable sample necessary to answer a set of specific research questions (summarised by Carver 1993). The resulting excavation campaign (1986-1992), a cruciform transect, over one hectare in area, on the northern part of the scheduled monument and its neighbouring eastern arable fields, uncovered a prehistoric, Anglo-Saxon, and later sequence. This represents approximately one quarter of the predicted extent of the early medieval cemetery, leaving the remainder unexcavated to allow future generations a chance to test the site. Such a policy was deemed necessary, not only because methods and techniques may evolve, but also, and perhaps more importantly, because fundamentally different hypotheses might be formulated and tested.

The results of the 1983-1993 campaigns are being prepared for publication at the University of York by a small team directed by Martin Carver and publication is anticipated in 1997/8. This particular paper represents an exposition of the practices devised for the recording of stratigraphic sequences at Sutton Hoo. It first discusses the excavation methods, using Mound 2 as a case study, then the techniques of exposing body silhouettes (‘sand bodies’ as the media likes to call them), illustrated by the sequence in Mound 17. We hope to show that past ritual behaviour can be reconstructed to a degree and that this behaviour can best be apprehended as a series of events, rather than as a single frozen frame, later modified by processes of decay.
Figure 1

General plan of Sutton Hoo, showing areas of the 1983-1993 campaign
Excavation

The cruciform transect which formed the excavation cut through the different terrains which make up the topography of Sutton Hoo. Thus the site presented a challenge to the excavator as it combined the characteristics of a `flat', eroded, ploughed rural site with those of a `deep' site where mounds have been piled up, thus protecting the underlying ancient buried soil.

For the Early Medieval period, apart from mound make-up sequences, little strata overlap was evident, and even the opportunities for observing 'conventional' stratigraphic sequences (features cutting each other) were fairly infrequent, the site having been laid out with an element of planning. Nevertheless some relationships could occasionally be observed in the sequential intercutting of the quarry pits dug for the erection of adjacent mounds (Mound 5 precedes Mound 6, for example). Such observations apart, Sutton Hoo presents itself as a palimpsest of features cut into the sandy subsoil (including some 2000 prehistoric, or presumed prehistoric, features yielding some 100,000 finds), augmented in places by soil dumps - the mounds, eight of which were excavated between 1983 and 1992 (Mounds 2,5,6,7,13,14,17,18).

The feature and context population of the excavated sample at Sutton Hoo was recorded according to their appropriate recovery level. Each level represents a coherent set of digging and recording techniques which allow information recovery through a particular `mesh'. Level A is the coarsest (such as excavation by machine) through to level F which involves excavation in the laboratory (for further explanation see Carver 1990, 77-78 and fig.16). Most features were dug at level D, graves at level E.

In order to reveal the spatial patterning of strata dumped on top of each other or deposits filling cuts into the ground, a procedure for unpeeling the site was devised, after experimentation during the evaluation phase. This became known as horizon definition. This tries to accommodate the two imperatives of archaeological excavation, namely the wish to observe spatial relationships in plan and the need to record vertical stratigraphic relationships.

In actual terms, a horizon can be equated with a level of visibility, where no assumption of the contemporaneity of the uncovered surface is made: coherence is given by what has been taken off, not by what is showing. The number of horizons recorded depends on the coarseness of the unpeeling procedure. At Sutton Hoo, in the flat areas between mounds, two horizon definitions were selected, Horizon 1 being the surface left after the removal of the turf / topsoil and Horizon 2 that left after the removal of the ploughsoil (in this case to the subsoil). In contrast, in the areas of surviving burial mounds seven horizons were recorded: 1 and 2 as above; 3 after the removal of the outer mound make-up; 4 after the removal of the mound core; 5, 6 and 7 refer to the removal of three stages of buried soil onto the subsoil surface.

In order to achieve consistency, speed and clarity in the recording of each successive horizon, the whole surface to be excavated was divided into modules measuring 8m x 4m. The size of the modules was dictated by practical considerations such as speed of trowelling, control over humidity, clarity of definition on a single A4 photographic colour print, and the scale of the definition plans drawn at 1:10 on A1 sheets. After a coarse definition trowelling, followed by fine trowelling, every module was photographed.
obliquely from a 5m tower and each of its components then identified by allocating feature and context numbers (on cards and in indexes: sketching their position and relationships in the site notebook; tagging them on the ground). The module was then surveyed and mapped in a single operation.

This straightforward procedure obviously works well on flat areas where the main object of the exercise is to document the density and population of visible strata and features, which can then be excavated in their entirety (Interventions 32, 39, 41 from 1984-1988) or selectively (Interventions 44, 48, 50, 55 from 1988-1992). However, the horizon definition proved itself a particularly useful tool when approaching large curved dumps of soil, the mounds, and their surrounding quarry pits and ditches.

In practical terms an excavator cannot recognise all the individual components (contexts) of a mound, being far too close to it while working on its definition and lacking the benefit of a permanently stationed highlift for viewing (not used because it was prohibitively expensive, although such equipment was brought in at specific times, in particular for photographic recording once a horizon was deemed ready). The concept of a horizon allows progress to be monitored effectively and meets easily the requirements for recording the stratigraphic order of deposits in vertical sections. The edges of modules form the quadrants used for dissecting a mound and the baulk between quadrants stays as a temporary vertical face between horizons. Once all quadrants have reached a given horizon, all vertical faces were drawn at 1:10 in colour (over 200m of sections from Mound 2 alone, produced by a single recorder, Catherine Royle). The baulks between quadrants were then removed to view the whole mound in plan, before reinstating the quadrant lines and repeating the whole process for the next horizon. Thus, the sections are added to periodically, resulting in the whole vertical order being recorded physically, though 'cumulatively' (ie. no section was ever seen as a single face, an exercise far too dangerous to undertake on over three metres of sandy soils, which would also limit the opportunities to observe the various stages of mound-building in plan).

Case Study: Mound 2 (Figure 2)

The staged dismantling procedure described above allows, after analysis, the reconstruction of mound-building sequences, where elements of the ritual that dictated the 'order of ceremony' can be glimpsed. Mound 2 provides a convenient example of the order of operations.
Figure 2

CHEMICAL MICROSURVEY IN MOUND 2 BURIAL CHAMBER

Mound 2: a) burial chamber, robber trench, 1938 excavation and plan of rivets
b) chemical microsurvey in burial chamber
First, turf and topsoil were stripped off the area which the mound was to occupy, its extent marked out by four corner pits and the outline of the future quarry ditch delineated by a ring of turves. Other turf and soil was kept for later use. In the centre of the reserved space an east-west, rectangular hole, 6m x 4m, was dug to a depth of c. 2m from the contemporary ground surface into the subsoil, the spoil from this operation being heaped to the north. Next the timber chamber was built in this cut, with overlapping vertical planks along the long (northern and southern) walls and horizontal planks along the end walls. The body of the occupant was laid at its west end, perhaps in a flexed position, with its head to the west (no trace of this body survived, its presence being indicated only by trace chemical elements concentrated at the west end of the chamber floor amongst 490 spaced samples: Bethell and Carver, 1988. Thus the body may be termed a conceptual context rather than a physical context).

The chamber was then furnished with grave goods including textiles, weapons (a sword, a spear, 5 knives with sheaths, a shield, a baldrick), vessels (a blue glass jar, bronze bowl(s), drinking horns), a silver-mounted box and a bucket. Most of these objects only survived as fragments which escaped the attentions of grave diggers in 1860 (see below) or, in the case of a cauldron, as a 'finds stance' denoted by a circular discolouration of soil in the base of the chamber accompanied by a swirling soil colour pattern which may denote the presence of a chain. A beam was then placed transversely across the top of the chamber and a ship, 20m-30m long, was set the right-way-up over the chamber, held up by raking shores. The size and position of this ship, totally destroyed by excavators in 1860 and 1938, is given not only by observation of features and strata but also by the number, shape, size, and distribution pattern of 834 fragments of rivets recovered in the excavations of 1938 and the 1980s.

The building of Mound 2, a barrow approximately 20m in diameter and at least 3m high, then commenced by excavating the 7m wide, surrounding quarry ditches. The order of removal of soil from the ditches (turf, ancient soil, subsoil) correlates with the reverse sequence of deposition in the mound make-up, capped finally by the turves kept in reserve. This observation, which would imply gang labour working simultaneously in an organised fashion along the whole perimeter of the quarry ditches, was arrived at not only by the traditional method of ordering the mound make-up contexts in a stratigraphic diagram, but also by an additional analysis of the Munsell colour codes recorded for each context describing the silty sand components of the mound make-up. This stratigraphic diagram with soil colours - dubbed a 'tintogram' - has shown itself quite effective in grouping contexts into families of colour derived from their soil-parents, regardless of small variations between different recorders (some degree of consistency was achieved by requesting that all records be made when the soil is sprayed damp).

The continuing story of Mound 2 refers to its afterlife. Pressure of the mound make-up and weakening of the timbers caused the ship to collapse creating an ovoid central impression above the chamber. The quarry ditches eroded, after initial stone roll, and the primary fill grew a mantle of turf.

However, that was not the end of the Mound 2 story. The natural decay of its components was speeded up by later disturbances and intrusions by antiquarians and archaeologists, the first of which may be dated to 1860. Indeed, on 24th November 1860, the Ipswich Journal reported "Roman mounds or barrows [at Sutton Hoo]: ... One of these
mounds was recently opened when a considerable number (nearly two bushels) of iron screw bolts were found, all of which were sent to the blacksmith to be converted into horseshoes. It is hoped, when leave is granted to open the others, some more important antiquities may be discovered..."

This entry seems to refer to Mound 2 and hints at an orchestrated campaign of excavations (rather than robbing) in 1860 or shortly afterwards. The evidence for such a campaign has been collected by Martin Carver (1992, 357-9 and fig.71), showing that at least eight mounds, but probably more, were trenched west to east. In Mound 2, an west-east trench, 3m x 20m, scattered the rivets of the rotten ship before descending into the burial chamber, steps were cut at its western end, the eastern end splayed out in a way compatible with its being a barrow run. Although no comment is made of the discovery of artefacts, or indeed of any subsequent barrow discoveries, it is likely that rich pickings were kept silent, given the fragmentary nature of artefacts recovered later.

This was still not the end for Mound 2. Having been left open long enough for rain-washed deposits to collect in the base of the chamber, the trench was backfilled and the whole mound ploughed, further levelling the quarry ditches with podsolised heathland sand sealing redeposited ship rivets in their new post-robbing position. When Basil Brown, the excavator of Sutton Hoo, arrived in 1938, Mound 2 was the first mound he tackled, opening yet another trench at a slight angle to the 1860 one. This slight change in alignment between the two trenches (the 1860 one being unknown to Basil Brown) led him to confuse some of the features left by the 'robbers' with original features. He also seems to have encountered the east end of the burial chamber, but, expecting a ship from the rivets he found, he mistook it for the transom of a dinghy. Basil Brown's excavation was backfilled before Mound 2 was used between 1939 and 1945 as a tank training area and was reopened for the third time by the current research programme.

This exposition of Mound 2's sequence shows that, behind the abstract ordering of strata into diagrams, lies a whole history of events referring not only to the construction and primary use of the structure, but also to its aftermath and finally to its unravelling and occasional distortion by more recent interventions.

"Sandmen"

What Mound 2, described above, and Mound 1 both lacked was the physical presence of bodies (although evidence for them can be shown in each case). Decayed human bodies were expected, following the British Museum's phosphate analysis of the Mound 1 objects (Bruce-Mitford 1975, 550-72) and the excavations of Longworth and Kinnes around Mound 5, which had encountered the remains of human silhouette burials (Longworth and Kinnes 1980, 23 and fig.14). Therefore, the discovery of further burials in the eastern peripheral cemetery (Group 1 comprising 23 flat graves in Intervention 32/52), around Mound 5 (Group 2 comprising 16 burials in Intervention 41/44/48/50) and of three furnished burials in Intervention 41/50, came as no surprise, although their location sometimes was.

These 'sand bodies' required a certain amount of care in the excavation and recording of ephemeral shapes in the sand, though in essence the procedures devised for recording surfaces and vertical deposition (horizons and cumulative sections), were adapted to suit the prerequisites of individual graves. Once a grave outline had been defined in plan, excavation proceeded with
the removal of each individual context in order but with the additional constraint of doing this in 5cm spits, adding to the section drawing along quadrant lines as excavation proceeded from stage to stage. Work continued until contact with the body remains, at which point the body’s shape in plan was revealed further in three dimensions by removing backfill adhering to its outlines.

The precision and trustworthiness of such sand shapes obviously depends on the observational and practical skills of the excavator, but, contrary to expectation, the task of dissociating body decay products from the surrounding matrix seemed, on the whole, not too difficult, the excavator being helped not only by colour but by the firmer and denser structure of the body. As for actual bone, preservation varied from grave to grave, from no bone whatsoever to fairly good preservation of the skull and long bones.

The records made for each individual grave were collated into a ‘feature pack’. For a typical grave this would consist of three categories: written records - feature and context cards and a diary kept by the excavator; drawn records - pre-excitation plans, stage plans and sections at 1:10 in naturalistic colour (Figure 3), interpretative plans of the body differentiating between body decay products and actual bone, a 3D hachure plan of the body, a plan of the location of finds numbers for each anatomical part prior to lifting, a plan of the emptied grave, and a location plan of the sampling array; and photographic records of each stage. In addition to this fairly demanding recording responsibility, excavators could spend a considerable amount of time protecting their burials and records from the elements, including building shelters, windbreaks and sunshades, making sandbag and plank runs to protect the edges of the features and sometimes even harnesses to prevent them from treading or kneeling on the feature.

Figure 3

An example of a plan and profile of a “sandbody” - burial 34
Case Study: Mound 17

The expertise gained in dissecting mounds and in making 'soft landings' on delicate body shapes in the sand were put to the test in 1991 when the intact inhumation of a young man accompanied by his horse was encountered under the ploughed-out Mound 17, which had survived the excavation campaign of 1860 because it was almost invisible. It had been cut along its western side by a medieval ditch and bank and had been almost totally levelled by ploughing. Indeed, it was only spotted as a slight platform in the grass by Martin Carver, as he was practising his golf shots from the top of Mound 1 one evening at sunset!

Excavation commenced with the stripping of the turf by machine, the resulting surface being fieldwalked and metal-detected. After an initial cleaning by hand, the area of the mound could already be identified by a concentration of rabbit burrows (mounds were always a target for rabbits, which preferred burrowing sideways into a mound to digging deep into a flat surface). In the case of this mound the lack of quarry ditches, the presence of the medieval ditch and bank and the edges of the British Museum's 1960s excavations meant that it was not possible to define the mound by the shape of its platform of buried soil.

The whole mound area was trowelled down and planned in 5cm spits, plotting all finds 3-dimensionally, until three substantial features were defined - two large sub-rectangular cuts with an oval pit in the middle. At this stage section lines were set up to form quadrants, taking the central pit to be the centre of the mound. The buried soil was then trowelled away in spits, always keeping the feature fills one spit ahead to avoid contamination, and the sections drawn. It was decided not to excavate the features from the top of the buried soil because definition was difficult due to the fact that they cut the intersections of various prehistoric ditches and previous experience had suggested that the best definition was gained at the interface between the buried soil and the natural subsoil.

Both the larger pits at this stage were thought to be attempts at robbing as the fills appeared to be very mixed. Hence excavation began at our recovery level D (see above), taking down spits of 10cm, plotting all finds in 3D, sieving all spoil and keeping a running section. However, after the removal of the latest mixed silty contexts, excavation of the sandy backfill of the larger of the two cuts, F318, started to reveal several stains which appeared to retain a shape. Also its preliminary interpretation as a robber trench gradually seemed less likely as there was no damage to the vertical sides, which it was already necessary to protect with planks and sand bags, whereas the robber trenches in other mounds usually had steps or a ramp cut for access.

When a large rectangular area of brown swirls in the sand and in one corner a brown stain forming a perfect circle became visible within the feature, we dared to believe that we had an intact burial, and so we changed our recovery level to level E, which meant excavating in smaller spits (no more than 5cm), making a detailed coloured plan of every spit or stage, and keeping a detailed diary of any thoughts, interpretations, weather conditions and mishaps. It was important to record every slight colour change in order not to miss any organic finds or features and to take a generous array of soil samples from each stage and from each suspected feature. As the feature was so large, c.3.5m x 1.6m, it was impossible to dig it from the surface and to prevent the weight and movement of the excavator or her
bucket from damaging any potentially fragile finds or deposits, a cradle of scaffolding poles was devised, which could be removed for photography, and from which all excavation and recording could be carried out without standing on the fill. The excavation continued through eleven stages: the second better defined the shape of the coffin; the third brought to light four iron coffin cleats which had already given readings on the metal detector which was employed at every stage; and the fourth, illustrated in (Figure 4), showed the coffin at its widest stage, the four cleats, the circular wooden tub first seen at stage 1, the rim of a bronze bowl surrounded by stains which persisted all the way down, and swirling patterns in the sand, which later proved to be the result of the grave backfill collapsing into vessels along the northern edge and into the coffin when its lid gave way.

Figure 4

F318: stage 4 plan translated into black and white from the original coloured field drawing

Stage 6 revealed an iron-clad wooden bucket to the north of the coffin, several ribs of lamb underneath the bronze bowl, a knife in its sheath inside the coffin against its southern wall, and the rivet of a bone comb which later proved to be leaning almost vertically against the outside of the northern coffin wall. Stage 7 showed the remains of the collapsed lid of the coffin, in part still retaining the structure of the timber, a bronze cauldron containing a small ceramic pot stood next to the iron-clad bucket, and beneath the circular wooden tub, now no longer visible, a heap of iron objects and silver and gilt bronze fittings interlaced with organic stains.

At stage 8, an angled, square post socket was seen at the centre of the western edge of the grave cut, and the coffin had a strong enough consistency to excavate the fill from against it. It contained the body of a young male, with much of the skeleton preserved as well as some body decay products, his sword in its scabbard and the remains of a purse containing loose fragments of garnet and millefiori at his right side. The body had slipped or rolled slightly to its right hiding its buckle beneath the sword. Outside the coffin were the bucket, the cauldron and ceramic
pot, a 'rack of lamb' still surrounded by a stain which at this stage was interpreted as a bag of organic material containing both the meat and the bronze bowl, the complex of silver and gilt bronze fittings (constituting the bridle belonging to the horse in the adjacent grave) and, beneath this and running underneath the coffin, a pair of spears, which were then better defined at stage 9.

At stage 10 the coffin was sectioned in order to see the shape of its base and, in addition to the spears, it became clear that there was also a shield on the grave floor beneath the coffin. Since many of the finds were in poor condition, members of the British Museum's conservation department came out to lift them in blocks, which, of course, caused a great deal of damage to the bottom of the grave although it was still possible to record a layer of trample and also the varying nature of the natural subsoil (stage 11). In the adjacent grave cut was found the well-preserved skeleton and body stain of a small robust male horse. Figure 5 shows the complete assemblage, as seen before the blocks were excavated in the British Museum.

Figure 5

The Mound 17 assemblage
The copious records made during the excavation of Mound 17 in September and October 1991 allow its story to be told (summarised in the stratification diagram, Figure 6, showing the order of deposition). First the grave, F318, was cut into the buried soil and a post, F357, was inserted into the base of western edge, probably leaning against the top of the grave on the eastern side (this may have facilitated the positioning of the grave goods). Next a layer of trample, 1588, formed in the bottom of the grave during construction and furnishing and two spears were then placed near its northern edge, with a shield on top of them (there were traces of wood from the shield board preserved on the spears). It is possible that the harness was also laid in the north west corner of the cut at this stage and the iron-clad bucket was placed next to, and slightly overlapping, the shield.

Figure 6

**Mound 17: stratification diagram**

It was only at this point that the coffin was lowered into the grave. To the north of the coffin, next to the bucket, was placed a bronze cauldron, probably filled with some organic produce, with a small ceramic pot on top (the pot was found inside the cauldron but it seems unlikely that this was its original position). Next to these was the rack of lamb with the bronze bowl on top of it and, since both items were consistently recorded within a stain of varying dimensions, it is suggested that they were contained in a bag,
perhaps of cloth or leather. On top of the harness was a possible wooden saddle and a wooden tub. Lastly, a decorated bone comb was placed on top of the coffin (found sticking vertically into the soft sand, it is likely that it slid off the coffin during backfilling). The post, F357, seems to have been extracted before or shortly after the start of the backfilling as no trace of it was seen at higher levels. Backfilling started from a spoil heap of fairly clean, redeposited subsoil on the southern side and continued with more mixed material from the north. Above this, the mound was probably constructed from heaped-up turf, since no quarry pits were found.

Finally, the decay trajectory can be read in the section reproduced here (Figure 7). It appears that the first thing to give way was the lid of the coffin, a plank of the same dimensions as the base, which came away from the iron clamps and fell directly onto the body crushing the uppermost part of the skull. In the meantime the organic fill of the cauldron decomposed allowing the ceramic pot to sink down into it, and the wooden bucket rotted to leave its iron hoops slumped on top of each other. The space left by the collapse of the coffin lid was immediately filled by the sandy grave backfill which shows as a series of dished deposits in the section, and as the swirling brown patterns which were seen in plan throughout stages 1-7. To a lesser extent these patterns were also seen above the grave goods along the northern edge of the grave.

Figure 7

F318: black and white "translation" of the original coloured field drawing
Conclusion

It is not the intention of this paper to publish the findings from the Sutton Hoo Research Project but rather, with the permission of the project's director, Martin Carver, to use the information and experience gained there to show how burials can be recorded and studied in such a way as to infer a sequence of events, rather than a static tableau.

This sequence of events can shed light not only on the ritual enacted at the time of burial (translated into a series of individual actions spread, sometimes, over a considerable period of time) but also on the post-depositional fate of the burials. The latter includes natural decay and collapse, as well as later intentional and unintentional interventions, such as rabbit burrowing, ploughing, antiquarian investigations and recent, or not-so-recent, deliberate excavation: in short the whole story which a burial can tell, not just that chapter confined to describing the original event.

The methods employed were developed specifically for Sutton Hoo but are still being successfully employed on similar sandy sites. Since Sutton Hoo was a research project, a certain amount of control could be exercised over the time and expenditure given to individual burials, perhaps more so than in the “rescue” situation. Nevertheless, there were constraints on time. It should be noted that the excavation of the Mound 17 burial from stage 1 (i.e. not including the definition of the mound and the removal of the first part of the fill) took about 53 days, often with two people to speed up the recording process when under pressure to finish before the wintry weather set in, threatening to damage both burial and finds. Much of the information gained, particularly for the organic finds, was due to digging in spits and recording in colour. The section, presented here is a composite: the top part was drawn cumulatively, the middle reconstructed from the stage plans, thus lacking the soil patterns of the backfill, and the bottom part again drawn from a standing section. Had the excavator attempted to maintain a cumulative section throughout, at least another week would have been added to the time.

Nonetheless, we hope to have shown that the effort expended has added considerably to the “dry bones” of a burial. The stories which burials provide are worth telling: this particular story ends with our own dissection of the Sutton Hoo mounds, leading us from the process of intervention in the filed into the realms of historiography, methodology and interpretation.

Bibliography


52
Carver, M (1990) “Digging for Data: archaeological approaches to data definition, acquisition and analysis” in R Francovich and D Manacorda (eds.) Lo Scavo Archeologico: dalla diagnosi all’edizione (All’Isegna del Giglio: Firenze), 45-120


“How did all these bones get in here?”

by Sue Stallibrass

Introduction

This paper has two parts. The first attempts to demonstrate how studies of animal bones can contribute to understanding of site formation processes and the integrity of stratigraphic units. By taking a case study of a common and standard type of site (a Roman fort) it reveals the complex variety of deposits that may be contained even within a restricted, and superficially uniform, type of context (in this case: military ditches).

The second part compares the results of the animal bone study with those of other aspects of the site, particularly the pottery, glass and leather finds. These show similar levels of complexities, together with conflicting evidence for the dating of the deposits and for degrees of residuallity or redeposition. By considering all of the information together, some apparent conflicts or discrepancies have been resolved, resulting in a more sophisticated interpretation of past activities at the site than might have been possible through the simple accumulation or juxtaposition of isolated specialist reports. The two conclusions are that:

- many useful details may be overlooked if the deposits at a site are assumed, rather than demonstrated, to be uniform
- no one type of data should be assumed to be analogous to another with regard to site formation processes.

The Site

Ribchester is a Roman fort, situated on low ground beside the River Ribble, which was partially investigated in 1989-90 prior to the extension of the graveyard of the current parish church. The excavated area included a section of the rampart and the triple ditches, sometimes individually recut, which surrounded an early timber fort (Phases 1 and 2) dating to the late 1st/early 2nd centuries AD. In a short-lived Phase 3, dated to around AD120, the triple ditch system was replaced by a single, very large 'Punic' ditch (known as such due to its characteristic cross-section, not its date) which appears to have acted as a site boundary and temporary defence whilst the timber fort was demolished and a new stone fort was built. In Phase 4, dating to about AD120-140, the area was used for industrial purposes and, possibly, for some horticulture. Concentrations of calcined bones implied, to the excavators, the possibility of human cremations, and they suggest that the area generally might have acted as a cordon sanitaire between the stone fort and the adjacent settlement.

From the point of view of an animal bone specialist, there was nothing unusual about the site apart from at least one literary reference to a cavalry unit being stationed there, probably during the second and third centuries. If this unit had also been present earlier, at the time of the timber fort, then the contemporaneous animal bone collection (Phases 1 & 2 and, possibly, Phase 3) might be expected to include rather more horse bones than is normal for a Roman fort garrisoned by infantry troops. The only other aspect of any note is the fact that most of the
ditch deposits were extremely wet and organic, leading to excellent preservation of biological material such as animal bones, leather, plant remains and insects.

The animal bones

The material

The vast bulk of the hand-recovered animal bone collection (and most of the other finds, too) came from the ditch deposits. Table 1 shows the distributions by phase and weight of the hand-recovered material from the whole site. Bulk sediment samples were processed from many contexts, and revealed the sparse distribution of small fragments of bone: the addition of this sieved material does not significantly alter the data presented and discussed here. Hence, apart from the calcined bones from Phase 4 which are discussed separately, all of the following descriptions and discussions refer only to the hand-recovered animal bones recovered from the ditches. Archive reports on the animal bones have been combined in Stallibrass 1995.

Table 1

<table>
<thead>
<tr>
<th>Date</th>
<th>Phase</th>
<th>Kg</th>
<th>%</th>
<th>Use of site</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-Roman</td>
<td></td>
<td>1</td>
<td>1%</td>
<td>fort construction</td>
</tr>
<tr>
<td>pre AD79</td>
<td>Phase 1:1</td>
<td>6</td>
<td>4%</td>
<td>deterioration of defences</td>
</tr>
<tr>
<td>AD79 - c.120</td>
<td>Phase 2:1</td>
<td>1</td>
<td>1%</td>
<td>fort modification</td>
</tr>
<tr>
<td>AD 79 - c.120</td>
<td>Phase 2:2</td>
<td>35</td>
<td>23%</td>
<td>extra-mural settlement modified</td>
</tr>
<tr>
<td>c.AD120</td>
<td>Phase 3</td>
<td>71</td>
<td>47%</td>
<td>fort demolition and rebuilding</td>
</tr>
<tr>
<td>c.AD120 - 140</td>
<td>Phase 4:1</td>
<td>1</td>
<td>1%</td>
<td>construction of military enclosure</td>
</tr>
<tr>
<td>c.AD120 - 140</td>
<td>Phase 4:2</td>
<td>6</td>
<td>4%</td>
<td>use of the military enclosure</td>
</tr>
<tr>
<td>AD140 - 200</td>
<td>Phase 5:1</td>
<td>3</td>
<td>2%</td>
<td>site degradation and continuity</td>
</tr>
<tr>
<td>AD200 ...</td>
<td>Phase 5:2</td>
<td>2</td>
<td>2%</td>
<td>site decay</td>
</tr>
<tr>
<td>post-Roman</td>
<td></td>
<td>0</td>
<td>0%</td>
<td>later Roman to modern activity</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The distribution of hand-recovered animal bone by phase and weight (periods with most data highlighted)

Preservation conditions

Almost all of the bones are in an excellent state of preservation, with satiny-smooth surfaces that show no signs of abrasion or acid etching. They appear to have remained in their original, waterlogged deposits ever since initial disposal. However, a few, less-well preserved bones appear to have been re-deposited. The numbers are very small but do tend to occur more frequently in the earlier deposits: the percentages of eroded and/or brittle fragments in the ditch collections range from 11%-32% in Phase 1, through 0%-9% in Phase 2, to a mere 1% in Phase 3. Some of these are clearly eroded, whilst others are simply rather brittle in texture compared to the robust waterlogged material.

Rates of chewing, however, do indicate that dogs had access to many of the bones before
they were buried, and there are notable differences in the rates of chewing for bones from different species. In particular, bones of sheep and pigs are often more frequently chewed than those of cattle, (30-40% of fragments, compared to <10%), implying that most of the latter were buried quite rapidly after discard, whereas the bones of sheep and pigs may have been thrown on top of surfaces or heaps of refuse initially, and buried slightly later. There cannot have been any long delays between initial discard and burial of sheep and pig bones, however, since their preservation conditions are the same as those of the cattle bones, suggesting that all were buried quickly in a waterlogged environment.

One possible explanation for these differences is that the larger, cattle bones were removed during butchery or processing for cooking in a kitchen, and thence discarded as dumps of noxious waste in the ditches. In contrast, the smaller bones may have been cooked with the meat still on them, discarded at meal times for the dogs to clean up beneath the tables where the food was eaten, and then swept up with other floor debris and dumped into the ditches a few hours or days later.

There is also the possibility that some, or even all, of the ditch material was deposited first in middens and then moved *en masse* into the ditches. In this scenario, it is not possible to guess at the time delay that may have been incurred between initial discard and burial in the ditch, excepting that the satiny surfaces of the bones suggest very little destruction by microbial activity before the bones were buried in a waterlogged context. Whether this implies a delay of a few weeks or a few years is unknown.

**Remains of cattle, sheep and pig**

The majority of the animal bones from the ditches derive from the three main domestic species that dominate most British (and Continental) sites from the Neolithic period onwards: cattle, sheep and pigs, these species accounting for 74% of the recorded bones from Phases 1 - 3 inclusive (Figure 1 shows the distribution of recorded fragments for each of these species, plus dog and horse, grouped by phase and ditch cut). The bulk appear to derive from ordinary practices of butchery, food preparation and meat consumption, as evidenced by the parts of the body represented, and by the frequencies and distributions of the cut marks on the bones.

However, there are some distinctive groups of bones that appear to have been treated in special ways, all of which are related to specific methods of processing cattle bones and are commonly associated with Roman forts. One method involves the standardised defleshing of cattle scapulae (shoulder blades). These bones are easy to fillet and bear a large muscle mass (ie weight of meat) that is highly suitable for preservation treatment such as smoking, drying or salting.

Several contexts contained groups of cattle scapulae that have all been trimmed with a cleaver around the shoulder joint, to disarticulate it from its humerus, and bear numerous sharp knife-marks along the flat portion of the shoulder blade itself. The bones show no signs of having been heated, so the meat was probably filleted off-the-bone before cooking (although it might have been smoked or salted prior to this). It could have then been processed for immediate consumption but, given the co-occurrence of several scapulae together, it is more likely that the meat was removed for preservation or storage: the troops would have required large quantities of food that could be
The Distributions in the Ditches of Recorded Bones of Cattle, Sheep, Pigs, Horses and Dogs
transported at low cost and dumps of such processing waste are not uncommon at Roman forts. However, it is worth noting here that, if the bones had been studied at a phase level rather than by individual contexts, the size of each discrete dump (which presumably derives from a single occurrence of a processing event) would have been un-knowable. Also it would not have been clear that this processing debris was disposed of into contexts also containing ordinary butchery or food refuse.

The other form of specialised processing waste, also mixed in with ordinary food refuse, involves the long bones from cattle limbs and, again, this type of deposit is quite common at Roman forts. Limb bones, particularly those from the lower limbs (ie the radius and tibia) but also, to a lesser extent, those from upper limbs (ie the humerus and femur) were sometimes found in a very highly butchered state. Their most distinctive attribute is the longitudinal splitting of the bones, which opens up the marrow cavity that runs down the centre of the bone's shaft. The usual explanation here is that the bones have been split open and fragmented and then boiled up to extract the marrow, which is rich in fats and other nutritious ingredients. Again, dumps of this specialised type of waste were found from discrete contexts within the ditch fills, giving an indication of the scale of each act of processing.

Remains of dogs and horses

In addition to the bones of cattle, sheep and pigs, those of dogs and horses also occurred in considerable numbers. Sample sizes are quite small for some cases, but are usually sufficient to demonstrate clear patterns. Dog and horse bones were of particular interest at Ribchester. Firstly, the presence of a large quantity of horse bones is unusual and suggests that the fort was being used by a unit that required more than the usual pack and transport animals, i.e. a cavalry unit. Secondly, at the assessment stage, it was noted that dog and horse bones seemed to co-occur in the ditch deposits, and this possibility was investigated further during the post-excavation analysis. Deep negative features such as wells and large pits often act as depositories for unusually large or noxious animal waste (the ‘dead dog syndrome’), and it was thought that certain Ribchester ditches might have fulfilled a similar role.

However, this subjective impression proved to be over-simplistic. Figure 1 shows that, whilst bones of horses and dogs do occur together in three groups, and are simultaneously absent from two others, they are mutually exclusive in the other two. In Phases 1 and 2, most of the horse bones (26/31 fragments) come from the Inner Ditch, with five from the Middle Ditch and none from the Outer Ditch. Although the sample sizes are often rather small, the overall pattern does appear to indicate that the horse bones are deriving from inside the fort rather than from outside. It is significant that horse bones in the Phase 2 Inner Ditch deposits outnumber those of pig. This is unusual for any Roman site, and may suggest that the numbers, although very small, are significant. The dog bones show a similar distribution in these phases, with 113 of the 125 fragments deriving from the Inner Ditch, again suggesting that the dogs originated from inside the fort. However, most of the horse bones (N=138) come from the Phase 4 Punic Ditch, and are associated with a complete absence of dog bones. This cannot be explained by sample size, recovery methods or preservation conditions, and presumably reflects a genuine difference in the availability of material (ie a lack of dead dogs!) or a change in activities relating to their deposition and disposal.
Dog bones proved extremely interesting for their evidence relating to site formation processes. None bear any cut marks, not even those that might relate to skinning rather than to butchery, implying that the dogs were discarded or buried as whole corpses. Equally, all lack chewing marks, indicating that the corpses were buried beyond the reach of scavengers shortly after death. However, although the dog bones were nearly always found in groups, each one deriving from a single individual, no complete skeleton was recovered from any of the excavated contexts. In fact, the groups of bones often represented considerably less than half a dead dog. This absence of large parts of each skeleton, and an accompanying lack of smaller bones, is surprising. Whilst the latter could be due to bias of recovery procedures, particularly when excavating by hand in black, wet and organic deposits in winter, a professional excavator who revealed a complete dog skeleton in a ditch deposit is then unlikely to miss the majority of the larger bones.

Some of the dog bones bear old breaks and the incomplete nature of these skeletons may be due to the disturbance of the sediments in which they were contained, which could also explain the lack of associated grave cuts. In one instance, articulating bones from a single individual were recovered from two discrete contexts that were separated by a third, although all three lay within the same recut of a ditch. Dog bones may also have been redeposited in successive cuts: those in the later Phase 2:2 cut of the Inner Ditch (N=33) may derive from the carcasses represented in the earlier Phase 2:2 cut of the same ditch (N=80). Skeletal matches were looked for within each ditch cut group, but not between cuts. Another possibility is that the remains of dead dogs were removed from their original place of burial and redeposited in the ditch (like excarnated human skeletons). But where have they been redeposited from? The preservation conditions of the dog bones were indistinguishable from those of the other bones, so all bones appear to have been in waterlogged sediments since they were first deposited. Had the dogs not formed incomplete skeletons, there would be no reason to doubt that they were in their original depositionary contexts.

The horse bones show a similar, although not identical, pattern. Most remains represent smallish parts of a dead horse's anatomy but were found with no signs of having been butchered or skinned: originally they had been disposed of, or left to rot, as entire corpses. Additionally, many bones have been chewed by dogs, implying that they remained accessible for some time prior to their complete burial. Given the size of a dead horse compared to that of a dead dog, incomplete burial is understandable, although a dead horse can produce unpleasant substances during its early stages of decomposition. A consideration of the sizes, ages and sexes of the horse bones shows that at least five or six individuals were recovered from the excavated section of the Punic Ditch, with a similar number represented by the material from the triple ditches. Whether the animals all died in one or two particular events, or their remains accumulated over several years, is unknown but the stratigraphic evidence probably supports a short time span. The Punic ditch, in particular, is thought to have been infilled deliberately and very rapidly (see further below).

It is tempting to suggest that these groups of dead horses represented casualties from military skirmishes, given that the site was a military establishment, or that the animals succumbed to disease. Yet both explanations are countered by the age and sex data from the bones, which show an even mixture of males and females, all aged between about two and five years of age. This is much
narrower than that expected from indiscriminate outbreaks of war or disease. Similarly, the lack of any signs of injury on any of the horse bones suggests that the animals did not die cumulatively over a long period of time from injuries that had failed to heal adequately. An alternative hypothesis is that the animals were deliberately culled and discarded if they proved unsuitable for cavalry requirements: horses would have been selected on the basis of their temperament and speed, and thus be unlikely to be suitable for alternative use as pack or draught animals if they failed to perform adequately in a purely military rôle (Hyland 1990).

Whatever the causes of death of the horses, and regardless of whether or not they died simultaneously, their corpses were left at the site exposed to scavenging dogs. Disturbance of the skeletons could have happened during scavenging prior to their initial burial, or after this, in which case both this and the final burial site must have enjoyed similar preservation conditions to those in the ditches. Since they show no signs of extensive exposure to weathering agencies, any redeposition must have occurred swiftly, as with the dog corpses.

Cremated bone or bonfires?

As mentioned previously, it was thought possible during excavation that the concentrated deposits of calcined bone in some of the Phase 4 contexts might relate to human cremations. However, further study post-excavation revealed that all of the identifiable fragments derive from non-human mammals such as sheep and cattle. Where did the calcined bone come from? Although the relevant contexts include several hearths, an analysis of the bone distribution revealed that it was more commonly associated with surface layers. In addition, it was simply burnt, not combined with slag as if used as a flux in an industrial process. Yet the material is not just charred but uniformly calcined (mostly white all over with occasional patches of bluey-grey), indicating a high temperature in firing and plentiful oxygen when burnt. Given that unburnt bone survived in good condition in the same deposits, the lack of charred bone cannot be ascribed to preservation factors. In a normal bonfire (the word derives from ‘bonefire’), accumulating ashes often produce reducing conditions at its base. The lack of black, reduced fragments at Ribchester suggests that the fires were raked over to ensure that all of the fuel was thoroughly consumed.

The area, it seems, was being used for clearance purposes rather than ad hoc rubbish disposal. Interestingly, almost every bulk sediment sample from the site produced some tiny fragments (<5mm maximum length) of calcined bone, implying that ashes blowing about the site had been incorporated into most deposits. If the bones burnt in Phase 4 had come from the clearance of midden deposits, these must have had a high organic component. An earth midden would have prevented free circulation of oxygen and left partially burnt bones, even if raked assiduously, and a midden of pottery should have left a residue of burnt pottery fragments amongst the bones. Only a midden of biological materials such as waste timbers, straw, leaves and roots would have been ashed so completely in a hot, well oxidised fire, and the residues could have been blown away or incorporated into the sediment matrix beneath the place of burning.
Integrating evidence from various types of material

It has been suggested that almost all of the animal bones from the Ribchester ditches have been recovered from their original places of deposition, with little or no disturbance. Although probably deposited more or less simultaneously, they were derived from a variety of discard processes, the majority from ordinary butchery, food preparation and consumption, but intermingled with groups coming from very specific, military processing. Also they may have come from different locations within or beyond the fort. Amongst the domestic and processing waste are the bodies of dead dogs whose character shows that they were either disturbed but left more or less in situ, or were re-deposited from elsewhere. Such re-deposition occurred quite rapidly and between deposits with similar sedimentary and hydrological conditions. Partial horse skeletons have similar implications, though these corpses had been exposed to scavengers prior to burial and may have been redistributed before, or after, initial burial: clearly the bones filling military ditches which had been cut originally for a single purpose, came from a variety of sources and their initial deposition may have occurred at a variety of times and places. Finally, an open area beyond the ditches was later used for burning plant and animal remains, with considerable care taken to ensure that the material was fully consumed.

When these results are set beside other specialist finds work, divergent interpretations are apparent, particularly with regard to dating evidence and degrees of residuality. The animal bone from Phase 1 contains a significant minority of material derived from pre-ditch activities, whereas the coarse pottery shows no signs of any residuality, the vast majority of the sherds dating to the late first/early second Centuries.

In contrast, the dog bones from Phase 2 demonstrate the disturbance of an apparently uniform assemblage of animal bones, either within the same ditch in re-cutting or incorporating material from elsewhere, yet the associated Samian pottery contains much residual material. Further analysis might establish whether this movement is vertical, within a ditch, or horizontal, from other areas. The apparent discrepancy between the evidence for bones and different types of pottery might be explicable in terms of differential deposition or dating accuracy. The deposition of a complete dog is 'instantaneous' and a partial skeleton indicates disturbance within a year or two, whilst it was still partially articulated. Styles of Samian changed quite rapidly, and 'residual' Samian may be merely a few years out-of-date. In contrast, coarse ware forms tend to be more long-lived, and the amalgamation of material deposited over a few years may not be discernible, just as bones accumulated over decades would be indistinguishable from those deposited in a single event.

Other material from the triple ditches indicating general refuse disposal includes pieces of leather distributed throughout all context types, some coins, plant remains and pieces of wood. The bones, at least, indicate an origin within the fort and distributions of these other finds could be similarly investigated to confirm this. The plant remains, both waterlogged and carbonised, show evidence for the discrete dumping of refuse from a variety of activities and ecological habitats, in a manner very similar to that evidenced by the animal bones.

The stratigraphic evidence for the fills of the Punic Ditch in Phase 3 indicate that it was dug, and deliberately infilled, within a short
period of time. This conclusion is supported by the insect remains which suggest that the ditch was open for a time with some standing water in its base, before being rapidly infilled. There is little evidence for any accumulation of foul matter in the deposits and no re-cutting or dog bones. The latter perhaps implies a lack of dead dogs 'to hand' when the ditch was rapidly infilled, whereas the more slowly infilling deposits in the triple ditch system (which needed to be periodically re-cut in order to maintain their function) could accrue dog carcases over several decades. Alternatively there may simply have been a change in disposal methods between Phases 2 and 3.

The infilling of the Punic Ditch facilitated, or required, the deposition of a large quantity of material. Much could have derived from the upcast from its construction but some appears to be 'new' waste. Large quantities of coarse pottery were recovered, most being residual from Phases 1 and 2. However some later material dates to the early-mid second Century and was especially concentrated in upper ditch fills, though there is no stratigraphic evidence for a hiatus in the infilling process. Almost all of the glass in the Punic Ditch comprises bottles manufactured in the late first to very early second Century, with only a handful of sherds from early-mid second Century types. The fragments, large and unburnt, suggest a fresh deposit and would probably have been interpreted normally as a late first Century group mixed with a little intrusive material from a couple of decades later. However, given the pottery evidence, it seems more likely that the glassware was curated prior to its primary deposition in the Punic Ditch, at a time when the styles had become anachronistic. Similar evidence for curation comes from the leatherwork. Although pieces of leather were common throughout the sequence, the Punic Ditch contained several distinctive pieces which had been folded as though stored for future use. Perhaps the glass bottles and the leather pieces had been stored in workshops that were cleared out when the timber fort was demolished and the stone fort constructed (compare the modern need of some people, when moving house or work premises, to have a refuse skip as well as a removals van!).

The animal bones from the Punic Ditch occurred in large numbers but their uniform (and excellent) preservation condition precludes the identification of any bones that may have been redeposited within a few years between contexts with similar matrixes. The nature of the remains demonstrates that the bones derive from a variety of activities, rather than a single event. Whether these occurred in Phases 1 and 2 (in which case the bones are redeposited) or whether the bones represent 'new' material whose original deposition dates to Phase 3, is unclear. Only the horse remains appear, given their numbers, to be a fresh input to these deposits.

More generally in the first three phases, the sheer number of horse bones is unusually high for a Roman fort and supports the suggested presence of a cavalry unit before the time implied by the known documentary references. Corroborative evidence comes from metalwork and leather finds, many of which derive from military styles of horse equipment. The relatively high denominations of some of the coins may also be circumstantial evidence for the presence of a cavalry unit whose men received a higher allowance than infantry soldiers. Finally, carbonised and waterlogged remains indicate the presence of hay, and many of the highly organic deposits contain relatively few seeds, which may indicate that they consist of straw for flooring or bedding, although neither type of material can be linked indisputably with
the welfare of horses rather than cattle or some other species.

In Phase 4, the excavated area was relatively free of structures, and carbonised plant remains indicate the presence of many ruderals (colonisers of open ground) and perennials (indicating that ground remained open for at least a couple of years). Other species suggest limited horticulture and still others high levels of nitrogen (which are usually associated with organic waste). Lastly, as mentioned previously, the calcined bones may be the residue of clearance of plant and animal remains. Of the 3000 pottery sherds from this phase, a significant minority are residual forms mixed with early-mid second Century debris. Thus all lines of evidence point towards the presence of considerable quantities of rubbish, some of which was tidied up, in a generally open area used for industrial purposes.

Discussion and Conclusions

At a general level, the dating evidence from the coins (studied by David Shotter) and the Samian (studied by Brenda Dickinson) indicate that the fort went through periods of relatively intense occupation and activity, interspersed by much slacker periods, between cAD75 - cAD145. Certainly, the dumps of out-of-date pottery and glassware, of leather off-cuts, animal bones and plant remains, all point to a major clear-up session when the Punic Ditch was infilled (when the stone fort replaced its timber forerunner), and a similar clearance period may be indicated by the bon(e)fires of Phase 4. This scenario - periods of low-key activity interspersed with major clearance episodes and restructuring of the fort - goes some way to explaining the degrees of residuality, curation and redeposition that appear to be demonstrated by the various types of material and stratigraphic evidence at the fort.

One could speculate that, given the position of the fort behind the lines on a major south-north roadway, it may have acted as a stop-over point, as a reserve for 'front-line' troops, and as a fall-back position in times of trouble, as well as being a supply depot for the frontier along Hadrian's Wall and, later, the Antonine Wall. Cavalry units, in particular, could have used it as a base from which to move swiftly when required elsewhere but, if called away at short notice, half-trained horses, a liability on active service, may have been culled. Unburied corpses of horses, though unpleasant in the early stages of decomposition, need not have afforded much discomfort in a fort manned only by a 'caretaker' garrison.

Of course, the above is only a working hypothesis which may be very different from what really went on at Ribchester during the late first - early/mid second Centuries. Once an hypothesis has been framed, it is all too easy to find evidence which appears to support it, and to avoid looking for that which might refute it. Also the excavated area is only a tiny portion of the overall site of the fort and the adjacent civilian settlement. It might have had a very different function to these other areas - indeed, the evidence recovered already indicates that considerable variation exists even within a single assemblage of a single type of find, derived from a small sample of an apparently standard type of context. Given this variability, it would be foolhardy to extrapolate too far: nine dead horses in a ten metre length of ditch cannot be used to calculate that there would have been 90 dead horses in a 100 metre length of the circuit, for instance! Such variability has important implications for the design of strategies in post-excauation, which could easily miss out on particularly interesting collections of material (see Gidney 1992 on the post-Medieval pits at The Shires, Leicester for a parallel lesson).
Further, it should not be assumed that the variations will correlate with each other: residuality of one type of material may not match that of another. By treating each type of material on its own merits, site formation processes which acted upon it prior to its excavation can be understood. 'Splitting' rather than 'lumping' groups of material can allow greater detail and insights to be attained at an early stage of analysis. Where it does not, repetitive data can always be amalgamated, whereas detail cannot be extracted retrospectively from a bland overview. Furthermore, feedback between specialists working on such small groups of material can be provided as each is studied, and ideas can be created and debated prior to an overall draft report being produced.

The final lesson of Ribchester is in fact its first in terms of importance. The discussion of ideas, results and queries by a variety of specialists, with different interests, backgrounds and preconceptions, at a series of meetings during the post-extraction stage is not only extremely stimulating for the individual specialists concerned but also essential for a holistic approach to the site. This type of approach has major implications in terms of time (and, hence, salary costs) for whoever authors and edits an excavation report which must present the data, hypotheses and interpretations in an integrated manner, rather than simply concatenate the specialist reports supplied by a list of contributors. Such a report should provide significant information and stimulation to all readers, whatever their specialist or general interests, whilst making a clear distinction between 'objectively' observed data and subjective, but well-informed, interpretations. Hopefully, the Agatha Christie days of publication, where each specialist provided some clues, but only the excavator (alias Hercule Poirot) had access to all of the evidence, are now a thing of the past.

Bibliography


Acknowledgements

I should like to thank all those involved for the lively post-exavcation project meetings, and for some memorable lunches. Thanks, too, to everyone who excavated the material from the wet and gungy deposits: I hope I have demonstrated that it was worth collecting the animal bones. People whose work I have drawn upon in particular are Kath Buxton (site director), Chris Howard-Davis (finds co-ordinator), Louise Hird (coarse pottery specialist), Sally Cottam & Jenny Price (glass specialists), and Jacqui Huntley (plant remains) and I apologise to them if I have misrepresented their work or ideas. Without the meetings and everybody’s contributions, only half of this paper
could have been written. The project was supported financially by English Heritage through the Lancaster University Archaeology Unit and the Ancient Monuments Laboratory. The excavation report *Brigantia to Britannia: Excavations at Ribchester 1980 and 1989/90* edited by Kath Buxton & Chris Howard-Davis has been submitted to English Heritage for a grant to enable its publication as a Lancaster University Archaeological Unit /EH monograph.
Dealing With Vague Date Ranges: A chronology for a Roman Cemetery

by Peter Hinge

Introduction

This paper discusses a method of dealing with a commonly encountered, yet poorly served, problem in archaeological data sets, particularly in certain periods: the vague date range. In the right conditions, datable artefacts allow the relative order of the events with which they are associated to be expressed in the absolute scheme of years. Yet, even if artefacts exist in the most undisturbed condition devoid of intrusive or residual material, the intrinsic error that all but a few date ranges express often renders such a pristine situation impotent for dating purposes, as the period in which the deposit could have been generated overlaps with the creation date of adjacent deposits. Naturally, the problem is compounded if the actual period of occupation is relatively short.

Vague date ranges also provide a conceptual problem for site interpretation because they introduce the unimaginable: a burial takes place in a single day, rather than over the century of its associated pot dates, and rubbish takes seconds rather than a generation to fall into the pit. Yet the apparent conflict between the instant act and its protracted presence in our chronologies is a matter of fact: it reflects our current state of knowledge. This holds true both for objects which have long and well-attested periods of production/availability, and those which receive ranges of similar duration due to great uncertainty about their actual period of use. It is self-evident that, if every episode could receive accurate individual dates, the chronological precision of our dialogues would increase. Yet both fine detail and the more vague information can contribute to archaeological narratives in an aggregated form, with the nature of that aggregation being of great importance to interpretation in general, and to this paper in particular.

Thus archaeologists require tools which enable them to confront the vagaries of their dating evidence in an objective manner. Advances in information processing provide new ways of conceptualising this specialist knowledge, enabling us to further exploit the decades of scholarship that have provided the date ranges used today. The method discussed below attempts to consider that data in an aggregate manner and in conjunction with the stratigraphy, aiming to provide a chronological structure which enables general changes over time to be observed. The aim is, emphatically, not to develop a further method to derive singular dates, as 'best guesses' of the most likely point in time at which a particular event occurred. Rather the approach accepts, and attempts to use, that very vagueness which was the incentive for such 'best guess' initiatives in the first place.

In particular, the paper aims to use the stratigraphy and a computing system to make the most of the available dating evidence in providing valid chronological divisions between which changes in the burial rite may be apparent. The techniques presented were developed as part of an inter-specialist research project into Roman London's
Eastern Cemetery (RLEC), and built on recently completed SERC/CASE research into the application of Relational Database Management Systems (RDBMS) to archaeological data (Hinge 1995 - further details of the computational component are available from the author).

The power of such a RDBMS is that it provides an environment in which the various strands of information, which have been carefully recovered and analysed by disparate specialists, can be re-united in a targeted, analytical manner. It enables the rounded multi-disciplinary nature of the most thorough archaeological interpretation, and realises the compound effect of specialist data analysis. Thomas (1991) has drawn attention to the magnitude of the archive which the field profession has generated. This, and the increasingly commercial environment in which many of us now work, have made the RDBMS a critical IT tool for quality archaeological interpretation. Indeed, relational database software is now of a price and power that even the smallest unit can afford. RDBMSs are interrogated using the Structured Query Language (SQL) which is highly portable, ensuring that tools such as that described here are easily passed between systems, regardless of the particular vendor or platform involved.

The paper begins with a short introduction to the RLEC project and details of data organisation. The two components of the approach devised are then presented, beginning with the means by which stratigraphic relations between burials can be manipulated ("Modelling Stratigraphy"). From this a technique was developed to allow the date range of each burial to be progressively refined by combining the stratigraphy and dating information and interrogating it in an iterative manner ("Propagation of Dates"). The second part discusses the technique by which the date ranges of each burial thus defined were processed in a cumulative manner ("Working the Date Ranges") to provide a set of four, objectively generated divisions which formed the chronological control for the project. By comparing the incidence of date ranges belonging to burials exhibiting certain rites with the background frequency within a phase as generated by all burials, meaningful changes could then be sought.

Roman London's Eastern Cemetery and Its Data Organisation

Archaeologists at the Museum of London Archaeological Service have recently completed an English Heritage funded research project into the Roman Cemeteries on the Eastern side of Londinium (RLEC). The project considered a burial ground that was in use from the second to the fourth century, periods for which pottery provides an abundant, yet frequently widely-dated, data set. Its research aims were essentially divisible into those relevant to the understanding of Roman cemeteries in general, and the cemetery of Roman London in particular.

For the latter, the atypical nature of London was of especial interest: a Roman centre without a native British pre-cursor, one of the real 'new towns' of Britannia (Williams, 1990, 51). If an indigenous power vacuum existed in this first century port-cum-capital of Roman Britain, it might have acted as a magnet for the dispossessed, a place in which industrious groups could make good the trauma of invasion by weaving themselves into the fabric of imperial rule: hence the cemetery should provide valuable evidence of a more cosmopolitan burial rite than may be expected at the older centres such as Colchester. Alternatively, the desire to be associated with the ruling power may have resulted in a more overtly Roman material
culture: hence one could predict an accelerated Romanisation that quickly resembled the trappings of life, and the manner of death, in centres like Colchester.

The project involved 10 team members with various specialises, who analysed some 851 burials from 12 sites excavated since 1983, including burials partially recorded during watching briefs or located in the work of other non-MoLAS researchers and antiquarians. 635 yielded suitable data for the work described here (See tables 1 and 2). These operations made extensive use of the ORACLE relational database, resulting in the creation of 67 tables and 17 inputting/validation forms. On completion, some 40,000 rows of data had been recorded.

The various data sets from the sites were organised into database tables, each of which held a generic data type such as pottery, registered finds etc. In normal circumstances, the site-code and context (the smallest excavated unit) would appear in each of the tables to indicate the provenance of each row of data. However, the objects of interest here were individual burials and, as each burial consisted of a number of contexts - cut, coffin, skeleton, coffin fill etc. - a single numbering sequences was devised to refer to all components.

Absolute dating for the burials consisted almost solely of ceramic, glass and numismatic evidence which provided a frequent yet, given the number of burials, not overwhelming amount of dating evidence. As first step, this evidence was compared with that from each burial. The date ranges of each burial were studied and compared so as to generate a single period that became the date range for the burial, and was accordingly termed the burial date range. This became the raw material for the propagation techniques discussed below.

The stratigraphic relationships from each site were loaded into Oracle tables and validated for errors and logical (archaeological) topology using methods devised in the SERC/CASE project (Hinge 1995).

All methods were carried out within the database, required no external applications, and exist for use on any RDBMS platform. Yet they are also interpretative constructions, and thus as open to criticism, improvement or rejection as any of the other interpretations that the RLEC volume will present. What they do offer is a new way of perceiving some of the most fundamental archaeological information.

**Modelling Stratigraphy**

Acquiring useful dates from the above data required a number of steps: modelling the stratigraphy, dating it by association and manipulating the date ranges to reach interpretations. The SERC/CASE research had demonstrated how one could use matrices within a RDBMS to do the first of these, thus allowing stratigraphy to be integrated with other data sets held on computer (Hinge, 1995:244). The initial aim there had been to devise an objective means of identifying cases where the order of stratigraphically related contexts disagreed with the absolute order indicated by the dated material within those contexts, i.e. finding cases of residuality and intrusion.

This was further developed by the creation of tools to display and interrogate the occurrence and intensity of datable artefacts through the stratigraphic sequence. Such work, though in the tradition of seriation discussed by Carver and others (Carver 1985, 1987, Cooper 1987), also strove to make such methods mainstream tools for site interpretation by enabling their production directly from the database itself. In essence
the research provided a means of relating stratigraphic units - and any of their attributes - to those immediately adjacent and to distant stratigraphic neighbours. It was mechanisms of this type that were exploited during the RLEC project.

In addition to the problem of vague date ranges mentioned initially, the RLEC project had to allow for the fact that many of the burials had no dating evidence whatsoever. Naturally, any excavation will produce a set of excavated units, a sub-population of which will be datable, and it is a common procedure to derive dates for the undated portion by associating it with the dated: a pit cut is dated through its association with the datable material it contains (a direct relationship in that the pit literally contains the dates). Using this principle, archaeological chronologies can be propagated.

Thus many Roman ceramics are dated on the basis of their common appearance in association with other types whose dates are already known, for instance because they are found in contexts dated by external sources. Sites on London's waterfront, for example, can enhance ceramic chronologies by providing pottery groups in association with timber waterfront revetments accurately dated by dendrochronology. With more historical 'fixed points' within such networks, the chronology becomes firmer, since there are fewer types dated solely by association with other types. This allows greater chronological cross-referencing, the date of types providing each other with a mutual check.

An indirect association, in contrast, would be where a pit fill's contents are undated but the pit itself cuts another which is dated: here stratigraphy and dating material are considered in unison. For a computerised tool to use the stratigraphy to generate such associative dates, there were two distinct problems to solve, which are considered in order below:

- How to model complex stratigraphy without overwhelming the computer
- How to share and compare dates using the stratigraphy

The complexity of an urban stratigraphy means that there are many possible itineraries through the stratigraphic matrix which illustrates it, even on a simple matrix. These myriad routes, and the ability of machines to deal with them, is a central issue for computerised matrix processing, (Dalland 1984, 134, Harris 1984, 144). Reducing complex stratigraphy to its essential components, in a process christened 'squashing', therefore becomes necessary. The principle followed here is that, if one wishes to stratigraphically compare a sub-population of a complete matrix, it is far more efficient to first establish which members of that sub-population are interlinked.

The RLEC project was interested in comparing the dates of burials with each other on stratigraphic grounds. Naturally, those burials existed in sequences in which a variety of other entities - walls, pits, layers - lay on a stratigraphic route between two burials. Yet, for the purpose of comparing the date, age or sex of those two burials on stratigraphic grounds, the number or type of intervening events is irrelevant: what is important is that one burial occurred after the other. The derivation of a 'burials only' matrix was possible by repetitive interrogation of the complete matrix in a pair-wise fashion, which directed the following question at each relationship:

If the context which I overlie is not a burial, then substitute the context it overlies in my overlying field, else do not substitute any values.
Each repetition updated the previous set of relations, which were then interrogated by the next, with the process being complete when every burial overlaid either another burial or un-excavated strata. This enabled the database to cope with the inherent complexity of an urban matrix without being overwhelmed by it (further details of the approach are presented in the SERC report).

**Propagation of Dates**

Once the burial matrix had been generated, the second problem concerned the propagation of dates, in particular how to use the dated component to date the undated. Of the 812 burials investigated by the project, there where 673 for which stratigraphic relationships and appropriate dating evidence was available. Of these, 137 (20.4%) had no dates of their own. The aim was twofold: to give dates to these undated burials on stratigraphic grounds; and to compare the dates of stratigraphically related burials to ensure that, once resiliency and intrusion had been taken into account, a logical sequence of dates would exist. The first objective can be achieved by using the *Terminus Post Quem* (TPQ) of one burial to date overlying ones (i.e. “pushing TPQ’s upwards”) and then, more tenuously, to use the *Terminus Ante Quem* (TAQ) to date underlying burials (“pulling TAQ’s downwards”).

To take a hypothetical example for the first technique, if one burial has a date of AD210 and is underneath another that has no date, then one can say that the superior must be dated to some time after AD210. Alternatively, if the superior burial does have a date, then a comparison needs to take place. If it is dated AD260, then this date is retained. If it is dated to AD160, then AD210 becomes its new date and this will be propagated up the string of burials until it is superseded by a burial with a later date. The computerised implementation of this method was a development of that which produced the burial matrix itself, using the same pair-wise processing technique but with dates of burials revised, rather than their stratigraphic relationships. Thus the question posed in the same iterative structure was:

*If the burial which I overlie has a later TPQ than me, then substitute its TPQ for my TPQ, else do not substitute any values*

Each repetition updated the previous set of burial dates, which were then interrogated by the next, with the process being complete when every burial had a TPQ equal to, or later than, the burial it overlay, excepting burials over un-excavated strata. As a result, each burial had a stratigraphic TPQ, while those which had dating evidence also had their original TPQ. Intrusive material would cause problems for this procedure by injecting an artificially late date into the sequence which would then be propagated up through the matrix, superseding what were legitimate dates of superior burials. Thus the generation had to be repeated a number of times following removal of such alien dates, which of course the method served to highlight. At the end of the procedure the following figures were produced (Table 1), showing that c.9% of the undated burials either overlay natural/were at the limit of excavation, or themselves overlay such burials.
Table 1

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>All eligible burials</td>
<td>635</td>
<td></td>
</tr>
<tr>
<td>Undated burials</td>
<td>116</td>
<td>(18.2% of all eligible burials)</td>
</tr>
<tr>
<td>Undated burials receiving dates</td>
<td>56</td>
<td>(48.3% of the undated burials)</td>
</tr>
<tr>
<td>Total dated burials</td>
<td>575</td>
<td>(90.5% of all eligible burials)</td>
</tr>
</tbody>
</table>

A further development modified the procedure again, to enable that other archaeological constant, the TAQ, to be utilised. Given that the basic date ranges being dealt with were rather vague, the propagation of stratigraphic TAQ's down the matrix would allow a narrower stratigraphic date-range to be specified. For this exercise only the TAQ's coming from grave goods were used, involving 23% of the burials, as these could be securely related to each burial and formed the strongest source of dating. However, using TAQ's from ceramics in this way still constitutes a tenuous process because of the unknown factors in the treatment and life-cycle of a pot, i.e. its average use life, availability, desirability, affordability. In defence, it can be argued that the date range allows for the fact that some examples of a type will be especially long-lived, although this assumes that a range is that of common usage, as opposed to indicating the dates of production, or dates of availability. As the method was essentially a reversed version of that used for stratigraphic TPQ's, the iterated question became:

*If the burial which I underlie has an earlier TAQ than me, then substitute its TAQ for my TAQ, else do not substitute any values*

Each repetition updated the previous set of burial dates, which were then interrogated by the next, with the process being complete when every burial had a TAQ equal to, or later than, the burial which it overlay, excepting burials over un-excavated strata. If a burial could not be given a stratigraphic TAQ in this manner, then the default date of AD400 was given to it. As a result, each burial would have a stratigraphic date range, which was then available for further interrogation.

**Working The Date Ranges**

Notwithstanding the processes discussed, the date ranges generated were still comparatively vague, and a means was required to provide general phases for the sites without relying on the rather blunt and overly exact TPQ. The aim here was to look at general trends over the period of the cemeteries use, and to accept the uncertainty in the data set rather than ignore it. Thus the whole date range of each burial was taken into account, rather than simply the TPQ. However, it would have been no solution here to take a derivative of the TPQ, such as the date range mid point that a burial contains, or the weighted average mid-point of all its date ranges. These would fail in exactly the same way as the straight TPQ, in that they would directly provide an over-exact date, and a false sense of the periodic intensity of cemetery use as a consequence, indirectly echoing the uncertainty of the start and end points of certain dated types, (Figure 1: this is a particular problem in the late Roman period. If much of the pottery found in burials has mid- and late-third century start dates, it
would appear - on the basis of the single-point-in-time approach - that AD250 and AD280 were particularly fashionable years in which to die! In reality, the burials could have taken place at any point during the period bracketed).

Figure 1

![Graph showing frequency of TPQs in the RLEC Burial Dates Table]

*Frequency of TPQs in the RLEC Burial Dates Table*

Hence the chronological profile derived from such use of TPQ’s and TAQ’s was dropped in favour of a less exact, yet more representative, profile which offered a more accurate reflection of the underlying knowledge base being used. The strategy adopted here was to first generate a background based on all of the burial date ranges, which was then divided into four periods, with a known percentage of those ranges within each (the division into four periods was an intuitive choice, based on what was thought reasonable given the typical length of many ceramic date ranges).

The behaviour of a certain burial rite over time - inhumations with grave goods, for example - is then considered by comparing the incidence of the dat the date ranges belonging to such burials within the four periods to that of all burial date ranges i.e. to the general background. To facilitate this, three stages were required:

- generation of the general background from which the four periods would be defined.
- for each burial date range, the description of how much of it was incident on each of those periods.
the actual comparison of certain rites on the basis of the distribution of date ranges of burials in each period belonging to burials of different types.

First, in order to break the whole period of cemetery use into four general periods, the data to identify those broad divisions had to be collated at a more detailed level, because the decision on where those divisions should fall would be based on the points in time at which a certain, pre-defined percentage of all the burial date ranges had accumulated. Short periods allowed this to be more accurately specified, thus intervals of a decade were chosen (Figure 2).

Figure 2

Division of Date Ranges into Decades
For each burial a factor was generated by dividing a constant equally amongst all decades in which a range started, finished or spanned. This figure became the 'amount' that the date range would contribute to those decades it impinged on. Thus a date range of AD150-250 would contribute one-tenth or 10% to the ten decades it spans, while one of 180-210 would provide 33.3% to the each of the decades AD181-190, 191-200, 201-210. By expressing the proportion of a whole range that fell in each period as a percentage, one is taking account of the fact that we have greater certainty about shorter date ranges. Thus in the above examples, the 100 year range contributes 10% to the decade AD181-190, while the shorter 30 year range provides 33%. The factors of all those burials whose date range began, ended or traversed the decade in question were summed and these summations were then themselves expressed as percentages of those from all decades, such that the percentage of all burial date ranges in each decade was produced (Figure 3).

As the second step, these percentages were added in a cumulative fashion, which allowed the point at which a certain percentage of all the burial date ranges had accumulated to be identified, thus providing an objective means of describing the spread of dates. The cumulative frequency was used to determine the break points between four general periods. For the RLEC project, this was decided as the decade by which 16.5%, 33% and 66% of the ranges had accumulated (Figure 4: the rationale for selecting these particular divisions was to allow slightly better definition in the cemeteries earlier phases where the dating evidence was at its best).
These four general periods then became the new sub-periods, and the first half of the procedure was repeated. However instead of sharing the 100% of a burial's range equally over the periods it impinged upon, the actual portion of the range that fell into each sub-period was calculated. Thus if the division between two periods were AD197, then a burial date range of AD150-250 would have 47% of its range in the first period and 53% in the latter (Figure 5).

**Figure 5**

```
Division of Date Ranges into Each Period
```

75
All the percentages from all burial ranges in each period where summed, and themselves expressed as percentages. Following slight adjustments to the period break points and re-runs of the algorithm in order to make the proportions in each period come as close to the ideal as possible (i.e. 16.5%, 16.5%, 33% and 33% in Periods 1-4), figures of 16.28%, 17.1%, 32.47% and 34.15% were obtained - it was neither possible, nor necessary, to be more exact. The actual break points between the periods were:

Period 1  39-197 AD
Period 2  198-250 AD
Period 3  251-325 AD
Period 4  326-410 AD

Thirdly, with the dating evidence stored in this manner, it became possible to consider various aspects of the burial rite over time. This was done by first taking the date ranges of burials which exhibited the rite of interest and then summing, and expressing as a percentage, the incidence of those date ranges in the four periods defined previously. Table 2 show the type of data produced: the first row gives the percentage of date ranges in each period for all burials; subsequent rows provide the percentages of date ranges in each period for each of the rites listed; and the final column lists the number of dated burials that exhibit the rite in question (Figure 6 gives the first three rows of this data as plotted).

Figure 6

Incidence of Date Ranges from Inhumations and Cremations in Each Period
This clearly demonstrated, for example, that the distribution of the date ranges belonging to cremations is at odds with the overall trend and that of inhumations, with 14.42% more cremations than inhumations occurring in the earliest period. In addition, these trends could be further broken down, as shown in the subsequent rows of table 2. For example the distribution of date ranges belonging to inhumations with grave goods, though only a sixth of the total inhumations, is very similar to the overall pattern, suggesting that the provision of grave goods is no more temporarily specific than the rite of inhumation itself. Finally, the distribution of the range belonging to the last three rites illustrated are at variance with their 'parent' population. However, these are the product of a small number of burials (<28): interpreters may see what they will in such distributions, but the magnitude of these figures should urge caution.

<table>
<thead>
<tr>
<th>Rite</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall/Ideal</td>
<td>16.5</td>
<td>16.5</td>
<td>33</td>
<td>33</td>
<td>635</td>
</tr>
<tr>
<td>Inhumations</td>
<td>13.32</td>
<td>16.06</td>
<td>33.98</td>
<td>36.64</td>
<td>513</td>
</tr>
<tr>
<td>Cremations</td>
<td>27.74</td>
<td>21.62</td>
<td>26.33</td>
<td>24.31</td>
<td>122</td>
</tr>
<tr>
<td>Inhumations with grave goods</td>
<td>11.34</td>
<td>18.39</td>
<td>33.48</td>
<td>36.79</td>
<td>129</td>
</tr>
<tr>
<td>Cremations with grave goods</td>
<td>12.47</td>
<td>28.29</td>
<td>34.85</td>
<td>24.39</td>
<td>26</td>
</tr>
<tr>
<td>Male inhumations with grave goods</td>
<td>7.41</td>
<td>9.45</td>
<td>38.38</td>
<td>44.75</td>
<td>19</td>
</tr>
<tr>
<td>Female inhumations with grave goods</td>
<td>21.9</td>
<td>12.52</td>
<td>35.95</td>
<td>29.62</td>
<td>28</td>
</tr>
</tbody>
</table>

**Table 2**

*Distribution of Date Ranges by % Belonging to Burials Exhibiting Various Burial Rites*

A further example of where this work enabled temporal changes to be observed is in relation to the location of the head (Table 3 and Figure 7). The biggest disparity between a specific head location and the average distribution of date ranges for all burials is for those with head to the south.

<table>
<thead>
<tr>
<th>Head Position</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Inhumations</td>
<td>13.32</td>
<td>16.06</td>
<td>33.98</td>
<td>36.64</td>
<td>513</td>
</tr>
<tr>
<td>To the East</td>
<td>15.82</td>
<td>13.93</td>
<td>32.52</td>
<td>37.73</td>
<td>33</td>
</tr>
<tr>
<td>To the West</td>
<td>10.72</td>
<td>13.97</td>
<td>34.7</td>
<td>40.61</td>
<td>219</td>
</tr>
<tr>
<td>To the North</td>
<td>13.50</td>
<td>17.07</td>
<td>35.58</td>
<td>33.85</td>
<td>131</td>
</tr>
<tr>
<td>To the South</td>
<td>22.83</td>
<td>19.34</td>
<td>30.52</td>
<td>27.30</td>
<td>60</td>
</tr>
</tbody>
</table>

**Table 3**

*Distribution of Date Ranges by % of Inhumations Grouped by Head Location*

As a technique to help identify changes in rite over time, the method relies on the assumption that the divergence in the relative percentages of all date ranges against just those of burials exhibiting a certain rite is diagnostic. Such divergence, and the diagrams
derived from them, have to be intelligently interpreted however. In this respect the last column in Table 1 is of importance. If there is a small number of burials exhibiting a certain rite, then the likelihood of a wayward range having a marked effect on the percentage-within-period figures is high. Alternatively, if the rite is a very popular one, then the percentage breakdown will be very close to the ideal. This latter effect is shown in Figure 6 where the proportions of date ranges from inhumations are very close to the ideal. Clearly, however, the fact that the proportions of date ranges from cremations is markedly different to that of inhumations, is not simply a function of their being fewer cremations.

Figure 7

Incidence of Date Ranges from Inhumations Grouped by Head Location
Conclusion

This paper has discussed different ways of viewing data which archaeological sites have been generating since the primacy of the stratigraphic observation was realised, and the notion of a 'closed group' of finds, or the individual archaeological context was conceived by Thomsen and Worsaae in the middle of the last century (Clark & Hutcheson 1992, 65). Such data has been collected from hundreds of archaeological sites in London alone, and the volume of data, coupled with the diminishing resources available for its investigation, can insidiously motivate its narrower, if financially expedient, under-use. To both maintain the research initiative and exploit the fullness of our data sets, intellects need to be exercised in applying appropriate information technology at source, less hindered by reductionist perceptions of data which older information systems have shoehorned. Moreover, such initiatives should be founded in the belief that it is not simply there to allow old jobs to be done more quickly.

It can be argued that, in concentrating on the TPQ as the main ingredient of our chronological constructions, we are using a codified, reductionist shorthand for something which decades of scholarship have told us is actually more complex. The reason for this, while laying partly in the undoubted logic of what a TPQ means, is also derived from the lack of an implemented method that allows a more holistic consideration to take place within workable timescales.

The method discussed here has shown how an objective chronological structure can be generated for a group of sites on the basis of dating evidence which is also often itself general. The vague date range, sharpened by interaction with the unequivocal stratigraphy, is thus embraced as a resource. It enables one to observe some of the other chronological possibilities that a site will always have, as long as we attempt to date them using material that cannot be dated to the second. The uncomfortable bluntness of the TPQ is avoided as the whole date range is given the space it deserves, to contribute more fully to our discussions of social development, change and evolution.

Bibliography


Dalland, M (1984) "A Procedure For Use In Stratigraphic Analysis" Scottish Archaeological Review 3 (ii), 116-27


Thomas, R (1991) "Drowning In Data?: Publication And Rescue Archaeology In The 1990s." *Antiquity* 65, 822-28