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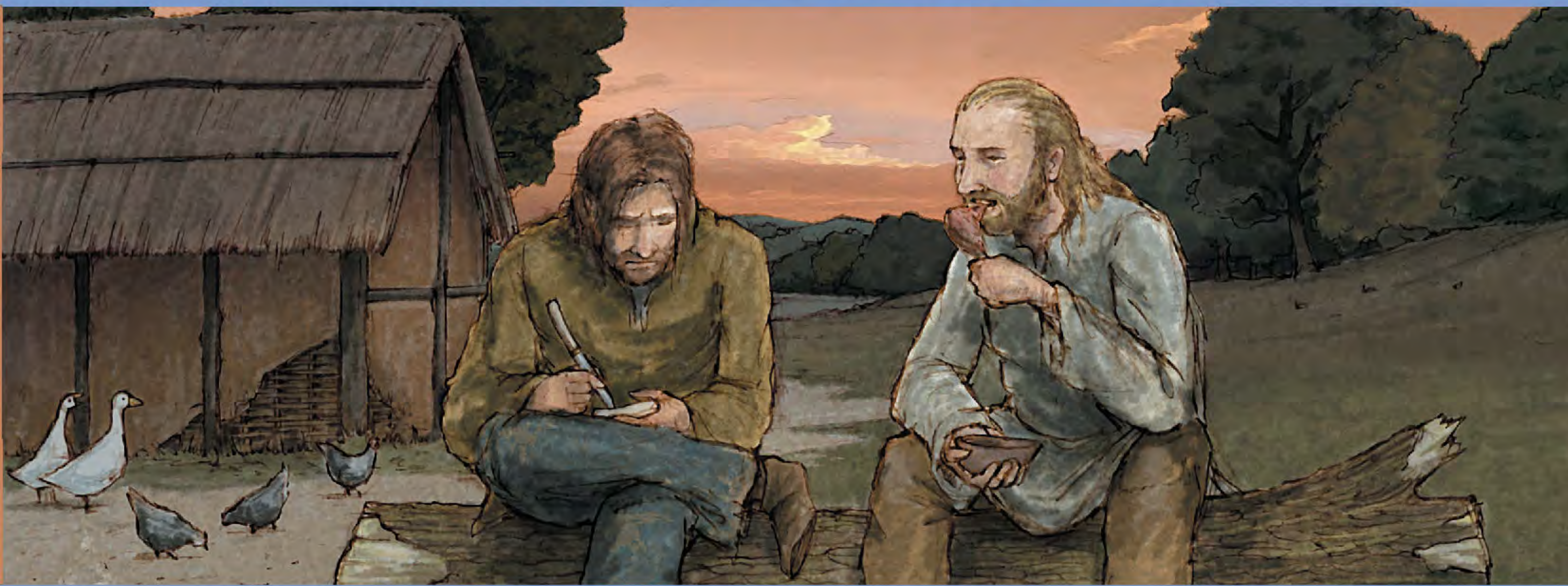

ARCHAEOLOGICAL EXCAVATIONS IN MIDDLE SAXON LONDON BY JIM LEARY
WITH GARY BROWN, JAMES RACKHAM, CHRIS PICKARD AND RICHARD HUGHES

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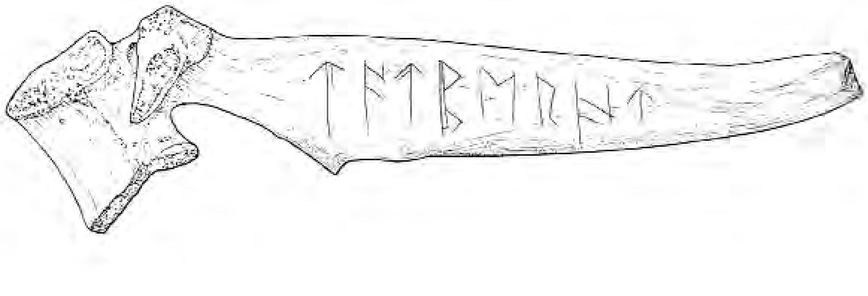
TATBERHT'S LUNDENWIC
ARCHAEOLOGICAL EXCAVATIONS IN MIDDLE SAXON LONDON

Tatberht's Lundenwic Archaeological Excavations in Middle Saxon London

By Jim Leary
With Gary Brown, James Rackham,
Chris Pickard and Richard Hughes
Foreword by Ian Riddler



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Tatberht and 'Dric' carving the runes – a reconstruction by Jake Lunt

Back cover:
From left to right:
Excavations at the Lyceum Theatre; the James Street loomweights in a reconstructed loom

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Foreword

By Ian Riddler

It is almost seventy years since R. E. M. Wheeler published his catalogue of *London and the Saxons*, and twenty years since *Lundenwic* was rediscovered and excavations there began in earnest. *Lundenwic* has been excavated, studied and published in some detail since 1984 and this represents the second monograph to deal specifically with the settlement. This volume illustrates extremely well how the range of interests has grown steadily and how different approaches to similar material can be accommodated, even within the same publication.

This monograph brings together four sites located in various parts of *Lundenwic*. A contrast is drawn between the suburban and almost rural environment of the National Portrait Gallery and sites closer to the centre of *Lundenwic* at Exeter Street, Maiden Lane and James Street. The extraction of brickearth on a wide scale from the area of the National Portrait Gallery suggests that Middle Saxon craftsmen who supplied the raw material for commodities like daub and loomweights may also have been located at the periphery of the settlement, for at least part of its duration. Thus, even if it was a semi-rural area, populated by farmsteads and extraction pits, it was still a busy part of the settlement and there is clearly much more to be discovered in the area. Richard Hughes provides an exhaustive examination of daub, based on the National Portrait Gallery material, considering both the technology of its manufacture and its engineering characteristics, as well as reconstructing the methods by which it was both made and used. It is an important, in-depth analysis, which develops the study of daub by relating it directly to its function. Brickearth was used also in the manufacture of loomweights. Most *Lundenwic* sites have produced loomweights but the large assemblage from James Street provides the first group that may represent a complete set, although this is not accepted by all. As noted in the volume, the presence of brickearth may have been a key element in determining the location of the settlement. It forms one of a series of important local resources.

Sites within the core of the settlement both reflect earlier discoveries and add important new information. In one case, at Maiden Lane, excavations took place adjacent to two sides of an earlier site and, as a result, several questions about that area have now been resolved. The small site at Exeter Street is typical of many excavated in Middle Saxon England for the presence of rubbish pits and little else. The sheer quantity of animal remains from the site is remarkable, however, and it appears that this could be butchers' waste, tied perhaps to related occupations. At James Street one of the earliest phases provided an inhumation burial. Whilst *Lundenwic* has yet to produce the sizeable cemeteries of *Hamwic* and Ipswich, each grave adds to the understanding of burial practices at this time. The site also produced building remains, as scant and vestigial as any from *Lundenwic* but evidence – alongside the presence of a road – for the infrastructure of the settlement, and the manner in which it was laid out over time. Alongside *Hamwic*, Ipswich and York, *Lundenwic* grew rapidly in size, but shrank just as quickly.

One of the significant aspects of this volume is the breadth of opinion that is expressed, particularly in relation to the environmental remains. Where earlier studies at *Hamwic* revealed animal provisioning that was 'homogeneous, adequate for food, but very dull' each site at *Lundenwic* appears to reveal a different aspect of food supply, leading to several possible interpretations of its meaning. Provisioning is a broad subject, extending in this volume beyond animals and plants to the spectacular discovery of the remains of honeybees from James Street. They form a salient reminder of the importance of honey as a commodity in Anglo-Saxon England. In addition, James Rackham rightly stresses the importance also of fish remains at a time before herring and cod became the dominant catches. The variation in fish remains between sites seems to echo the variability in animal resources, with an emphasis in both cases on local provisioning.

The volume thus covers a wide range of subjects and incorporates the work of a considerable number of specialists, all of whom shed light on a settlement whose characteristics are now emerging, to the fascination of us all.

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Summary

During the course of the excavations at the National Portrait Gallery a single sheep's bone containing two runic inscriptions was uncovered. One read 'Tatberht', an Old English male name, whilst the other, cut by a different hand, read 'dric', possibly also a name. The name Tatberht must surely be the name of the inscriber and a resident of *Lundenwic* during the 8th and 9th centuries. He here lends his name to this volume, a presentation of four excavations in and around *Lundenwic*.

The problem with drawing together a series of site reports in a publication of this kind is that each site was written and studied individually and not within a single programme of research, so that individual sites have been treated and reported somewhat differently. The four sites were supervised and interpreted by different people, the site sequences written by various authors, and the material studied separately by different specialists, who wrote them up in diverse ways. For these reasons it is both difficult and necessary to present these sites together and to try and draw together their results. No attempt has been made in this volume to provide a single, consistent theory across the sites, indeed the discrepancies have been highlighted to reflect the variety of ideas and viewpoints of those working on and in *Lundenwic*.

The excavations at 28-31 James Street were situated in the core settlement of *Lundenwic* and demonstrated the presence of Middle Saxon rubbish pits as well as an area containing a complete sequence of Middle Saxon occupation layers overlying a burial, which contained both a spear and a buckle. James Street provides the chronological sequence identified at the Royal Opera House and the animal bones indicate an urban consumption site. The floral assemblage, which was probably cleaned and processed outside the settlement, suggests a significant role for barley in the Saxon economy. The recovery of 31 complete loomweights within a single context provides confirmation of the typological sequence for Anglo-Saxon loomweights in London and may represent a complete assemblage from a single loom. The evidence of large quantities of iron slag from two pits associated with a building suggests that a smithy was functioning in the immediate vicinity, and the discovery of honeybees provides interesting archaeological confirmation of the documentary evidence for Anglo-Saxon beekeeping.

The excavations at the Lyceum Theatre, Exeter Street, were situated close to the Saxon riverfront to the south of *Lundenwic*, and recorded thirteen Middle Saxon pits in seven rows, containing evidence for deposition of domestic debris, craft industry waste and in particular butchery and other food debris. Also to the south of *Lundenwic* were a series of excavations carried out on a site previously excavated in 1986 by the Department of Greater London Archaeology at 21-24 Maiden Lane and 6-7 Exchange Court. The Maiden Lane excavations recorded archaeological features and deposits of comparable Saxon date to those recorded in 1986, as well as additional data absent from the original Maiden Lane stratigraphic sequence.

Excavations at the National Portrait Gallery, situated on the western periphery of *Lundenwic*, produced archaeological and environmental evidence for Middle Saxon semi-rural agriculture and occupation as well as brickearth quarrying. The inhabitants of what was probably a farm showed a largely self-sufficient lifestyle, raising predominantly sheep alongside cattle, pigs, geese and fowl. They supplemented their diet with both freshwater and sea fish and oysters, seasonally collected nuts and berries and imported semi-cleaned cereals from a possible variety of sources. The excavations revealed a boundary ditch and pits, the function of which varied over time, from being quarries for brickearth to cesspits and receptacles for processed animal bone and domestic debris. Artefactual evidence was of an industrial and domestic nature including the nationally significant find of a sheep's vertebra with two runic inscriptions, whilst structural evidence took the form of a brickearth floor, numerous stakeholes and considerable quantities of daub.

The daub from these pits and the ditch forms the basis for the penultimate chapter in this volume; a technical and experimental study of Middle Saxon fired daub. The first part of the study analyses the source soils as well as building technologies in *Lundenwic*. The second part geotechnically examines brickearth and reports on experiments and engineering analysis undertaken to help interpret the findings from the National Portrait Gallery site. Particular attention is given to understanding wattle and daub materials, construction and performance technologies, from an engineering point of view. The study also includes a technical reconstruction of a typical Middle Saxon wattle and daub hut based on various features found in *Lundenwic*. Finally, a glossary fully defines descriptive and technical terms that have been used in the first and second parts of the study. The study aims to establish a documentation methodology for archaeologists, in order to improve data recovery, innovative interpretations and a reporting consistency.

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Chapter 1 **Introduction**

The four excavations presented here were undertaken by Pre-Construct Archaeology (PCA), with a contribution from Wessex Archaeology (WA), between 1995 and 2002, and were managed as separate projects. The first site discussed is 28-31 James Street (NGR TQ 3031 8095), which consisted of an archaeological evaluation, excavation and watching brief during the remodelling of Buildings 28-30 in 1999 and 2000 (site code JES99) and a second phase at Building 31 in 2002 (site code JST02). The redevelopment involved the lowering of the internal ground level, the underpinning of the party and retaining walls, and the provision of new services. Work also included the extension of the existing basement in Building 29, which involved the excavation of an untruncated area 5.5m by 4.5m behind the rear retaining wall of Building 29.

The second paper discusses excavations undertaken at the Lyceum Theatre, 33-37 Exeter Street, close to the Strand (NGR TQ 3055 8084), in 1995 (site code ERT95). For logistical reasons the excavation was conducted in two phases and was followed by a watching brief at the west, adjacent to Burleigh Street, the investigations encompassing the whole of the redevelopment footprint. The excavation was undertaken on the north side of the Lyceum Theatre at 33-37 Exeter Street on a vacant plot of land previously used as a car park. The watching brief was along the Burleigh Street frontage where the potential for the survival of archaeological remains was anticipated to have been considerably reduced due to the deep level construction of the theatre's stage basement, dressing rooms and offices. Parallel with the archaeological excavations major refurbishment of the theatre was undertaken, but was not subject to a recording brief. On completion of the archaeological works, an extension of the theatre stage along Burleigh Street and a four-storey building at 33-37 Exeter Street were built. The theatre fronts on to Wellington Street to the northeast and the Strand lies to the southeast.

The third site discussed is at Maiden Lane; the excavations were carried out between 1996 and 1997 by WA and PCA at 21-24 Maiden Lane and 6-7 Exchange Court, (NGR TQ 3031 8072). A previous excavation had been undertaken on the same site in 1986 by the Museum of London's Department of Greater London Archaeology (site code MAI86), and was one of the first published archaeological sites to identify the location and importance of Middle Saxon *Lundenwic* in the area of modern day Covent Garden/Strand (Cowie *et al* 1988). In October 1996, an archaeological excavation was undertaken by WA on part of the site formerly occupied by the North Room of

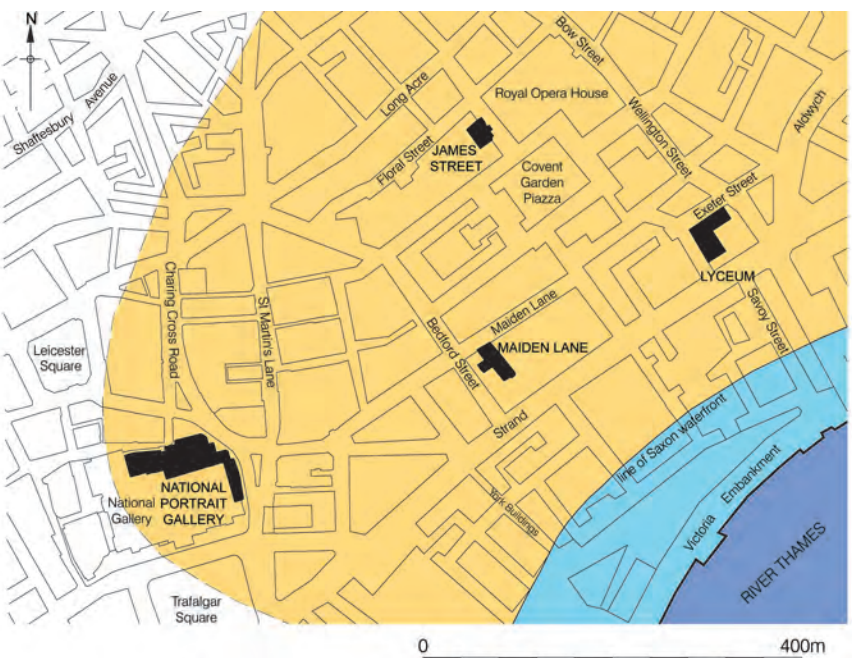


Fig. 1 The location of the four excavated sites in relation to the known area of Lundenwic. Scale 1:8,000

Burgoyne House (site code ECT96), in an area not available for excavation in 1986. This excavation, measuring approximately 40m^2, lay directly south of the MAI86 site and identified an area of surviving archaeological deposits, which although heavily truncated, were significant and included deposits and features that related in location, level and alignment to those identified in 1986. Following the ECT96 excavation, PCA carried out a watching brief on the development building programme. The watching brief led in May 1997 to the excavation of approximately 20m^2 of archaeological deposits located immediately to the west of the MAI86 and ECT96 excavation areas, below Exchange Court, an alley running between Maiden Lane and the Strand (site code EXC97). Although these excavations were undertaken by two separate organisations, the assessment, analysis and publication has been conducted as a joint venture; WA undertaking the majority of the finds and the environmental analysis and PCA the pottery analysis, stratigraphic analysis and report management. Every attempt has been made to integrate the three separate sites into a single, phased report, however, this chapter in no way replaces the original publication of the site (Cowie *et al* 1988) but aims to add to the information of the area.

The fourth paper considers five phases of archaeological work at the National Portrait Gallery (NGR TQ 3000 8059) between 1996 and 1998 (site code NPG97). The investigations were conducted in the skylight and yard area between the National Portrait Gallery and National Gallery, where a four-storey extension was to be erected with a basement and sub-basement. A mitigation strategy was instigated to minimise the impact of the proposed development on surviving deposits. As part of this strategy the evaluation of thirteen pile locations revealed significant Middle Saxon remains in the upper courtyard area. A further five trenches were subsequently excavated in this area which again produced Middle Saxon material. Following the

Fig. 3 The Lyceum Theatre

excavation, a watching brief took place in the basement of the National Portrait Gallery, which revealed two Middle Saxon rubbish pits.

This volume aims to provide a history of a broad area of *Lundenwic*, based on the archaeological findings from the four archaeological sites. The following section summarises the geological, topographical, archaeological and historical background of the area. Chapters 2, 3, 4 and 5 describe, illustrate and discuss the stratigraphic data from the four sites, with the integration of relevant dating evidence and parts of the specialist reports. Specialist finds reports, which focus on certain, more important, aspects of the finds assemblages, follow the stratigraphic descriptions of each individual site, after which the environmental evidence is discussed. Chapter 6 is a technical and experimental study of fired daub, which analyses the source sediments used in daub as well as technically reconstructing a typical Middle Saxon wattle and daub hut. Chapter 7 aims to draw together conclusions from the individual chapters, and will provide a broad and interpretative discussion of specific elements of *Lundenwic*: the sequence; the evidence for antler, horn and bone working; and the environmental remains. The full reports, catalogues and methodologies used will be lodged with the archives of the various projects at the Museum of London's London Archaeological Archive and Research Centre, Eagle Wharf Road, where they can be consulted by prior arrangement.

During the post-excavation analysis of the sites the stratigraphic information was organised into chronological periods based on stratigraphic and dating evidence. The sites were developed as distinct entities and the phasing reflects this as separate phases were accorded to the individual sites. In the following text individual context/feature numbers appear in square brackets (e.g. [134]). Registered finds (small finds) are preceded by the identifier SF (e.g. SF25).

Fig. 2 Excavations at James Street

GEOLOGY AND TOPOGRAPHY

The geology of the area is represented by Drift Deposits of brickearth and Terrace Gravels, overlying the London Clay, which in turn overlie Woolwich and Reading Beds. The Woolwich and Reading Beds and London Clay were formed during the Palaeocene and Eocene periods respectively, whilst the Terrace Gravels and brickearth were laid down in the Pleistocene period.

Brickearth, also known as the Langley Silt Complex, is an orangey-brown sandy clayey silt, the upper layers of which can often be weathered and contain roots and charcoal flecks. Brickearth varies in thickness across the *Lundenwic* area and at the National Portrait Gallery it was, in places, more than 2m thick, whereas at James Street it was recorded as 0.8m thick, at the Lyceum 0.57m thick and at Maiden Lane 0.47m thick.

The brickearth outcrop of direct interest extends through Covent Garden north of the Strand to Southampton Row. Other significant outcrops occur around St. Paul's Cathedral, in the east part of the City of London and in the Hammersmith area of west London. The two City 'capping' deposits may be a contributory factor for the positioning of Roman London and the Covent Garden outcrop for *Lundenwic*, since brickearth would be relatively free-draining and could be easily excavated into for slope terracing, as well as creating rubbish pits and well sumps. Further, with additions of sand from the underlying terrace formations it would have provided an easy source of building material (*see* Hughes, Chapter 6 this volume). Brickearth is so named because of its common use in the 17th to 19th centuries for making fired bricks.

The topography of the area reflects the fact that it is situated on the slope of the northern terrace of the River Thames. At the National Portrait Gallery the top of the brickearth was located at 13.53m OD in the north and 13.15m OD in the south reflecting a downward slope towards Trafalgar Square, which is also apparent in the modern-day street topography. Again, at the Lyceum Theatre the natural slope of the gravel river terrace was to the south, towards the River Thames, and is reflected in the slopes of the present day Wellington Street and Burleigh Street. Here the top of the brickearth was recorded at 15.78m OD. At James Street post-medieval basements had removed the brickearth in all but a small area of the site, where it was recorded at levels of between 20.19m.OD and 20.07mOD, however the natural topography is likely to have been reflected in the modern land surface, which slopes to the south. Maiden Lane also lies on a southern incline, and the top of the brickearth was recorded at between 14.83m and 15.00m OD.

ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Environmental and archaeological evidence suggests that the site of *Lundenwic* was largely open ground in both the prehistoric and Roman periods, with the earliest archaeological features being Middle Saxon. There is, however, a general scatter of residual artefacts from these earlier periods recorded from many of the excavated sites in the vicinity. The line of a Roman road (presently known as the Strand and Fleet Street) was apparently retained throughout the Saxon era, and delineated the higher and dry ground from the riverside beach or strand. A second Roman road (presently known as Oxford Street, New Oxford Street and High Holborn) was also retained and passed to the north of *Lundenwic*.

The Middle Saxon settlement of *Lundenwic* is now thought to exist in the Covent Garden area, 1km upstream of Roman *Londinium* (Vince 1983; 1984; Biddle 1984). The migration to the west, away from the previous urban nucleus, is a much-debated subject, but may have been dictated by a reliance on a more rural lifestyle following the decline of 'urban' Roman London. As noted above the settlement also coincides with a major brickearth outcrop, a feature also noted at *Hamwic* (Saxon Southampton), a sought-after material for hut construction as well as being utilised for floor surfaces, loomweights and possibly pottery. This may have been made more attractive since the brickearth source materials within the walled city would have become masked, disturbed or even dug out. It has also been suggested that the good beaching facilities that were available further west were preferable to the disintegrating riverside walls and quay of *Londinium,* made perilous by neglect and erosion (Tatton-Brown 1986, 22; Blackmore 1997, 124; 2002, 278).

The former Roman city was not entirely abandoned however, as we know from documentary sources that it enclosed at least a cathedral church (Bede, trans. Sherley-Price 1968), and a monastery (as indicated by a grant from Ethelred, king of Mercia, to Wealdhere, bishop of London) (trans. Whitelock 1979, 488), whilst Tatton-Brown (1986, 23) suggests that a series of churches may have dated from this period. The Laws of Hlothere make reference to a king's hall (trans. Whitelock 1979, 394), which is also likely to have been located within the intramural area (Bailey 1989, 110). Further, Tatton-Brown has argued that the later medieval street plan in the City of London may reflect an earlier Saxon grid (Tatton-Brown 1986, 22-24). This suggests that the walled city was at least an ecclesiastical and administrative centre, however, the true extent and character of this intramural settlement, as well as the 'negative' archaeological evidence recovered from the City of London, remain a significant problem (Samson 1994; 1999; cf Cowie 2001). Bede informs us that Æthelberht, the over-king of the East Saxons, founded the cathedral church of St. Paul the Apostle inside the intramural area soon after the Gregorian mission with the arrival of Augustine in AD 604 (Bede II.3, trans. Sherley-Price 1968, 104). After a brief return to paganism, Christianity was revived in the mid- 7th century (Bede II.5 + 6, trans. Sherley-Price 1968, 107-111).

Amongst the earliest features recorded in *Lundenwic* are a number of burials, which, where dateable, appear to be 7th century. This suggests that the origin of *Lundenwic* is likely to be of 7th century date, although a recently excavated 5th to 6th century quarry pit at 15 – 17 Long Acre (Fig. 4, **1**) may indicate a greater antiquity (Capon 2002). This, however, could also be interpreted as part of an early Anglo-Saxon rural predecessor, linked to *Lundenwic* by its location only. The majority of the *Lundenwic* burials are located on higher ground, to the north of the modern day Covent Garden Piazza, suggesting that this area may represent a cemetery or zone of burials (Scull 2001). A further zone may have existed to the south, on the lower-lying area around the church of St. Martin-in-the-Fields (Fig. 4, **2**). This is evidenced by stone coffins discovered in the 18th century, one of which was accompanied by a spearhead and another by two glass palm cups of late 6th or early 7th century date, although Evison suggests that the palm cups are more likely to be later than earlier, supporting a 7th century date for the graves (Evison 2000, 68). A 13th century reference to "treasure" being looted from consecrated ground at St. Martin-in-the-Fields (Harden 1956) also points to graves of this period in the area. A burial, thought to pre-date AD 650 and accompanied by a spear, has been recorded to the east at Hare Court, Inner Temple (Fig. 4, **3**), and may represent a third burial area (Butler forthcoming). Many of the burials were overlain with midden deposits (Leary this volume; Malcolm *et al* 2003), as well as alignments of post- and stakeholes indicating the positions of buildings and/or fencelines, and gullies and wells (a sequence also common to *Hamwic* and Ipswich). This suggests that from the mid- to late 7th century the settlement was rapidly expanding inland, spilling over onto earlier burial zones.

By the 8th century the settlement had become more densely populated and the archaeological record is dominated by substantial strata of dump layers, metalled surfaces, pits and wells, as well as structural features of postholes, stakeholes, beamslots and brickearth floors, yielding considerable detail relating to the chronology and morphology of the settlement. As with other contemporary sites the artefactual evidence suggests that crafts such as weaving, smithing and bone, horn and antler working were a feature of the settlement, whilst imported quernstones and pottery wares indicate foreign trade.

Bede's description that ". . . the city of London, which stands on the banks of the Thames . . . is a trading centre for many nations who visit it by land and sea." (Bede II. 3, trans. Sherley-Price 1968, 104) suggests to us that *Lundenwic* was a trading place (emporium) in continuous contact with the Continent and other parts of England. However, today there is an increasing amount of archaeological data, providing a vital source for the character of *Lundenwic* and the activities that went on in a Middle Saxon urban settlement. At present, the archaeological evidence from *Lundenwic* does not clearly reflect either trade or production on a larger scale, suggesting a more complex picture than the prevailing model of early urban development (Hodges 1982; 1989). There is now a wide range of both urban and non-urban settlements demonstrating evidence of trade and production in the Middle Saxon period, not least including ecclesiastical communities (Hinton 1986; Blinkhorn 1999), suggesting that mercantile activities were far more widespread than previously thought.

The boundaries of the late 7th and 8th century settlement are uncertain although the distribution of known sites covers an area of more than 60 hectares (Cowie 1988). The southern limit was defined by the River Thames and excavations at York Buildings (Fig. 4, **4**) revealed staked revetments with possibly wattle fencing defining the shoreline, which was 160m north of its present position (Cowie 1988). Further timbers and Thames foreshore deposits ascribed to the Saxon era were recorded at Arundel House (Fig. 4, **5**) (Proctor 2001), whilst Saxon foreshore deposits were recorded from Globe House (Fig. 4, **6**), north of Temple Place (Bowsher 1999). To the east, Saxon deposits have been recorded at least as far as Somerset House (Fig. 4, **7**) and although find spots and occupation sites have been recorded further east along Fleet Street, for example Hare Court, Inner Temple (Butler forthcoming), the impression is that the sites peter out (Vince 1990, 16). The northern limits have been recorded at Shorts Garden (Fig. 4, **8**) (Cowie 1988).

The sites clustered on the western periphery of *Lundenwic*, by contrast to the core areas, reflect 'industrial' activity characterised by pits for gravel or brickearth extraction and the disposal of domestic and small-scale industrial refuse within a farmstead environment. These include sites at 8-18 Charing Cross Road (Fig. 4, **9**) (Holder *et al* 2000), 5 Excel Court (Fig. 4, **10**) (Bruce 1998), National Portrait Gallery, Trafalgar Square (Fig. 4, **11**), 10 Great Newport Street (Fig. 4, **12**), Cavell House (Fig. 4, **13**), National Gallery Basement and Extension (Fig. 4, **14**) and Orange Street (Fig. 4, **15**) (Pickard this volume; Cowie *et al* 1988; Cowie & Whytehead 1989). Associated 'farms' on the margins of main habitation centres have been inferred at the contemporary Saxon sites of Dorestad (Prummel 1983, 15) and *Hamwic* (Morton 1992).

By the 9th century the archaeological evidence points to the contraction and decline of *Lundenwic*, with indications that areas previously used for buildings were abandoned, leading to a reduction in craft and industry. However 9th century building activity, in the form of a hearth and a brickearth surface, at the Lyceum Theatre (Brown this volume) and occupation layers from James Street (Leary this volume), suggest that at least some occupation continued. The evidence of two 9th century defensive ditches, from Maiden Lane (MAI86) and the Royal Opera House (Fig. 4, **16**), may indicate that there was at least a perceived threat of attack (although *see* Leary, Chapter 7, this volume), and the Anglo-Saxon Chronicles document Viking raids throughout the mid- 9th century (for example in AD 842 it was recorded, "In this year there was a great slaughter in London . . .") (trans. Whitelock 1979, 187). Deposits of dark earth have often been used as evidence for the abandonment of *Lundenwic*, indicating degeneration into open land and fields, whilst the population focused their attentions on the more defendable former Roman city to the east, which was refortified by Alfred around AD 886 and known as *Lundenburh*. *Lundenwic* was to be remembered as the 'old wic', later to become 'Aldwych'.

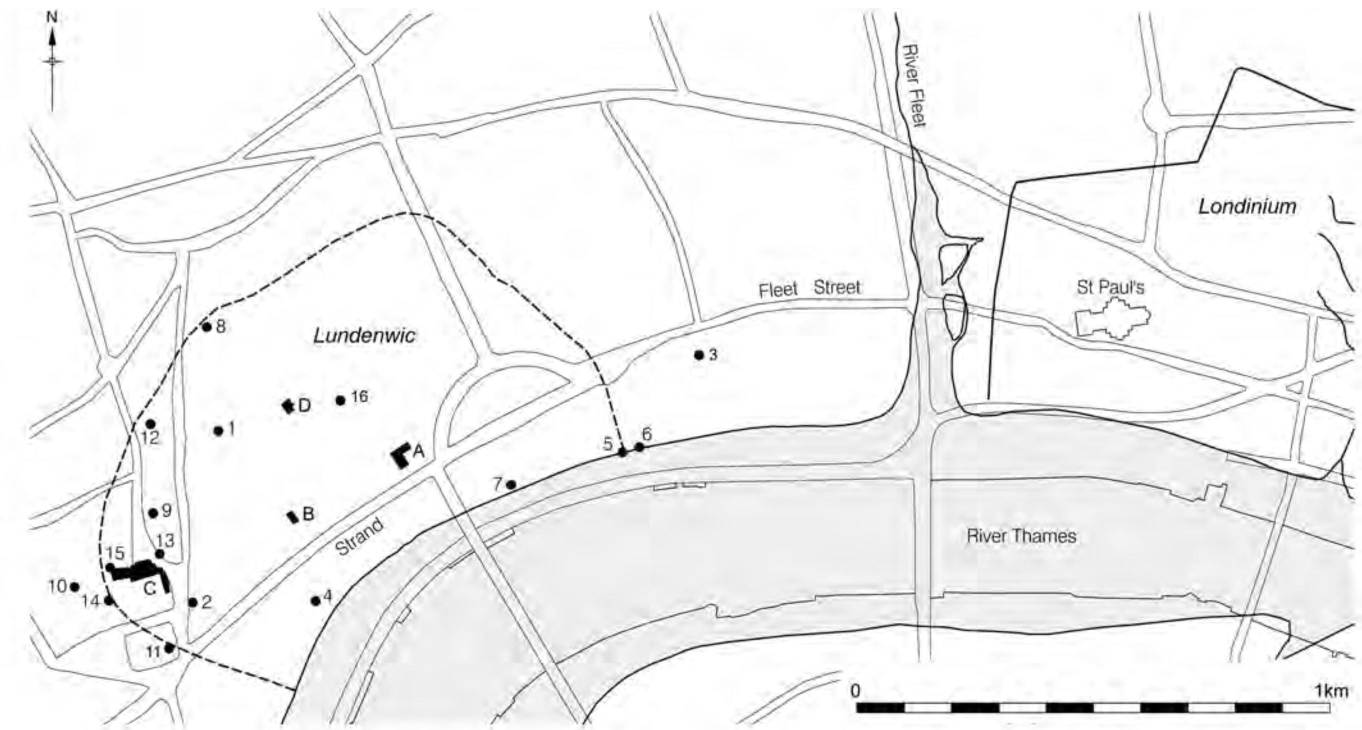


Fig. 4 The location of other sites in the study area, in relation to the currently accepted boundaries of Lundenwic. Scale 1:16,000.

A, Lyceum Theatre; **B**, Maiden Lane; **C**, National Portrait Gallery; **D**, James Street.
1, 15-17 Long Acre; **2**, St Martin's Church; **3**, Hare Court; **4**, York Buildings; **5**, Arundel House; **6**, Globe House; **7**, Somerset House; **8**, Shorts Garden; **9**, 8-18 Charing Cross Road; **10**, 5 Excel Court; **11**, Trafalgar Square; **12**, Great Newport Street; **13**, Cavell House; **14**, National Gallery basement and extension; **15**, Orange Street; **16**, Royal Opera House

Chapter 2 **Life and Death in the Heart of the Settlement: Excavations at 28–31 James Street**

JIM LEARY

Archaeological investigations were carried out in 2000 (JES99) and 2002 (JST02) by Pre-Construct Archaeology Ltd during the remodelling of the basements in buildings 28-31 James Street, (Fig. 5). All four buildings were heavily truncated by post-medieval basements, despite this however, cut features such as pits and wells survived across the area. Also an area measuring 5.5m by 4.5m (Area A) to the rear of Building 29, produced a complete sequence of Middle Saxon occupation layers, with an inhumation at the earliest phase and a layer of dark earth as the latest.

THE ARCHAEOLOGICAL SEQUENCE

Phase 1 and 2: Mid 7th Century

Phase 1 represents the natural geology of the area and is discussed above. The first clear evidence of activity was an inhumation composed of a skeleton within a grave cut (Fig. 7). The cut [433] measured 2m long and 0.7m wide by 0.75m deep and contained the skeleton [432] of an adult male in a supine position with legs extended. The burial was orientated west - east and there was no evidence it had lain within a coffin. The right arm was flexed at the elbow so

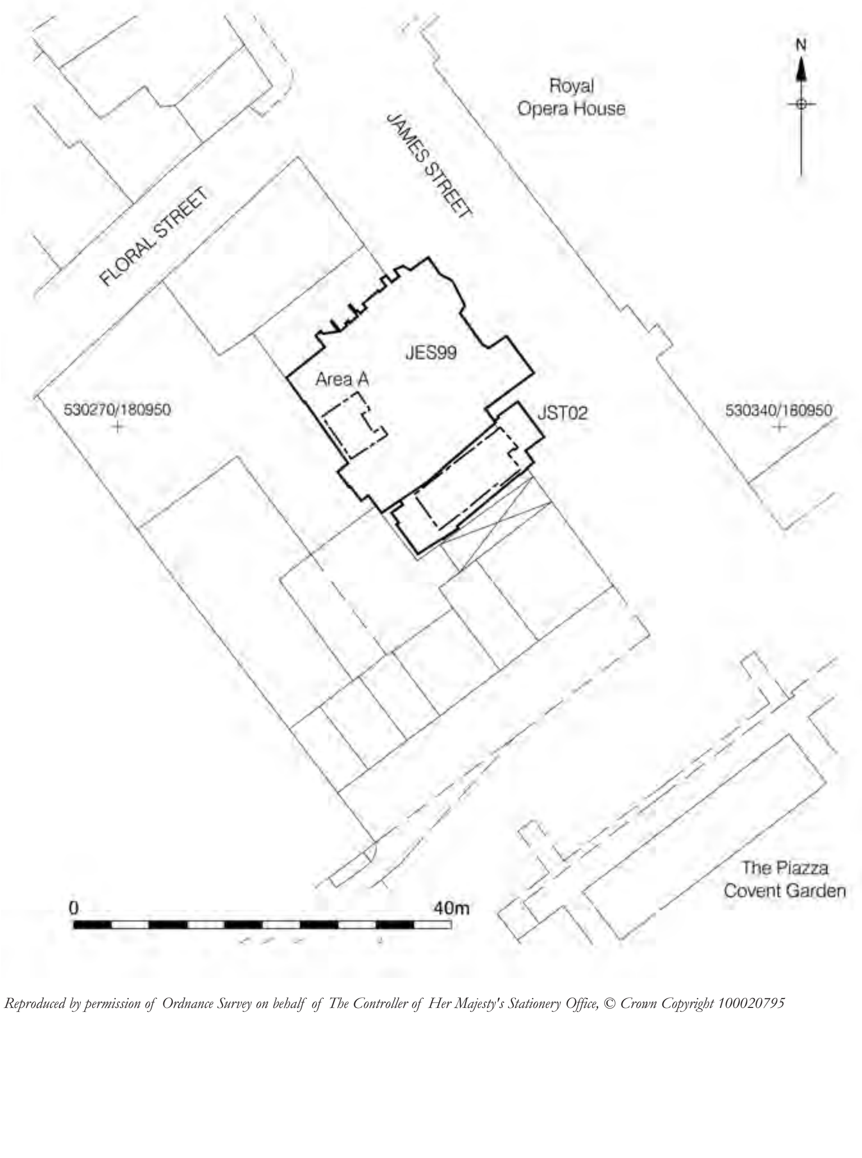


Fig. 5 James Street site location. Scale 1:800.

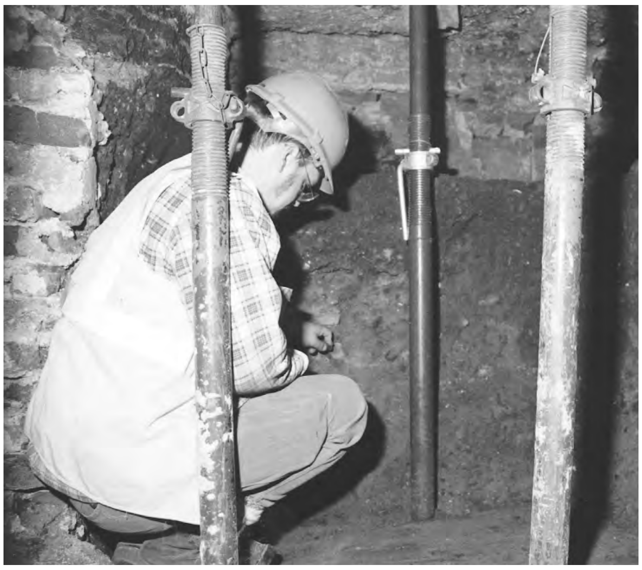


Fig. 6 Excavations at James Street

Fig. 8 The James Street burial

that the lower arm crossed the abdominal region and the left arm was flexed at the elbow so that the hand rested on the chest (Fig. 8). An iron spearhead with a leaf-shaped blade lay on the left shoulder (SF 73) (Fig. 24.4), and the left hand may have grasped the spear. A small copper buckle and plate, datable to the mid- 7th century, was recovered from the waist region (SF 74) (Fig. 24.5). The buckle may have been used to fasten a belt, or, given the small size, to secure a strap for a shield, pouch or knife sheath. The cut was filled with [431], a clean re-deposited brickearth, suggesting that little prior activity had occurred in the vicinity of the burial.

Phase 3: Mid to Late 7th Century

Overlying the burial was a deposit containing decayed animal bone fragments, which may represent a dumped layer, possibly forming part of a midden, suggesting that the area lay just outside the main settlement at this time. This may correlate with the 'grey layers' recorded at the Royal Opera House site (Malcolm *et al* 2003). Approximately sixty stake- and postholes and the fragmentary remains of a gully cut this layer. Alignments were extrapolated from the stakeholes and postholes and indicate the presence of buildings, fencelines or field plots (Fig. 9).

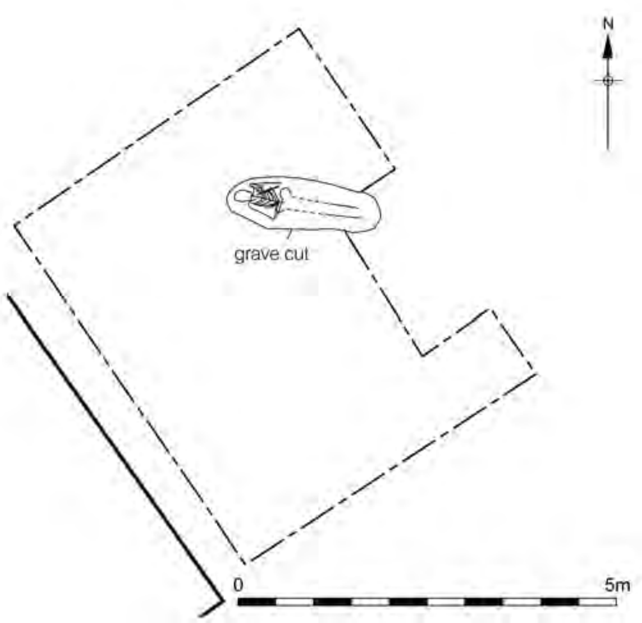


Fig. 7 Plan of James Street Phase 2 burial. Scale 1:100.

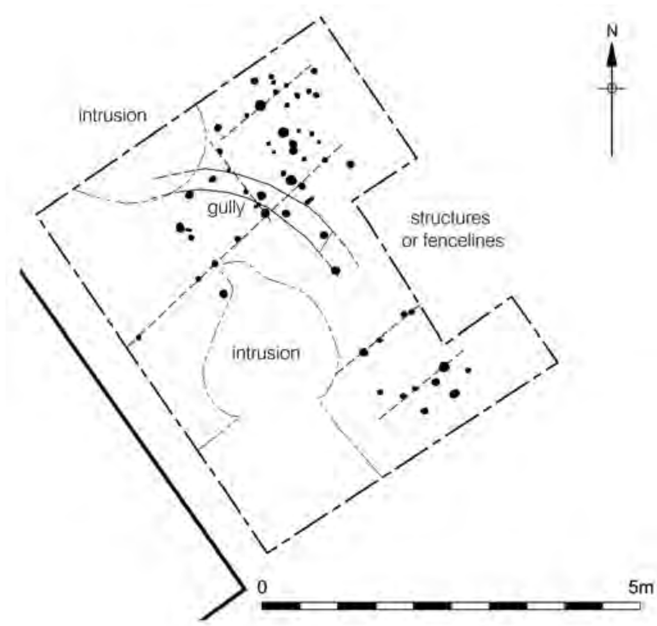


Fig. 9 Plan of James Street Phase 3. Scale 1:100.

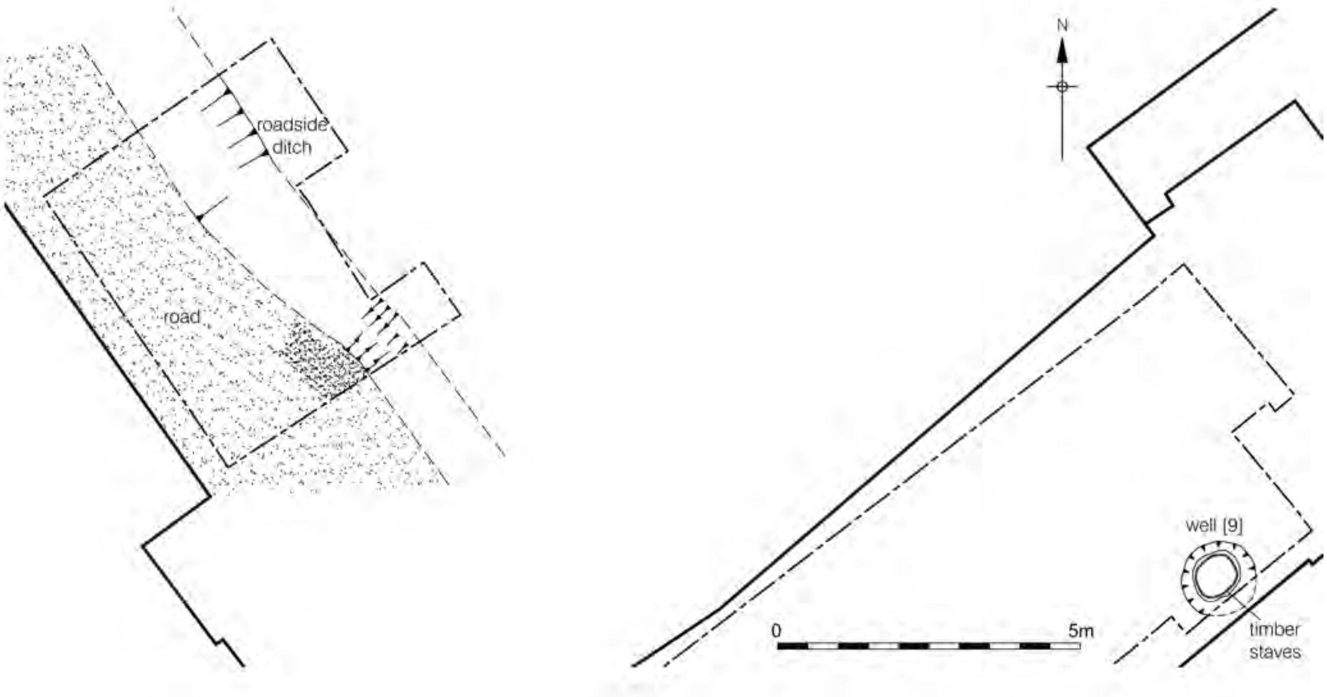


Fig. 10 Plan of James Street Phase 4. Scale 1:125

Phase 4: Late 7th Century

The next major development was the clearance of the above structures; the area was then overlain with a 0.2m thick layer of grey clay with occasional inclusions of animal bone fragments [335/356]. This may represent the renewed deposition of the Phase 3 midden and therefore may also compare to the Royal Opera House deposits ('grey layers'). A road was constructed directly over the midden and perhaps respecting the alignments of the Phase 3 fencelines and field plots. The road, comprising the fragmentary remains of rammed gravel surfaces, had been re-metalled at least five times, and was aligned northwest – southeast as evidenced by the flanking drainage ditch [337/323] (Fig. 10). The road ran parallel to a similarly phased (and therefore probably contemporary) road recorded from the Royal Opera House, (R1), and both would have provided access into and out of the settlement. Both roads would have presumably linked to the east-west retained Roman roads to the north and south of the settlement, forming part of a grid.

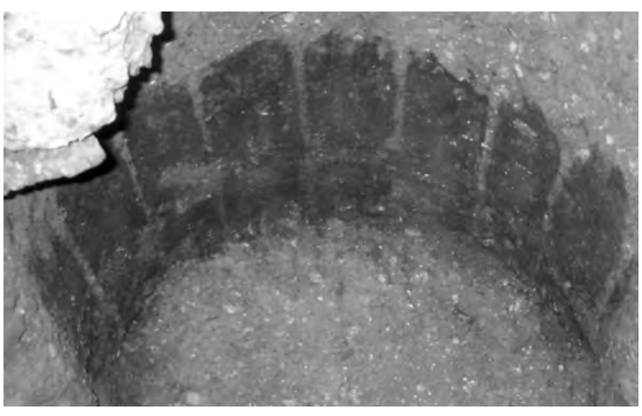


Fig. 11 The James Street cask-lined well

Evidence for settlement activity is suggested by a cask-lined well recorded to the south of the site (Fig. 10). The shaft of the well measured approximately 1m in diameter and had survived to a depth of 1.2m, the base of which was recorded at a height of 17.85m OD. The original cut had been lined with a thick layer of brickearth clay and a thinner, outer skin of puddled London Clay. The staves of the probably straight-sided cask measured *c.* 105mm wide, although later shrinkage would have distorted these measurements, and were preserved to a height of 0.38m from the base of the well (Fig. 11). Nine staves were preserved on one side of the well (from this we can estimate that the cask would probably have originally had seventeen staves), remaining only as organic staining and highly degraded wood. A wooden band, presumably hazel or willow, was recorded as a stain around the staves. A radiocarbon determination from the degraded wood suggests a date of AD 610-780 (at one standard deviation) with the mid- to late 7th century being the most likely date (*see* 'Radiocarbon Dating', this chapter). This well is similar in construction technique to other wells from contemporary sites (Whytehead *et al* 1989, 43; Morris 2000, 2237 – 2243; Malcolm *et al* 2003). It is suggested that straight-sided casks were made in England during this period (Morris 2000, 2240).

Phase 5: Late 7th to Early 8th Centuries

The late 7th and early 8th centuries provide much clearer evidence for settlement activity on the site, represented by the excavation of a number of rubbish pits, possibly demarcating property boundaries (Fig. 12). One such pit was excavated through the Phase 4 road, suggesting that it had ceased to function, and the roadside ditch was backfilled. The road remained in use for a considerably shorter period than the road recorded at the Royal Opera House, further indicated by the fact that it was only resurfaced five times, compared to the Royal Opera House road, which was resurfaced ten times. Domestic activity occurred in the vicinity and the ditch backfill comprised, at least in part, of human or animal faecal waste as indicated by the relatively large number of small bone fragments, including some that had been burnt and mineralised, as well as an apple pip. Also within the backfill were two cattle horn cores and a fragment of antler waste indicating that small-scale craft activity occurred nearby. Charred remains were recovered from the fill, and included hulled-type barley and wheat-type grains. The pottery assemblage of the ditch backfill included a number of sherds of chaff-tempered ware as well as sherds of imported North French/Rhenish whiteware from the Seine Valley and North French/East Belgian hard greyware. Cattle, sheep and pig bones, as well as domestic cat and domestic fowl were also recovered from this context, further suggesting that domestic activity occurred in the immediate vicinity.

The pottery assemblage from the pits was dominated by chaff-tempered ware, which, given the absence of Ipswich-type ware, suggests a late 7th or early 8th century date. The pits contained domestic refuse, including a double-sided composite comb with a triple lattice pattern from pit [245], (SF 72), reflecting the domestic nature of the fill. Pit [271] contained a high concentration of calcined animal bone (*ie* heated to above 700-800 °C) and a large quantity of charred cereal grains, suggesting the contents had been intentionally burnt, possibly as a sanitary measure, before burial. Alternatively this deposit may have been burnt in a house fire. Unlike many other features from the site, pig bones dominated the bone assemblage, suggesting that it may have derived from the preparation and serving of complete carcasses of roast pigs, such as for feasts (although *see* Rackham and Snelling, (chapter 3, this volume). This burnt deposit had been sealed with a layer of clean gravel, and a layer of brickearth sealed the subsequent fills. The alternating deposition of dirty and clean fills has been noted in pits at the National Portrait Gallery (Pickard this volume), as well as at *Hamwic* (Holdsworth 1980), where it has been interpreted as a technique to mask the smell of the dirty layers. As a result, the charred cereal grains were sealed very quickly after deposition and therefore protected from physical weathering, resulting in excellent preservation. Analysis of the plant macrofossils

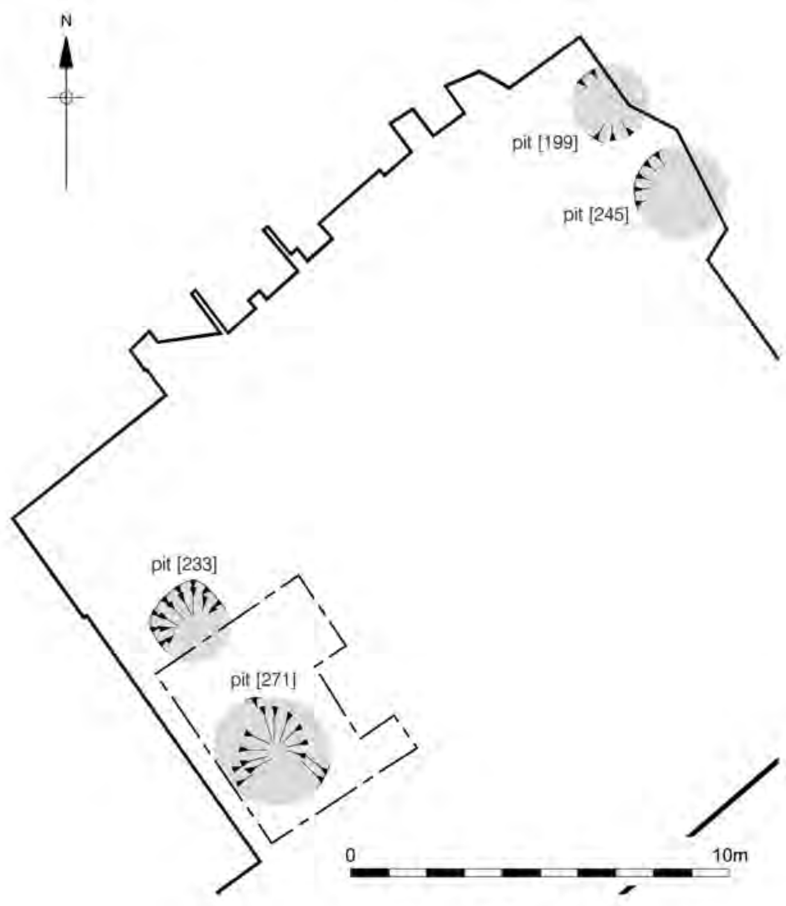


Fig. 12 Plan of James Street Phase 5 pits. Scale 1:200

ANGLO-SAXON BEEKEEPING

The remains of part of a colony of honeybees (*Apis mellifera*) from a late 7th to early 8th century context represent the oldest known bee colony recovered from an archaeological site in Britain. The only other British site to produce evidence for bees was Coppergate, York, in 1980, where the remains of bees along with what may be part of a hive were recovered from a 12th century context (Crane 1983, 102).

The bees would have been kept in a hive known as a skep, an inverted basket usually made of coiled-straw but also of woven wicker coated in daub (Hagen 1995, 150), thought to have originated among Germanic tribes west of the Elbe (Crane 1983, 103). Skeps would have varied in shape but were mostly small and conical in form, the bees gaining entry by a hole in the side. Skeps may have been protected from the elements by a straw thatch (Crane 1983, 105), and would have been set upon tables to protect them from the damp and scavengers.

Unlike modern removable-frame hives, skep beekeeping nearly always required the bees to be killed in order to harvest the honey. This could have been done in a number of ways; by immersing the skep in water and drowning the bees; by asphyxiating the bees with smoke; or, as noted by Thomas Tusser in 1557 in 'A hundreth good pointes of husbandrie', by knocking the bees out of the skep into a fire below (Crane 1983, 106). The latter would clearly result in charred bee remains such as were excavated from the site.

After cutting the comb from inside the skep, the better quality 'run' honey was allowed to drip into a container, whilst lower quality honey was obtained by pressing the comb through a cloth bag or strainer (Hagen 1995, 151), which could be heated to separate out the beeswax. Finally the remains of the comb and the cloth bag were soaked in water and the resultant liquid used for the production of mead (Crane 1983, 106), (this technique for mead production is indicated in the sixth line of the riddle below). Mead was a popular drink and drunk not only by the characters in the heroic world of poetry but also by the masses (Hagen 1995, 233). The riddle below, taken from the Exeter Book and written in the 10th century, not only exemplifies the Saxon love of mead but also the dangers of drunkenness:

> "Men are fond of me. I am found everywhere,
> brought in from the woods and the beetling cliffs,
> from down and from dale. In the daylight wings
> raised me aloft, then into a roof's shade
> swung me in sweetly. Sweltered then
> by men in a bath, I am a binder now,
> soon a thrasher, a thrower next:
> I'll put an old fellow flat on the ground.
> A man who tries to take me on,
> tests my strength, soon he finds out,
> if his silly plan doesn't pall on him,
> that it is his back that will hit the dust.
> Loud in words, he has lost control
> of his hands and feet, and his head doesn't work:
> his strength has gone. Guess my name
> who have such mastery of men on earth
> that I knock them about in broad daylight."
>
> (trans. Alexander 1991, 73)
> The answer to the riddle, of course, is mead.

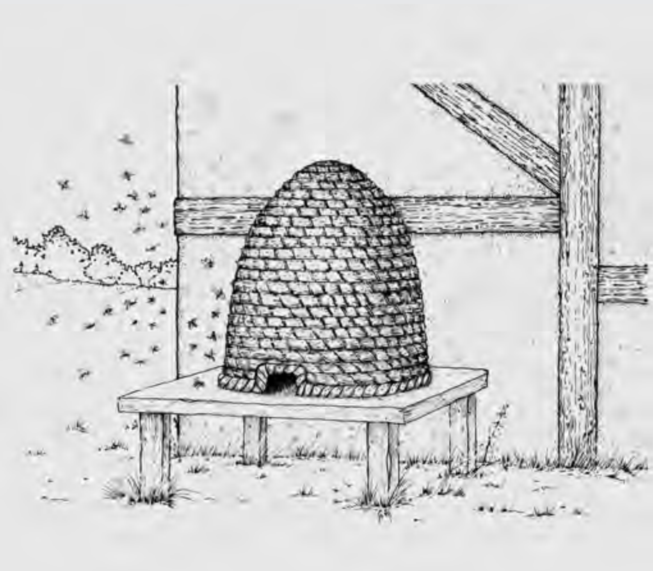


Fig. 13 A reconstructed bee skep

Fig. 14 The James Street loomweights in situ

from this fill suggests a significant role for barley in the Saxon economy, although wheat, oat and rye were also recorded. The relatively small number of chaff and weed seeds, despite the good preservation of the sample, suggests that the deposit had been winnowed and sieved elsewhere before arrival on the site. Also recovered from this context were a number of charred insect fragments, which proved to be honeybee (*Apis mellifera*). The most readily identifiable remains of the bees were heads, twenty-one being from workers and two from drones. Fragments of abdomen were also present, along with flight muscles from the thoracic box. If the fill of this pit was the debris of a house fire, it is possible that there had been a skep on the outside of the building. However, if the material was domestic refuse that had been burnt in the pit as a sanitary measure, it could have resulted from a skep after the bees had been killed and the honey had been extracted (*see* box text). The evidence of beekeeping within the settlement, however, suggests that open areas may have existed and that buildings were dispersed.

Isolated from the stratified sequence but associated with this phase by the pottery dating was a large, circular, clay-lined pit [199], notable since it contained a relatively homogeneous group of 31 loomweights, nearly all complete and almost certainly from the same loom (Fig. 14). The loomweights were fire-blackened on one side, which may reflect that they were suspended on a loom when burnt, but alternatively may have been stored in rows within a building that caught fire, before being discarded into a rubbish pit. However, clear traces of a groove cut by the warp on many of the weights suggest that they had been in use. It is suggested that thirty-two loomweights in sixteen pairs could have been used on a warp of around 1.14m in width, in which case the loomweights represent a near complete assemblage. However, warp-weighted looms may have been wider (*c.* 3m or more), so if this were the case here the loomweights recovered would represent approximately half the total assemblage (Riddler this chapter). Environmental samples from this pit produced charred remains of barley, wheat and oats, as well as possible evidence of faecal material, suggesting that it derived from a domestic context.

THE WARP-WEIGHTED LOOM

The warp-weighted loom is a vertical loom that uses a system of holding the warp threads parallel under tension by tying them in small bunches to weights (hence the name). The loom was either leant against a wall of a house or set upright in the ground and consisted of two vertical uprights, a horizontal warp beam, a shed rod, and the weights. The warp threads (vertical threads) were tied to the beam at the top and hung down vertically towards the ground and the weights were attached to the ends of these, which were grouped together and tied. The weft (horizontal threads) could then be beaten up toward the beam.

Fig. 15 The James Street loomweights in a reconstructed loom

The photograph (Fig. 15) shows the original Saxon loomweights attached to a reconstructed upright loom. The warp has been gathered in groups of seven or eight threads per weight (I Riddler, pers comm) and tied to the weights using a slipknot, therefore allowing more thread to be passed through the weight when necessary. In order to maintain an even spread to the threads a single thread has been ‘finger-crocheted’ across the warps and attached to the uprights (E Andersson, pers comm).

Phase 6: Mid 8th to Early 9th Centuries

By the mid- 8th century a picture of a much more intensively settled landscape is evidenced from James Street. Overlying the Phase 5 pits in Area A were the fragmentary remains of brickearth and gravel surfaces, as well as a beamslot and post- and stakeholes, representing the construction of timber buildings (Fig. 17). No complete dimensions of the building plots were represented, but four successive phases of building were recorded: [324] (Phase 6.1), [315] (Phase 6.2), [267/192] (Phase 6.3) and [256/173] (Phase 6.4). The earliest surface, [324], was recorded at a height of 20.7m OD and the latest, [256/173], recorded at 21.28m OD. Layers of silt and charcoal overlay the individual brickearth surfaces and may represent occupation horizons as well as periods of burning, which were often further sealed by layers of burnt daub representing burnt and collapsed walls; this may have then been used as a levelling layer for the subsequent surface (Hughes this volume). This suggests that the buildings were frequently replaced, perhaps due to regular house fires, whilst maintaining the same location. The brickearth surfaces were cut by stakeholes, and, although no coherent pattern was discernible, they probably represent the positions of internal wall partitions, providing subdivisions within the buildings. The alignment and position of the internal partitions varied with each surface reflecting the changes and modifications made to the buildings as they were re-built and a pit [327], excavated between Phases 6.2 and 6.3, may represent a period when the area remained open for a short time (Fig. 18). It has been suggested elsewhere that the brickearth surfaces represent internal floors, whilst the metalled surfaces may have been external (Whytehead *et al* 1989, 43; Bowsher 1997, 21). Ipswich-type ware was present in this phase for the first time and dominates the pottery assemblage in this occupation sequence. A sherd of North

Fig. 16 The James Street antler waste

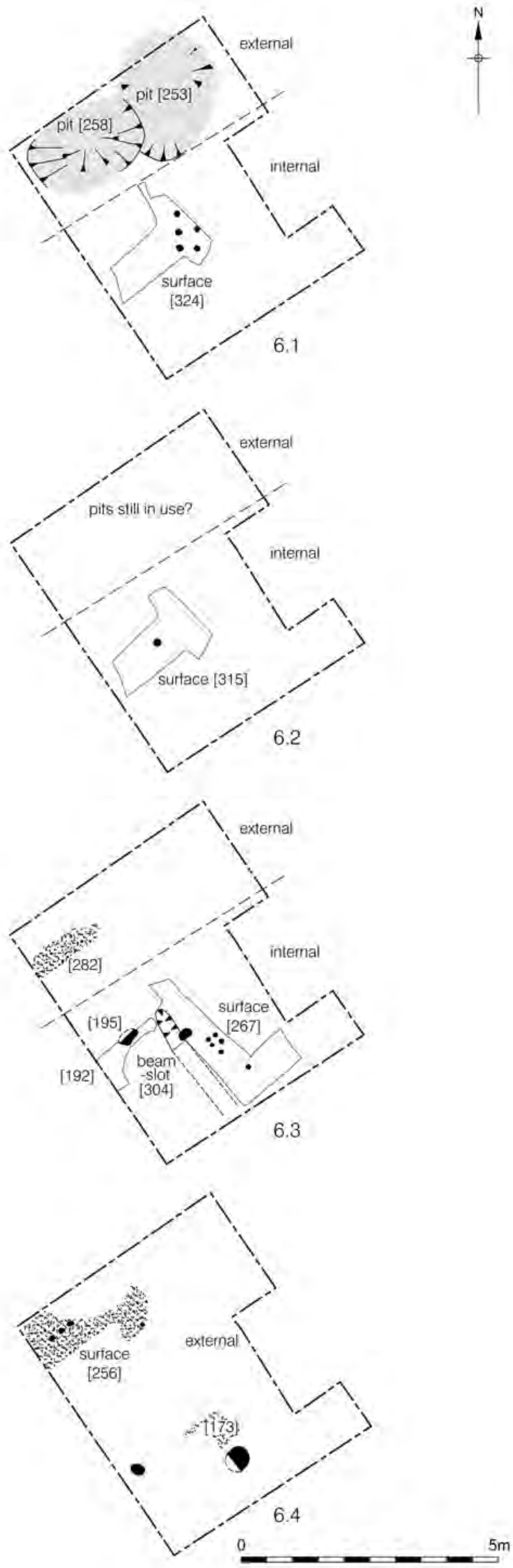


Fig. 17 Plan of James Street Phase 6 surfaces. Scale 1:125

French/East Belgian ware was also present and one of the latest layers of building activity produced a sherd from a North French/Rhenish whiteware pitcher with a diamond lattice pattern; a 9th century innovation. This suggests that the building activity took place from the mid- 8th century and continued into the 9th century.

Associated with the earliest phase of building activity were two intercutting pits [253] and [258] (Fig. 17), both of which produced large quantities of iron slag. Pit [253] contained twenty-two fragments from smithing hearth bottoms, while [258] contained eight fragments. This strongly suggests that a smithy was functioning in the immediate vicinity, probably associated with surface [324] (Phase 6.1), although it may have continued to be used in Phase 6.2. The evidence points to hot hammering of iron and sugguests a smithing operating close by at this time (Keys, this chapter). Pit [253] also produced two sherds of a crucible, containing copper alloy residue on the internal surface suggestive of a metallurgical use. The fact that both iron working waste and a crucible, indicating non-ferrous working, were discarded within the same pit suggests that they derived from the same workshop, possibly even from the same person. This would indicate that more than one craft took place within the same property and that smiths may have been skilled at both ferrous and non-ferrous working.

A number of domestic and personal objects were recovered from the occupation sequence. From Phase 6.3 occupation debris [180], associated with surface [267], a complete example of an iron ferrule (SF 49) (Fig. 24.3) and an iron awl (SF 51) with a diamond-shaped central cross-section, were recovered. Iron ferrules were fastened to wooden shafts and could have served as reinforcements for the ends of wooden poles, which helped skaters to glide across ice and snow, using bone skates (as recovered from the Royal Opera House excavations), alternatively they may have been agricultural dibbers. Although known from other sites, the awl is the first example to come from *Lundenwic*. Awls of this particular type were used in leatherworking, once again suggesting that craft activity took place alongside domestic activity. An overlying layer [168] contained a

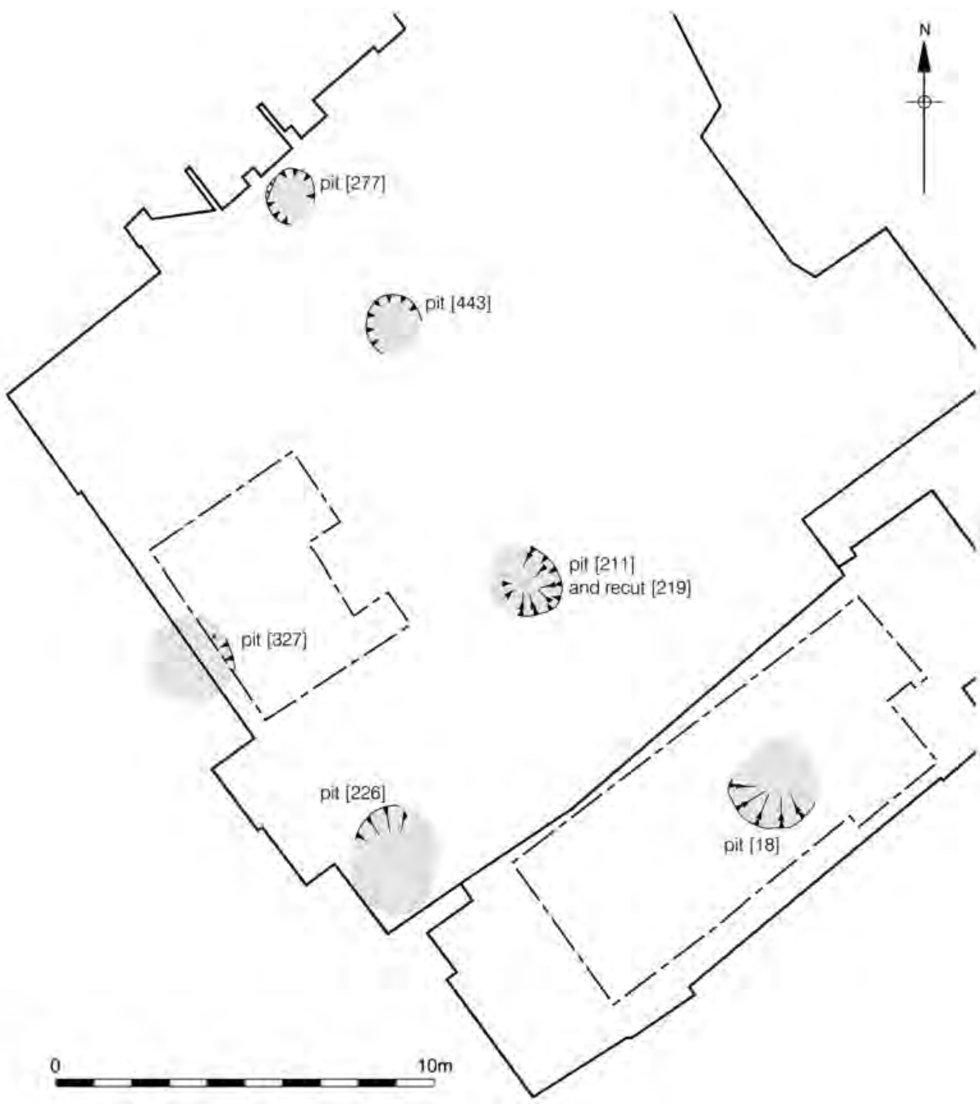


Fig. 18 Plan of James Street Phase 6 pits. Scale 1:200

conical lead weight (SF 46) (Fig. 24.2), probably used for line fishing. There are few comparable lead weights from this period, although a close parallel comes from Wood Quay, Dublin, and a small series of conical lead weights have come from Dorestad and Flixborough. A fragment of lower stone from a discoidal quern (Fig. 23), derived of basalt lava, was recovered from a layer of burnt daub [157] and may represent a discarded household object.

A number of pits, isolated from any stratigraphic sequence but contemporary in date with the buildings, were recorded across the site, and may represent boundaries for plots of land (Fig. 18). The pottery assemblage contained Ipswich-type ware, as well as imported wares, and the pits may reflect an initial industrial use, followed by backfilling with domestic refuse. Four pits were clay lined; one using puddled London Clay. The clay lining suggests the need for the pits to remain watertight; either to hold liquid, such as for tanning or dyeing, or to keep the contents of the pit dry, such as for food storage. Degraded wooden planking, recorded from the base of two of the pits, may represent the remnants of a collapsed wooden cover. The pits contained bone from the principal animal domesticates (cattle, sheep and pig), as well as fish (roach) and domestic fowl. Some of the bones had been singed, perhaps due to the casual throwing of food scraps into or near hearths or open cooking fires, suggesting that the backfill represented domestic rather than industrial waste. As with Phase 5, two pits contained unusually high concentrations of pig bones, which may be indicative of feasting (pit [211] and the recut of this pit [219]). Some of the pits contained discarded waste from horn- and antler-working crafts (Fig. 16) and were inter-mixed with household food-refuse. A double-sided composite comb, decorated with a series of vertical lines, was recovered from pit [327], (SF 70, Fig. 22.2).

Phase 7: 9th Century

Two layers of dark earth [156] and [254], representing a period of abandonment, sealed the stratified sequence. The dark earth was approximately 0.35m thick and probably included the reworked latest phase of occupation. The pottery assemblage was dominated by Ipswich-type ware but also included sand-tempered and shell-tempered wares, and an Offa Group III silver coin dated AD 792 – 796 (SF 60, Fig. 25), as well as two fragments of a quern of basalt lava. The dark earth was cut by 17th century features, suggesting that the area remained open ground until the post-medieval period.

THE POTTERY

Chris Jarrett

The fabric types present on the sites can be classified using Blackmore 1988a; 1989; and 2003, but some new fabric types occurred which have not previously been recorded in *Lundenwic*. Blackmore (1999; 2001; and 2003) has proposed a revised ceramic phasing for *Lundenwic*, the earliest phase dating from *c.* 650-670 contains chaff-tempered and sand-tempered pottery fabrics as well as imported Merovingian-type black and greywares. By *c.* 670 imported Rhenish Walberberg buff wares first occur in the settlement along with French reduced wares and imported whitewares. From *c.* 730 the first Ipswich-type wares began to appear, along with Rhenish amphorae, whilst there was a decline in chaff-tempered pottery. Between *c.* 750-770 Ipswich-type wares began to reach *Lundenwic* in noticeable amounts and became the main pottery type from *c.* 770 until the end of the settlement in the late 9th century. Imported pottery during this period included types previously seen, but *reliefbandamphorae*, 'classic' Badorf and Tating ware also occur. In the period of *c.* 775-810 the first shelly wares appeared but in the final ceramic phase of activity between *c.* 810-870, shell-tempered pottery was much more common, as was Badorf-type pottery, while red painted wares were also present.

JES99 produced 97 sherds of Middle Saxon pottery, weighing 2,817g, whilst JST02 produced 7 sherds weighing 137g, almost exclusively found in one pit.

Fabrics and Forms

Chaff-tempered wares
*(CHAF, CHSF, CHFS, CHFI, *CHFST)*

Organic-tempered pottery occurs as hand-made (coiled) jar or closed-shape vessels. Most of the chaff-tempered fabrics have been found elsewhere in the settlement and have been described by Blackmore (1988a, 84). The basic chaff-tempered fabric (CHAF), containing mostly organic material in a London Clay matrix, is the commonest fabric on other *Lundenwic* sites such as Jubilee Hall and Maiden Lane (MAI86), but here was only represented by the rim sherd of a jar-shaped vessel (Fig.19.1). Sparsely chaff-tempered fabric with moderate quartz (CHSF) was much more common; represented by fifteen sherds from probable jar-shaped vessels. The most diagnostic sherd was from a base (Fig. 19.2). Also present, as four sherds, was the abundant quartz and moderate chaff-tempered fabric (CHFS), including two jar-shaped vessels, one with a typical everted, simple rim (Fig. 19.3) and another also everted, but with a flattened top;

possibly a more open form (Fig. 19.4). A sherd of iron oxide or haematite and chaff-tempered ware (CHFI) was also identified, probably from a closed form.

Chaff and sandstone-tempered ware (*CHFST) has not been previously recognised in *Lundenwic*. It was present on the site as a hand-made, globular-shaped jar, its rim being upright and simple, but with an external bead (Fig. 19.5). Both the internal and external surfaces had been smoothed by light burnishing but the external surface was burnished to a greater degree.

Ipswich-type ware
(IPSF, IPSM, IPSC)

This wheel-finished ware occurred on the site as fineware (IPSF), represented by ten sherds, medium-tempered ware (IPSM) by nine sherds, but most commonly by coarse ware (IPSC), namely 20 sherds. Kiln sites for this ware have been found in Ipswich, although it has also been suggested that other production centres existed in the London area, copying this type of pottery (Blackmore 2001, 27; 2003, 229). Most forms present on the site were jar shapes (Figs. 19.6-19.10), usually with simple upright rims, and with shoulder sherds demonstrating the characteristic horizontal ridges of this ware. A possible bowl was also represented (Fig. 19.7).

Stamped decoration was present on two fineware vessels; the first was a body sherd with circular 'rosette' stamps, 20mm in diameter with nine 'points' on the circumference (Fig. 19.9). Similar, stamped vessels have been found previously in *Lundenwic* (Blackmore 2001, fig. 5.2.26) and York (Mainman 1992, fig. 2.13, 18). The second stamped Ipswich-type ware fragment of a shouldered jar-shaped vessel (Figs 19.10) was recovered from a post-medieval context. The segmented circular stamps on this vessel are 10mm in diameter and have eight 'spokes'. These were positioned at the base of the vessel's neck and in pairs straddling the carination. Below the carination were burnished arcs, but it is uncertain whether this is decoration or surface finish. There was also a small fineware sherd with possible roller stamping (Fig. 19.11).

Shell-tempered wares
(MSSE and MSSF)

The main shell-tempered ware present on the site was MSSE (with abundant shell fragments) and comprised five sherds, probably from jar-shaped vessels (Figs. 19.12-19.13). This fabric seems to be the most commonly occurring shell-tempered ware found on other *Lundenwic* sites. There was also a single sherd of the abundant fine shell-tempered ware (MSSF) probably from a jar. Recent research has shown that the *Lundenwic* shell-tempered wares derive from a Kentish source.

Sand-tempered and other wares
(SSANA, SSAND, SSANE, SLGSA, SLGSB, MSCH, MSCR)*

A small number of sherds on the site could be classified as sand-tempered or containing inclusions of Lower Greensand ironstone sand, or chalk. One sherd of mixed sand and chalk-tempered ware (MSCH) was present, as the simple rim of a jar-shaped vessel (Fig. 19.14). Three sherds of coarse sand-tempered ware (SSANA) were present, notably the rim from a straight-sided bowl with a simple rim and an internal bevel, the exterior of the vessel roughly finished (Fig. 20.1). Two sherds of fine sand-tempered ware with sparse organic temper (SSAND) were found and a single sherd of pale grey fine sand-tempered ware (SSANE) was identified with highly burnished surfaces, possibly indicating an Early Saxon date, though recovered from a post-medieval context. Sandy-gritty wares were present as two rim sherds from jars, one in Brickearth fabric (SLGSA) (Fig. 20.2), and the other of Reading Beds clay (SLGSB) (Fig. 20.3), both with Lower Greensand ironstone sand.

Two sherds of crucible (MSCR) from this site were recovered from a Phase 6 pit [253]. The exterior was self-glazed from metallurgical use and a possible fragment was found at Maiden Lane (Jarrett, Chapter 4, this volume). Middle Saxon crucibles are rare from *Lundenwic* and a crucible used for glass making recovered from an early 9th century well at Hare Court, Inner Temple (Jarrett forthcoming). Evidence for metal-working activity within the Middle Saxon settlement was also found at the Lyceum Theatre (Jarrett, Chapter 3, this volume) and the Royal Opera House site, and a key mould was found at the Peabody site (Bowsher & Malcolm 1999; Blackmore 1989, 128-9).

Imported Pottery

North French reduced wares
(NFBWA, NFBWB, NFGWA, NFGWB, NFEBB, NFEBC)

North French blackware was represented by a sherd in fine brown/pink fabric NFBWA, and another in sandy, reduced

* CHFST: chaff and sandstone-tempered ware, abundant amber and grey, iron-stained, sub-angular sandstone quartz, occurring as occasional to moderate angular fragments of sandstone up to 2.5mm. Sparse to moderate organic temper up to 5mm. Sparse white mica up to 0.1mm.

* MSCR: The fabric is white firing with abundant, clear, sub-rounded quartz up to 0.25mm and sparse organic inclusions.

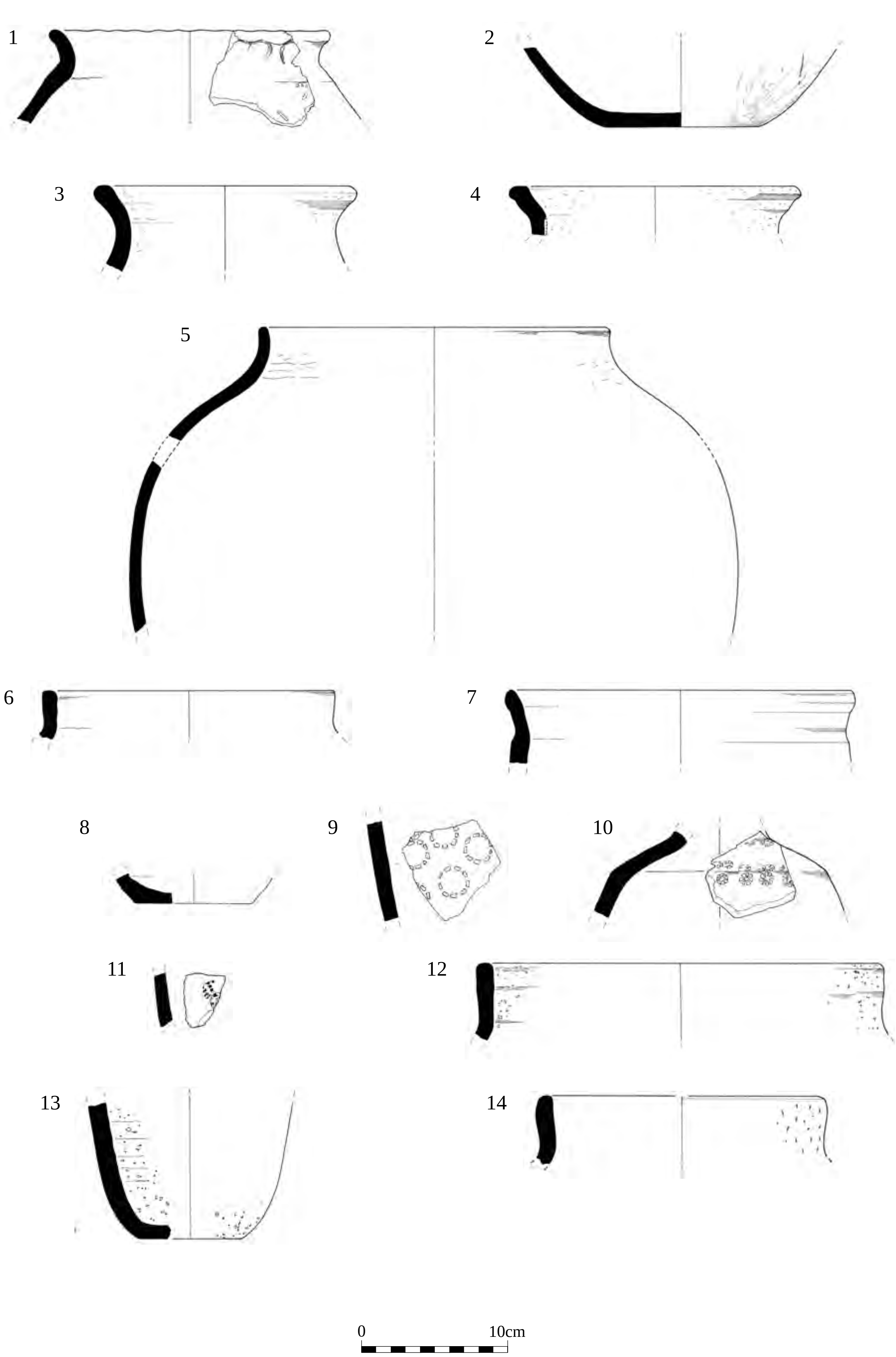


Fig. 19 The James Street pottery
(1-5) chaff-tempered wares; (6-11) Ipswich-type wares; (12-13) shell-tempered wares; (14) chalk-tempered ware. Scale 1:4

fabric (NFBWB), comprising the rim of a probable jar (Fig. 20.4). North French greywares were found as a body sherd of a closed form in coarse sand-tempered ware (NFGWA), and two sherds of fine sand-tempered ware NFGWB were identified, one of which was the strap handle of a pitcher. Northern France/Eastern Belgian wares were present as a sherd of a possible pitcher with a horizontally ribbed body in hard grey ware (NFEBB) and as a sherd of a coarse sand-tempered grey ware (NFEBC).

French/Rhenish whitewares
(BEAV, MSWWA, MSWWB, MSWWD)

Whitewares of a North French/Rhenish source were also found; a single sherd, probably originated from Trier (MSWWA), and two sherds, representing two vessels, probably from the Seine Valley (MSSWB), first as the rim of a possible pitcher with a cordon (Fig. 20.5) and the second as the body sherd of a carinated vessel, externally sooted. Whiteware fabric (MSWWD) was present as a base (Fig. 20.7) and a body sherd with lattice burnishing (Fig. 20.6). A single body sherd, probably of Beauvais whiteware fabric (BEAV), deriving from a pitcher or jar, was also present.

The Distribution of the Pottery

Phase 4

Stratigraphically the earliest deposit to contain pottery was middening deposit [356], which produced the rim of an intrusive Ipswich-type ware vessel.

Phase 5

The primary backfilling deposit [322] of Phase 4 ditch [323]/[337] produced a sherd of chaff-tempered ware (CHSF), while a later fill [314] produced a chaff-tempered ware jar (CHAF) (Fig. 19.1) and two sherds of imported pottery; first, a sherd of North French/Rhenish whiteware (MSSWB), possibly from the Seine Valley and a second sherd of North France/East Belgium hard greyware (NFEBB). Pit [245] contained in its latest fill [246] a body sherd of chaff-tempered ware (CHFS). Pit [199] produced a sherd of a sand-tempered ware (SSAND) in its lowest fill [205] and above it in fill [204] the rim and shoulder of a chaff and sandstone-tempered ware jar (CHFST) (Fig. 19.5).

Phase 6

Pit [253] produced sherds of chaff-tempered ware (CHSF) in fill [251], probably from jar-shaped vessels and four sherds of Ipswich-type ware, probably from jars. The rim of a jar in a sandy-gritty brickearth ware (SLGSA) (Fig. 20.2) was also present. Imported pottery in this pit consisted of the inturned and cordoned rim of a pitcher in a North French or German whiteware fabric, MSWWB (Fig. 20.5) and a sooted, flat base of a vessel in the MSSWD fabric (Fig. 20.6). A sherd of North French greyware (NFGWD) was also present, its surface laminated. This pit also contained two crucible sherds (MSCR). Pit [258], which cut [253], produced a single everted rim sherd of a chaff-tempered ware (CHFS) jar (Fig. 19.3) from its primary fill [309], and fill [307] produced a further sherd of chaff-tempered ware (Fig. 19.4). The latest fill [257] produced the rim of a shell-tempered ware vessel although this may be intrusive (MSSE) (Fig. 19.12).

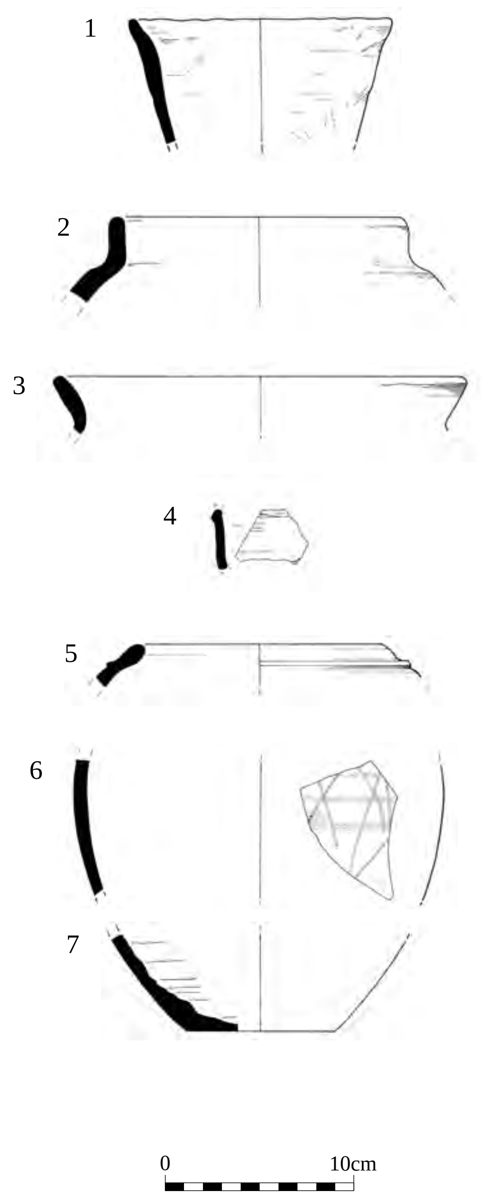


Fig. 20 The James Street pottery
(1-3) sand-tempered wares; (4) North French blackware; (5-7) North French/Rhenish whitewares. Scale 1:4

Pottery came from two fills of pit [226]. The earliest [231] produced sherds of a North French black burnished ware (NFBWB) jar or pitcher with a bevelled rim (Fig. 20.4) while fill [229] produced the strap handle of a North French greyware (NFGWD) pitcher. There is also the rim of a vessel (Fig. 20.3) in fabric (SLGSB). Pit [277] produced a laminated body sherd of chaff-tempered ware (CHFS) and a body sherd of Roman pottery.

Bedding layer [193] for Phase 6.3 surfaces produced a small sherd of sand-tempered ware (SSANA) whilst the associated occupation horizon [190] produced a sherd of North French/Eastern Belgian ware (NFEBC) and above it, occupation [185] included the base of a Coarse Ipswich-type ware vessel, with a small basal diameter. Above this slumped daub deposit [183] contained two sherds of imported pottery; a sherd of North French/Rhenish whiteware and a North French blackware (NFBWA). Occupation debris [180], overlying surface [267] contained the convex base of a burnished chaff-tempered ware (CHSF) vessel (Fig. 19.2) and the base of an Ipswich coarse ware (IPSC) pot and a sherd of IPSM.

Phase 6.4 occupation debris [163] contained two sherds of Ipswich-type ware (IPSF and IPSM), both from the shoulders of jar-shaped vessels with the characteristic external ridges of this ware. Primary fill [222] of pit [211] contained a chaff-tempered (CHSF) sherd of a thin walled rounded-shape vessel, with a sooted or carbonised deposit on both surfaces. Above it fill [216] produced four sherds of Ipswich coarse ware (IPSC). A re-cut of this pit [219] produced sherds of Ipswich-type ware in two of its fills [214] and [217] including one sherd of fine Ipswich-type ware with a surviving small area of either comb point or roller-stamping decoration (Fig. 19.11). Occupation deposit [158] contained the rim of an Ipswich coarse ware jar with a simple, upright rim and flattened top (Fig. 19.6) and a body sherd of an Ipswich fineware vessel and a body sherd of a North French/Rhenish whiteware (MSWWD) pitcher with a diamond lattice pattern (Fig. 20.6), probably 9th century in date, along with a sherd link to the base (20.7) in pit [253].

Pit [18] from JST 02 contained Middle Saxon pottery in the clay lining to the pit [17], including the laminated surfaces of a chaff-tempered ware vessel (CHAF) and a large body sherd of a shell-tempered ware (MSS) with a post-depositional surface concretion. The latest fill of the pit contained a single sherd of Roman pottery, a sherd of a chaff-tempered ware (CHAF) and the rim of a sand-tempered ware (SSANA) straight-sided bowl (Fig. 20.1).

Phase 7

Dark earth deposits also contained Middle Saxon pottery including four sherds of Ipswich-type ware jars and the simple rim, neck and shoulder of a fineware jar, a sherd of an Ipswich coarseware jar and a body sherd of a thin walled sand-tempered ware (SSAND) vessel form [156]. Overlying this, deposit [254] contained fourteen sherds of pottery, mostly in Ipswich-type ware (seven sherds), including a body sherd from a jar shaped vessel with 'rosette' stamp decoration (Fig. 19.9), a sherd of Ipswich-type ware (IPSM) with a burnished diamond pattern, the rim of a mixed sand and chalk-tempered ware (MSCH) jar, and an MSSE jar base (Fig. 19.13).

Discussion

Chaff-tempered ware was common in Phase 5. Imported wares, represented by North French Rhenish whiteware, possibly from the Seine Valley, along with North France/East Belgium hard greyware, were also recovered from this group of material, suggesting that this period dates to 670-730/750.

Ipswich-type ware was the dominant fabric in Phase 6, represented by twenty-one sherds, as it is in the dark earth layers of Phase 7. Shell-tempered wares were mostly confined to the dark earth layers of Phase 7.

Imported pottery was found throughout all the phases of Middle Saxon activity and to a certain extent follows the pattern described by Blackmore (2001, 40). However, some of the imported pottery on site was abraded, or restricted to reduced wares or whitewares, and the diagnostic date markers such as the Walberberg and Badorf wares, were absent. Two sherds of imported wares derived from Phase 5; a hard greyware from North France/Eastern Belgium and a Seine valley whiteware (MSWWB), the latter imported into the settlement for the first time during this phase. The largest number of imported pottery sherds were present in Phase 6, including a sherd of an MSWWD pitcher with burnished lattice decoration, indicating a 9th century date. The only import in Phase 7 was the base of a Beauvais whiteware jar or pitcher; red painted wares of this type are characteristic of 9th century pottery assemblages. An associated sherd of Ipswich-type ware (IPSM), with burnished lattice decoration, supports a 9th century date for this decoration.

Jars and pitchers were the predominant forms identified and examples of both were sooted, indicating that they were used to cook food or heat liquid, in addition to use as storage jars or liquid serving vessels. Open forms (bowls or dishes) were restricted to two examples; a chaff-tempered (CHFS) example in pit [258] and a sand-tempered ware (SSANA) fragment in JST02 pit [18]. Industrial vessels were represented by two sherds of a crucible, recovered from a Phase 6 pit, dating from the mid- 8th to early 9th century, and therefore contemporary with the silver and copper alloy industrial activity found at the Royal Opera House site (Bowsher and Malcolm 1999, 9; Malcolm *et al* 2003).

Table 1 Distribution of James Street pottery fabrics by phase,

	Phase 4		**Phase 5**		**Phase 6**		**Phase 7**	
Fabric	SC	WT	SC	WT	SC	WT	SC	WT
CHAF			1	58				
CHFS			1	10	3	124		
CHSF			1	8	14	399		
CHFI							1	9
CHFST			2	214				
IPSF					3	104	6	426
IPSM					2	83	4	195
IPSC	1	12			16	319	3	73
SSANA					1	12		
SSAND			1	5			1	6
SLGSB					1	31		
SLGSA					1	28		
MSCH							1	20
MSCR					2	30		
MSSE					1	33	3	105
MSSF							1	13
NFBWA					1	1		
NFBWB					1	5		
NFGWD					2	44		
NFEBB			1	12				
NFEBC					1	5		
MSWWA					1	15		
MSWWB			1	9	1	10		
MSWWD					2	88		
BEAV (?)							1	34
Total	**1**	**12**	**8**	**316**	**53**	**1331**	**21**	**881**

SC = sherd count, WT = weight

THE LOOMWEIGHTS

IAN RIDDLER

A total of 54 fragments of loomweights, weighing 17.35kg, were recovered from nine separate contexts. The majority of these are complete and come from a single context [206], the fill of Phase 5 pit [199]. They amount to a total of 31 loomweights, weighing 15.23kg, and they form a relatively homogeneous group, which almost certainly came from a single loom. In addition, fourteen fragments from a further ten loomweights, weighing 2.12kg, were retrieved from separate contexts and these extend the range of ceramic objects from the site as well as providing confirmation of the typological sequence for Anglo-Saxon loomweights in London.

Of the 31 loomweights from context [206] almost all are complete and most are fire-blackened. The extent of fire damage varies across the assemblage from slightly sooted to examples that are almost completely black (Fig. 14). The blackening is often confined to one side of a loomweight. This may reflect the fact that they were suspended on a loom when burnt, and the faces of loomweights that were close together escaped the worst effects of the conflagration. Equally, they may also have been stored in rows within the building, a situation that can be seen with a number of Anglo-Saxon loomweights, as noted below.

Within the typological system for Anglo-Saxon loomweights, almost half of the assemblage can be described as intermediate in shape, following the scheme outlined by Hurst (1959, 23-5). He recognised at an early date that Middle and Late Saxon loomweights from London did not fit entirely well into a typological scheme (Hurst 1959, 24). Nonetheless, the broad division into annular, intermediate and bun-shaped forms, derived from Wheeler's earlier classification (Wheeler 1935, 154-5 and pl VI), still holds good for the Anglo-Saxon period and for the situation in London. Within Middle Saxon sites in London, all three types can be seen, in some cases on the same site.

Intermediate loomweights lie between the annular and bun-shaped forms in terms of their shape. Annular loomweights were usually made from cylinders of clay and the diameter of their central aperture is greater than the width of the clay coil. Their height is usually less than the thickness of the clay ring (Blackmore 1988a, 111). With intermediate weights, the diameter of the central aperture is the same as the thickness of the clay ring, or is a little less. Both intermediate and bun-shaped loomweights were usually formed as rounded clay discs with a central hole created with a former, or by pulling the clay apart with the hand. This manufacturing process can be seen with the James Street loomweights. A number of them have one flattened face, whilst the other is more rounded and irregular. The central hole is often splayed, rather than being perfectly round. In some cases a small lip of clay remains on the flattened face, indicating that the hole was made whilst the loomweight lay on a flat surface.

Under the definition of the types provided above, one example from context [206] (SF17) could be described as annular, by virtue of the size of the central, oval aperture. In addition, it appears to have been made from a coil of clay. However, the central aperture is wider than the clay ring only along two sides, and not around the entire circumference. A second example (SF7) (Fig. 21) is noticeably oval and distorted and it should be treated as an intermediate loomweight, particularly as it has one flat face and it was probably made in the same way as the remaining loomweights of the intermediate series. Both are marginal cases, a situation noted elsewhere with intermediate loomweights (Holden 1976, 315). A further fourteen loomweights are intermediate, with overall diameters of 100-110mm and central holes of 35-45mm in diameter, splayed to 50mm or more in some cases. This characteristic splaying is commonly seen within the intermediate series from London (Blackmore 1988a, fig 29.5; Williams 1989, fig 36.129).

Sixteen loomweights can be described as bun-shaped, although they closely resemble the intermediate series. Their overall dimensions are roughly the same as the intermediate series but the central holes are relatively small and they are not as overtly splayed. They are circular or nearly square in form. Whilst the size of the central apertures defines these loomweights as bun-shaped, their overall formal characteristics do not differ in any other respect from the intermediate series. Indeed, they are not biconical in section, unlike many of the late Saxon examples of this type.

Blackmore (1988a, 111) has defined the fabrics of Middle Saxon loomweights from London. The majority of examples from Jubilee Hall and Maiden Lane (MAI86) were made from fabrics 1a or 1b, with just a few produced in other fabrics (Blackmore 1988a, table 13). The two principal fabrics are substantially similar. They differ in the smaller quantity of organic inclusions seen in fabric 1b, and in the

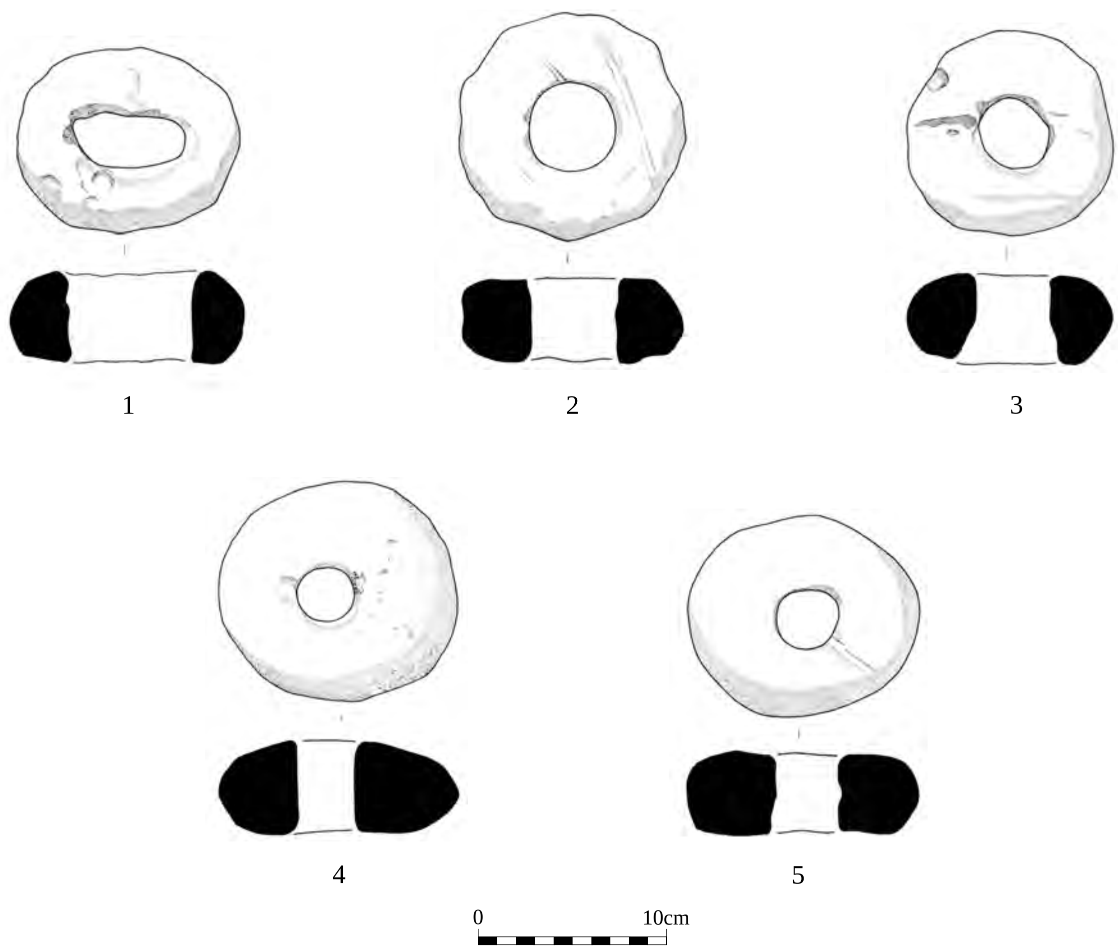


Fig. 21 Examples of the James Street loomweights
(1-3) intermediate loomweights SF 7, 10, 29; (4-5) bun-shaped loomweights SF14, 15. Scale 1:4

reduced quantity of mineral inclusions. The majority of loomweights from James Street, of whatever type, can be assigned to fabric 1b, principally on the basis of the quality of the firing and the sparse quantity of organic and other inclusions. As a fairly homogeneous group of loomweights, albeit with some differences in shape, size and weight, the distinctions within fabric 1 may be of no great significance.

The nature of their manufacture means that these loomweights are not perfectly shaped. Some can be described as circular or near circular, whilst others are oval. The central apertures, once formed, were distorted by the final shaping and finishing of the object. The apertures are placed towards the middle in each case, although with some the irregular shape of the loomweight means that they are not precisely at the centre. A few examples (SF7 and SF35, Fig. 21.1) are distinctly oval, with elongated central apertures. With several loomweights (SF10, SF11, SF29 and SF30, Fig. 21.2) lateral lines are scored across one face or, in one case (SF36 Fig. 21.3) on the edge of the object. These marks were made prior to firing and do not reflect traces of use. They suggest that a knife or similar implement was used in shaping each loomweight.

The maximum diameter of each loomweight varies from 100 - 125mm. Most, however, lie between 105 and 120mm. Similar dimensions have been recorded for other loomweights from Middle Saxon London (Blackmore 1988a, 112 and 114). Of the loomweights 67% have diameters between 110 and 120mm, compared with 70% of the sample from Exeter Street and 68% of the annular loomweights from Mucking in Essex (Barford in Hamerow 1993, 66). They vary in height between 35 and 51mm with most lying between 39 and 43mm. There are no examples in this assemblage from context [206] of the larger group of loomweights from London, which have heights in excess of 50mm (Blackmore 1988a, 111). The remaining loomweights from James Street do, however, include examples of this larger size.

In terms of the function of the objects, form and size may have been less important than weight. Loomweights were attached to warp threads of the warp-weighted loom, the threads probably gathered in groups and secured to the loomweights with slip cords (*see* box text p.11). Their weight held these groups of threads under tension. Each loomweight had to be of roughly the same weight, in order to provide a relatively even tension across the textile. Heavier weights may have been used at either end of the loom (Hoffmann 1964, 135). The weights of the near-complete examples can be estimated with reasonable accuracy. There may have been some slight loss of weight due to fire damage, but the range of weights established here closely resembles that for other contemporary sites and suggests that this is a negligible factor. The weights of the complete examples vary from 380 to 700g. The range of weights for the annular, intermediate and bun-shaped forms is similar and is centred on 475-500g. A few weights (SF5, SF13, SF14 and SF33), principally of bun-shaped form, are around or over 600g. One intermediate weight (SF35) weighs less than 400g.

Comparable loomweights from Exeter Street are slightly heavier, with estimated weights of 500-650g. There also, most of the weights are intermediate, although there are some annular and bun-shaped examples.

All of the loomweights from context [206] have been fired and there is good evidence to suggest that they have been used. In nine cases, clear traces of a groove cut by the warp threads can be seen. Possible traces are visible on a further five loomweights. Cord grooves of this type have been noticed previously on loomweights both from London and elsewhere (Wheeler, 1935, fig 31.2; Jackson *et al* 1969, 210 and pl XXIV.2; Holden 1976, 315; Walton Rogers 1997, 1753 and fig 813.6587; Westphalen 1999, 56).

The intermediate and bun-shaped loomweights from pit [199] were matched by a further fragment (SF56) from a nearby pit, [277]. This fragment comes from an intermediate loomweight with the same characteristics as the main group; it has also been burnt. The original number of loomweights of this assemblage may therefore have been a little over thirty-one.

Early Anglo-Saxon assemblages of fired and unfired loomweights are relatively common. The sizes of assemblages of this period may not always be an entirely reliable guide for the later situation during the 8th and 9th centuries, but they do provide some general indications. Around 140 unfired clay annular loomweights were found in a single building at Mucking, lying in at least nine rows (Barford in Hamerow, 1993, 68). They may have been stored in the building. Over 100 annular loomweights also came from a single structure at West Stow, disposed in three groups and two of these, at opposite corners of the building, were thought to represent the original positions of looms (West 1985, 23 and fig 71). Here again, though, they may have lain in rows for storage. Over sixty loomweights were recorded from a structure at Upton in Northamptonshire (Jackson *et al* 1969, 210). They were concentrated in two groups, including four short rows in the eastern part of the structure and two longer rows at the west (Jackson *et al* 1969, fig 4). Several of the buildings at Pennyland also included sequences of fired and unfired annular loomweights, including nineteen from sunken featured Building 2, around 48 from sunken featured Building 4 and approximately 46 from sunken featured Building 11 (Williams 1993, 123 and fig 64). Similar quantities were recorded for a sunken-featured building at Willington (Wheeler 1979, 210). Two groups of annular loomweights from Grimstone End at Pakenham included 30 and 32 loomweights in each row, with one additional example lying between the rows (Brown *et al* 1954, 198 and pl XXIV). At Barton Court Farm, thirteen lead loomweights of annular type were found together in the base of a sunken-featured building (de Hoog 1984, microfiche 5:A6).

Assemblages of Middle and Late Saxon loomweights of this type are much less common, although several groups contain large numbers of loomweights. At *Hamwic*, for example, the only substantial group of loomweights consisted merely of a few examples, recovered from the fill of a pit (Andrews 1997, 239). They are a little more abundant at Fishergate, York, if still not commonplace, and most examples there were fragmentary (Rogers 1993, 1269 and fig 626). Small numbers also came from Coppergate at York (Walton Rogers 1997, 1753). Twelve bun-shaped loomweights were found in a pit of the 9th or 10th century at the Longmarket in Canterbury and seven, mostly bun-shaped, were recovered from *Sandtun*, West Hythe (Rady 1991, 17; Riddler 2001a). Assemblages of a similar size have come from Middle and Late Saxon sites at Ipswich (T Loader and K Wade, pers comm). Greater numbers are known from Old Erringham, Shoreham, Sussex, where a sunken-featured building contained two groups of loomweights, most of which are of intermediate type (Holden 1976, 313-5 and pl VI). Around 32 lay in one group and 43 in the other, and a number show splayed central holes and irregular, somewhat angular shapes, recalling the examples from James Street (Holden 1976, fig 3). Over 40 loomweights were recovered from one of the sunken-featured buildings at Catholme, with smaller quantities coming from several other structures of that site (Losco-Bradley and Kinsley 2002, 110). An assemblage of 23 loomweights from Back Street, Winchester, also represents one of the larger groups of this period (Hedges in Collis 1978, 33). It is exceeded, however, by reports of over one hundred loomweights found on the site of the Adelphi Theatre in the Strand in London (Pritchard 1991, 167). Several sites have produced loomweights in even greater numbers. Over 450 loomweights of bun-shaped type were recovered from excavations at Elisenhof (Westphalen 1999, 55-9). Closer to London, 189 loomweights came from a single structure at Dover (Philp 2003, 24, 74-6 and figs 11, 48.79-80, 49.81 and 51.87-8). Although dated to the 7th century, the artefactual evidence suggests that the structure was actually destroyed by fire in the 8th or early 9th century (Philp 2003, 24). Five strings of loomweights were recovered from the infill of the building, with 16, 19, 21, 25 and 29 loomweights in them (Philp 2003, 74).

If Hoffmann's figures of seven pairs of loomweights for a warp of 500mm are taken as a guide, 32 loomweights in sixteen pairs could have been used on a warp of around 1.14m in width (Hoffmann 1964, 133; Holden 1976, 316). Warp-weighted looms may, however, have been much wider. One example from Dalem was estimated at 4m in width and utilised over 70 loomweights, disposed in two rows. Originally there may have been around eleven loomweights per metre in each row, with others perhaps kept in reserve to one side, echoing the storage of loomweights seen at Upton. The loomweights from Grimstone End were spaced at thirteen per metre, reflecting Hoffmann's estimates (Zimmermann 1981, 113 and abb 2). On this basis, the James Street assemblage would represent roughly half of the total number used on the loom, which would have been 3m or more in width.

Fourteen fragments of bun-shaped loomweights were retrieved from eight further contexts, two of which were the fills of pits. Each of these fragments differs in several aspects from the main assemblage. A single piece from the fill [197] of a post-medieval cess pit is abraded and survives in a reasonable, if worn condition. It has not been burnt. It is more properly biconical in shape than the main group, with well-rounded edges, and it has an estimated weight of 750g. Another fragment, again residual in a post-medieval pit fill [247], has a reduced core and an abraded surface that also defines it as fabric 2a. It has a height of 60mm, placing it in the same group of weights, which are substantially heavier than those of intermediate type. Bun-shaped weights of similar dimensions and weight are described from Maiden Lane (MAI86) in London (Blackmore 1988a, 112). The use of a different fabric, with a fine brickearth matrix, is of interest here. Three further fragments of bun-shaped loomweights from dark earth [254] are of similar dimensions.

These fragments stem from well-made, bun-shaped loomweights, which, in typological terms, could be later than the lighter intermediate and bun-shaped assemblage from context [206]. Equally, however, all three types co-existed in Middle Saxon London and these fragments, which came from a different loom endowed with heavier, bun-shaped loomweights, may be contemporary or near contemporary with the main group.

THE NON-CERAMIC FINDS

Ian Riddler

The objects of Middle Saxon date from James Street include fragments of three antler combs, five fragments of basalt lava querns, a lead weight, a stone hone, a ferrule, an iron awl and two objects from a burial: an iron spearhead and a buckle and plate. All of the items, with the exception of the lead weight and the iron awl, are of types that have been recovered from previous excavations at *Lundenwic*. As well as adding to the growing list of objects from Middle Saxon

Table 2 The James Street loomweight dimensions

Context	SF No.	Type*	Extent**	No.	Fabric	Weight	Diameter	Height	Cord Groove
168	47	Int	Frag	1	1B	270			
176		Bun	Frag	1	1	20			
197		Bun	Frag	1	1B?	150	115		
206	3	Int	Comp	1	1B	460	110	37	
206	4	Bun	Comp	1	1B	450	110	41	Possible
206	5	Bun	Comp	1	1A	600	110	41	
206	6	Int	Comp	1	1B	500	113	36	Yes
206	7	Int	Comp	1	1B	475	115	45	Possible
206	8	Bun	Incomp	5	1B	450	113	40	
206	10	Int	Comp	1	1B	550	120	40	Yes
206	11	Int	Incomp	1	1B	525	112	40	Yes
206	12	Bun	Incomp	2	1B	525	100	50	Possible
206	13	Bun	Incomp	1	1B	600	120	44	
206	14	Bun	Comp	1	1C	700	125	40	Yes
206	15	Bun	Comp	1	1B	525	118	40	Yes
206	16	Int	Comp	1	1A	485	112	43	
206	17	Int	Comp	1	1B	500	110	45	
206	18	Int	Comp	1	1A	475	105	43	Possible
206	19.1	Int	Incomp	1	1B	475	110	40	
206	19.2	Int	Frag	1	1B	75			
206	24	Int	Incomp	1	1C	450	117	36	Yes
206	25	Bun	Incomp	1	1B	410	110	35	
206	26	Bun	Comp	1	1B	475	100	42	Possible
206	27	Int	Comp	1	1B	575	110	42	Yes
206	28	Int	Incomp	1	1B	480	110	47	
206	29	Int	Comp	1	1B	480	104	43	
206	30	Bun	Comp	1	1B	550	103	51	Yes
206	31	Int	Comp	1	1A	475	108	41	Yes
206	32	Bun	Comp	1	1B	450	107	41	
206	33	Bun	Comp	1	1B	615	115	39	
206	34	Bun	Comp	1	1A	460	103	40	Yes
206	35	Int	Incomp	1	1B	380	107	42	
206	36	Int	Comp	1	1A	475	110	37	
206	9+19.3	Int	Incomp	2	1B	465	112	40	
206		Bun	Frag	3	1B	115			
224		Bun	Frag	1	1B	65			
229		Bun	Frag	5	1B	135			
247		Bun	Frag	1	2A	175			
254		Bun	Frag	1	2A	475	110	59	
254		Bun	Frag	1	2A	350	110	67	
254		Bun	Frag	1	2A	275		50	
276	56	Int	Frag	1	1B	200	105	46	

* Int = intermediate; Bun = Bun-shaped
** Comp = complete; Incomp = incomplete; Frag = fragment

London, they enhance developing images of object use within the settlement, particularly in terms of crafts and regional distinctions in object manufacture.

The antler objects are described in accordance with terms established by Galloway and MacGregor (Galloway 1976; MacGregor 1985). For all material types, comparisons have been made with earlier discoveries from London, using typologies established in published reports, where appropriate, as well as discoveries from Exeter Street and the National Portrait Gallery (this volume).

Object measurements represent maximum values. Dimensions for iron objects have been taken from x-radiographs.

Combs

The three fragments of combs all come from double-sided composites. They include an end segment (fill [246] of pit [245]) and two comb fragments, one of which (SF72) (Fig. 22.1) allows the original form and dimensions of the comb to be reconstructed. The smaller comb fragment (SF70) (Fig. 22.2) has a connecting plate that tapers towards its end. It is decorated by an extensive band of vertical lines, incised with the use of a saw. Vertical bands like this were commonly used to demarcate the ends of connecting plates, particularly on double-sided composite combs of the Middle Saxon period. The practice goes back to the late 6th or early 7th centuries and occurs, for example on combs from Brightwell Heath and Castledyke (Moir 1927, 154 and pl 20; Drinkall and Foreman 1998, fig 228). It can also be seen on Middle Saxon combs, as with those from Canterbury and Maxey (Blockley *et al* 1995, fig 509.1146; Addyman 1964, fig 16.23). Extensive banding, of the type seen here, is also visible on a comb from Winnall (Meaney and Hawkes 1970, fig 10). The tapering of the connecting plates towards their ends is a characteristic of combs of 7th and 8th century date.

The best-surviving comb (SF72) is decorated by a well-spaced triple lattice pattern, which occupies all of the available space on both connecting plates. Vertical banding lines are again placed at the ends of each connecting plate, although they are more restrained. Lattice designs are commonly seen on Middle Saxon double-sided composite combs. Often, however, as with the combs from Barton Court Farm, Canterbury, Dorchester, Exeter Street in London, and *Sandtun*, the lattice is confined to bands, usually located at either end of the connecting plate and occasionally in the centre as well (de Hoog 1984, fig 107.1; Blockley *et al* 1995, fig 511.1168; Sparey-Green 1984, fig 13.10; Riddler forthcoming). A comb from Shakenoak may have been decorated with an extensive lattice pattern, as here, but only a fragment of it remains (Brodribb *et al* 1972, fig 57.42). The same can be said for several unpublished comb fragments from *Hamwic* (SOU24.891 and SOU31.140) and an unpublished comb from Canterbury, which survives to a greater extent and echoes the decorative scheme seen here. A double-sided comb from Cottam also includes a similar pattern, which may originally have encompassed the entire connecting plate (Richards 1999, fig 51.2).

Double-sided composite combs have been found on a number of Middle Saxon sites within *Lundenwic* and they easily outnumber combs of other types (Riddler forthcoming b; *see* Riddler, Chapter 7, below). Within southern England during the Middle Saxon period, the double-sided composite comb was much more popular than its single-sided equivalent. Further north, within East Anglia and northern England, single-sided composites occur to a greater extent, and double-sided composites are correspondingly less common (*see* Riddler, Chapter 7, below).

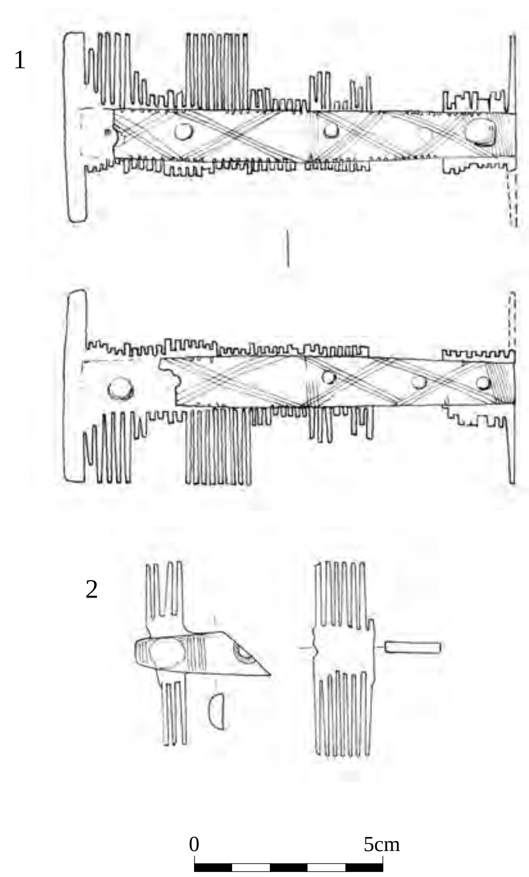


Fig. 22 The James Street combs
Double sided composite combs: (1) SF72; (2) SF70. Scale 1:2

Querns

Five fragments of basalt lava querns, weighing a total of 4.26kg, were retrieved from four separate contexts. Three of the fragments are relatively small and provide little information about the size and shape of the quern. Two larger pieces, from contexts [157] and [257], stem from discoidal querns. One of these (SF77) is quite thin and may well stem from an upper stone (Fig. 23); the other (context [157]) is just over 80mm in thickness and could be from a lower stone. Similar dimensions are recorded for other basalt lava querns from Middle Saxon London (Blackmore & Williams 1988, 133-4; Whytehead *et al* 1989, 129-31). It has been argued that querns of 30-60mm in thickness are upper stones, and those of 70-90mm are lower stones (Blackmore & Williams 1988, 133). On that basis an upper and a lower stone are present in this assemblage.

One of the querns (SF77) has a diameter of around 420-440mm. Other examples of basalt lava querns from Middle Saxon London vary from 260-80mm to 400mm in diameter, whilst those from contemporary sites extend to *c.* 480mm (Riddler 2001b).

All of the fragments come from querns of basalt lava. These first occur in southeast Britain during the late Roman period and examples are known from both Canterbury and Ickham (Blockley *et al* 1995, 1206 no 1388; Riddler forthcoming b). The discoidal form remains the principal shape for querns of the Anglo-Saxon period. Those of basalt lava reappear in southern England from the 7th century onwards and form the dominant stone type for Middle Saxon London, occurring on virtually all excavations

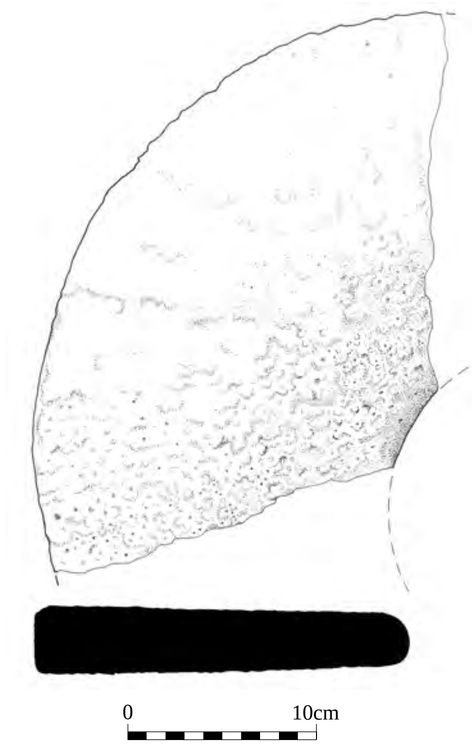


Fig. 23 The James Street quernstone SF77. Scale 1:4

within *Lundenwic*. Other stone types, most of which come from Kent, are sparsely represented.

Hone

The hone (SF78) (Fig. 24.1) has been sliced from a water-worn beach pebble, which might have been gathered from the foreshore, although it could have come from a more distant source. Most of the hones from Middle Saxon London have been cut from sections of Kentish ragstone and they are usually prepared in bar-like shapes with more care and skill than is seen here (Blackmore & Williams 1988, 133-4). Simple hones of the type seen here are recorded, however, from *Hamwic* (Addyman and Hill 1969, 74 and fig 30; Garner 1993, 105). Pebbles used as hones are also recorded from early Anglo-Saxon contexts, as well as from Dorestad (Evison 1975, 77 and fig 2g; Kars 1983, 8-9). During the Middle Saxon period both casual hones of this type and carefully prepared hones of Kentish ragstone were in use in southern England. From the 10th century onwards, however, mica schist hones became dominant in England as a whole.

Lead Weight

A conical lead weight (SF46) (Fig. 24.2) is unusual for its shape and for the presence of two lateral perforations across its upper rim. It weighs 267g, although that figure includes its infill, which has not been removed. There are few comparable lead weights from this period. A small series of conical lead weights have come from Dorestad, but these generally have suspension holes at the narrow end (Holwerda 1930, 83-4 and afb 65.1-2; Roes 1965, 36 and pl XV.116-7). Small conical weights, almost certainly for fishing, have also come from Flixborough (M Foreman, pers comm). A closer parallel for the London example is provided, however, by a lead weight from Wood Quay, Dublin, which is axially-perforated and also shows traces of similar lateral perforations along its rim (Wallace 1998, fig 7.DFW 22). It has been classified as a Dublin type 3 weight, possibly used for line fishing (Wallace 1998, 7).

Ferrule

A complete example of an iron ferrule (SF49) (Fig. 24.3) has a wide but relatively short socket, leading to a tapering iron shaft. It differs from some contemporary examples, which are merely wrapped sections of iron sheet (Evison 1980, 37 and fig 20) for the provision of a welded shaft and a rounded end. Two types of ferrule can be identified and this example belongs to the heavier form, which has a solid terminal. Ferrules from *Lundenwic*, Thetford and York share similar characteristics (Malcolm *et al* 2003, 262; Rogerson & Dallas 1984, fig 135.216-8; Dallas 1993, fig 128.153; Ottaway 1992, fig 279.3586). Iron ferrules were fastened to wooden shafts. The most plausible explanation for their use is that they served as reinforcements for the ends of wooden poles, which helped skaters to glide across ice and snow, using bone skates (Rogerson & Dallas 1984, 97; Ottaway 1992, 655-6; Gardiner 1993, 45-7 and fig 16.14). One problem with this interpretation lies with the presence of ferrules in at least three different sizes from Viking Dublin, a settlement that has produced a few bone skates, a reflection of its temperate climate (Becker 1990, 19). Ferrules from Dublin are regarded as agricultural dibbers (Wallace 1995, 207). Similarly, there are several ferrules from Middle Saxon London, but no definite examples of bone skates (Malcolm *et al* 2003, 262).

Awl

The form of this iron awl is typical for the period, with two tapering arms and a diamond-shaped central cross-section. Middle Saxon examples are known from Cottam, *Hamwic*, Maxey, Ramsbury, Shakenoak, Wraysbury and York, and they are a common object type in deposits of this period, although this is the first example to come from *Lundenwic* (Richards 1999, 75 and fig 49.18; Garner 1993, 109, nos 5-6; Addyman

1964, fig 16.18; Evison 1980, 37 and fig 20.9-13; Brodribb *et al* 1972, 102, 114 and fig 48.261; Astill and Lobb 1989, 93; Rogers 1993, 1264-5 and fig 624). A close parallel for this example is provided by an awl from Coppergate at York (Ottaway 1992, 552-3 and fig 222.2708). Awls of this particular type were used in leatherworking (Ottaway 1992, 554).

The Objects from the Burial

A fragmentary iron spearhead (SF73) (Fig. 24.4) and a small copper buckle (SF74) (Fig. 24.5) were recovered from the inhumation grave. Only the lower part of the spearhead survives, which makes it difficult to assign it to type, following the sequence devised by Swanton (1973; 1974). The socket is quite long and the surviving section of the blade is leaf-shaped. The proportions of the surviving fragment resemble Swanton's type D, and in particular the sub-group D1, but too little of the object survives to place it securely within any of his classes.

A spearhead was recovered from a grave at the Peabody site (Whytehead *et al* 1989, 123-4 and fig 42.235). It is quite different from this example, however, in terms both of its size and its shape. It was the only object recovered from that burial, which was the grave of an adult male, thought to be of 8th century date (Whytehead *et al* 1989, 49 and fig 14; Cowie with Harding 2000, 189). A spearhead also came from a grave at St. Martin-in-the-Fields (Biddle 1984, 25; Cowie with Harding 2000, 189).

Closer dating is provided by the small buckle and plate (SF74), which was found at the waist area of the deceased. The shape of the buckle is simple, with an oval loop and a plain, rectangular plate, fastened by two rivets. Small buckles have been described as 'virtually a type-fossil of the late period', the late period in this case referring to the 7th century (Meaney and Hawkes 1970, 43). Hawkes argued that small buckles, intended for belts just 10 – 15mm in width, came into use in the first part of the 7th century (Hawkes 1973, 90). They are so small, however, that doubts have been raised about their use with belts, and they have been considered to fasten straps for shields, pouches or knife sheaths (Evison 1987, 90; 1988, 23). In this particular case there were no other grave goods in the waist area but the buckle may nonetheless have fastened a strap rather than a belt. It is of 7th century date, closer perhaps to the middle of the century than the beginning.

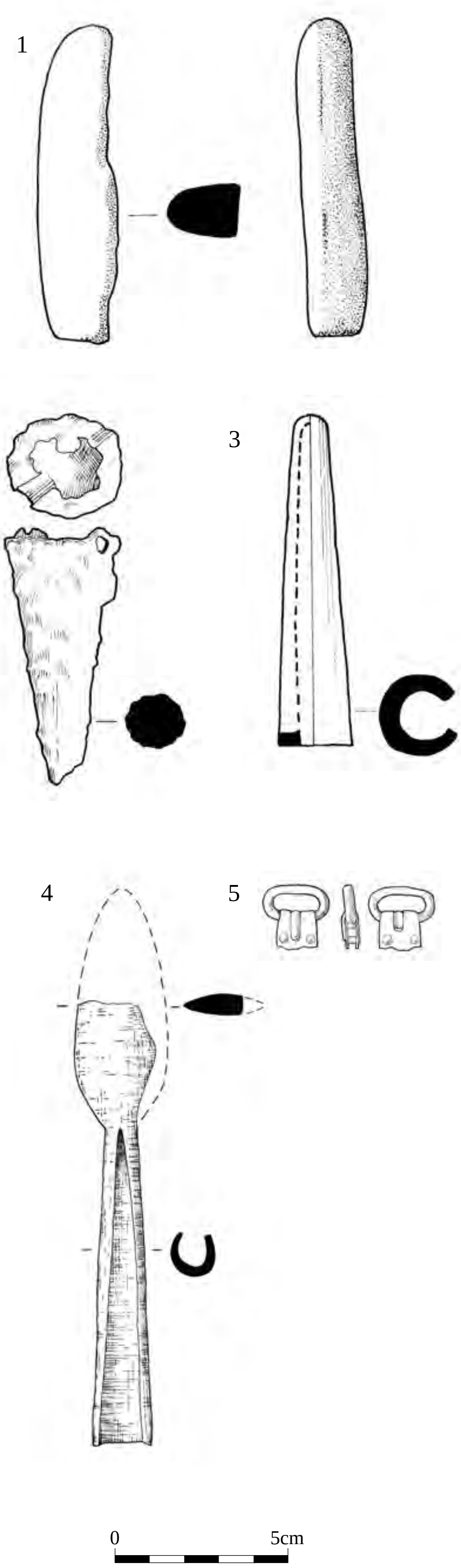


Fig. 24 The James Street small finds (1) water-worn pebble hone SF78; (2) conical lead weight SF46; (3) iron ferrule SF49; (4) Iron spearhead from burial SF73; (5) buckle and plate with pin from burial SF74. Scale 1:2

THE OFFA COIN

Märit Gaimster

Context [155], dark earth overlying the Middle Saxon occupation, yielded three fragments of an Anglo-Saxon silver coin of Offa (Fig 25). The coin (SF41) is of Group III, representing Offa's heavy coinage, which demonstrates a weight increase from *c.*1.3g to 1.45 g, towards the end of his reign. In this later coinage a standard obverse type was adopted, with M/+OFFA/REX (OFFA REX MERCIORUM) in three lines divided by bars. The James Street coin reverse shows the same three-line design, on a horizontal axis from the obverse. The bottom third shows the inverted M for MERCIORIUM, while the centre line carries the name of the moneyer (O)SMOD. The top of the James Street reverse is missing but a similar coin in the British Museum (BM 1844, 4-25-2569) carries the mirror image of two sideway crosses in this section. A date for this coin is most likely to fall within the years 792-96 AD.

Osmod is one of several moneyers attributed to the Canterbury mint, one of at least three mints operating under Offa; the other two being London and an unknown location in East Anglia. The attribution of mints to the over 30 moneyers associated with Offa's coins is clearly problematic. While a substantial number of moneyers of Offa's light coinage may today be referred to London, it appears that, by the end of the 8th century, Canterbury was the major mint, a situation clearly reflected in coins of the 9th century (Stewart 1986; Chick 1997). The James Street coin, raising the number of known Offa coins from London to four (cf. Stott 1991), fits well into this picture.

In relation to the earlier Anglo-Saxon coinage, the *sceattas* of the late 7th and early 8th centuries, Offa's coins are scarcer. While *sceattas* are known in their thousands, from both English and Continental finds, there are only some 500 Offa coins recorded. This raises interesting questions about the development of Anglo-Saxon coinages and their role and function in Anglo-Saxon economy. Today, there is a marked general increase in finds of early medieval coins due to the work of metal detectorists. The recognition of a rising number of "productive", non-urban, sites yielding large numbers of coins and metalwork, will undoubtedly add to our understanding of the economic and social history of this period. However, this situation also suggests that an increase in use of metal detectors on controlled excavations may be needed to redress the appearance of coins on urban sites.

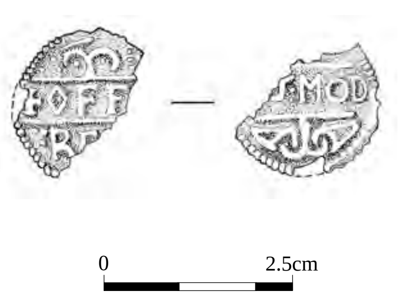


Fig. 25 The James Street Offa coin SF41. Scale 1:1

THE IRON SLAG

Lynne Keys

Over 23kg of iron slag representing iron smithing was recovered from the JES99 site, most of it from two pits in Phase 6. Pit [253], fill (251) produced 22 smithing hearth bottoms; while pit 258 context (257) produced eight smithing hearth bottoms. Pit [258] cuts [253] so the volume of slag from this particular part of the site is increased in such a way as to strongly suggest a smithy was functioning in the immediate vicinity of the pits during Phase 6.

Further information on the type of smithing being carried out is provided by a micro-slag adhering to some of the slag. This was principally flake hammerscale, indicating hot hammering of single pieces of iron rather than high temperature welding to join two pieces together.

THE FIRED DAUB

John Brown

Substantial amounts of daub fragments were recovered, with a weight of approximately 26.4kg, particularly from contexts [155], [156], [157], [257] and [276]. Contexts [155] and [156] originated from dark earth deposits, [157] represented a collapsed wall, while [257] and [276] represented fills of pits [258] and [277] respectively. Many pieces showed withy impressions, especially one fragment from [302], also a fill of pit [258], which showed very deep ones.

Discussion

Daub fragments were represented in two fabric types. The great majority were of a mainly soft, friable fabric with a slightly silty matrix, generally greyish brown in colour, although one or two pieces that were harder and more strongly fired were redder. Occasional to frequent inclusions of quartz up to 0.5mm were seen throughout, and occasional large rounded pebbles or angular flint up to 50mm were included in the samples analysed. Often the daub was burnt or reduced in some manner, particularly in core areas. Voids, charcoal flecks or elongated, striated impressions attest to the presence of organic material in many examples. This is probably evidence for chaff or grass.

The second fabric, represented only by occasional examples, was reddish brown in colour with frequent to abundant coarse angular to sub-angular quartz, lacking in organic inclusions. The two fabric types may be paralleled at Jubilee Hall and Maiden Lane (MAI86) (Goffin 1988, 115) where two similar but distinct fabric types have been identified.

Three different classes of impression were recorded, namely thin [horizontal] members (withies), thicker [vertical] members (rods) and very thick, incomplete impressions of vertical members probably representing structural elements (posts or planks: both referred to as Vertical Structural Members or VSMs). Many fragments bearing impressions also showed a smoothed face. The thickness of such fragments was generally between 35 and 42mm, although one particularly sizeable fragment from [302] showed a thickness to face of 93mm.

An analysis of the impressions found was conducted using the following methodology:

1. Fragments showing impressions running in two different planes were examined, this enabled the identification of the warp and weave of the wattle, and the fact that withies ran in the horizontal plane, while rods shared the vertical plane with VSMs.
2. Fragments showing impressions running in only one plane were interpreted either as withies or rods, depending on their girth and pattern of impression, the general trend having been established by fragments of the first group.
3. Only the minimum possible diameter of withies or rods was estimated from the impressions, although all three minimum possible dimensions were taken for VSMs. Of all classes of impression the longest surviving length was noted at 92mm for a withy.

Some general trends were observed. Most rods were above 16mm in diameter, where they fell below this there were usually two rods in close association. The diameter range was 14-30mm with the average diameter at 19mm. With the exception of three fragments (all of which only show impressions in one plane) withies were seen to be under 20mm in diameter. The range was 4-21mm and the average was 10mm (*see* Hughes, Chapter 6, for a discussion of optimum withy diameters). This represents an average diameter ratio of just under 2:1 of rods to withies. Of the four major contexts [155], [156], [257] and [276], the average diameters for both withies and rods was lower than the overall average in the case of the first two contexts and higher in the latter two, particularly [257]. Both [257] and [276] were noted for larger than usual fragments. This may indicate the presence of more substantial structures, or perhaps the coppicing of wood at different stages of growth. Typically coppicing was undertaken every four to ten years (Rackham 1994, 7). It is interesting to note that both [257] and [276] represent material from the main phases of occupation, while [155] and [156] are associated with the decline of the site.

VSM impressions indicated the use of curved wood (?posts) and trimmed wood surfaces (planks). Dimensions were not readily estimated from the depth of the impressions, however examination suggested that both planks and posts were used in close proximity to one another, with possibly differing structural functions. Structural evidence in terms of postholes was poor, but the impressions left on two fragments, in particular from [254] and [276], indicated a technique similar to that described at Maiden Lane (MAI86) (Goffin 1988, 117-118) and illustrated at both Cowdrey's Down Hall C12 (Welch 1992, 19) and Well Court (Horsman *et al* 1988, 77 & 79). This technique consisted of wattle frames supported at intervals by bracketing posts, planks or stakes. Fragments with such impressions were not recovered from the Peabody site or the National Gallery, however the diameters of withy impressions were between 10 and 15mm, described as the size of rods often used for interweaving between larger rods and typical of wattle infill (Goffin 1988, 111). These measurements fall well within the range found here.

The material recovered does seem to support the evidence from other Middle Saxon sites, particularly Maiden Lane (MAI86), with structural evidence suggesting wattle and post buildings with beaten clay floors. Both 'posts' and 'planks' were indicated, although the exact classification must remain vague due to the lack of excavated structural features. Such structures, especially if thatched, would have been susceptible to fire, weathering and insect infestation and were probably replaced on a relatively regular basis; a sequence that is borne out by the stratigraphic relationship of the primary contexts.

THE ANIMAL BONE

Philip Armitage

A total of 3,095 animal bones were submitted for analysis: 2,406 (77.7% of the total) of these were hand-collected during excavation, and 689 (22.3%) were recovered from sieved environmental samples. Employing standard archaeozoological methodological procedures, 1,873 (60.5% of the total) of the bones are identified to taxon/species and part of skeleton and 1,222 (39.5%) fragments remain indeterminate. Eleven species are represented: cattle *Bos* (domestic); sheep *Ovis* (domestic); goat *Capra* (domestic); pig *Sus* (domestic); cat *Felis* (domestic); dog *Canis* (domestic); red deer *Cervus elaphus*; goose *Anser anser*/domestic; domestic fowl *Gallus gallus*/domestic; sturgeon *Acipenser sturio*; roach *Rutilus rutilus*.

A detailed list of the bone elements by taxon/species and site phase/context forms part of the site archival records held by PCA. This report presents an interpretation of the data collected. Of particular interest was the question of whether the results indicated that the site was a net livestock "consumer site" and therefore formed part of the central hub of the settlement of *Lundenwic* or functioned as one of its livestock-production/provisioning sites on the periphery (according to the criteria of Rackham 1994). Inter-site comparisons were also made with contemporary or near contemporary animal bone assemblages from *Hamwic* (Saxon Southampton), *Eoforwic* (Anglian York), Carolingian Dorestad and *Haithabu* (Viking-age Hedeby) as a contribution to the emerging models formulated to explain the food procurement, provisioning strategies and systems of these prototype urban trading or manufacturing centres ('wics') established in southern England and in Continental North Western Europe during the early medieval period (7th to mid-9th centuries AD). Study of the James Street material formed a useful basis for testing the criteria proposed by O'Connor (2001) for distinguishing between 'wic' and 'non-wic' bone assemblages.

Condition of the Bone

Preservation

Although the majority of the bone fragments are generally well preserved, 470 (15.2% of the total) exhibit signs of sub-aerial weathering and/or abrasion, and leaching or erosion, indicating they had lain exposed for some considerable time before burial or perhaps represent redeposited secondary or tertiary refuse. Concentrations of such modified material were recorded from the following JES99 Phase 6 features: pits [211] and [226]; deposit layer [185]; and JST02 well [9] in Phase 4.

Burnt bone

For the Middle Saxon bone assemblages as a whole, the incidence of burnt bone is moderately high (6.1% of the total). The distribution of such material over the site however was uneven with a particularly (noteworthy) high concentration in context [331] the fill of Phase 5 pit [271]. Out of the 135 bones from this context, 109 (80.7%) are burnt; comprising virtually all of the identified pig bones (60/61), 9/22 cattle bones and 40/50 unidentified mammal bone fragments. The majority of the burnt pig bones are calcined (white with a chalky texture and exhibiting fissuring and cracking of the bone surfaces), indicating they had been subjected to very high temperatures in the range 700-800 °C (according to the criteria of Nicholson 1993). While these bones could derive from the intentional, controlled burning of food refuse as a sanitary measure before burial, an equally plausible explanation is that this particular meat (pork) had been accidentally incinerated in a house fire. Applying the classification system for burnt archaeological animal bones used by Albarella *et al* (1997, 13) the material from pit [271] is shown in Table 3.

Pit [199] (Phase 5) also produced quantities of burnt bone (18/36 = 4.9% of the total) but here they were scattered throughout the six contexts representing the infill sequence; with the majority of them burnt/blackened (56% of the total) and the balance comprising equal numbers of singed (22%) and calcined (22%) specimens. This pattern of burning is perhaps more consistent with the casual throwing of food scraps into or near open hearths or cooking fires than incineration in a house fire.

Patterns of Refuse Deposition

The majority of the contexts contained a general mix of skeletal elements of the principal domesticates (cattle, sheep and pig) representing all body parts, including heads and feet extremities, and therefore indicating the bone assemblages were composed of the remains of animals that had been brought in live on-the-hoof for the purposes of

Table 3 The James Street burnt bone from pit [271]

Category of burning	Number of burnt fragments/species				Total	%
	cattle	sheep	pig	unident.mammal		
singed/charred	2	0	1	0	3	2.8%
extensively burnt/blackened	7	0	5	0	12	11%
calcined	0	0	54	40*	94	86.2%

* Although recorded as unidentified, 33/40 of these fragments are possibly the burnt/pulverised remains of pig bone elements.

slaughtering, butchering and consumption locally. There was no apparent evidence for the importation onto the site of "pre-processed", already disjointed, portions of meat either as fresh or preserved (salted/dried) provisions; as there was for example at Fishergate, *Eoforwic* (York), where dressed pig carcasses were imported (according to O'Connor 1994:139).

Despite the conclusion drawn that slaughtering of live animals had taken place locally, none of the contexts or group of associated contexts produced any direct evidence of specific large-scale primary-butchering activity or carcass processing within any particular area on the site. Perhaps individual households throughout the settlement were responsible for killing and cutting up of animals in order to supply their own immediate needs. This situation may be contrasted with the later medieval City of London where such activities were highly regulated by the City authorities and were largely confined to specialist butchers (belonging to the Butchers' Guild) working in restricted, well-defined locations (the three city "butcheries": St. Nicholas Shambles, the Stocks Market and at East Cheap) away from the more densely inhabited central areas (Sabine 1933).

In virtually all contexts throughout the James Street site, cattle bones dominated the bone assemblages. However, one context in Phase 5 and two in Phase 6 provide an exception to this and are particularly noteworthy for the unusually high concentration of pig bones. In [331] (fill of pit [271], Phase 5) pig bones were 71.8% of the total; in [217] (fill of pit [219], re-cut of Phase 6 pit [211]) pig bones formed 90.6% of the total identified skeletal elements represented; while in [220] (fill of pit [211], Phase 6) they were 97.4% of the total (cf. [222] - another fill of the same pit-where they comprised only 29.3% of the total).

It is difficult to understand the significance of these deposits in terms of the meat consumption patterns of the settlement but it may be suggested that perhaps they derive from individual households where particular meals (feasts?) featured the preparation and serving of complete carcasses of roast pigs. Refuse in other contexts at this site derived from the consumption of a wider selection of meat (beef, mutton as well as pork) as reflected in the mix of bones of these species. It is of interest that the Royal Opera House site also included a particular deposit (pit fill [1275]) adjacent to the central building, which was dominated by pig bone fragments (Rielly 1997, 61; Malcolm *et al* 2003).

In those contexts where it was represented, discarded waste from horn- and antler-working crafts was intermixed with household food-refuse (as in Phase 4: road metalling layers [325], [354], [358]; Phase 5: ditch backfill [323] and pits [253], [199] and [271]; Phase 6: pits [211], [219], [226], [277], [327]). In the absence of any particular context containing (exclusively) a large volume of such material, it appears that no specific large-scale horn or antler working area had been established in the vicinity but may have existed nearby (*see* Riddler, Chapter 7, this volume).

Descriptions of Animals

Cattle

Type and stature

Based on the classification system of Armitage & Clutton-Brock (1976) both short- and medium-horned cattle types are identified and sexed from their distinctive horn cores:

Type (horn-length class)	cows	bull	castrates (oxen)
Short-horned	3		1
Medium-horned		1	2

Withers heights in six of the cattle are calculated from the lengths of their metapodial bones (using factors of Fock 1966); with the stature in the smallest animal calculated at 110.1cm and the tallest at 128.6cm (mean 117.7cm). The James Street mean is remarkably similar to the values established by West & Rackham (1988) for the cattle from Maiden Lane (MAI86) and the Peabody site (both 117.9cm) while falling slightly above the means recorded for the National Gallery basement site (116.4cm)(West 1989) and the National Portrait Gallery site (116.2cm) (Armitage, Chapter 5, this volume).

Age profile

Fifteen jawbones are aged according to their patterns of dental eruption and wear (using the criteria of Silver 1971 and Andrews 1982), and shown in Table 4.

Further information on the ages-at-death in the James Street cattle is provided by epiphyseal fusion in their long bones. The horn cores also indicate the ages in seven animals (using the criteria of Armitage 1982): two (both castrates) were aged 7 to 10 years at time of death, and five others (3 females, 1 male and 1 castrate) over 10 years. A single cranial portion with a horn bud (from context [250] the fill of ditch [323], Phase 5) and another piece of cranium

Table 4 Patterns of dental eruption and wear at James Street

Age-class	suggested age range	No	%
Neonatal/juvenile	under 6 months	0	0%
Immature	6 to 12 months	3	20%
Sub-adult	1.5 to 2 years	1	6%
Young adult	2.5 to 3 years	4	27%
Older adult	4 years and older	7	47%

together with a proximal fragment of metacarpus, both from context [13], the fill of well [9] in JST02 Phase 4, provide evidence of the slaughter of at least two infants or calves (under one year old).

Reviewing all the available evidence suggests that while there was some eating of veal, much of the meat supply was provided by sub-adult and adult animals. Those in the over 7 to 10 year category represented cattle whose primary purpose was other than as meat producers – and they had been culled only after they were no longer useful as draught/plough animals or in the case of females, as milk and calf producers. It is interesting to note that the slaughter pattern of the JES99 cattle also reveals the killing of animals that had just reached their prime in terms of body size/weight and fertility (between 1.5 to 3.5 years of age) but before they could have been much utilised for traction, milk yield or in the production of herd replacements – and whose contribution to the meat supply indicates the local farming system was well-established and flourishing, providing a "solid sufficiency" of surplus animals for feeding the 'wic' settlement.

Sexes represented

In four adult innominate bones sex can be determined as follows (using diagnostic characters described by Grigson 1982): one male and three castrates. Although no females are identified in the innominate bone sample, at least three cows are represented in the JES99 bone assemblage by their horn cores (as noted above).

Pigs

Size

Shoulder heights are calculated in the James Street pigs from the lengths of their long bones (based on data from 1 radius, 8 metacarpus III, 2 metacarpus IV, 1 metatarsus III and 2 metatarsus IV using the factors of Teichert as referenced in Becker 1980, 27). The values calculated for the James Street pigs compare directly with their counterparts from the Peabody site documented by West (1989: 162) except there are no equivalent dwarf animals represented. The pigs from the National Portrait Gallery site (Armitage, Chapter 5, this volume) are somewhat smaller than the James Street animals – but this may be a reflection of the limited sample size available. In comparison with the pigs from *Hamwic* (Bourdillon & Coy 1980 statistical appendix: 24) and those from *Haithabu* (studied by Becker 1980) the *Lundenwic* animals exhibit a narrower size-range but higher mean values. The larger pigs in the *Haithabu* sample may be wild rather than domestic, which would account for the extended upper limit to the size-range. From data published by Prummel (1983, 214) the calculated mean shoulder height for the pigs from Dorestad is noticeably smaller than the *Lundenwic* animals (as demonstrated in Table 5).

Sexes represented

Gender in thirteen pigs (six female and seven male) is determined from their lower and upper canines (tusks) (using the criteria of Mayer and Brisbin 1988). In terms of percentage frequencies, the JES99 pigs comprise 54% males and 46% females; but given the limited sample size the actual ratio is probably nearer to parity (*ie* the sex ratio was 1:1). The site data may be compared against other London Middle Saxon sites, as follows:

Peabody site (West 1989, 162)	Males 71% : Females 29%
Maiden Lane (MAI86) (West 1989, 162)	Males 65% : Females 35%
National Portrait Gallery site (Armitage, this volume)	Males 43% : Females 57%

(Note that the National Portrait Gallery values are also based on a relatively small sample (N=14))

Age profile

On the basis of the patterns of eruption and wear in the premolar and molar teeth, eighteen pigs are aged (using the criteria of Bull and Payne 1982) from examination of their mandibular dentition, as shown in Table 6.

Table 5 Middle Saxon pig shoulder heights

			Shoulder height (in cm)	
	No	Mean	Range	SD
Lundenwic:				
James Street	14	75.9	71.6 - 80.9	2.39
Peabody site	8	75.3	70.9 - 80.6 plus 1 dwarf pig of 52cm	
National Portrait Gallery	5	74.8	72.0 – 76.7	
Hamwic:	16	72.3	63.2 – 83.5	
Haithabu:	3914	70.5	57.5 – 88.8	
Dorestad:	15	69.3	62.1 – 81.4	

Table 6 Age profile of James Street pigs

Suggested age	No	%
Under 1 year	0	0%
1.5 to 2 years	11	64.7%
over 2 years	6	35.3%

Although not reflected in the sample of jawbones (above), at least two young pigs just under one year of age are represented in the bone assemblages, as evidenced by two humeri with unfused distal epiphyses. From the overall pattern of epiphyseal fusion in the pig long bones it is revealed however the majority of animals had reached sub-adult/adulthood (1.5 to 2.5 years) and therefore were at prime carcass size and weight when slaughtered. Only a rather small proportion had been kept on to advanced age, presumably these "elderly" individuals aged over 3.5 years were breeding sows. No neonatal or sucking piglets are represented at the site.

Sheep

Appearance and stature

No polled crania are represented and all crania are from horned sheep. On the evidence of the crania and horn cores found, it appears the local sheep were horned in both sexes and in the castrate.

Withers heights may be calculated in thirteen of the sheep from the lengths of their long bones; comprising six metacarpi, four metatarsi, and three radii, using the factors of Teichert (Becker 1980). The values so obtained may be compared against data on sheep from other London Middle Saxon sites as shown in Table 7.

Table 7 Middle Saxon sheep withers heights

	Withers height (cm)			
	No	Mean	Range	SD
James Street	13	60.6	55.3 – 65.5	3.3
Peabody site (West 1989: 162)	49	60.3	50.9 – 67.7	-
National Portrait Gallery (Armitage this volume)	19	60.9	52.7 – 70.0	4.1

Age profile

Age at death in eighteen sheep (represented by their jawbones) is determined using the pattern of eruption and attrition in the lower cheek teeth, after the method of Payne 1973 and shown in Table 8.

Table 8 Age profile of James Street sheep

Suggested age range	Wear stage	No	%
0 – 2 months	A	0	0%
2 – 6 months	B	0	0%
6 – 12 months	C	1	5.6%
1 – 2 years	D	6	33.3%
2 – 3 years	E	8	44.4%
3 – 4 years	F	0	0%
4 – 6 years	G	3	16.7%

Further insight into the ages of slaughter in the sheep is provided by epiphyseal fusion in their long bones.

Considering all the available evidence, it appears that relatively few lambs were eaten, with the greatest proportion of the meat in the diet coming from animals aged between 1 to 2.5 years at time of death. In terms of carcass quality these animals would have just reached their prime but as observed by O'Connor (2001, 59) in reviewing a similar peak in the slaughter pattern of sheep at other 'wic' sites, such relatively young animals were being killed off before their potential as wool- or offspring producers could be fully exploited. Their contribution to the meat supply indicates (as in the cattle) a well established and thriving local farming system that was readily able to meet the specific provisioning requirements of the 'wic' settlement. A second peak of slaughtering in the sheep occurred after 4 years of age and it is suggested this group comprised culled wethers and old ewes that had been kept primarily for their wool and milk yields, and production of offspring for flock replacements, rather than specifically as meat-producers.

Goats

Two bone elements are positively identified as goat:

An adult radius; recovered from context [251], fill of pit [253] (Phase 6). An adult horn core with attached portion of frontal bone; from context [354], road metalling layer (Phase 4). The specimen is of the form commonly recorded from Saxon sites and is long, backward curving, with a well-developed keel on the anterior edge. From its size and robust-appearance this horn core is believed to be from a male; an identification supported by the size of its basal circumference (136mm), which falls within the male/castrate size-range of the *Hamwic* goat horn cores (120 – 250mm), documented by Bourdillon and Coy (1980, 111).

Dog

An isolated tibia from context [13] (fill of well [9], Phase 4 JST02) is the only dog bone element represented in the bone assemblages.

Cats

Domestic cat is represented by four bone elements from two phases. One adult humerus came from Phase 4 layer [325], one immature ulna came from Phase 5 fill [329] of pit [271] and the infilling of ditch [323] contained an adult ulna in fill [314] and an adult tibia from fill [250].

Birds

Two bird species only are represented, both domestic: domestic fowl and goose.

The two domestic fowl tarsometatarsi are identified as males by the presence of spurs (criteria of West 1982): specimens from Phase 5 (context [314], backfill of ditch [323]) and Phase 6 (context [222], fill of pit [211]). Measurements (GL) taken from the intact bone elements from the site reveal the birds represented all fall within the expected size-range of Middle Saxon domestic fowl, as exemplified (in Table 9) by comparison with those from *Hamwic* documented by Bourdillon and Coy (1980):

Table 9 Size range of Middle Saxon domestic fowl

	Greatest length (GL) in mm		
	No	Mean	Value/range
Lundenwic: James Street			
carpometacarpus	1		35.9
femur	1		79.0
tarsometatarsus	1		81.5
Hamwic:			
carpometacarpus	15	36.7	33.5 – 42.5
femur	50	73.8	66.0 – 84.2
tarsometatarsus	12	79.5	58.0 – 89.6

The size of the goose sternum from context [25] (fill of well [9] Phase 4 JST02) is slightly larger than those from modern wild greylag geese (collections: P L. Armitage) as demonstrated by measurement SBF (smallest breadth between the facets of the costo-sternal articulations): 62.6mm in the Saxon specimen cf 56.5 and 57.1mm in the modern birds.

Fish Species

Roach

Identified from an isolated pharyngeal bone from context [217] (sieved sample number 7), fill of pit [219] (Phase 6). As with the other bone elements from context [217], the specimen is abraded and encrusted with a silty/sandy deposit.

Roach, a freshwater fish, is generally well represented in Middle Saxon food-refuse deposits excavated in London; including those at Maiden Lane (MAI86) and Jubilee Hall (*see* Locker 1988), Royal Opera House site (Rielly 1997; Rielly 2003), National Portrait Gallery (Armitage, Chapter 5, this volume) and 2-3 Hare Court EC4 (Armitage 2001).

Sturgeon

This andromous fish spends most of its life in the sea but ascends rivers to spawn. At James Street, it is identified from an isolated dermal scute in the hand-recovered bone assemblage from context [232], a fill of pit [233] (Phase 5).

Among the records of sturgeon bone elements from other London Middle Saxon sites are those from the Peabody site (West 1989, 152) and the Royal Opera House

Table 10 James Street faunal assemblages (Phases 3-6).

Taxon/species	No. Fragments (NISP)			Weight (g)		
	HC	S	Total	HC	S	Total
Mammals:						
Cattle	935	29	964	40783	753	41536
Pig	517	24	541	9215	152	9367
Sheep	230	43	273	4076	192	4268
Goat	2		2	175		175
Cat	4		4	3.5		3.5
Red deer	12		12	757		757
LAR	77		77	670		670
SAR	68	39	107	244	46	290
Unident mam.	454	536	990	1699	392	2091
Birds:						
Goose	4	3	7	10.5	2	12.5
Domestic fowl	10	9	19	14.5	3	17.5
Unident birds	4	2	6	9.5	0.5	10
Fish:						
Sturgeon	1		1	NR		NR
Roach		1	1		NR	NR
Unident fish		3	3		NR	NR
Totals (NISP)	2318	689	3007			

HC = hand collected, S = sieved, NR = not recorded site (Malcolm *et al* 2003; Rielly 1997). Excavated evidence from other early-medieval settlements throughout North Western Europe indicate this particular fish was a favourite food source (and of economical importance) where available locally in rivers; as exemplified at 8th-10th century Elisenhof, where sturgeons, captured in large numbers when ascending for spawning in the nearby river Eider, were processed (cleaned and cut up) on a commercial-scale at a specific area within the settlement (*see* Heinrich 1985). Adult sturgeon can grow up to 2.5 m (8ft 3in) long (Wheeler 1997, 35) and such large-sized fish would have represented a prize catch that served as a bountiful food source. By later medieval times sturgeon had become scarce throughout North Western Europe and the fish, often in preserved form, was an expensive delicacy enjoyed only by the wealthier households, where it was stored in barrels (in the form of salted/dried strips) for year-round consumption (*see* Woolgar 2000).

Catalogue of the Waste Products from Horn- and Antler-Working

Horn-working waste

Evidence of horn-working activity comprises five chopped or sawn horn cores of cattle and sheep, together with three sheep crania with their horn cores removed by means of an axe or cleaver blow directed through the base of each horn in turn (*see* Table 11). In addition it seems highly likely that a complete, adult male goat horn core with portion of cranium attached (from road metalling [354] Phase 4) also represents horn-working waste.

Table 11 Horn-working waste from James Street

Phase	Context	Feature	Description of waste
4	325	layer deposit	sheep cranium
5	250	fill of ditch 323	cattle horn core, chopped through the base & tip removed by sawing
5	314	fill of ditch 323	cattle horn core, chopped
5	206	fill of pit 199	sheep cranium
5	208	fill of pit 199	cattle: frontal portion of skull with both right & left cores; base of skull chopped obliquely
6	214	fill of pit 219	sheep cranium
6	222	fill of pit 211	cattle horn core, chopped

Antler-working waste

Evidence of antler-working activity is provided by the eighteen sawn pieces of red deer antler listed in Table 12.

Small quantities of waste, mostly of antler, have come from the majority of *Lundenwic* sites (Blackmore 1988b, 135-8; Blackmore 1989, 132; Riddler, Chapter 7, this volume). Larger quantities have been recovered from the Royal Opera House excavations, where a workshop for bone and antler working has been located (Bowsher and Malcolm 1999, 7-8 and fig 3; Malcolm *et al* 2003, 170). The distribution of bone and antler waste within *Lundenwic* reflects the situation with a number of 'wic' settlements. Concentrations of bone and antler waste occur in association with some properties, with the remainder of the material dispersed widely and sparsely across a large number of contexts suggesting that they were deposited away from the focus of activity (Riddler, Chapter 7, this volume).

The three burrs from the site are naturally shed. Two naturally shed and two skull-attached antler burrs are recorded from Maiden Lane (MAI86) (Blackmore 1988b, 138 and fig 39).

Table 12 Antler-working waste from James Street

Phase	Context	Feature	Part(s) of antler
4	358	metalled surface	base/burr (from shed antler)
5	250	fill of ditch 323	frag of beam/tine junction
5	329	fill of pit 271	tine
5	329	fill of pit 271	burr
5	200	fill of pit 199	base
5	204	fill of pit 199	tine
6	251	fill of pit 253	tine
6	251	fill of pit 253	crown with both tine missing
6	257	fill of pit 258	section of tine, split lengthways
6	257	fill of pit 258	curved antler shaving
6	225	fill of pit 226	tine (sawn tip)
6	229	fill of pit 226	2 specimens: 1 base/burr(from shed antler); 1 tine
6	276	fill of pit 277	tine
6	326	fill of pit 327	4 specimens: 1 beam; 3 tines

Interpretation and discussion

Diet of the inhabitants

Bone-weight data provides the most reliable means of determining the relative contribution each of the major domesticates made to the overall diet of the James Street site inhabitants during the Middle Saxon period. The results (expressed as percentage frequencies) of this analysis are presented in Table 13 in comparison with data from previous *Lundenwic* sites (documented by West & Rackham 1988 and West 1989).

Table 13 Frequencies of Middle Saxon domesticates

	%Frequencies (bone weight)		
	Cattle	Sheep/goat	Pig
James Street	75%	8%	17%
Peabody site	74%	10%	16%
Maiden Lane (MAI86)	79%	6%	15%
Jubilee Hall	79%	9%	12%

As with the other *Lundenwic* sites, in the James Street site diet, beef was the staple meat, followed by pork, with lesser amounts of mutton consumed. This is also the dietary profile documented by Rielly (1997, 2003) for the Royal Opera House site inhabitants.

Viewed overall, there is a conspicuous absence in the James Street site diet of wild game species such as deer, boar and hare, or wildfowl, that would have been readily available in the forests, marshlands, and riverbanks close by the settlement. Apart from the inclusion of some fish and the few domestic fowl and domestic geese, the diet reflects a very low diversity of exploitation of the available food resources and is predominated by meat derived from the major domestic (farm) animals. This evidence of a narrow food resource base, and the low relative abundance of birds, conforms to the typical (distinguishing) profile proposed by O'Connor (2001) for bone assemblages from 'wic' sites.

Identification of James Street as a "net livestock consumer" site

From the distribution pattern of known Middle Saxon sites, and from the structural, artefactual and environmental evidence associated with these, Cowie and Whytehead (1989) defined *Lundenwic* as comprising a nucleated "domestic" core-settlement ('wic') clustered north of the Strand around Covent Garden, with sites of industrial and agrarian activity around its periphery. On the western boundary (in the area now occupied by the National Gallery/National Portrait Gallery) were located "farmsteads" in a semi-rural/semi-industrial landscape (s*ee* Pickard, this volume). Produce (grain and livestock) from these "farmsteads" sustained the 'wic' inhabitants. In general terms, the central Strand sites were "net agricultural consumers" whilst those on the periphery functioned as "net agricultural producers" (as defined by Rackham 1994 and in the context of *Eoforwic* by O'Connor 1994); the latter are identified (among other indicators) by the very much higher incidence of foetal, neonatal and very young cattle, sheep and pigs. Applying this criterion James Street, with its noticeable absence of foetal or neonatal animals and low frequencies of lambs and young pigs, clearly belongs to the former group of "net agricultural consumer" sites that lay within the core of the settlement. Further indicators linking James Street with the central Strand sites is provided by the concordance in the rank order of the major domesticates (based on numbers of fragments) which may be summarised as follows: cattle>pig>sheep. It is noted that the peripheral ("producer") sites exhibit an altogether different rank order, which may be summarised as: sheep>cattle>pig.

THE PLANT REMAINS

K. L. HUNTER

Although environmental samples (30 and 40 litres) were taken from all Saxon deposits (where possible) only three samples were identified as being well preserved and therefore selected for further analysis. All of the samples derived from Phase 5 contexts. One (sample 55, context [331], primary fill of pit [271]) proved to be very rich in charred cereal grains. Other samples (sample 17, context [206], secondary fill of pit [199] and sample 49, context [317], fill of roadside ditch) contained only a few charred cereal remains but contained evidence of mineralised plant remains.

Results

Charred Plant Remains

The charred remains from samples 17 and 49 included only a few complete cereal grains and it was not possible to identify these securely beyond genus level as the individual grains were distorted and degraded. This was due either to the charring process and or to subsequent physical damage. In contrast, sample 55 produced a large quantity of charred remains, much of which comprised degraded cereal remains, but it also contained a relatively large number of well preserved cereal grains. Some of these had retained characteristics that suggested identification to a particular

Table 14 Charred Plant Macrofossils from James Street

Taxa	**Common name**	**Component**	**Habitat***	**Numbers per sample**		
				17	**49**	**55**
Triticum sp.	Bread Wheat type	Grain	C			15
Triticum sp.	Cf. Glume wheat type	Grain	C			21
cf Triticum sp.	Possible Wheat	Grain	C	2	2	23
Hordeum vulgare cf var. *tetrastichum*	Hulled Lax-eared variety	Grain with attached lemna base	C			46
Hordeum vulgare cf var. *tetrastichum*	Hulled Lax-eared variety	Twisted grain with attached lemna base	C			47
Hordeum vulgare/ distichum.	Barley (hulled)	Grain	C	5	1	3000+
cf Hordeum sp.	Possibly barley	Grain	C			3000+
Avena fatua L.	Wild Oat	Grain with floret base	Da			1
Avena sp.	Oat	Grain	C			21
cf Avena sp.	Possible Oat	Grain	C	2		66
Secale Cereale	Rye	Grain	C			2
Secale Cereale/Triticum sp.	Rye/Wheat	Grain	C			4
Cereal NFI	Unidentifiable cereal remains	Grain fragments	C	8	1	2000+
Triticum spelta/dicoccum	Spelt/Emmer	Glume base	C			1
Hordeum vulgare cf var. *tetrastichum*	Lax-eared variety	Unattached Lemna bases	C			38
Hordeum sp.		Lemna bases	C			34
Hordeum sp.	Barley	Rachis fragment	C	5		6
Hordeum sp.	Barley	Rachilla				1
cf Hordeum / Avena Sp.	Barley/Oat	Palea /lemna fragments	C			1000+
Avena sp.	Oat	Awn fragment				1
	Cereal type	Detached embryos				54
	Cereal type	Detached embryos sprouted?				2
	Cereal type	Culm node	C			1
	Cereal type	Straw Fragment	C			
Chenopodium sp.	Goosefoot type	? Seed	n			28
Agrostemma githago L.	Corn Cockle	Seed	Da			3
Persicaria Lapathifolia/ Maculosa Gray		Achene	DampB, Da (G)		1	1
Fallopia convolvulus (L.) Love.	Black Bindweed.	Achene	Da			36
Brassica/Sinapis Sp. L.	Cabbage/Mustard	Seed	B,da,C			1
Raphanus raphanistrum ssp. cf raphanistrum L.	Wild Radish	Capsule	Da			1
Raphanus raphanistrum ssp. cf raphanistrum L.	Wild Radish	Capsule with seed	Da			1
cf Odontites/Euphrasia L.	Bartsia/Eyebright	Seed	Da G	1		
Anthemis cotula L.	Stinking Chamomile	Achene	Da, esp. base rich heavy soil			1
Poaceae	Grass	Caryopsis				
Indet.					1	

* B = bankside, C = cultivated, D = disturbed, Da = disturbed ground including arable, G = grassland, M = marsh, n = nitrogen rich soils

variety of barley. A relatively small number of chaff and weed seeds were also present.

Barley

Over 6,000 cereal grains were extracted; the majority of which appeared to be of a hulled barley type. The presence of apparently twisted grains suggested that at least some of this was of a multi-rowed type (*Hordeum vulgare*). A small proportion of the grains still had part of the *lemna* and *palea* attached. These were well enough preserved in some cases, that it was possible to distinguish the abscission scar, formed at the point the spikelet joins the rest of the ear. The form of the abscission scars was more or less horseshoe shaped suggesting that the grains represent a lax-eared or four-row type (*Hordeum vulgare* cf var. *tetrastichum*). However as Jacomet (1987) suggests there may be intermediates between the lax-eared and the dense-eared types and there may also be a variation in scar shape from different parts of the same ear. Though there was such variation, none exhibited the clear fold indicative of the dense-eared type. There were a number of grains that appeared to have "collapsed" and the

Table 15 Mineralised plant macrofossils from James Street

Taxa	Common Name	Component	Habitat*	Numbers per sample	
				17	49
Chenopodium cf album.	Fat hen type	Seed	D, n	5	1
Cf. Malus sp.	Apple	Seed	W, B, C		1
Brassica/ Sinapis sp. L.	Cabbage/Mustard.	Seed	B Da, C,	1	
Lamiaceae	Dead Nettle Family	Nutlet		1	
Galium sp.	Bedstraws	Nutlet		1	
Apiaceae	Carrot family	Mericarp		1	
Indet					5

*B = bankside, C = cultivated, D = disturbed, Da = disturbed ground including arable, n = nitrogen rich soils, w = waterlogged

contents extruded out during the charring process. This may have been because the grain was green (W Carruthers, pers comm); the moisture content of the grain was too high for successful storage, leading to the need to dry the grain. This may suggest the cereal came to be burnt, either accidentally during the drying process, or deliberately as the disposal of spoilt grain. There were fifty-four detached embryos in the assemblage of which only two were starting to sprout and a few grains also possibly exhibited evidence of insect damage. However, these were in such small quantities that it is unlikely that the unwanted sprouting or pest damage were the main reason why the grain was discarded. Likewise, it is unlikely that this deposit was the result of the accidental charring of malting barley.

The sample also contained a relatively large number of small, unattached *palea* and *lemna* fragments. It is probable that the majority of these are barley in origin, however, the presence of oat florets in the assemblage mean this cannot be said for certain. Six barley type *rachis* fragments were also present but none of them exhibited any characteristics that could help identify them further. Two samples produced a few grains each of hulled type barley, (five and one grain respectively). No diagnostic chaff was associated with these so further identification was not possible. Five rachis fragments were recovered from sample 17.

Wheat

Sample 55 produced fewer than a hundred wheat grains compared with the thousands of barley. There were fifteen examples of what appeared to be of a free threshing type with large rounded grains. However no free threshing type rachis fragments were found so it has not been possible to suggest if these grains represent a tetraploid (macaroni/Rivit wheat) or Hexaploid (Bread Wheat) type.

Twenty-one of the wheat grains showed characteristics closer to that of glume wheat, the grains being much narrower and possessing a markedly flatter ventral surface. However, as Jones (1978) suggests there can be a marked variation in the shape of bread wheat grains with some closely resembling those of Spelt and so it is probably unwise to base identification on grain shape alone. The one degraded glume base suggests the potential for the presence of glume wheat in the assemblage, however it is not possible to say if it is Emmer (*Triticum dicoccum*) or Spelt (*Triticum spelta*). Samples 17 and 49 both contained two wheat type grains but these were not sufficiently well preserved to allow identification beyond genus.

Oat

Sample 55 contained 21 oat grains (*Avena* Sp.) along with 66 possible oat grains. One grain still had its floret base attached, which had a distinctive sucker shaped abscission point suggesting it was Wild Oat (*Avena fatua*) rather than a cultivated type. It is not possible to say if all the oat grains can be attributed to this species and the presence of cultivated oat (*Avena sativa*) should not be ruled out. Sample 17 also contained two possible oat grains

Rye

Two grains of rye were recovered from sample 55, along with four grains that were less well-preserved but exhibited characteristics of rye and wheat grains.

Weed seeds

The number of weed seeds from sample 55 was very low compared with the cereal remains. There were 28 *Chenopodium album* (Fat Hen) type seeds, a species which prefers nitrogen rich soils, often associated with occupation and agriculture. These could represent weeds growing close to the area of cultivation, but may be evidence of a fodder crop or even a potential human food resource.

Agrostemma githago (Corn cockle) is a weed that in the past was commonly associated with arable crops. The relatively large size of the seed meant that it was often retained with cereal grains as they were processed. The poisonous seeds were later removed by hand picking. The large seeds of

Fallopia convolvulus (Black Bindweed), the wild oat and the mericarps (seed capsules) of *Raphanus raphanistrum* (Wild Radish) could also potentially be retained with the cleaned cereal grain in this way.

The much smaller single seed of *Anthemis cotula* (stinking Mayweed), a common arable weed that prefers heavier base rich soils, may represent another seed retained during crop processing or general background debris from animal bedding or hay. It is probable that the excellent preservation of some of the cereal and the bee remains (*see* Robinson below) is a result of the conditions under which they were charred, as well the fact that the deposit was probably sealed very quickly after deposition and therefore protected from physical weathering. In contrast, the condition of the cereal remains from the other samples is relatively poor. In addition, the presence of mineralised remains and bone fragments mixed with these suggest that they represent secondary or even tertiary deposition.

Mineralised plant remains

A relatively small quantity of mineralised seeds and other plant remains were recovered from samples 17 and 49. Chenopodium type seeds were the most frequent type found. Most of the Genera represented were probably weed types. There was also a possible apple pip from sample 49. No mineralised remains were present in sample 55. The relatively large number of small bone fragments, some of which were burnt, others mineralised, from both samples 17 and 49, suggest the deposition of human or animal faecal material. The relatively small amount of mineralised material overall may indicate the redeposition of the material from elsewhere or that the processes and conditions needed to facilitate mineralisation within the deposit were limited in some way.

Discussion

A comparison of the four cereal assemblages suggests a significant role for barley in the Saxon economy in human consumption, as animal fodder and perhaps in trade. The predominance of barley in Saxon cereal assemblages seems to be a pattern that is repeated not only in local sites such as Maiden Lane (MAI86) and Jubilee Hall (Davis & de Moulins 1988), but also further afield, for example West Heslerton, Yorkshire (Carruthers & Hunter forthcoming). These sites had little or no diagnostic chaff preserved, which has previously been interpreted as the result of burning. However, the presence of the *lemna* and *palea* from James Street suggest that the absence of other chaff is, in this case, due to it being separated from the grain at an earlier point in time.

Though charred cereals were present in other samples analysed from the site and from other published Saxon sites in the area, it is the quantity of grain and the level of preservation, which distinguishes it from other published *Lundenwic* assemblages. It is unusual to find identifiable barley chaff, beyond a small number of rachis fragments, preserved in Saxon deposits in the area. The absence of any significant quantity of chaff suggests a deposit of barley, which had been processed or cleaned elsewhere. The presence of the seeds of large arable weeds such as Corn cockle, Black Bindweed, Wild Radish and Wild Oat suggest that the deposit had been winnowed and sieved elsewhere to remove the chaff and smaller weed species. The other cereals may be residual grains from around the area in which the assemblage was burnt. However, they could have been examples of plants that had grown up amongst the barley crop as relicts of former crops in the field rather than being evidence of the deliberate cultivation of mixed crops or maslin. Compared to the results from Jubilee Hall and Maiden Lane (MAI86), there are only a few mineralised plant remains and they suggest a weed assemblage rather than domestic waste. The possible apple pip may be the exception to this.

Table 16 Other remains recovered from the James Street Samples

Other remains	Preservation	Sample*		
		17	49	55
Charcoal	Charred	P	P	P
Honeybee (*Apis mellifera*)	Charred			P
Insect remains	Mineralised		P	
Animal bone			P	
Fish bone		P	P	
Mineralised concretions	Mineralised	P	P	
Oyster shell		P		

*P = present

THE CHARRED HONEYBEES

MARK ROBINSON

The analysis of charred plant remains from sample 55 (context [331]) discovered much charred amorphous material and many charred insect fragments. The amorphous material could not be identified but the insect remains proved to be *Apis mellifera* L. (honeybee). The most readily identifiable remains of the bees were heads, twenty-one being from workers and two from drones. Fragments of abdomen were also present, along with the flight muscles from the thoracic box.

Finds of charred insect remains are very unusual. The deposit from which the bees were recovered was a layer of burnt debris within one of a group of pits that contained domestic refuse. The burnt material was interpreted as resulting from either a house fire or the burning of domestic refuse. The concentration of bees and the presence of drones make it highly likely that a colony of bees had been burnt. If the material was indeed the result of a house fire, it is possible there was a hive on the outside of the building. If the material was domestic refuse, it could have resulted from the burning of bees from a skep hive after the honeycomb had been extracted. The bee colony was often asphyxiated before the skep was opened. The discovery of bees provides interesting archaeological confirmation for the documentary evidence for Anglo-Saxon beekeeping. Wicker skeps are documented from the early 8th century AD and it is believed the Saxons also used straw skeps (Crane 1999, 251-2; *see* box text p. 10).

THE HUMAN BONE

NATASHA DODWELL

The osteological analysis of a single Saxon skeleton, context [432], from the site is presented below. General methods used in the osteological report are those of Bass (1992) and Buikstra and Ubelaker (1994). Age was assessed from the degree of dental attrition (Brothwell 1981) and the stage of epiphyseal fusion. The pelvis was not available for examination and so the sex was assessed using characteristics of the skull and metrical data. The living stature was calculated from the humeri lengths using the regression equation devised by Trotter and Gleser (1958).

Skeleton [432]	
Age:	25-35years
Sex:	Male
Stature:	1.80-1.82m
Orientation:	W-E

Position of the Body

Supine with legs extended. The right arm is flexed at the elbow so that the lower arm crosses the stomach region, the left arm is flexed at the elbow so that the hand rests on the chest.

Condition of the Bone

The right side of the skull is fragmentary, as are the ribs and the long bones of the legs. The surviving bones have a smooth, almost polished appearance with small concretions of iron panning and small areas of black/dark purple staining. The legs have post-mortem breaks and there are thick, beige post-mortem concretions on the lower legs and the surviving bones of the feet. Neither the pelvis nor the cervical vertebrae were available for analysis.

Pathology

An increase in porosity, characteristic of incipient joint disease, was noted around the margin of the right humeral head.

Slight deposits of calculus (mineralised plaque) were recorded on the lingual surfaces of each of the surviving teeth.

Large (10mm) septal apertures were observed on both humerii; these are non-metric traits and are probably hereditary.

THE RADIOCARBON DATING

Radiocarbon Dating Laboratory, The University of Waikato

Atmospheric data from Stuiver *et al* (1998)

JST02, Well lining [24], Wk-10808	
Delta ^{13}C rel. PDB	-25.4 ± 0.2
Radiocarbon Age (Yrs BP)	1353 ± 73

Calibrated Age Ranges

One standard deviation	cal 610-780 AD
	cal BP 1340-1170
Two standard deviations	cal 540-880 AD
	cal BP 1410-1070

Chapter 3 **Pits, Bones and Foodstuffs: Excavations at the Lyceum Theatre, Exeter Street**

GARY BROWN AND JAMES RACKHAM

In 1995 Pre-Construct Archaeology was commissioned to undertake an archaeological excavation at 33-37 Exeter Street (hereafter the Lyceum), close to the Strand (Fig. 26). The excavation was undertaken on the north side of the Lyceum Theatre at 33-37 Exeter Street on a vacant plot of land previously used as a car park. As with the majority of the 75+ sites with Middle Saxon remains recorded to date within *Lundenwic* the site had been seriously impacted upon by later developments, in this instance by 18th century cellars and more recent theatre basements. No horizontal features survived, indeed the survival of the natural brickearth cap was patchy, with terrace gravels exposed over much of the excavation area.

An indication of how much the brickearth and overlying stratigraphy had been reduced was demonstrated during the removal of part of a cellar wall adjacent to Exeter Street, beyond the actual development footprint. At this location the top of the brickearth was recorded at 15.78m OD and

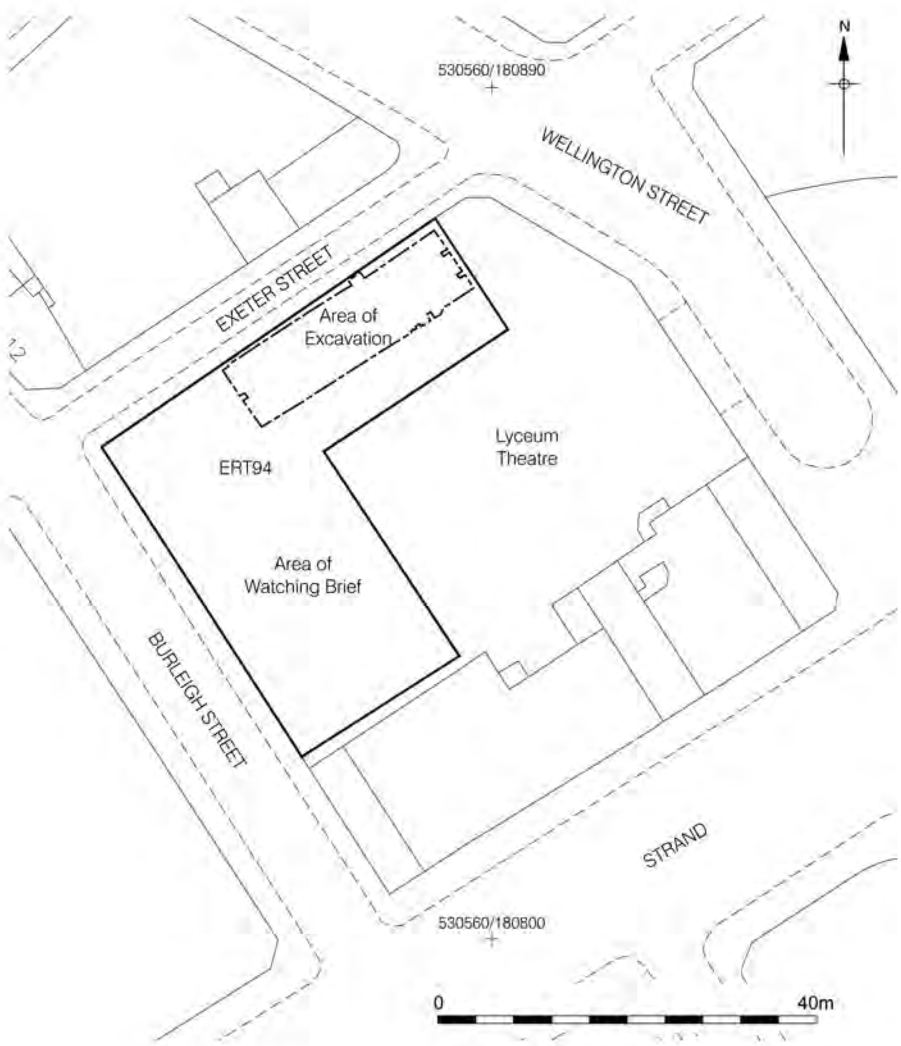


Fig. 26 The Lyceum Theatre site location. Scale 1:800

Fig. 27 Excavations at the Lyceum Theatre

was 570mm thick. Elsewhere at the site the top of the brickearth was recorded variously at between 15.40 – 15.20m OD suggesting that the original ground surface had been reduced by at least 300mm.

A total of thirteen Middle Saxon pits were recorded in apparent linear arrangements, representing seven rows. The severe truncation of the site removed any depth of stratigraphy and as a consequence the majority of Middle Saxon features lay in isolation. The pits contained evidence for deposition of domestic debris and craft industry waste and, importantly, they incorporated butchery waste and other food debris. Evidence for a structural phase of activity was slumped into the top of two of the pits.

The pits' spatial distribution on rough alignments and a minimum of intercutting relationships may indicate a systematised deposition of specific waste products, or the alignments and position may reflect some form of delineation of property boundaries or topographic considerations.

THE ARCHAEOLOGICAL SEQUENCE

Phase 1

The earliest activity at the site was demonstrated by post- and stakeholes cut directly into the brickearth (Fig. 28), and was also recorded as the earliest Saxon activity at nearby 20 Tavistock Street (Densem 2000). A flat-bottomed posthole was revealed in section and had not been modified by later truncation. Elsewhere all Saxon features had been (apparently) truncated. There was no coherent pattern to the postholes and stakeholes that survived mostly in the west and centre of the site. These features are very likely to represent several phases of activity. The absence of beam slots or other indicative evidence of structural dwellings suggests that the postholes and stakeholes were related to non-domestic structures as either fence lines along tracks, temporary fences around open pits or animal corralling areas. However, note is made of the general truncation the site has endured and some structural features may have been removed from the record.

A total of ninety-two stakeholes were recorded cutting the brickearth. The average diameters of the stakeholes ranged from 35mm to 70mm and the depths covered a range from 40mm to 100mm. The sides tapered to rounded or pointed bases. Further to this, sixteen postholes were recorded which had an average top diameter of 200mm and depths ranging from 70mm to 200mm.

Phase 2: Soil Formation, 7th Century

Following this putative corralling was an episode of soil formation, possibly representing a plough soil. Evidence for this formation was limited to sectional information only below Exeter Street, where soil filled the open flat-bottomed posthole and covered the exposed brickearth. It was composed of mottled dark green grey silty clay on average 270mm thick. No finds were recovered from the deposit. Similar deposits have been recorded at several *Lundenwic* sites including the National Portrait Gallery (Pickard this volume), James Street (Leary this volume), Trafalgar Square (Cowie 1988) and possibly at the Peabody Site (Whytehead *et al* 1989). At the Royal Opera House however grey layers were examined in detail and were interpreted as midden deposits (Malcolm *et al* 2003, 20). One apparent difference between the Exeter Street and Royal Opera House deposits is that the latter contain frequent inclusions of cultural debris and therefore the two examples may have different origins. Blackmore (2002) notes the presence of a grey layer of rubbish that accumulated over burials at the Royal Opera House *ie* was stratigraphically early, and suggests that it was introduced to the area from elsewhere in the settlement (*see* also Leary, Chapters 2 and 7, this volume).

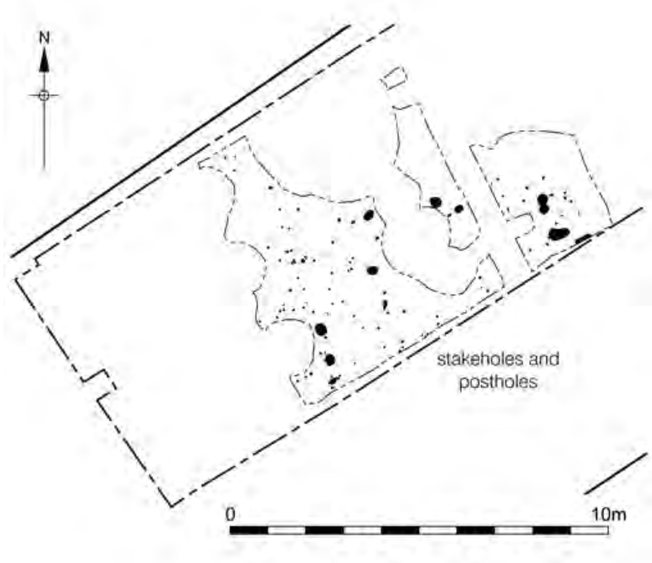


Fig. 28 Plan of Lyceum Phase 1 stakeholes. Scale 1:200

Phase 3: Pits, 7th to Late 8th Century

There can be little doubt that but for the severe truncation by the 18th century buildings a much more comprehensive site sequence would have been forthcoming. As it is, a total of thirteen pits, their contents and remnants of horizontal deposits that have settled into some of the pits are the clearest indication of landuse in the 7th and 8th centuries (Fig. 29). It appears that the pits were set out in linear arrangements, although it is not clear whether these were north to south or east to west. For the purpose of this discussion the former alignments are used. Three phases of pit activity can be determined, either on stratigraphic relationships or on dated finds. Where no datable finds were recovered the pits are included in the earliest phase. It is clear from the finds recovered from several of the pits that primary butchery and processing practices were being undertaken at, or very close to, the site and that such activity was undertaken over a period of approximately one century. Table 17 outlines the physical characteristics of each pit by phase and row.

The pits varied in size and were differently filled, but many contained a primary deposit of animal butchery waste with occasional domestic refuse and cess deposits. Rackham and Snelling set out below detailed analyses of the faunal and botanical data. All the pits had been truncated by post-medieval activity and contemporary occupation horizons did not survive except as two discrete slumped horizons above the respective pits. Despite the truncation the surviving depth of some of the pits provide an indication of their original plan dimensions.

Phase 3.1

Row 1 Pit 1

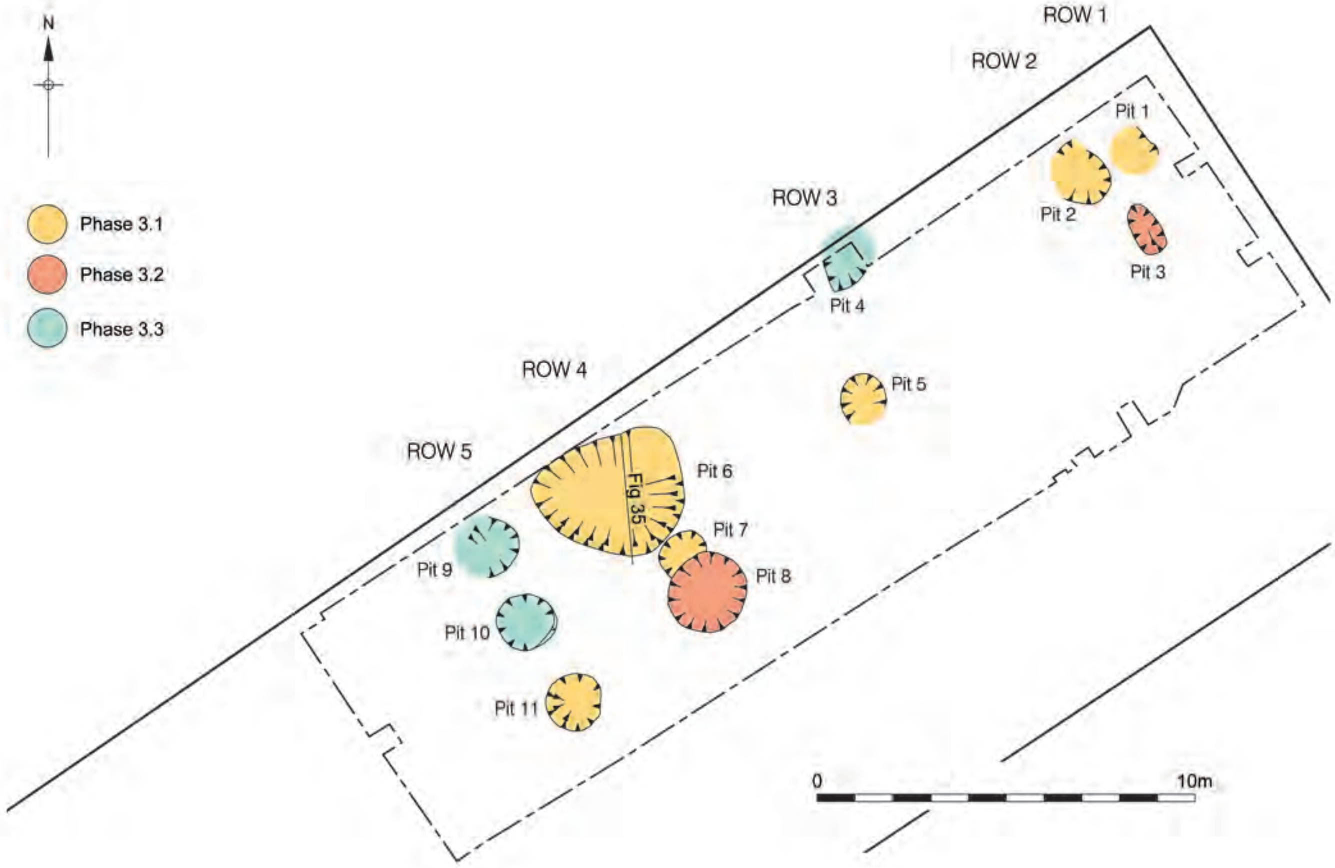
Pit 1 was very heavily truncated, only part survived within the excavation area. It contained three fills [1065], [1064] and [1082] from which neither artefacts nor ecofacts were recovered.

Row 2 Pit 2

Pit 2 contained five fills of which the basal fill [1055] was composed of clean, friable silt and sand and represents collapse of the edge after cutting. This was overlain by [1048] and [1043], loose sandy silts, of which [1048] appeared to be the primary fill, and contained 8kg of animal bone, composed mostly of large fragments of cattle bone

Table 17 The Lyceum pits

		Pit	Cut	Fills	Dimensions	Base Level	Shape
Phase 3.1	Row 1	1	1063	1065, 1064, 1082	1.0m x 0.45m (minimum) x 0.35m deep	14.53m OD	? sub-rectangular
	Row 2	2	1041	1055, 1048, 1043, 1060, 1042	1.74m x 1.4m x 0.65m deep	14.42m OD	sub-rectangular
	Row 3	5	1080	1079, 1078, 1077, 1076	1.2m diameter x 1.05 m deep	14.05m OD	sub-circular
	Row 4	6	73	72, 71, 62, 115, 61, 60, 59, 58	3.8m diameter x 1.6m deep	13.69m OD	sub-circular
		7	88	92, 87	1.2m x 1.0m x 1.8m deep	13.61m OD	sub-circular
	Row 5	11	93	34	1.52m x 1.43m x 1.6m deep	13.68m OD	circular
	Row 6	12	1135	1134	1.0 x 0.7m (minimum) x 0.48mm deep	12.64m OD	sub-circular
	Row 7	13	1136	1133	1.8 x 0.74m (minimum) x 0.40m deep	13.56	sub-circular
Phase 3.2	Row 2	3	1052	1049, 1042, 1035	1.42m x 0.72m x 0.81m deep	14.18m OD	sub-rectangular
	Row 3	5a		1075, 1074, 1057, 1071, 1073, 1072, 1070, 1058	1.2m diameter x 0.67m deep	14.43m OD	sub-circular
	Row 4	8	63	70, 69, 68	2.14m x 2.0m x 1.38m	13.87m OD	circular
Phase 3.3	Row 3	4	1112	1098, 1094, 1093, 1113	1.5 m wide x 1.41m deep	14.64m OD	Sub-square
	Row 5	9	19	16	1.46 x 1.28 x 0.40m deep	14.91m OD	circular
		10	57	47, 56, 41, 32, 29, 28	1.4m diameter x 1.33m deep	13.85m OD	Circular
Phase 3.4	Row 4	Slumping over Pit 6		55, 116, 117, 54, 53, 52, 51, 85, 50, 49, 48		[48] at 15.32m OD	
		Slumping over Pit 8		66, 65, 64		[64] at *15.13m OD*	



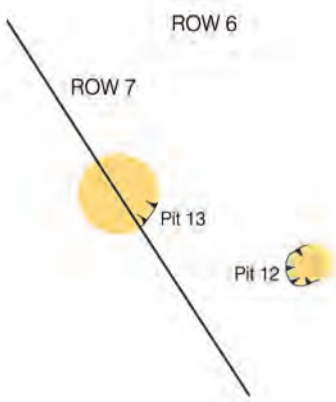


Fig. 29 Plan of Lyceum Phase 3 pits. Scale 1:200

Fig. 30 The Lyceum pits

Fig. 31 Excavation at the Lyceum Theatre

Fig. 32 Lyceum Pit 6

Fig. 33 Antler waste from the Lyceum

Fig. 34 Lyceum Pit 8

with occasional sheep and pig and a few goose bones. Occasional fish bones were also recovered, including shad and large salmonid. The overlying fill [1043] contained a similar assemblage and also contained some concretions that are possibly cess related. That this pit contained some faecal matter is also attested as the fish vertebrae were misshapen suggesting passage through the gut. Neither of the upper fills contained significant faunal assemblages.

Pottery recovered from [1043] comprised two sherds of a chaff-tempered jar with a burnished external surface, dated AD 600/650 - 750. Also present were one sherd of North French grey ware and one sherd of Walberberg type ware dated AD 670-850. From the same deposit came a double-sided composite comb (Fig 38.2), with lattice decoration (*see* Riddler, below) and a fragment of burnt clay loomweight was recovered from one of the upper fills [1060].

Fill [1048] and overlying fill [1043] contained several fragments of iron slag totalling almost 700g, the bulk of it being smithing slag. Its deposition in this pit was presumably opportunistic, but suggests iron smithing was being undertaken in the vicinity.

It would appear that Pit 2 may originally have been dug for domestic refuse and was occasionally utilised as a latrine pit whilst open.

Row 3 Pit 5

As excavated Pit 5 contained eleven fills. However, further examination of the evidence suggests that the feature was recut later in its period of use, the recut recorded in Phase 3.2. Cut [1080] contained four fills of clayey silts, of which the basal deposit [1079] contained possible cess concretions, and a stool, probably from a dog. A relatively large bone assemblage (6kg) was also recovered from this fill. A single fragment of sand-tempered jar (AD 600 - 800) was also recovered.

The primary function of this pit was probably as a latrine pit with perhaps contemporary or later deposition of other waste.

Row 4 Pit 6

Pit 6 was the largest feature investigated at the site. Its overall dimensions suggest that it may originally have been a brickearth quarry pit. The basal fills of cut [73] comprised collapsed sand and gravel, [72] and [71], from the side of the pit, which accounts for the irregularity of the slope of the sides. Fills [62], [61] and [60] represent the primary fills of this pit and it was from these deposits that the largest assemblage of bone was collected (207kg), representing 40% of the whole sample. The assemblage was dominated by cattle with most parts of the skeleton present, but pig and sheep were also represented as well as some dog. Fill [61] contained some faecal matter which probably represented redeposited material as opposed to primary deposition. Although these fills represent several deposition events the bone assemblage suggests a consistent origin. Fills [59] and [58] were thin layers of gravelly sand and silt that contained some oyster shell, with very little bone, and probably represent the original capping-off of the pit (Fig. 35).

A relatively large Middle Saxon pottery assemblage (45 sherds) was recovered from Pit 6, consisting mostly of chaff-tempered wares, present as large fragments of jar shaped vessels (Figs. 37.1-3) and a sherd decorated with parallel lines made with a comb point, (Fig. 37.4). In addition to the pottery a number of other cultural artefacts were recovered from the fills. Fragments of antler tines of red deer were recovered from [62] and [61] representing evidence for antler working (Fig. 33). One of the tines from [62] had an extended series of lateral marks, seemingly made by a knife, extending along the crown. The marks do not represent attempts to dismember the crown and their purpose remains unclear. Other evidence for craft industry was also recovered. Several loomweight fragments were recovered from [61] and from the same context an antler needle. The loomweights and needles are indicative of textile manufacture having taken place on or close to the site, and further examples have been recovered from other features at the site. A honestone was recovered from the same context.

Also from [61] was a piece of 'exotica' in the form of an inscribed fossil echinoid or sea urchin (Fig. 40). The inscription is of three or more letters in upper case Latin script, EEB followed by a possible N or U and then by an A or R. The meaning of the text is not clear and it cannot be attributed to any particular language. Its purpose is also not clear but it may have been a gaming piece or amulet, or have had magical significance, (for a more expansive discussion *see* Brown *et al* 2001, 203-210). No comparable fossil echinoid inscriptions have previously been found in Anglo-Saxon England. Although such an inscription appears to be otherwise unique, there is an example from a Twelfth Dynasty context at Heliopolis, Egypt, that has hieroglyphs inscribed on its lower surface which indicate the name of the fossil's finder and where it was found (K McNamara, pers comm).

Whilst the original intention for the use of Pit 6 is unclear, perhaps quarrying, it was subsequently used for the deposition of considerable amounts of butchery waste. Some rubbish deposition also occurred whilst the pit was open, and the whole was capped with relatively clean brickearth. Evidence of non-ferrous metal working at the settlement was provided by the presence of a single sherd of crucible (*see* Jarrett, below). The fragment does not indicate *in situ* working, but adds further to the evidence for working non-ferrous metals in *Lundenwic*, a craft confirmed by evidence from the excavations at the Royal Opera House and James Street (Malcolm *et al* 2003; Leary this volume).

Row 4 Pit 7

Pit 7 contained two fills. The basal deposit [92] was eroded sand and gravel overlain by the primary fill [87], a single homogeneous deposit. The assemblages from this fill

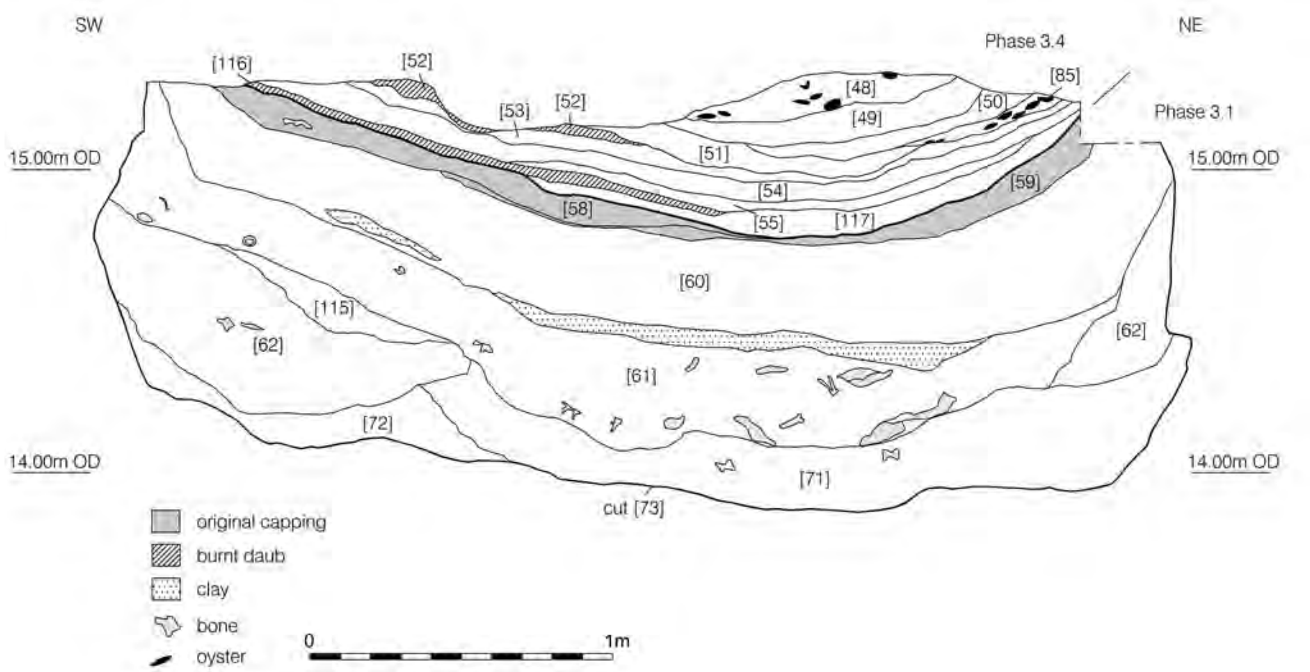


Fig. 35 Section drawing showing Lyceum Pit 6. Scale 1:25

indicate domestic-derived waste, and included charred cereals, shellfish and fish bone as well as 14kg of animal bone. In addition an antler tine was recovered and, from a bulk sample, pieces of sawn antler cortex and antler shavings were retrieved. This is the clearest evidence from the site for antler working, although the product was not apparent. Pottery included chaff-tempered wares, North French grey wares and Walberberg-type wares. Over 2kg of iron slag again reflects smithing in the vicinity.

Row 5 Pit 11

Pit 11 was anomalous to other pits at the site. It was circular in plan, vertically sided and contained a single fill [34] of loose mixed sand and gravel. The homogeneity of the fill suggests deliberate backfilling. Whilst the nature of the fill and paucity of finds (a small amount of bone and a single sherd of chaff-tempered ware pottery) indicate that it is unlikely to have functioned as a rubbish pit, its use was not determined. One possibility is that it was a well, albeit shallow, the base being at 13.68m OD.

Row 6 Pit 12

Pit 12 contained a single homogeneous fill [1134], of loose and friable clayey silt with frequent charcoal flecks. The quantity of bone, 8.2kg, reflected its function as a butchery waste disposal pit.

Row 7 Pit 13

Pit 13 extended beyond the limit of excavation to the west and was therefore only partially excavated. The basal fill [1133] comprised a firm and sticky matrix of fine sandy, clayey silt containing frequent charcoal flecks, dominated by bone refuse (2kg). The pottery assemblage comprised chaff-tempered ware, North French grey wares, and a sherd of Hampshire Coarse Sandy ware. Other finds included loomweight fragments.

Rows 6 and 7 are represented by single features and were recorded during the watching brief exercise in an area heavily truncated by the theatre basement. Therefore only the very base of the pits are represented and the large space in the area between rows 5 and 6 reflect the extent of the truncation rather than necessarily an absence of Middle Saxon activity.

Phase 3.2

Two features represented in the Phase 3.2 sequence are distinguished by their stratigraphic relationships with Phase 1 features, a third, Pit 3, by the presence of rouletted Walberberg amphora in [1052].

Row 2 Pit 3

Pit 3 contained a basal fill [1049] that appeared to have derived from fine waterborne particles filtered through from the upper layers, the circumstance of this is clarified by the overlying fill [1045] which was a sandy, clayey silt that contained a large proportion of cess, probably human. A low quantity of mineralised seed and insect puparia were present as well as eggshell and small fish bone, items easily passed through the gut.

The overlying fill [1035] demonstrates a change in use of the pit. No cess material or concretions were found but the layer was rich in animal bone and produced several hundred fish bones, mostly cyprinid, shad and plaice/flounder. The domestic animal bone demonstrates another unusual assemblage. The sample was dominated by sheep bone, with cattle uncharacteristically the least frequent of the domestic species. Fragmentation of the long bones was relatively high, and foot bones and vertebrae, including the tail vertebrae, were also numerous, suggesting that the remains may relate to a primary phase of butchery. Both juvenile and adult animals are present.

Again fragments of a sand-tempered jar were recovered, as were sherds of chaff-tempered ware and Walberberg-type ware, the latter dating to after AD 730. A single loomweight fragment was also recovered from the pit.

The cess fill suggests that the primary function may have been as a cess or latrine pit, however it could also represent a short-term use prior to the deposition of animal bone waste.

Row 3 Pit 5a

Pit 5 contained a recut that was not determined during the fieldwork. As a consequence its overall characteristics in plan are shared with the Phase 1 feature. Basal deposit [1075] was, as with other pit fills, generally composed of clayey silts incorporating general domestic objects, bone, oyster shells and some pottery. In addition a single antler tine was also recovered. It appears that, in contrast to the Phase 1 pit, which contained considerable amounts of butchery waste, the later recut, Pit 5a, was domestic in nature.

Row 4 Pit 8

Pit 7 (Phase 1) was intruded into in the south by Pit 8. The basal fill [70] of sandy silty gravel represented erosion and collapse from the pit sides. The primary fill [69] was a single homogeneous deposit composed almost entirely of bone representing the second richest bone deposit on the site, dominated by heavily butchered cattle bone (Fig. 34). A domestic component is indicated by the presence of burnt bone, bird and fish bone and oyster shell. However the cattle bone points to a primary butchery process. A number of interesting non-butchery finds were also recovered from [69]: a bone needle, antler pin and loomweight all indicative of textile manufacture or working; a copper stud and several fragments of copper sheet binding with ring and dot design. The overlying fill [68] was relatively clear of finds of any sort.

Phase 3.3

Two of the three features representing Phase 3 activity are distinguished from earlier features by their inclusion of Ipswich-type ware pottery fragments, which indicates a deposition date after AD 770. The third pit contained shell-tempered ware that dates after AD 790.

Row 3 Pit 4

Four fills were defined within Pit 4. The basal fill [1098] of loose clayey sand produced very little cultural debris. Overlying fill [1094] produced one of the larger assemblages from the excavation despite only being half excavated (the remainder being outside the area of excavation). It contained 35kg of animal bone, with cattle bone dominant, although sheep and pig were present. Burnt bone was common, bird and fish were also present. The subsequent fills were represented in section only. Fill [1094] was sealed by a thin layer of crushed burnt daub and clean clay which may have formed a seal over the lower fill of decaying organic matter. Sealing the crushed daub was fill [1093], a loose, sandy, clayey silt with frequent charcoal flecks, which contained occasional oyster shell and daub fragments and a quantity of large mammal bone. The upper fill [1113] was sandy, clayey silt containing occasional flecks of charcoal and daub, marine shell and bone. The presence of Ipswich-type ware and Middle Saxon Shelly ware suggests a deposition date after AD 775.

Despite the presence of butchery waste the assemblage is probably domestic in origin, with opportunistic deposition of the butchery discard.

Row 5 Pit 9

Pit 9 was relatively shallow and contained a single homogeneous fill [16] of moderately compacted clayey, sandy silt. The bone assemblage collected (11kg) comprised fragmented domestic animal bone dominated by sheep and pig with a number of sheep horn cores. The evironmental sample produced a mixed assemblage of cereal grain, shell, fish bone, and a fragment of a goose bone, all indicative of a domestic type assemblage.

A number of objects were recovered from this feature including an antler tine, bone needle, a copper alloy pin and a fragment of Niedermendig lava quernstone. Several pieces of structural ironwork were also recovered, including a length of iron rod of square section that has been bent over to a U-shape (Fig. 39.1), a further section of iron bar, and a diamond shaped rove nail (Fig. 39.2). It is possible that the assemblage represents evidence for the dismantling of a timber structure located in the general vicinity. Several fragments of pottery were recovered including one of Ipswich-type ware, which along with the absence of chaff-tempered ware indicates a deposition date after *c.* AD 730/750.

The pit probably functioned as a domestic rubbish pit.

Row 5 Pit 10

Pit 10 contained five fills with clear deposition horizons and also evidence of post depositional slumping. The base fills [47] and [56] were sandy, silty gravel that produced little material. The overlying fill [41] however was extremely rich, composed almost entirely of bone with silt and frequent charcoal fleck inclusions. The bone assemblage (34kg) was almost entirely pig, covering a range of ages, including neonatal individuals, and all parts of the carcass were represented. Hundreds of fish bones, wheat and barley grains were also present but the assemblage points to activities associated with breeding, stalling or butchery of pigs (*see* Rackham, below). The upper fill [29] was heavily slumped in the centre. It was composed of silty sand and contained only cattle and sheep bone, a substantial quantity of fired clay, with a few fragments of glassy slag and possible cinder also present, the by-products of some form of ‘industrial’ episode.

Two sherds of pottery, one a north French import, were recovered from [47] whilst from [41] further French vessels were represented as well as more local wares. The presence of a North France/Eastern Belgium Hard Grey ware pitcher indicates a deposition date after AD 750/800. A loomweight fragment further attests to textile weaving occurring in the vicinity of the site. Another antler tine was recovered from [41] whilst a corroded small Roman copper coin (illegible) came from [29].

Phase 3.4: 9th Century Slumped Deposits

Later Middle Saxon horizontal sequences were recorded at two locations where they had settled into earlier pits, viz. Pit 6 and Pit 8, both Row 4 (Fig. 35). However, two different sequences are represented despite their close proximity to one another. (Fig. 36).

Overlying the subsided fills of Pit 6 the lowest slumped layers [117], [116] and [55] were composed of ash and charcoal, burnt daub and clay lenses, and successively a thick oyster shell dump [54] and mixed silty sand [53], all of which are reminiscent of midden deposits, as recorded elsewhere (cf Royal Opera House, Open Area 16). A number of artefacts were recovered from [55]: an antler tine, daub, iron slag, and perhaps more significantly an antler comb blank fragment. The latter suggests that combs may have been manufactured at the site, and this in conjunction with the numerous sawn antler tines and the shavings from Pit 7, immediately to the north indicate that manufacturing items out of antler, and possibly bone, was undertaken in the immediate vicinity over a period of time.

The overlying layer [52] was composed largely of fired clay/brickearth fragments covered with ashy silt [51], the latter containing a fragment of quernstone. These layers appear to represent the location of a fire or hearth. A hearth was recorded at 20 Tavistock Street in a similar, post-pit use, stratigraphic position (Densem 2000, 11). A dump of oyster shells may represent a return to external dumping, albeit short lived as it was overlain by a layer of moderately compacted silty gravel [50] up to 100mm thick. It was of limited extent however, and may represent the margins of a yard or alley. A broken fragment of a honestone (SF 50) was recovered from the gravel. The gravels were overlain by a similar deposit [49], which in turn was capped with ashy silt, perhaps a resumption of the midden sequence.

The second slumped sequence was over Pit 8 and was dissimilar to the first. At the lowest level was a fragment of probable floor [66] composed of compact clayey sand into which were cut nine stakeholes, [65]. These were all circular with an average diameter of 50mm. The surviving area was too limited in extent to discern the arrangement but they are considered to have been internal structural features. A layer of silt and decayed organic matter [64] may represent occupation debris. The assemblage collected from this horizon included Ipswich-type ware pottery, as well as a bone needle and antler tine.

The evidence provided by the two slumped sequences is limited due to the restricted nature of survival. However, it is possible to speculate that the Pit 6 sequence is external, whilst the Pit 8 sequence is internal. It is not possible to extrapolate information about the settlement patterns from these sequences.

THE POTTERY

Chris Jarrett

Middle Saxon pottery was recovered from Pits 2-11 and 13 as well as a small number of other deposits on the site as 205 sherds weighing 4408g. The material varies between small sized and large diagnostic sherds. The pottery was assessed by Alan Vince (1996) and later classified according to Blackmore (1988a and 1989), where the fabrics are described in detail. The dating of the *Lundenwic* ceramic sequence is discussed elsewhere (*see* James Street pottery, this volume).

Fabrics and forms

Chaff-tempered wares (CHAF, CHSF, CHFI, CHFX)

The chaff-tempered wares are the most frequently occurring fabric on the site and are coded CHAF, where organic vegetable matter was abundant; CHSF, with sparser chaff tempering and fine quartz and CHFS, a coarser version of the latter with abundant sand and grits. A variant on the latter fabric is present as two sherds with the addition of chalk (CHSF + Chalk). Other chaff-tempered fabrics that occur in smaller amounts are a single sherd with an iron-rich matrix (CHFI) and a single sherd with sparse shell (CHFX). The latter fabric is something of an anomaly as shell

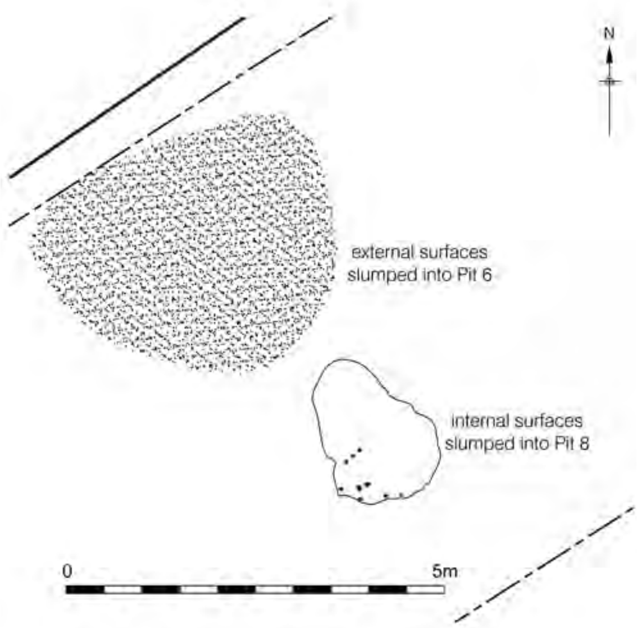


Fig. 36 Plan of Lyceum Phase 3.4 slumping. Scale 1:100

tempering is a feature of later pottery in *Lundenwic* and is not contemporary with chaff-tempered wares. The forms all appear to be closed shapes with simple everted rims, occasionally slightly thickened as in the case of rounded jar shape (Fig. 37.1) or as more cylindrical-shaped smaller sized vessels (Figs. 37.2-3). Vessels have either burnished or wiped surfaces and decoration was only seen on a single body sherd with two parallel lines of dots, probably made with the teeth of a comb or an antler die (Riddler 1986) (Fig. 37.4). Decoration of this type is dated to between *c.* AD 650-700 in *Lundenwic* but is rare (Blackmore 2001, 34). Two of these vessels, jars in CHSF and CHFS fabrics (Figs. 37.2-3) had probably been used for cooking, the exterior of the vessels being burnt and the interiors of each having a carbonised deposit adhering to them. A small number of other chaff-tempered sherds show similar evidence, while one other sherd has a reddish brown internal deposit. However, most sherds of chaff-tempered pottery showed no evidence of being used with a heat source. These vessels such as the CHAF rounded jar (Fig. 37.1) may have been used for cooking with a non-direct source of heat, or possibly storage.

Sand and chalk-tempered wares
(SSANB, SSANC, SSANE, SSAND, MSCH, SGFM/CHARN, MSCR)

Sand-tempered wares were present as SSANB, a medium sand-tempered reduced fabric; SSANC, a white firing fabric; SSAND, a fine sand, sparse chaff-tempered ware with burnished surfaces and SSANE, a fine sand-tempered, pale grey fabric. The majority of the sand-tempered sherds were non-diagnostic body sherds and only one sherd each of SSANB and SSAND showed any evidence of use as indicated by the presence of an internal carbonised deposit, with the SSAND sherd also externally sooted. A flat-based SSAND vessel was also present as were sherds of a thin walled, highly burnished SSANE rounded jar-shaped vessel. There was also a single sherd of a coarse sand-tempered ware with sparse to moderate organic inclusions, SHGSA, with a possible Hampshire origin. Single sherds of chalk-tempered ware (MSCH) from a shouldered vessel were recorded, including abraded sherd with igneous inclusions (SGFM/CHARN), possibly from the Charnwood Forest area, Leicestershire. There was also a sherd of a crucible (MSCR) in a white firing fabric with abundant fine clear quartz. The vessel has an external self-glaze from use and an internal dark reddish brown deposit with sparse greenish blue flecks.

Ipswich-type ware
(IPSF, IPSM)

Three sherds of fine and medium tempered Ipswich-type ware (IPSF and IPSM) were recovered from the pits; identifiable forms consist of possible pitchers or jars, of which one sherd is externally sooted. The fabric was most common on the site as residual material in deposit [1028], which included the rim of a coarse ware (IPSC) jar.

Shell-tempered ware
(MSSD, MSSE)

Six sherds of shell-tempered ware were present on the site as MSSD with moderate to abundant shell, and MSSE with abundant bivalve shell and sparse organic temper. The forms include a MSSE jar shaped vessel with an everted rim and thumb impressions around the neck (Fig. 37.5) and a residual jar-shaped vessel in MSSD (Fig. 37.6).

Imported pottery

North French reduced wares
(NFBWA, NFBWB, NFBWC, NFBWD, NFBWD, NFBWE, NFGWA, NFGWB, NFGWD, NFGWE, NFEBB)

Imported Middle Saxon pottery, mainly in the form of North French black and grey wares, but additionally other sherds from Northern France/Eastern Belgium and the Rhineland, were all found at the Lyceum. The North French black wares NFBWA, a fine pinkish brown fabric with black surfaces; NFBWB, a sandy ware reduced throughout; NFBWC, a fine fabric with a bluish-white core; and NFBWD, a coarse sand-tempered version of NFBWA with a brown/pink core were all represented. Nearly all the sherds in these fabrics have burnished surfaces and diagnostic sherds come from pitchers, while one laminated sherd of NFBWD has an inverted flanged rim with a strap handle attached to it. A NFBWE pitcher sherd was identified with an internal black deposit.

The North French grey wares include coarsely sand-tempered NFGWA fabric, present as the everted rim of a jar or a pitcher with the characteristic inverted flanged rim. Sherds of fine sand-tempered fabric NFGWB, sherds of the fine sand-tempered, micaceous fabric NFGWD and a very fine sand-tempered ware NFGWE were also represented. The North France/Eastern Belgium hard fired greyware fabric NFEBB was present as a pitcher or jar with an everted and internally thickened rim above a circular piercing on the neck, (Fig. 37.7) the piercing probably used for the

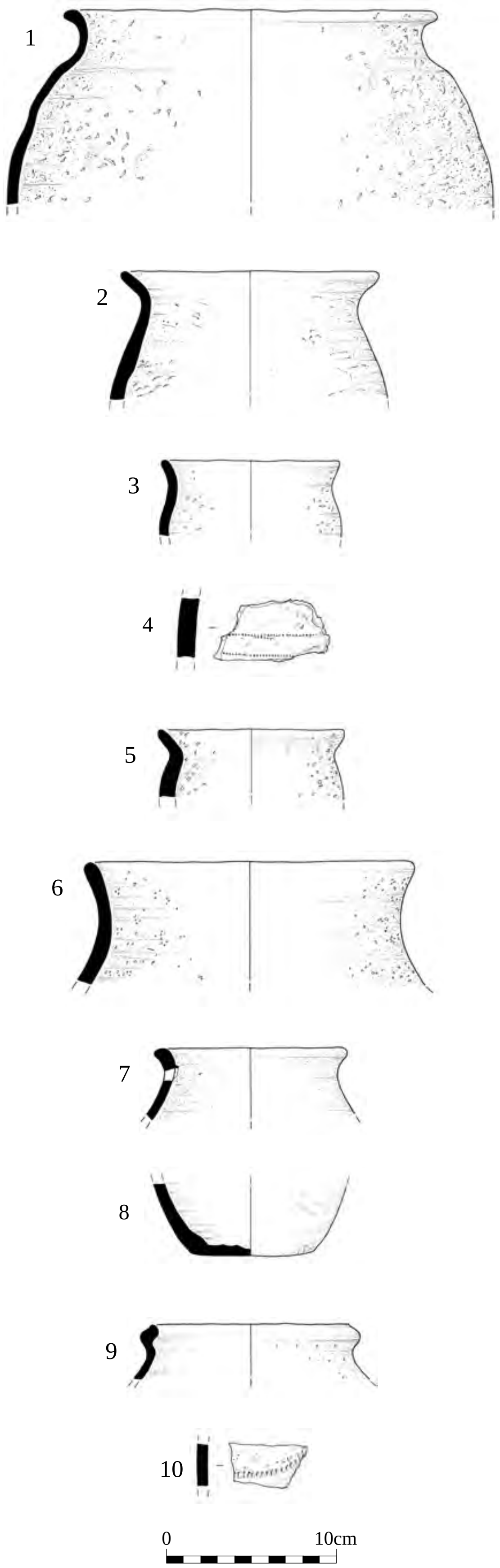


Fig. 37 The Lyceum pottery (1-4) chaff-tempered wares; (5-6) shell tempered wares; (7) N French reduced wares; (8-10) North French/Rhenish wares. Scale 1:4

suspension of the vessel by a thong. Other vessels with pierced necks of this date are known from Barking Abbey, as an Ipswich-type ware rounded jar (Redknap, 1991, Fig. 3.1, p.357); and at *Hamwic* as a Class 3 sand-tempered ware cooking pot and a Class 10 Mayen ware closed form (Hodges, 1981 p.7, Fig. 2,2.16, p9, Fig. 3,1 7).

North French/Rhenish wares (HUY/WALB, MSRWA, MSRWB)

The base of a wheel-thrown vessel (Fig. 37.8) in white-firing clay, which has fired to a light buff colour, with moderate fine sub-angular quartz and sparse rounded black iron ore up to 1mm in size may derive from a source between the Meuse and Rhine, either coming from Huy or Walberberg (L Blackmore, pers comm) and is temporarily coded HUY/WALB. The base is slightly convex and shows evidence for knife trimming. The interior of the vessel has a carbonised deposit and is externally sooted across a sherd break, suggesting that the vessel broke whilst in use over a fire. Recognisable fabrics of a Northern France/Rhineland origin, probably from Walberberg were present as oxidised sherds of a fine sandy ware (MSRWA) (Figs. 37.9 – 10) and a coarser version (MSRWB), mostly as thin walled body sherds that could come from a number of forms. This material includes the inturned rim of a closed-shaped vessel (Fig. 37.9), a strap handle, probably from a pitcher, and a sherd from a possible amphora that has a band of horizontal square grid rouletting (Fig. 37.10).

The Distribution of the Pottery

In Phase 3.1, Pit 5 produced a single sherd of sand-tempered ware (SSAND); Pit 11 contained a single sherd of chaff-tempered pottery and with the absence of any other types of pottery in these two pits they could be assigned to the early Middle Saxon period (before *c.* AD 750), although the sand-tempered wares could indicate a later date. Four pits, 2, 6, 7 and 13 contained similar types of pottery, with chaff-tempered, sand-tempered wares and imported Merovingan wares, early Walberberg-type wares and whiteware, all indicating deposition dates between *c.* AD 670 and AD 730/750. Pit 13 also produced a Hampshire coarse sand and organic ware (SHGSA) sherd. Pit 6 contained 46 sherds of Middle Saxon pottery, consisting mostly of large fragments of jar-shaped vessels in chaff-tempered wares (Figs. 37.2-3), as well as a comb-point decorated sherd (Fig. 37.4), a small number of sand-tempered sherds (SSAND), abraded igneous-tempered ware (SGFM/CHARN) and a crucible fragment. The date of this assemblage in Pit 6 would on the whole indicate deposition between *c.* AD 670-700, further confirmed by the single base sherd of the Huy or Walberberg whiteware (Fig. 37.8) together with the high occurrence of chaff-tempered wares including the sherd with comb-point decoration. This date would be in keeping with a location in the early nucleus of the *Lundenwic* settlement.

From Phase 3.2 pitting, a Walberberg sherd with rouletted gridded band (Fig. 37.10) recorded in Pit 3 may have been from an amphora and therefore imply a deposition date between *c.* AD 730-750 when this vessel form first starts to appear. Chaff-tempered and sand-tempered wares were present in pits 5a and 8, alongside sherds of Walberberg ware (MSRWA), indicating a date from *c.* AD 670. However, Pit 5a additionally produced the base of an Ipswich-type fineware vessel, indicating deposition after *c.* AD 730/750 and possibly dating to the start of this ware's appearance in the settlement.

In Phase 3.3, Pit 9, produced sand-tempered wares alongside Ipswich-type ware indicating a date from *c.* AD 730/750. Pit 10 could also be similarly dated with a single sherd of a pierced pitcher in North France/Eastern Belgium greyware, dated to the late 8th century (Fig. 37.7), with chaff-tempered wares and other imports. Pit 4 produced the largest assemblage of pottery from a single feature (50 sherds), dominated by chaff-tempered wares, including: a large rounded jar (Fig. 37.1); a single base sherd of an Ipswich-type fineware vessel; and five sherds of Middle Saxon shelly wares, including a small jar (Fig. 37.5). The presence of these shell-tempered wares indicates deposition from *c.* AD 775 onwards, but an early 9th century date is possible.

The Phase 3.4 slumped deposits over Pit 6 produced largely chaff-nd sand-tempered wares as well as imported wares, such as pitchers in North French black ware and North French or Rhenish oxidised ware (Fig. 37.9).

The groups of pits at the Lyceum Theatre contain pottery groups dating from the 7th to early 9th centuries; with the majority (Phase 3.1) dated to *c.* 650-750 by the presence of chaff-tempered wares. However, this could be further refined by the incidence of an imported whiteware in Pit 6 and Walberberg fabric in Pit 7, both dating from *c.* AD 670, while a possible Walberberg amphora with rouletting in Pit 3 may date the pit to after *c.* AD 730. In Phase 3.2, Pit 8 produced chaff- and sand-tempered wares as well as Walberberg fabrics dated from AD 670. A sherd of Ipswich-type ware was present in Pit 5, which may represent the early introduction of this ware into *Lundenwic* between *c.* AD 730-750, although it could be later. Phase 3.3 pits generally contained smaller amounts of apparently residual chaff-tempered ware and indicate a date after *c.* AD 750. Pit 9 contained a single sherd of Ipswich-type ware and Pit 10 a North French-Eastern Belgium pierced pitcher, supporting a late 8th century date for these features. However, the ceramic group recorded in Pit 4 of this phase contains a dating contradiction; the types of pottery present should not all have been in use at the same time. The pit produced a noticeable quantity of chaff-tempered wares, as sizeable proportions of two vessels, together with a sherd of Ipswich-type ware and five sherds (representing two vessels) of shell-tempered wares, dated in *Lundenwic* from *c.* AD 775-810 when they were first introduced, becoming more prominent in the early 9th century. This suggests either a long use-life for the chaff-tempered ware vessels, or that they derived from earlier features truncated by the pit. An early 9th century date is suggested for Phase 3.4 occupation deposits, though much of the recovered material appears residual and there was a noticeable absence of Ipswich-type ware, shell-tempered wares or the imports that are a signature for this date.

On the whole, the Middle Saxon pottery from the Lyceum site is representative of that found across the settlement. Although some of the pottery may have been marketed in its own right, the local wares, like the imports, were used for cooking, storage or liquid serving, but may have entered the settlement as containers for traded products and then used for secondary functions. Of note is a sherd of crucible recovered from Pit 6 that fits in with other metal working evidence on the site; not all associated with smelting (*see* Riddler, this chapter). It is only recently that fragments of Middle Saxon crucibles have started to be recorded in *Lundenwic*: at James Street (Jarrett this volume); the Royal Opera House (Bowsher and Malcolm 1999; Malcolm *et al* 2003;); and a glass-working crucible at Hare Court, Middle Temple (Jarrett forthcoming).

Table 18 Distribution of the Lyceum pottery in Pits 2-11 and 13

	Phase 3.1 pits						Phase 3.2 pits			Phase 3.3 pits			Phase 3.4, slumping	
Fabric	Pit 2	Pit 5	Pit 6	Pit 7	Pit 11	Pit 13	Pit 3	Pit 5a	Pit 8	Pit 4	Pit 9	Pit 10	Pit 6	Pit 8
CHAF			12 (393)	7 (379)		1 (23)			4 (230)	30 (875)		2 (65)	2 (84)	2 (24)
CHAFX			1 (5)											
CHFI											1 (11)		1 (5)	
CHFS	1 (2)		7 (136)					1 (4)					1 (4)	
CHSF	2 (88)		18 (136)		1 (17)		4 (52)		4 (58)	5 (72)			8 (81)	
CHSF + CHALK			2 (68)											
IPSF								1 (25)		1(26)				
IPSM											1 (11)			
SSANB									1 (9)	6 (36)				
SSANC											1(5)			
SSAND		1 (6)	3 (15)				1 (1)		1 (9)			4 (10)	2 (13)	1 (9)
SSANE												1 (12)		
MSCH										1 (9)				
SHISA						1 (33)								
SGFM/CHARN			1 (28)											
MSCR			1 (11)											
MSSE											5 (150)			
HUY/WAL			1 (54)											
MSRWA	1 (1)			2 (14)			1(10)		2 (6)			1 (1)	3 (22)	
MSRWB									1 (2)				1 (8)	
NFBWA	1 (1)									2 (9)				
NFBWC												3 (8)		
NFBWD													2 (23)	2 (9)
NFEBA												1 (1)		
NFEBB												1 (22)		
NFGWA	2 (8)					1 (28)							1 (12)	
NFGWB				1(13)		1 (20)							1 (8)	
NFGWD													3 (35)	
Total	7 (100)	1 (6)	46 (1227)	10 (406)	1(17)	4 (104)	6 (63)	2 (29)	13 (314)	50 (1177)	3 (27)	13 (119)	25 (295)	5 (36)

By sherd count (weight in g in brackets)

THE SMALL FINDS

Ian Riddler

Dress Accessories

The three pins (Fig. 38.1) include one of copper alloy (SF 2) (Pit 9) and two of bone or antler (SF 1) (Pit 9) and (SF 19) (Pit 8). The copper alloy pin (SF2) has a simple, undecorated biconical head, which is a common Middle Saxon form, and there are several examples with similarly shaped heads from *Lundenwic*. Ross has suggested that the floruit of this type lay in the 8th century and this is borne out by discoveries from the Royal Opera House (Green 1963, fig 5; Ross in Whytehead *et al* 1989, 120; Blackmore 2003, 267).

Comparable pins are known from *Hamwic*, where there are at least seventeen examples, a number of which include ring collars below the head, as is also the case here. They are common also at other Middle Saxon sites (Garner 1993, 109 and fig 11.12; Hinton 1996, 25-8; Richards 1999, 71; Leahy 2000, 65-71; Riddler 2001b, 228).

One of the bone or antler pins (SF 19) has a straight shaft, which is devoid of any swelling or hipping, and a lightly modelled head. Evison has reviewed bone pins of early Anglo-Saxon date and her work has been supplemented by recent studies, which are concerned also with pins of Middle Saxon date. Similar, slender pins that can be assigned to this period are also known from Frisia (Roes 1963, 65-6 and pl LIII.11-13 and 15; Evison 1987, 83; Riddler 1993, 115; Riddler *et al* forthcoming). This example can be assigned to Ipswich-type 4, which also includes pins from Appledown, *Hamwic*, Nazeingbury, Pennyland and Wharram Percy (*ibid*). They are largely of 7th and 8th century date.

The head and a small part of the shaft survive from a second bone pin (SF 1). The head is discoidal, with a central perforation. This is a common form of Middle and Late Saxon bone pin, and examples are widespread in northern Europe. They occur at Birka, Dorestad, Dublin, Ipswich, Thetford and York, amongst other sites (Danielsson 1973, fig 26m; Roes 1965, pl XX.150; Schwarz-Mackensen 1976, 35; Riddler *et al* forthcoming; Rogerson & Dallas 1984, fig 190.38; Waterman 1959, fig 14.15; MacGregor *et al* 1999, fig 909.6865). A larger example recovered from the Royal Opera House has been discussed by Blackmore (2003, 310).

Small bone pins without perforations, of 7th and 8th century date, were used to fasten textiles, rather than hair. Evison has plausibly suggested that they were used to fasten textiles around spearheads when found in male graves, as well as securing jewellery about the neck in the graves of women (Evison 1987, 82-3). Several bone pins were also found with the Cuerdale hoard of silver coins and bullion, where they had presumably helped to fasten a purse of textile or leather (Edwards 1977). They are now thought, however, to be of Roman date (Edwards 1984). Perforated bone pins would also have been used as dress accessories, with those of 8th and 9th century date generally being of a larger size than the earlier, unperforated examples.

Items of Personal Use

Double-sided composite comb

The form and decoration of the double-sided composite comb (SF 59), (Pit 2) (Fig. 38.2) are characteristic of Middle Saxon design and, on typological grounds, it should belong to the earlier part of this period. This accords with the phasing of the site, based on the ceramic evidence. It is a fragment of a long and narrow comb of an elongated type that is familiar in Anglo-Saxon contexts from the second half of the 7th century onwards (Sparey-Green 1984, 151; Riddler 1993, 112; 2001a, 229; Riddler *et al* forthcoming). The comb has been riveted between tooth segments and through the end segment, using the most common system adopted during the Anglo-Saxon period. It is decorated on both sides in the same manner, with bands of lattice patterns confined to either end of each connecting plate. This type of decoration can be seen on 7th century combs from burials at Chadlington, Dorchester and Winnall, and on combs of 7th and 8th century date from settlement contexts at Barton Court Farm, Canterbury, *Hamwic*, Ipswich, Walton and West Stow, as well as other sites (Leeds 1940, pl VIb; de Hoog 1984, fig 107; Blockley *et al* 1995, fig 511.1168; Sparey-Green 1984, fig 13.10; Riddler *et al* forthcoming; Farley 1976, fig 25; West 1985, fig 73.4). It is commonly seen as a decorative device on Frisian combs and other items of the 7th century, but combs from the North Sea littoral of this period are mostly single-sided and tend to have display sides (Tempel 1972, 57).

A number of combs have been published from *Lundenwic*, and most of them are double-sided composites (Blackmore 1988b, 137 and fig 38; Blackmore 1989, 131 and fig 45). The majority of these combs are undecorated, and only two further examples, one of which comes from James Street, have lattice designs on their connecting plates (Malcolm *et al* 2003, fig 96.B114; Riddler this volume). The type of decoration and its confinement to the ends of each connecting plate of the Exeter Street comb are typologically early features, which suggest that the comb can be dated to the 7th century, or to the first part of the 8th century. However, the comb with lattice decoration from the Royal Opera House came from a context placed in the first half of the 9th century (Malcolm *et al* 2003, 113). In contrast to the Exeter Street comb, that example has a display side and a narrow format, and those are typologically later elements of Middle Saxon comb design, although the 9th century dating for the comb is questionable.

Household Equipment

Quernstones

Three fragments of quernstones (SF 47-9) were recovered from Middle Saxon pits. Fragments (SF 47) and (SF 49) were recovered from the Phase 3.4 slumped deposits over Pit 6 and (SF 48) from Pit 9. A fourth piece (SF 68) came from a context associated with site clearance, which also produced a number of other items of Middle Saxon date. All four pieces are fragments of basalt lava querns, almost certainly from the Niedermendig region of Germany. Querns produced in this material are relatively common finds in Roman Britain, and they reappear in some quantity during the Middle Saxon period (Jankuhn 1963, 198-200; Crummy 1983, 73-6; Freshwater 1996; Goffin 2003a, 205). Virtually all Middle Saxon querns recovered to date from *Lundenwic* are made from basalt lava (Blackmore & Williams 1988, 133-4; Whytehead *et al* 1989, 130-1; Goffin 2003a, 204 and 209).

The dimensions of one fragment of a lower stone (SF 47) can be reconstructed, providing a diameter at the rim of approximately 400mm, and a thickness of 70mm, which places it within the range of dimensions established previously for quernstones from Middle Saxon London (Cowie *et al* 1988, 133; Goffin 2003a, 207).

Honestone

A broken fragment of a honestone of trapezoidal cross-section (SF 50) (Pit 6, Phase 3.4, slumping), (Fig. 38.3), can be identified as light, greenish grey, calcareous, silty, fine sandstone. The origin of the stone is uncertain but its appearance is similar to samples of sandstone from the Thanet Sands in Kent, and notably the Reculver silts. It is deeply scored by grooves on two surfaces, confirming its function as a hone.

Several hones, some of which also use Kentish stone, have been found in previous excavations within *Lundenwic* (Green 1963, fig 7; Blackmore & Williams 1988, 134; Whytehead *et al* 1989, 130 and 131; Goffin 2003a).

Textile Equipment

Needles

The three bone and antler needles display a variety of head and eye forms (Fig. 38.4). The antler needle (SF 41) (Pit 6) is now curved but may originally have been softened during manufacture and straightened. Equally, however, the curve of the shaft could be a deliberate (if rare) feature. It can be compared with an antler needle from Wharram Percy, Area 6 (Andrews and Milne 1979, fig 70.35). It is relatively narrow, in comparison with the two complete bone needles (SF 10) (Pit 8) and (SF 38) (slumping over Pit 8), which have large perforations in their expanded heads, and taper to sharp points. Both of these needles are made from pig fibulae and one of them (SF 10) also has a lightly curved shaft. The perforation of the other example (SF 38) is set well down the shaft, which is normally a characteristic of narrow bone needles, rather than these wider examples. The head has been cut from the proximal end of the bone, which is not a common procedure, although it can be seen with comparable examples from Ipswich and York, and this may explain the location of the perforation (Riddler *et al* forthcoming; MacGregor *et al* 1999, 1951 and fig 910.6895). The other needle (SF 10) includes a standard large, sub-circular perforation at the head, which retains most of the original surface of the bone. It represents one of the most common forms of bone implement of the Anglo-Saxon period.

Some confusion remains concerning the distinction between bone and antler pins and needles during the Anglo-Saxon period (MacGregor *et al* 1999; Malcolm *et al* 2003, 306). The antler object (SF 41) can be readily accepted as a needle on the basis of its slender shaft and the position of its perforation, located well down the shaft. The pig fibula objects (SF 38) and (SF 10) both belong to a more indeterminate category of broader, larger and longer implement. Both implements could have been used in textile manufacture and repair but they are perhaps better suited to working with nets, which have a wider mesh. Both are relatively crude objects, which could be produced in a few minutes and they are not necessarily the products of a bone worker; they could be manufactured as required from pig fibulae obtained from a butcher. As such, it is difficult to believe that they served as dress accessories.

Earlier published needles from *Lundenwic* have consisted largely of modified pig fibulae; although several examples made from other bone types are also known (Green 1963, fig 9; Blackmore 1988b, 134 and fig 38.2, 3 and 9; Blackmore 1989, 132 and fig 45.294-8; Malcolm *et al* 2003, 306).

Loomweights

Twenty-four fragments stemming from sixteen loomweights were retrieved from eleven contexts (Table 19). Most contexts produced only a single example but two were recovered from one context and six came from a further deposit associated with the initial clearance of the site. With some exceptions, these contexts are the fills of Middle Saxon pits. The relative quantity of loomweights from this site accords well with the totals from most of the previous *Lundenwic* excavations, with the exception of James Street (Riddler this volume). Large quantities of loomweights also came from the Royal Opera House (Goffin 2003c).

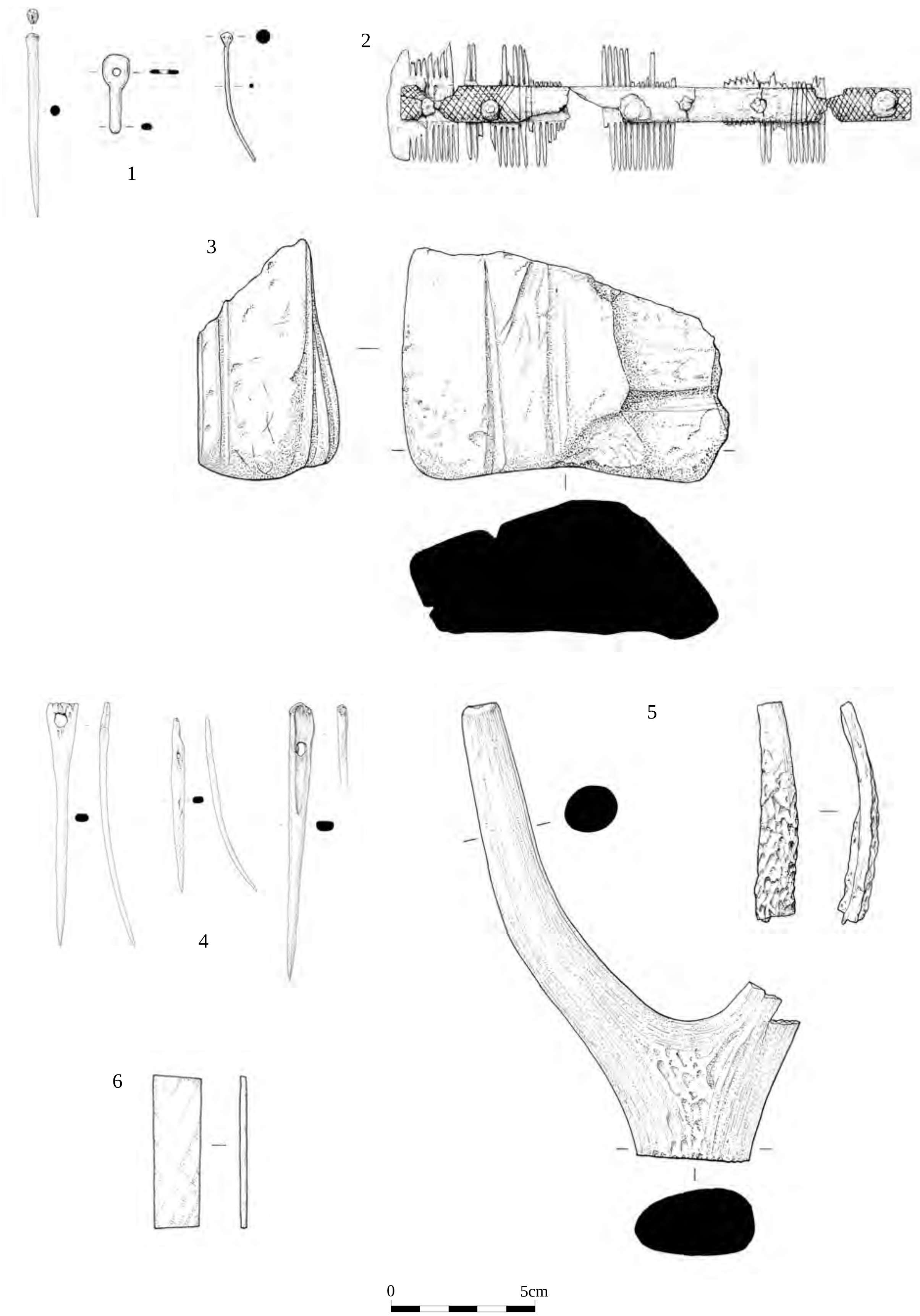


Fig. 38 The Lyceum small finds (1) pins SF19, 1, 2; (2) double sided composite comb SF59; (3) fragment of hone stone SF50; (4) needles SF10, 41, 38; (5) antler waste SF93, 98; (6) antler blank SF 70. Scale 1:2

Table 19 Lyceum loomweight dimensions

Context	Pit	Phase	Sf	Type	Weight	Quantity	External Diameter	Internal Diameter	Height	Estimated Weight (g)
26			17	Bun-shaped	91	1		10		606
29	10	3.3	11	Intermediate	263.5	1	140	20	44	752.9
47	10	3.3	37	-	58	1		10	47	446.2
60	6	3.1	23	Intermediate	213	1	115	15	51	507.1
61	6	3.1	13	Intermediate	144.5	1	110	10	51	578
61	6	3.1	12/35	Intermediate	294.5	2	110	15	50	525.9
85	Over 6		36	-		1				
1028			None	Intermediate	334.5	2	115	15	50	539.1
1035	3	3.2	65	Intermediate	160.5	2	115	20	48	642
1060	2	3.1	64	-	99.5	1		10	44	321
1130			67A	Intermediate	387.5	2	120	20	48	692
1130			67B	Intermediate	265	1	110	20	50	757.1
1130			67C	Annular	319	1	125	20	50	559.6
1130			67D	-	361.5	5	130	15	52	561.6
1130			67E	-	51.5	1		20		
1130			67F	-	59	1				

There is one example (SF 67C) (from a modern feature) of an annular loomweight and another (SF 17) (from a post-medieval feature cut into Pit 10), which can be described as bun-shaped, using Dunning's definitions. The remaining eight examples that could be identified to type are of intermediate form. The bun-shaped loomweight (SF 17) is a residual find from a post-medieval context and it cannot be related stratigraphically to the annular and intermediate series. Typologically, the annular loomweight could be earlier than those of the intermediate series or concurrent with them, as seen at the Royal Opera House (Goffin 2003d, table 34).

The range of external diameters for the ten measurable loomweights lies between 110 and 140mm, which compares well both with the figures for a larger sample of annular and intermediate loomweights from Mucking and with those from other sites within *Lundenwic* (Hamerow 1993, fig 45; Blackmore 1988a, 112 and 114; Goffin 2003c, 221 and table 35; Riddler forthcoming c). Seven out of ten loomweights possess diameters between 110 and 120mm, which can be compared with 68% of the total of annular loomweights from Mucking and 67% of the sample from James Street. This suggests that loomweights of both annular and intermediate forms were produced to similar sizes. The height of the loomweights in this sample varies between 44 and 52mm, which also compares well with previous examples (Blackmore 1988a, 114). There are no examples of the larger group with heights well in excess of 50mm, which have been noted previously (Blackmore 1988a, 111; Malcolm *et al* 2003, table 7).

If loomweights of the two forms were produced to similar sizes, it follows that the intermediate type, which uses more clay and has a narrower central aperture, should be heavier than the annular type. The overall weight of each loomweight has been estimated on the basis of calculations similar to those used for Estimated Vessel Equivalents, and this suggests that most of the sample originally weighed between 500 and 650g. These weights are generally greater than the Mucking sample, which is the expected result. Equally, they are slightly heavier than the assemblage from James Street, which varied from 380 to 700g, with most loomweights lying within the range of 475 – 500g (*see* above).

Most of the loomweights from Exeter Street can be ascribed to fabrics 1a and 1b, although it has proved difficult to reconcile the fabrics with the descriptions provided for earlier discoveries. All of the loomweights have been fired.

The loomweights would have been used on a warp-weighted loom, originally in sets perhaps of around sixty, although the width of the loom would have determined the number present (Hoffmann 1964, 133; Plunkett 1999).

Crafts and Industries

The antler waste

Twenty-two fragments of antler, weighing 1.37kg, were recovered from eleven contexts within the sample of worked and unworked bone selected for analysis (examples of which have been illustrated, Fig. 38.5). In addition, several antler shavings were recovered from a sample taken from Pit 7,

Table 20 Antler Waste from Lundenwic sites

	Burrs:			Other Antler:						
	Naturally-Shed	**Skull-Attached**	**Indeterminate**	**Crowns**	**Tines**	**Beam/Tine Junctions**	**Beam Sections**	**Beam or Tine**	**Cortile Tissue**	**Total**
Maiden Lane (MAI86)	2	2	1		12					17
Maiden Lane (ECT96)					2					2
Jubilee Hall					1				1	2
James Street	3			1	10	1		1		16
Peabody Site				1	1		1			3
National Portrait Gallery				1	5		4			10
Exeter Street		4		8	7	1	1		1	22
Total	**5**	**6**	**1**	**11**	**38**	**2**	**6**	**1**	**2**	

[87] context. The assemblage is clustered around Pit 6, which produced twelve fragments, in comparison with three from Pit 7, two from Pit 8 and Pit 10 and one from Pits 4 and 5. All of the material stems from the antler of red deer. It survives in good condition and provides useful corroborative information on antler working at this period. A rough estimate of the quantity of antlers utilised for working can be established by considering the components of the assemblage (Table 20. There are four burrs, all of which retain pedicles, and they include a pair forming a calvarium, still attached to the upper part of a skull. This would indicate that four antlers had been used, but there are also eight separate sections from crowns, suggesting that at least eight antlers formed the raw material. If this was the case, then comparatively little of each antler remains.

All four burrs are skull-attached and this is an unusual circumstance within any antler assemblage of Middle Saxon date. In most cases naturally shed antlers form the majority of an assemblage (Table 21). The situation may vary a little, however, either with proximity to waterfronts, or possibly for other reasons. The antler waste of 9th century date from Greyfriars Road at Ipswich included a larger proportion of skull-attached burrs than the contemporary sample from the Buttermarket, which was further inland (Riddler *et al* forthcoming). In contrast, Ulbricht noted that at Schleswig the ratio of naturally shed to skull-attached antlers changed over time, in favour of the latter (Ulbricht 1984, 73). At Saint-Clair-sur-Epte, an assemblage of 5th century date included more skull-attached burrs than naturally shed examples (Thuet 2003).

The two pedicles were removed from the skull with the use of an axe or knife, but subsequent dismemberment of the material utilised a saw, one of the most important tools of the antler and bone worker (Ulbricht 1978, 33; MacGregor 1985, 55; Riddler forthcoming c). Most of the antler was sawn cleanly in a single direction, although larger surfaces were sawn from several locations and the central cortile tissue was then broken. Two grooves cut by a saw were recorded, of 1.4 and 3.1mm in width. The latter measurement is wide for an antler worker's saw, most of which do not exceed 2.5mm in width (Riddler forthcoming c). Examples of saws that may have been used in this process have come from York and Dublin (MacGregor *et al* 1999, 1945-8; Lynch and Manning 2001, 178 and fig 6). A Middle Saxon saw blade came from excavations at the National Portrait Gallery (Riddler this volume).

The surviving antler consists mainly of burrs and tines (including a number from crowns) and represents antler discarded in an early stage of the working process, when the material was sawn and split roughly to size (Ulbricht 1978, 25-30).

Two pieces indicate the nature of the finished product. A

Table 21 Naturally shed and skull attached burrs from selected sites

Site	**Naturally Shed**	**Skull Attached**	**% Skull Attached**	**Reference**
Hamwic	245	46	18.8	Riddler forthcoming b
Ipswich	78	37	30.6	Riddler forthcoming d
York, Coppergate	35	13	27.1	MacGregor *et al* 1999
Whithorn	116	11	8.7	Nicholson 1998, 475
St Clair-sur-Epte	4	6	60	Thuet 2003
London, Royal Opera House	14	8	36	Malcolm *et al* 2003, 171

rectangular blank of antler (from slumping over Pit 6) was intended as a tooth segment for a composite comb (Fig. 38.6). It has been cut to shape, but has not been riveted and it does not, therefore, derive from a comb that had been fully assembled. Rectangular blanks of this form were prepared alongside pairs of connecting plates, which were then assembled together and fastened with rivets. Similar blanks have been noted previously from excavations within *Lundenwic* (Blackmore 1988b, 137; Malcolm *et al* 2003, 174).

In addition, a segment of cortile tissue of triangular section stems from a section of beam 68mm in length. It is likely that the surface tissue that originally accompanied this fragment was also used to make tooth segments for combs. The significance of the lengths of cortile tissue, in relation to tooth segments, has been outlined by Hilzerówna and Christophersen (Hilzerówna and Rogownictwo Gdánskie 1961, 54; Christophersen 1980, 160). From the 4th century onwards, the principal object to be produced from antler was the composite comb (Ulbricht 1978, 26) and the waste assemblage from Exeter Street is liable to have been discarded by a comb maker.

The quantity of antler from the Lyceum is relatively small but, as noted above, it stems from at least eight antlers. Estimates of the number of combs that could be manufactured from a single antler have been produced for several sites of a slightly later date, and notably for the settlement of Haithabu (Tempel 1970; Ulbricht 1978, 117-8; Ambrosiani 1981, 155-7). Tempel argued that an average of 3.7 combs could be made from a single antler at Haithabu, although Ambrosiani felt that the figure would be closer to three (Tempel 1970, 221; Ambrosiani 1981, 155). On that basis, eight burrs would provide material for 24 combs, each of which might take two or three days to manufacture.

Small quantities of antler waste have come from other excavations in *Lundenwic*, and a slightly larger assemblage was retrieved from the Royal Opera House (Bowsher and Malcolm 1999, 7; Malcolm *et al* 2003, 170-5). Evidence from that site, in particular, supports the general image of antler working at this time (Riddler 2001a). Until recently, comb makers have been viewed as itinerant craftsmen (Ambrosiani 1981, 38-40; MacGregor 1985; Crummy 2000). Within the Middle Saxon 'wic' sites it may well have been a more sedentary craft, however, practised in the same location over a relatively long period of time (Bowsher and Malcolm 1999, 8-9; Riddler forthcoming a). Equally, it was not practised in every household, and comb making in particular remained a specialist craft. Its relationship with the working of horn at this time is significant, given that horn working is a sedentary occupation, carried out by necessity over a relatively long period of time. The principal deposits of antler from the Royal Opera House were accompanied by horn working waste (Malcolm *et al* 2003, 94). Moreover, Irish sources suggest that by the 7th century comb makers worked also with horn, in sedentary circumstances (Dunlevy 1988, 345 and 347).

Buildings and Services

Structural ironwork

Within one layer of a Middle Saxon pit (Pit 9) lay several pieces of structural ironwork. They include a length of iron rod of square section which has been bent over to a U-shape (SF 29.2) (Fig. 39.1), a further section of iron bar (SF 29.5) and a diamond-shaped rove (SF 29.4), which is accompanied by a second example from a further fill of the pit (SF 9), (Fig. 39.2). Roves are familiar from Anglo-Saxon ships, from burials, and from some structures, including several of those at Yeavering (Brown 1925, 117; Hope-Taylor 1977, 193). They have also been retrieved from contemporary settlements and burials (Addyman and Hill 1969, fig 24.5; Kjolbye-Biddle 1995; Rodwell 1993; Riddler forthcoming a).

Daub

A total of 334 fragments of daub, weighing just under 9kg (8968.5g), came from fifteen contexts. Only three contexts produced weights in excess of 1kg, as shown in Table 22.

Table 22 Quantities of daub from selected contexts from the Lyceum

Pit	Context	Quantity	Weight (g)
3	1035	125	2670.5
3	1045	93	2659.5
4	1094	39	1076

Fragments from all of these contexts are composed of a fine sandy clay matrix, which has been tempered with organic material to a greater or lesser extent. There are also traces of fine quartz inclusions. The overall fabric type is consistent across the sample, although some fragments contain angular flint and quartz inclusions, and others include hollows that indicate their former presence. The single fabric identified here is essentially that seen in earlier studies of daub from Middle Saxon London (Goffin 1988, 115; Goffin 2003d, 214-5).

The visual appearance of the material, its weight and its hardness all vary considerably, according to the amount of heat to which it has been subjected. The colour varies from buff grey through red and orange to black, with the material

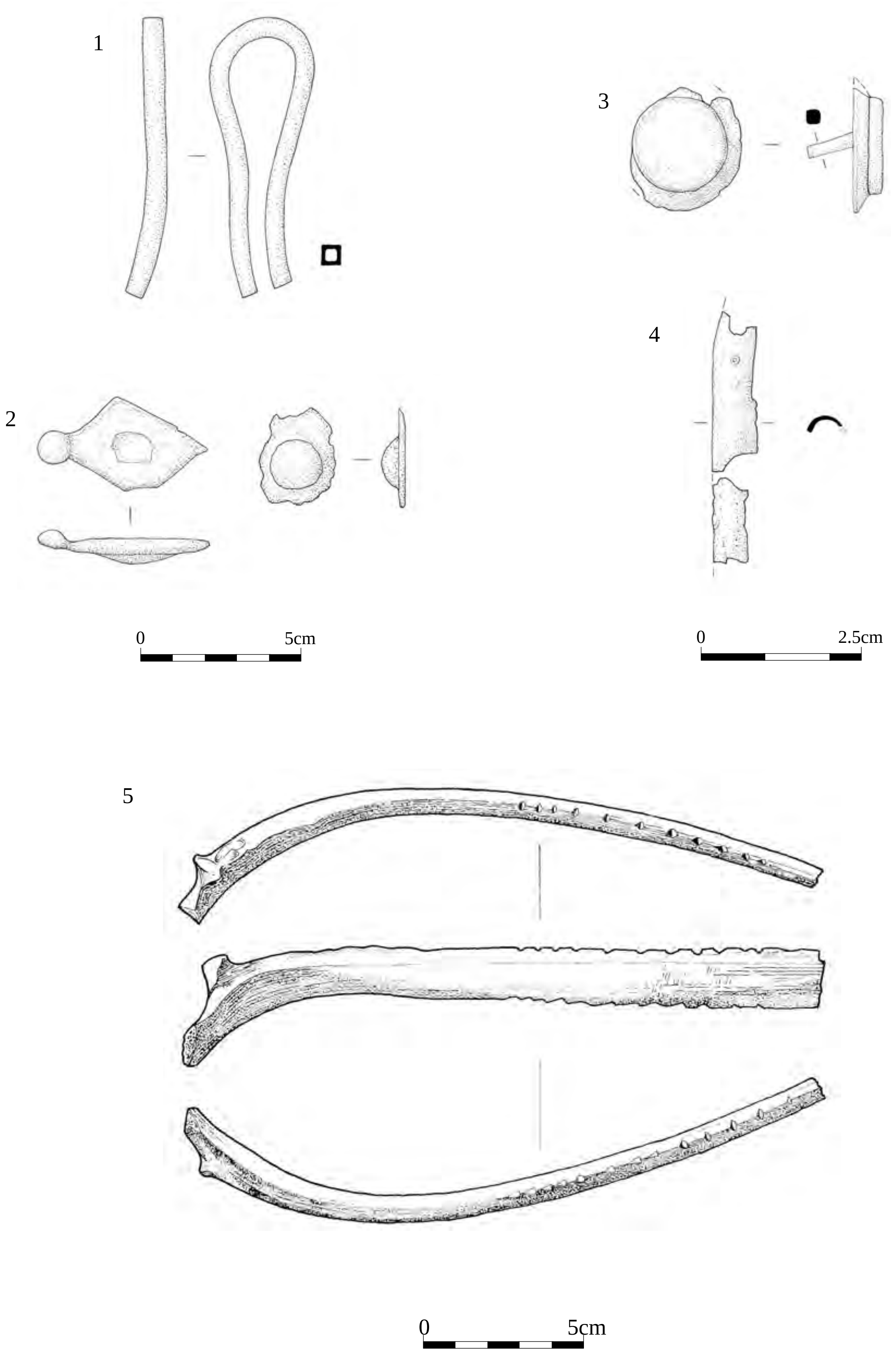


Fig. 39 The Lyceum small finds (1) length of iron rod SF29.2; (2) roves SF29.4, 9. Scale 1:2; (3) flat-headed copper alloy stud SF7; (4) copper alloy sheet metal binding SF6. Scale 1:1; (5) the serrated cattle rib. Scale 1:2.

from one context [1045] (Pit 3) showing the most pronounced evidence for burning.

The majority of contexts from which the daub has been recovered are the fills of Middle Saxon pits, with one exception [64], a layer covering a series of stakeholes (Phase 3.4). There is no evidence that would place any fragments of daub in a direct relationship with any structures, and none of the material exhibits any constructional features, other than the imprints of wattles and other timbers. The existing fragments are commensurate with use as clay-skimmed fencing on structures.

Of nine fragments with an applied whitewash, four come from one context [1035] and two from another [1045]. Both are fills of the same pit, Pit 3. Just under one third of the fragments bear distinct impressions of wood and withy traces, with four pieces showing evidence for juxtaposed vertical and horizontal timbers. These pieces with wood running in two perpendicular directions demonstrate the use of a larger rod with an average diameter of 20mm, about which withies of 10-15mm diameter were interwoven. The larger rods may have been placed directly into the ground, or attached to wooden framing.

No traces of bark or textile could be seen, although there was clear evidence for smoothing of the outer facing side of the daub. Of particular significance is a facing fragment [1045], which has three distinct rows of withies visible, each 15-17mm in diameter. The fragment is heavily burnt.

Miscellaneous Objects

Amongst the assemblage of small finds from Middle Saxon contexts is a flat-headed copper alloy stud (SF 7) (Pit 8), (Fig. 39.3), which surmounts a shaft of circular section. The same context also produced several fragments of copper alloy sheet metal binding (SF 6), (Fig. 39.4) which, to judge from their x-ray, may have been decorated with ring-and-dot designs.

A copper alloy disc (SF 5) from context [29] appears to be a Roman coin, which, unfortunately, is illegible.

A serrated animal rib

A cattle rib from Pit 7 ([87]), (Fig. 39.5), includes a series of notches on each edge, spaced at intervals of 5, 8 and 10mm. They have been cut with a knife and they are irregular both in their spacing and in the depth that they have been cut into the bone. Nonetheless, there was a deliberate intention to modify the bone.

A similar object has come from a context of early Anglo-Saxon date at Pakenham in Suffolk (Brown *et al* 1954, 206 and fig 30b; Riddler 1993, 117). The notches extend across at least 140mm of one edge of that rib, which is fragmentary. In addition, Roes has illustrated several examples from Frisia with notches on one or two edges and, in some cases, with additional marks at either end (Roes 1963, pl XLIII.1-5). She regarded them as implements for scraping, 'perhaps for scaling fish or cleaning pelts' and this object, which retains the curved end of the bone, would have been suitable for that purpose (Roes 1963, 48).

As an alternative, the presence of notches on both edges of the rib bone would also have allowed it to be used as a winder, possibly for wool. Some of the notches are aligned with each other across the bone, although others are not.

Equally, however, objects of this type could possibly have been used as tally-sticks. Wooden tally-sticks, like those from York, belong essentially to the medieval period, although an example from London came from a context of late Saxon or early medieval date (Morris 2000, 2338-9). Formal medieval tallies were split in two but private tallies were also current in the 13th and 14th centuries, and they were not divided. The notches do not form distinctive and obvious patterns, however, which would be expected with a tally device.

The rib bone has been notched with the aid of a knife and it is also possible that it served merely as a bone trial for that implement, acting in effect as a gauge for the sharpness of the blade and for its cutting action. Antler trial pieces for comb makers are known from Dublin and so-called 'practice pieces' have been published from Maastricht (Riddler & Trzaska-Nartowski forthcoming b; Dijkman and Ervynck 1998, 25 and fig 18). These objects should be distinguished from motif pieces, which are also common in Dublin (O'Meadhra 1979; 1987).

THE METAL WORKING

Ian Riddler and James Rackham

Forty-two fragments of iron slag, weighing 3.6kg, came from eight contexts, all of which were the fills of Middle Saxon pits. One context [1043] (Pit 2) provided seventeen fragments weighing 539.5g and the layer beneath it [1048] provided two further pieces, weighing 180.5g. Over 2kg came from a further context [87] (Pit 7). The remainder of the material was dispersed in small quantities across the fills of three pits.

The assemblage consists largely of fragments of smithing slag, as well as two small pieces, which may represent smelting slag, and three small sections of hearth bottom. Both the range of material seen here, and its quantity, are matched by earlier discoveries from London and by those from contemporary sites (Cowie *et al* 1988, 131; McDonnell

1989a; McDonnell 1989b, 126-8; Morton 1992, 56; Garner 1993, 111-3).

Hammerscale was recovered from several bulk environmental samples by running a magnet through the fine residue (<2mm) of the soil samples. The hammerscale was found, albeit in small quantities from contexts [16], [48], [1035], [1058], [1076], and [1094], from Pits 3, 4, 5, 6 and 9 respectively. None of the samples produced hammerscale in abundance but its occurrence with small and large fragments of slag indicates that smithing was probably carried out nearby, possibly in the tenements with which the pits were associated. A smithy was identified at the Royal Opera House, in an 8th century context (Malcolm *et al* 2003 p176 and indicated at James Street (Leary, Chapter 2, this volume.)

As noted above a crucible fragment from the slumped deposits above Pit 6 (Phase 3.4) proves further evidence for the working of non-ferrous metals at *Lundenwic* (*see* Blackmore 2003 for a more expansive discussion).

THE INSCRIBED ECHINOID

Elisabeth Okasha

An inscribed fossilised echinoid was recovered from Pit 6, (Fig. 40). A detailed account, with full discussion of the possible interpretation of the lettering, has been published elsewhere and will not be replicated here (Brown *et al* 2001). Scratched on to the side of the fossil are upper case Latin letters that varying between 6mm and 9mm in height. The letters are E, E, B, N or U, A or R but in either case lacking a top horizontal bar. There is no conclusive evidence for any further letters.

Fig. 40 The Lyceum inscribed echinoid. Scale 1:1

The epigraphic evidence is in accordance with the Middle Saxon date of the fossil's archaeological context, although the meaning of the text is not clear and it is not certain whether it is in Latin, in Old English, or is gibberish.

It seems likely that the text consists either of practice letters or of a string of letters felt to have magical significance. Practice letters, including casually scratched personal names and alphabets both Roman and runic, appear on a number of different sorts of object from Anglo-Saxon England (Page, Chapter 5, this volume; Okasha 1992, no. 186, pp. 41-2; 1983, no. 178, p. 100) and the letters inscribed here might have no meaning and be simply practice letters. However it is considered that the most probable explanation is that the inscribed fossil was an amulet and the text might well have contained letters indicating, or reminiscent of, a magical formula.

THE ENVIRONMENTAL ARCHAEOLOGY

James Rackham and Andrea Snelling

In the expectation of Middle Saxon occupation at the site a series of research topics were proposed before the excavation. The *Lundenwic* sites represent an early stage in the development of early medieval urban settlements and as such the development of hierarchy, social stratification and specialisation are topics that can be addressed through the environmental and archaeological analyses. Previous authors have posed questions concerning the nature of the food supply to these Saxon 'wic' sites. O'Connor (1991, 1994) has postulated a centrally controlled supply of animal food resources to the Middle Saxon site at Fishergate, York, and has tested three hypotheses; an exchange, a redistribution and a commodity structure (O'Connor 2001). His conclusion is to tend to advocate the redistribution hypothesis controlled by a command economy or institutional organisation. Bourdillon (1994) who suggested that *Hamwic* was provisioned from royal estates surrounding the settlement reached similar conclusions. Saunders (2001) describes emporia as having little or no impact on the rural economy since they were supplied with their food resources indirectly through the tributary system of food renders, and were dependent settlements "reliant on the powers of the tributary king". He specifically uses faunal evidence in support of the tributary system (*ibid* 12-13), agreeing with O'Connor in his conclusion that the limited or restricted resource base reflects food renders and central control over procurement and distribution. Rackham (1994) in contrast has suggested a possible market system in operation in *Lundenwic*. All these proposals remain hypotheses and much work needs to be undertaken on old and new sites to further test them. Early urban development may be characterised by the increasing level of specialisation within the system and the demand for a variety of services occasioned by the concentration of population. This, irrespective of central control or otherwise, might be expected to manifest itself in the form of industrial developments such as smithing, bone working, precious-metal working, butchery, etc. The environmental samples collected from the deposits can, in particular, contribute to such studies and excavation and sampling was therefore targeted to ensure the recovery of assemblages, which could be used to address these areas of study (*see* Rackham and Holden 1996 for procedures).

Unfortunately not all of the thirteen Middle Saxon pits excavated produced environmental assemblages, either hand-collected animal bone or environmental samples; eleven of the features were sampled, while twelve of them produced animal bone. The animal bone was hand recovered from a small number of other Middle Saxon deposits on the site; three postholes and the series of layers slumped into the upper fills of two of the pits. A total of 37 soil samples were collected from Middle Saxon deposits from the eleven pits (Table 23) while hand recovered animal bone was recovered from 45 contexts, 33 of them from the twelve pits, the remainder from postholes and slumped deposits (Table 25). All this material was assessed (Tables 23- 25), but the detailed analyses reported here equate to approximately 41% of the animal bone and 27% of the samples, other data discussed being derived from the assessment (Rackham and Holden 1996).

Industrial Activities

Environmental samples are a useful, and sometimes unique, method for the recovery of industrial and craft evidence. Much of this evidence may not be easily visible during excavation and is often of such a small scale (less than 10 mm in diameter) that hand recovery is unlikely or impossible. Sometimes artefacts or bulk waste, for instance bone working debris, may be recovered by hand, but this does not *per se* indicate that their manufacture was undertaken on site.

The majority of the debris recovered from the samples and the hand recovered animal bone reflects the dietary and other domestic and butchery rubbish disposed of on the site, but a small component suggests that craft activities were undertaken either on or very close to the site.

Riddler (*see* above) has reported upon the antler waste from the site, there being only twenty fragments and a calvarium of red deer among over 6000 fragments of hand collected bone, and a further two fragments from the environmental samples. Although a little more abundant, relatively, than the waste from other *Lundenwic* sites (Riddler above) this does not compare to the quantities that might be expected from a workshop (Riddler above estimates a minimum of eight antlers). Of perhaps more interest was a small collection of antler shavings in context [87], Pit 7. These shavings are likely to represent a primary deposit within the pit and their occurrence is a good indication of at least some limited working of antler on the site using a chisel type tool or a drawknife. The significance of the shavings in determining the location of bone and antler working has been outlined previously (Riddler 1993, 115). This pit yielded only one large hand collected antler piece, a relatively large fragment of beam and crown with a tine (Riddler above), while the bulk of the rest of the antler waste (ten pieces) derived from three of the upper fills of Pit 6, immediately adjacent to the north. No shavings were recovered, however, in the samples from the same layers.

Much as shavings indicate local working of antler, evidence for local iron smithing is often best indicated by the presence of flakes and spheroids of hammerscale, examples of which were found in several samples (*see* Riddler & Rackham above).

Pit Functions

It is evident from the wide range of materials contained within the pit fills (Tables 23 and 24) that these features functioned as rubbish pits and there is considerable evidence that this was not purely domestic rubbish. The presence of phosphatic concretions in four of the pits (2, 3, 5 and 6) and some misshapen fish vertebrae suggests that they also received human cess (*see* Wheeler and Jones 1989, fig 5.2). Whether they ever functioned primarily as latrine pits is perhaps unlikely, except for Pit 3, since this direct evidence was limited and the quantities of other waste great. The very considerable volume of animal bone and shell in most of the pit fills (Tables 24 and 25) suggests that their primary function was as rubbish pits for the disposal of food waste and food processing waste (*see* below). The purely domestic character of some of this rubbish is reflected in the range of finds that the deposits produced – pottery, glass, metal finds, fish bone, domestic animal bone, marine shellfish, charred cereal grains, charcoal and fired clay; a range of typical domestic food and artefactual waste characteristically

Table 23 Archaeological finds from the Lyceum soil samples (arranged in stratigraphic order within pits)

Pit	Phase	Row	Sample	Context	Vol l.	Resid. wt. kg	Cess	Pot*	Glass*	Metal *	Slag	Ham'r-scale	Comments	Context date AD	Pit date
1	3.1	1	114	1064	3	0.699							no finds		?670-750
2	3.1	2	109	1055	9	5.458							no finds	670-750	670-750
2	3.1	2	110	1043	27	8.055	+	6			+		quernstone fragment	670-750	670-750
2	3.1	2	111	1048	25	9.821					+				670-750
3	3.1	2	108	1035	25	6.32				3	+	+		600/650-750	730-750
3	3.1	2	112	1045	27	9.269	+	1	1			+	fired clay	600/650-750	730-750
3	3.1	2	113	1049	9	5.781				1					730-750
5a	3.1	3	115	1058	20	6.161		+	2			++		670-870	730-750
5a	3.1	3	116	1070	10	5.053								No pot	730-750
5a	3.1	3	117	1071	10	3.409								No pot	730-750
5a	3.1	3	118	1073	5	1.851							fired clay	No pot	730-750
5a	3.1	3	119	1074	10	4.791				1				No pot	730-750
5a	3.1	3	120	1075	10	3.294				1				No pot	730-750
5	3.1	3	121	1076	10	2.905				1		+		650-775	650-750
5	3.1	3	122	1078	15	5.336			1					No pot	650-750
5	3.1	3	124	1079	24	5.26	+		3		+			No pot	650-750
7	3.1	4	12	087	30	8.7		3	1	1	+		antler shavings, worked antler	670-750	670-750
6	3.1	4	11	048	30	12.3		3	1	3		+		670-750	670-700
6	3.1	4	13	085	30	19.6				1	2			650-810	670-700
6	3.4	4	14	051	30	15.15			4	2	2	+	abundant fired clay	650-810	670-700
6	3.4	4	16	052	30	17.8							abundant fired clay	No pot	670-700
6	3.1	4	15	060	30	8.4		2					worked antler	650-750	670-700
6	3.1	4	17	061	30	6	++	1					sea urchin	650-750	670-700
6	3.1	4	19	062	30	3.025								650-750	670-700
6	3.1	4	18	071	30	16.7		2						670-750	650-700
11	3.1	4	20	034	30	22.95								650-750	650-750
8	3.4	4	7	064	30	9.325		+	+	+	+		abundant fired clay	650-750	670-750
8	3.2	4	8	068	30	0.8								No pot	670-750
8	3.2	4	9	069	30	9.7		+		+				670-750	670-750
8	3.2	4	10	070	30	12.3			2					650-750	670-750
4	3.3	3	126	1094	15	5.374		8		7		+		775/810-870	775/810-870
9	3.3	5	1	016	30	9.075		4	1	1		+		730/750-775	730/750-775
10	3.3	5	2	029	30	8.2		+	1	2	+		abundant fired clay	650-775	750-800
10	3.3	5	3	032	10	0.8								No pot	750-800
10	3.3	5	4	041	30	10.8		+						670-750	750-800
10	3.3	5	5	056	30	21.9								No pot	750-800
10	3.3	5	6	047	30	15.1							abundant fired clay	670-750	750-800

\+ = 1-10; ++ = 11-100; +++ = 101-250 fragments or items

* count of sherd or object numbers from each sample

associated with occupation. Nevertheless the quantity of animal bone from the features (Tables 24 and 25), sometimes almost solid in terms of its concentration in the deposits, is not typical of purely domestic rubbish and other possible origins for this waste are considered below.

Diet

The pit fills contained considerable evidence of the inhabitants' diet. With only 45 contexts producing over 500 kg of hand-collected animal bone these twelve pits contain the largest concentration of bone so far excavated from Middle Saxon deposits in *Lundenwic*. But this is only the most visible fraction of the evidence. All except five of the 37 samples produced edible marine shell; all but seven, fish bones; three samples produced chicken eggshell, and charred cereal grains were recovered from all except eleven of the samples; while nutshell was recovered from seven, legumes from four and fruit stones or pips from two. Since the environmental samples represent a fairly small proportion of the excavated pit fills, a factor clearly indicated by the fact that over 500 kg of animal bone were hand excavated, while all the sieved bone from the samples from the same features weighed only 35.5kg (*ie* probably less than 5% if the smaller bones not picked up by hand are included). If one were to multiply the quantities recorded in Table 24 by 21 would arrive at figures comparable with the volume of hand excavated bone. This is important since the 82g of fish bone in the samples includes over 1600 identified fragments, suggesting perhaps that the twelve pits from which animal bone was hand recovered may have included well over 30,000 fish bones, perhaps 200 kg of marine shell, and several thousand charred cereal grains, and tens or hundreds of nutshell fragments, fruit stones and pips and legumes. These estimates are by their nature crude, and deposits such as context [61], one of the largest deposits, produced lower densities of fish bone and charred cereal suggesting that these elements at least may be somewhat exaggerated by these figures. Nevertheless these results indicate that considerable quantities of other food refuse were being discarded into the pits alongside the domestic animal bones.

Marine supplies, traded up the Thames, include shellfish, of which the oyster is ubiquitous and clearly a routine, perhaps even daily fare, also mussels, although much less abundant, and a few cockles and periwinkles. Occasional flat winkles and barnacles are likely to have been introduced on, or with, other shellfish. The relatively high concentrations of oysters in one or two contexts, particularly the slumped layers over Pit 6, contexts [48] and [85], suggest short term dumping episodes of large numbers of shells, suggesting consumption on a larger scale or perhaps processing prior to distribution or sale. As these two contexts actually represent occupation deposits that have slumped into Pit 6 they perhaps reflect *in situ* processing waste. It has also been suggested above that the shells may have been used to cap off Pit 6.

A similar scale of trade may be envisaged for marine fish. The fish remains from the samples have been studied in detail, and marine taxa are present with herring common and flatfish and estuarine species such as shad present. While the latter is a Thames fishery (Wheeler 1979) other species have been traded upstream from the estuary and waters off the Kent and Essex coast. Appreciable proportions of the fishes are likely to have been caught in the *Lundenwic* reaches of the Thames. Eels and members of the Cyprinidae, dace, roach, tench, etc., are likely to have been caught locally in freshwater conditions. Most of these fishes are small, but one or two larger fish are represented including salmon or trout and pike. The frequency with which eel, herring and cyprinid bones occurs would suggest that these items are also regular elements of the Middle Saxon diet, a picture similar to that already suggested for other *Lundenwic* sites (Rackham 1994), and fairly typical of sites of this period in England generally (O'Connor 1991; 1994).

Cereals are consistently present in most samples, although their abundance varies. Unlike many of the other food remains the survival of charred cereals is accidental, and requires the loss and carbonisation of the food material itself. The frequency of cereal grain and charred pulses in a sample does not therefore have quite the same relationship to, for example, the number of fish bones, as perhaps the number of bird bones or frequency of oyster shells might, since all the latter are intentionally discarded waste from food preparation or consumption. Their abundance reflects the frequency of accidents that lead to the charring of some grain or pulses and not their consumption although it is probably fair to say that there is some relationship between the frequency of accidents or accidental charring of a few grains and the frequency that cereals are prepared or cooked for food. Nevertheless this relationship is unknowable and therefore the abundance of cereals and pulses may be more a reflection of the quantity of fire ash and hearth material discarded into a pit than any indication of the importance of the food. Differences in processing methods may affect the representation of different cereals or legume crops so even though their survival can be attributable to the same processes the relative abundance of different cereals or pulses may also have no bearing on their relative importance in the diet. Pulses, for instance, are presumed to be under-represented in charred plant assemblages largely because drying is not generally viewed as a process they are likely to undergo, and therefore their chances of burning/charring are reduced. This assumption may be incorrect since peas

Table 24 Environmental finds from the Lyceum soil samples (in stratigraphic order within pits)

Pit	Sample	Context	Vol. l.	Resid. wt. kg	Charred cereal	Marine shell wt. g.	Domestic animal wt. g.	Fish wt. g	Egg-shell wt. g.	Squashed fish vertebrae	Comments
1	114	1064	3	0.699							
2	109	1055	9	5.458							
2	110	1043	27	8.055		100	1735	7		Yes	Oyster, cow, pig, sheep/goat, goose, salmon/trout, other small fish, cf field bean
2	111	1048	25	9.821		29	2722	3			Oyster, cow, pig, sheep/goat, chicken, house mouse, frog/toad, eel, herring, other fish
3	108	1035	25	6.32		71	1882	9	1	Yes	Oyster, cow, pig, sheep/goat, cyprinid, shad, plaice/flounder, other small fish
3	112	1045	27	9.269	++	19	211	1	<1	Yes	Cow, pig, sheep/goat, chicken, house mouse, rodent, frog/toad, eel, barley, apple/pear, birch
3	113	1049	9	5.781	+	8	12	<1			Oyster, chicken, barley, shad
5a	115	1058	20	6.161	+	155	406	1			Oyster, mussel, cow, pig, sheep/goat, frog/toad, eel, cyprinid, other mall fish, wheat, barley, oat
5a	116	1070	10	5.053	+	3	92				Oyster, mussel, cow, sheep/goat, rodent, frog/toad, wheat/rye?
5a	117	1071	10	3.409	+	4	58				Oyster, sheep/goat, wheat, barley, cf currant
5a	118	1073	5	1.851	+	2	11				Oyster, cattle, wheat/rye?
5a	119	1074	10	4.791	+	14	23	<1			Oyster, barley, hazelnut
5a	120	1075	10	3.294	+	179	103	<1			Oyster, cattle, sheep/goat, frog/toad, barley, hazelnut
5	121	1076	10	2.905			52				Cattle, pig, hazelnut
5	122	1078	15	5.336			153	<1			Cattle, sheep/goat, hazelnut
5	124	1079	24	5.26		134	439	4			Oyster, cattle, pig, sheep/goat, wood mouse, small bird, frog/toad, dog stool, frog/toad, eel, other small fish, hazelnut
7	12	087	30	8.7	+	60	1114	1			Oyster, cattle, pig, sheep/goat, frog/toad, eel, herring, other small fish, wheat, barley
6	11	048	30	12.3	+++	1174	694	7		Yes	Oyster, mussel, cattle, pig, sheep/goat, goose, chicken, small bird, barnacle, frog/toad, eel, cyprinid, herring, other small fish, wheat, barley, legume
6	13	085	30	19.6	+++	4781	482	<1		Yes	Oyster, mussel, cattle, pig, sheep/goat, rodent, eel, herring, other small fish, wheat, barley, hazelnut
6	14	051	30	15.15	+++	502	519	1			Oyster, mussel, cockle, cattle, pig, sheep/goat, eel, cyprinid, herring, wheat, barley
6	16	052	30	17.8	+++	48	64	<1			Oyster, cockle, pig, eel, cyprinid, wheat, barley, oat, sloe
6	15	060	30	8.4	+	671	608	2			Oyster, cockle, cattle, pig, herring, salmon/trout, barley, field bean
6	17	061	30	6	+	235	3971	1			Oyster, cockle, periwinkle, cattle, pig, sheep/goat, goose, dog, frog/toad, herring, barley
6	19	062	30	3.025		<1	<1				

+= 1-5; ++= <10; +++ =>10

Table 25 Weight (kg) of Lyceum hand excavated animal bone by context, and summarised by pit. (Layers in stratigraphic order within feature)

Context	Ceramic dating	Phase	Feature	Excavated wt. of bone	Total wt. from each pit
078	Middle Saxon		Posthole 79	0.15	
080	Middle Saxon		Posthole 81	0.02	
082	Middle Saxon		Posthole 83	0.1	
1042	600/650-750	3.1	Pit 2	0.01	
1060	600/650-750	3.1	Pit 2	0.4	
1043	600/650-750	3.1	Pit 2	6.02	
1048	600/650-750	3.1	Pit 2	5.75	12.18
1035	600/650-750	3.2	Pit 3	10.0	
1049	600/650-750	3.2	Pit 3	1.5	11.5
1093	early 8th C.	3.3	Pit 4	3.5	
1094	early 8th C.	3.3	Pit 4	35.9	
1098	early 8th C.	3.3	Pit 4	4.8	44.2
1057	post 670	3.2	Pit 5a	6.4	
1058		3.2	Pit 5a	2.6	
1070	post 670	3.2	Pit 5a	0.8	
1071	post 670	3.2	Pit 5a	1.25	
1074	post 670	3.2	Pit 5a	0.4	
1075	post 670	3.2	Pit 5a	1.75	13.2
1076	post 670	3.1	Pit 5	0.4	
1078	post 670	3.1	Pit 5	1.4	
1079	post 670	3.1	Pit 5	6.0	7.8
048	pre c. 750	3.4	Slump in Pit 6	4.5	
050	pre c. 750	3.4	Slump in Pit 6	0.15	
085	pre c. 750	3.4	Slump in Pit 6	0.75	
051	pre c. 750	3.4	Slump in Pit 6	1.6	
052	pre c. 750	3.4	Slump in Pit 6	0.4	
053	pre c. 750	3.4	Slump in Pit 6	0.07	
054	pre c. 750	3.4	Slump in Pit 6	2.15	
055	pre c. 750	3.4	Slump in Pit 6	10.55	20.17
058	650-750	3.1	Pit 6	2.5	
060	650-750	3.1	Pit 6	36.3	
061	650-750	3.1	Pit 6	155.85	
062	650-750	3.1	Pit 6	14.8	
071	650-750	3.1	Pit 6	0.7	210.15
087	c. .670-750	3.1	Pit 7	6.5	
092	c. .670-750	3.1	Pit 7	7.75	14.25
064	> 750	3.4	Slump in Pit 8	3.4	3.4
069	c. .670-750	3.2	Pit 8	115.45	
070	c. .670-750	3.2	Pit 8	0.7	116.15
016	post c. 770	3.3	Pit 9	11.0	11.0
029	> 750	3.3	Pit 10	2.3	
041	> 750	3.3	Pit 10	27.75	
047	> 750	3.3	Pit 10	1.0	31.05
034	before c. 750	3.1	Pit 11	2.0	2.0
1134	Middle Saxon	3.1	Pit 12	8.2	8.2
1133	Middle Saxon	3.1	Pit 13	2.0	2.0

and beans are dried for storage and beans can also be used to make flour and would therefore require parching. The crops that have been identified include bread/club wheat, hulled barley, oats (possibly a weed of the other cereals) and field bean (Tables 24 and 26), although 30% of the cereal grains were unidentifiable, even to genus. Wheat occurs in the most samples (Table 24) but is only marginally more frequent than barley where the cereals have been quantified (Table 26), while field bean is recorded from only two samples and a possible third. No rachis or chaff was recovered from any of the samples. In contrast to the cereals, the hazelnut shells and fruit pips and stones do reflect the waste after consumption but their survival is dependent upon chance preservation through charring or mineralisation, for instance in a cesspit. The very low incidence of sloe stones and apple/pear pips in the samples is more likely a reflection of this chance survival through mineralisation than any indication of their relative importance.

Table 26 The botanical remains from selected samples from the Lyceum

	Pit	**9**	**10**	**8**	**7**	**6**	**66**	**6**	**6**	**3**	**4**
	context	16	41	69	87	52	60	61	62	1045	1094
	sample	1	4	9	12	16	15	17	19	112	126
	vol. soil (l)	30	30	30	30	30	30	30	30	27	15
	vol. flot (ml)	55	250	75	5	10	20	6	<1	5	6
cereal											
Triticum aestivum/compactum	bread/club wheat	16	5			33					
cf. *Triticum aestivum/compactum*	cf. bread/club wheat	7	1	1		9					
Triticum spp.	cf. wheat spp.	2		1	1	12		1			
Hordeum vulgare	barley	8	5	13	1	6	3	7			5
cf. *Hordeum vulgare*	cf. barley		1	8	1	4	1	1		1	2
indet. cereal		12	10	20	1	22	4	7		1	1
indet. frags.		*	*		*	**	*	*			*
weeds											
Ranunculus batrachium (DC.) A. Gray	water crowfoot									1mn	
Chenopodium cf album L.	fat-hen					31				1	
cf. Atriplex spp.	oraches									2mn	
Caryophyllaceae	campion family							1			
Rumex acetosella L.	sheep's sorrel	1	1			1					
Rumex spp.	docks									3mn	
Prunus spinosa L.	blackthorn					1					
Malus/Pyrus spp.	apple/pear									5mn	
Vicia/Lathyrus/Pisum	vetches/pea	4					1			1mn	
Medicago/trifolium sp.	medick/clover							1			
Galium spp.	cleavers	1									
asteraceae	daisy family									1mn	
Anthemis cotula L.	stinking mayweed									2	
Carex spp.	sedges					25		2		1mn	1
Avena spp.	oat	1				2					
Poaceae indet.	grasses				1	14	2				*
Poaceae frags.					*	*					
indet.		1			1	12	3	1	2	5	1
indet. (mn)										2	
Corylus avellana L. frags.	hazelnut frags.	5				28					
total (charred)		53	23	43	6	172	14	21	2	10	10
total (mineralised)										14	
grain		45	22	43	4	86	8	16	0	2	8
weeds		8	1	0	2	86	6	5	2	8	2
seeds/litre		1.767	0.7667	1.433	0.2	5.733	0.467	0.7	0.067	0.889	0.667
weed:grain		0.18	0.05	0.00	0.50	1.00	0.75	0.31		4.00	0.25
wheat		56%	27%	5%	25%	63%	0%	6%	0%	0%	0%
barley		18%	27%	49%	50%	12%	50%	50%	0%	50%	88%
indet.		26%	46%	46%	25%	25%	50%	43%	0%	50%	12%

+= <10; ** = 10-50; mn = mineralised

The majority of the plant remains from the ten samples selected for detailed study (Table 26) were charred, and preservation of this material was moderate, with many of the remains quite easily identifiable, although some had suffered distortion during charring and breakages which made specific identification impossible, even to genus. Mineralised seeds were identified in only one of the studied contexts, context [1045], although they were recorded in nine samples in the assessment (Rackham & Holden 1996). The seeds are preserved by the replacement of plant tissue by phosphates and are typically found in cess-rich features. Several species were identified, represented by one or two seeds only (Table 26) and included one pulse as well as apple or pear species.

Most of the barley grains appeared to be hulled and it is likely that a mixture of two-row and six-row varieties were present. Although rye was identified in two of the samples during the assessment, no positive identification was made during the post excavation analysis and therefore if present, was probably also a weed within the main crop.

Weed seeds were recovered from all ten samples, and where they were identifiable to species are those commonly found in disturbed or cultivated ground, such as *Chenopodium album, Rumex acetosella* and *Anthemis cotula*. A number of other habitats could also be represented although some of the wild species were not identifiable beyond genus and so specific habitat information was not obtainable. The wild species probably arrived on site with the crops, although other sources are possible.

Discussion of the Botanical Remains

The ten samples from the Lyceum considered in this botanical analysis come from seven distinct pits. The lack of chaff and general absence of large weed seeds in the ten samples would suggest that the early stages of crop processing had been carried out elsewhere, and that grain would have been brought onto the site in a semi-cleaned state with any necessary fine sieving carried out on a day-to-day basis. Bread/club wheat and barley were evidently used, and these are the most commonly found species on Middle Saxon sites in London, although whether they were the most important economically is impossible to ascertain due to differential preservation and selective sampling (Davis & de Moulins 1988). The carbonised cereal and associated weed seeds are likely to have been the product of accidental charring during processing or deliberately thrown into the fire as a means of disposal or for kindling. The mixture of cereal types, in refuse contexts such as these, makes it impossible to say whether they were cultivated separately or grown as mixed crops. Seven of the samples (contexts [60], [61], both Pit 6 and [87], Pit 7 from Phase 3.1; context [69], Pit 8 from Phase 3.2; contexts [16], Pit 9, [41], Pit 10 and [1094], Pit 4 from Phase 3.3) are dominated by grain. The four samples from Pit 6: contexts [60], [61], [62] and [52], show some variation in their botanical content, context [62] being practically devoid of any material and context [52] (Phase 3.4) being the richest of all ten samples. This latter context is thought to derive from a re-deposited hearth or to represent *in situ* burning and the variety and quantity of material could suggest either of these possibilities. Although two deposits with cess were identified out of the ten samples, only one, context [1045] (Pit 3, Phase 3.2) was found to contain mineralised plant remains during this study.

The evidence obtained from this study is in keeping with the findings from other Middle Saxon sites in the Central London area, such as James Street (this volume), Maiden Lane (MAI86) and Jubilee Hall (Davis & de Moulins 1988) and the National Gallery and Peabody Buildings (Davis & de Moulins 1989) where barley and bread/club wheat appear to dominate.

The Animal Remains

The most abundant food remains that survive for study are the bones of domestic animals (Table 27), although as indicated above the site must have contained a considerable number of fish bones as well. The samples of hand collected animal bone selected for study include contexts from six of the thirteen pits. Single contexts from four of the pits have been selected, in each instance the richest from the sequence of fills in the pit; two consecutive fills from a fifth pit; and three fills and a slumped layer from deposits overlying the sixth pit. The latter group from the largest and most productive pit on the site. Of the larger contexts either approximately a third or a half of the context was selected for study. The total sample recorded comprises approximately 41% by weight of the whole Middle Saxon assemblage recovered by hand during the excavations, some of which derived from non-pit locations.

The total number of fragments of each taxa recorded are summarised in Table 27. The identified taxa include horse, cattle, sheep, goat, pig, dog, red deer, cat, chicken, goose and oyster and broadly relate to similar dated assemblages from other sites in *Lundenwic* (West and Rackham 1988; West 1989; Armitage, Chapter 2, this volume; Rielly 2003), although occasional wild birds and fish are recorded from other similar sized hand collected samples.

The bone assemblage is considerably less fragmented than other Middle Saxon samples (Rackham 2002) and the exceptional density of bone in some contexts, along with a lack, or relative lack, of evidence for dog scavenging suggests a primary burial context for many of the bones. Significantly higher proportions of the bones show evidence of butchery, as much as twice as many as some other Middle Saxon assemblages from *Lundenwic* (Rackham 2002). Pig bones show a much lower proportion of butchered bones and this evidence, combined with a higher level of fragmentation of the cattle and sheep bones, reflects clear differences in the manner of butchery of the carcasses of pig, sheep and cattle.

The most obvious results of the analyses of the bones are the marked difference in the frequency of pig, sheep and cattle in the different contexts. Cattle dominate in all but two deposits, but contexts [41] (Pit 10) and [1035] (Pit 3) show a very marked dominance, respectively, of pig and sheep bones. There are also interesting patterns in the butchery and carcass part representation and the age distributions. Only the pig rich context, [41], shows the 'classic' pattern for butchery waste (*ie* a high proportion of head and foot bones – *see* Rielly 2003 for an example from the Royal Opera House). The series of contexts [62], [61] and [60] in Pit 6 could nevertheless reflect progressive disposal of head,

Table 27 Frequency of Lyceum animal bone fragments of each taxon from each context

Phase	**3.1**	**3.1**	**3.1**	**3.1**	**3.4**	**3.1**	**3.1**	**3.2**	**3.3**	**3.3**
Pit	**3**	**6**	**6**	**6**	**6**	**7**	**7**	**8**	**4**	**10**
Context	**1035**	**62**	**61**	**60**	**55**	**87**	**92**	**69**	**1094**	**41**
Horse		1								
Cattle	60	66	667	251	116	68	85	704	409	53
Cattle size	111	5	262	71	43	21	29	260	365	33
Sheep	16		12	3		3	3	27	1	1
Goat			1		1			2		
Sheep/goat	234	4	68	11	25	5	9	102	94	14
Sheep-size	317		20	7	14	3	6	36	57	86
Pig	107	4	105	32	41	18	15	100	72	372
Dog									1	
Red deer		2	1	5	1		2	1	1	1
Cat							1			
Chicken	1		1		1				13	4
Goose	4		1	1	2		2	1	1	6
Indet. Bird	1									
Unidentified	53		16	3	4	2	5	2	29	199
Oyster						3			1	1

mandible, metapodial and long bones as a number of cattle carcasses are processed and their bones discarded. This might indicate a butchery practice where most of the bones (except vertebrae) are boned out and long bones and metapodials subsequently processed to extract fats. Context [55], the Phase 3.4 slumped layer over Pit 6, shows a pattern of cattle carcass representation very similar to those from other Middle Saxon sites, such as Maiden Lane (MAI86) and Peabody Buildings, and suggests primarily domestic food waste which contrasts with the bone assemblage in the fills of the underlying pit. Similar 'domestic' assemblages were recovered from the cattle dominated contexts [69] and [1094]. There is a difference in both frequency and location of butchery marks and the skeletal parts represented which suggests that the carcasses of pig and sheep were treated differently to those of cattle (Rackham 2002). There is much less evidence for butchery of the long bones or splitting of the carcass into sides. While most of the sheep butchery showed removal of the flanks and transverse dismemberment of the vertebral column, the evidence indicates relatively little butchery of the pig carcass aside from a similar removal of the flanks and splitting the skull to remove the brain.

The age structure of the different taxa also varies between contexts. A much younger profile is indicated for the cattle bones from contexts [69] and [1094] than those in [60] and [61]. The sheep bones in [1035] also show an appreciably younger profile than the sheep bones from all other contexts, as do the pigs from context [41]. These groups appear to reflect the selection of younger stock for slaughter than the same taxa from the remainder of the site and might represent the disposal from a single purchase or acquisition of a number of animals by a butcher.

Interpretation of Assemblages

It is clear that the pits were receiving domestic rubbish. The pattern of fragmentation in some of the contexts in the bone assemblages are similar to those from other *Lundenwic* sites, and the occurrence of shellfish, fish bone, charred cereal remains and fragments of pottery, fired earth, and occasional small finds is typical of the majority of such features from many Middle Saxon contexts from sites in the Covent Garden area. Some of the pits clearly functioned, at least for part of their life, as cesspits (Rackham and Holden 1996), a further indication of the domestic character of the site. The moderate numbers of charred and mineralised plant fragments in the domestic contexts suggest that cereals played a significant role in the daily lives of the inhabitants of the site. Barley and bread/club wheat appear to be the main crops although their relative importance is not possible to ascertain given the generally accidental nature of their preservation. The composition of the samples suggests that the crops were brought onto site in a semi-cleaned state and were probably finally cleaned on a piecemeal basis when used for potages or ground for flour. Hazelnuts and fruits were also gathered and eaten. Oysters, herring, eel, cyprinids, shad and plaice/flounder were regular elements of the diet as well as the products of domestic mammals and birds.

The occasional flakes of hammerscale and small pieces of slag are evidence for a local blacksmith but in none of the samples does this evidence occur with a frequency sufficient to indicate iron smithing was being undertaken on the site. A scatter of antler working evidence has been noted in this chapter and discussed by Riddler and the presence of a number of shavings and pieces of antler in [87] implies that this activity was being undertaken in the immediate vicinity, although perhaps not in the quantity that might be expected from a 'workshop'.

Despite this background of material that is consistently found on *Lundenwic* sites, and other contemporary 'wic' sites in the country (Bourdillon and Coy 1980; O'Connor 1991; Bourdillon 1994), several of the pits at the Lyceum Theatre produced densities of animal bone within individual layers far greater than that normally found. Furthermore the fragmentation of these assemblages is much less than other samples and individual pits show species specific concentrations only matched in a few features on all the other sites. Other individual characteristics include species slaughter patterns apparently specific to individual contexts, a very high incidence of butchery in the species specific assemblages, and marked differences in the parts of the carcass represented in individual contexts. Rather less secure indications that individual contexts might have received the bones of stock from different sources also helps to illustrate that these assemblages are somewhat different to the 'normal' or typical pattern previously recorded from *Lundenwic*. One or two individual contexts from the Royal Opera House, James Street and the pits from the National Gallery basement show some similarity, but such a concentrated group of pits with such assemblages has not been found before. The layout of the pits, in rows, could mark individual properties with a property width of approximately 5 or 6 metres orientated north/south. Within such a pattern the sheep assemblage comes from Pit 3 in the most eastern division (Row 2), cows from Pit 4 in the next – Row 3, cows in Pits 6 and 8 in Row 4 and pigs in the most western of these four potential units, Row 5. The antler working evidence derives from a small pit, Pit 7, in the centre of Row 4.

In an earlier discussion the Lyceum was described as a butchery site on the basis of the initial conclusions from the great bulk of animal bone recovered and the general character of some of the bone assemblages as determined during the assessment (Farid and Brown 1997). This now requires some review. None of the cattle assemblages fulfils the criteria that Rielly (2003) uses in his discussion of 'butchers' deposits at the Royal Opera House. He describes assemblages where primary waste, head and feet parts, comprise over 60% of the skeletal part representation based upon fragment counts and a weighted method of minimum number of skeletal parts for each part of the carcass. Four contexts fulfil these criteria for cattle at the Royal Opera House. In the Lyceum where the carcass parts have been assessed by weight and fragment counts only one context, [41], shows a greater than 60% representation of head and foot bones and this is for pigs. A relatively large number of pigs occur within this one context, at least ten different individuals, which since only 44% of the context has been studied could equate with fifteen individuals in total. The considerable density of pig bone and the age structure of the sample suggest that these probably accrued quickly, perhaps even during a single or short period of slaughter. The presence of very young piglets or neonates including a partial skeleton, particularly in the collection from the environmental sample, may indicate that pigs were also being bred and stalled on site. This collection may therefore be the primary butchery of a number of pigs bred at the site, probably over a fairly short time period, first and second year pigs being slaughtered at the same time. The girdles, femora and humerii are fairly well represented which suggests that the meat was boned out rather than cured on the bone. This assemblage cannot be equated with a simple domestic context and although special pleading for feasts or some such event could account for such a collection, local breeding of pigs and their slaughter and butchery for commercial exploitation is clearly an alternative conclusion.

The sheep rich assemblage from context [1035] in Pit 3 has some similarities. It has an age structure different from the remainder of the site; it includes a high proportion of lambs and late 2nd years that could indicate contemporary slaughter of these two age groups. The bones of a minimum of nine animals are present. It is however dominated by long bones, with girdles and vertebrae and only 24% (by weight) of the assemblage is head and foot parts. This, on the face of it, does not fit the model of primary waste or a butchery assemblage but we should perhaps reconsider the model.

Most detailed analyses and models of animal carcass butchery have been concerned with early prehistoric sites (*see* Lyman 1994) rather than urban environments where commercial and market interests may be dominant, although O'Connor (1993) has considered the butchery process. Both domestic and commercial food preparation and consumption can complicate distribution networks, and the secondary or by-products of the butchery process itself have a commercial value, sometimes greater than the carcass meat itself (Rixson 2000). In a domestic situation animals are presumably slaughtered infrequently. A carcass will be divided into utilisable units for immediate consumption or preparation. For instance the blood will be used immediately and the skin must be prepared within a day or two; the brains, liver, kidneys and other offal food items have a short life expectancy, while the meat, if the animal has been properly killed and bled, can be dried and cured for the longer term. The carcass parts therefore could enter the archaeological record in a sequence, skull first, feet shortly afterwards, vertebrae and ribs in the short term and most of the major limb bones in the longer term if meat is cured on the bone. The mandible of pigs is cured as a chap so this might enter the record long after the skull has been split to extract the brain and the resulting pieces been boiled up for brawn. Pig is habitually dried and cured because it will putrefy more rapidly than other meats if not consumed fresh (Rixson 2000), while other animals can benefit from hanging after slaughter and initial butchery, this process helping to tenderise the meat and add flavour. In a domestic situation the process of butchery is therefore very important if the potential of the carcass is to be maximised. While the same sequence and circumstances apply to butchery in a commercial environment the difference is that the dispersal of the products may be undertaken very quickly because the 'market' is much larger than a family group, and the rate of slaughter of the animals is also much greater for the same reason. The need to cure the meat may not exist, although it may be undertaken seasonally, and a butcher who slaughtered a sheep in the morning could have disposed of the 'saleable' parts of the whole animal before the end of the day. The butcher may bone the animal and discard the bulk of the carcass at the site, possibly into a single deposit. In the domestic context while the probability is that most of the carcass will end up being deposited at the site this may take some time and it is unlikely that the bones will be deposited together, particularly if some food sharing takes place and dog scavenging is routine.

We do not yet know the structure of the settlement in Middle Saxon London, but the agglomeration of people represented in this fairly large settlement, of 60 hectares (Cowie 1988), is such that a tradesman class must have been established to supply the needs of those that did not produce their own food, clothing and other essential supplies. Whether or not this class was controlled or organised in some manner by a ruling elite and the supply of these resources was restricted by 'institutional mechanisms' as suggested by O'Connor (1994) for the settlement at Fishergate, York, need not for the moment concern us. The character of the settlement has now been sufficiently established through excavations such as those at the Royal Opera House for us to be certain that meat distribution must have been on a scale to require butchers' stalls or shops, processing and curing facilities and the subsequent paraphernalia of tanners, skinners, horners and other tradesmen who used the skins, horns, offal and fat from the butchered carcasses for their own crafts. Perhaps one issue is the level of trade or craft specialisation that may already have been established in the settlement but there can be little doubt that the basic structure of an urban settlement had been.

To return to the question of butchery, apart from the pig carcasses in context [41], could the other assemblages be interpreted as the waste from a 'butchers'?

> Relatively low fragmentation could be seen as a reflection of removal of meat and low utilisation of the bone by the butcher. Domestic establishments might reduce the fragment size to make it easier to boil the bone in the stockpot and would also undergo more taphonomic factors. The butchers might also have extracted the fats, hence the butchery of the pig mandibles and the splitting of the cattle metapodials.
>
> Individual contexts have a relatively high minimum number of individuals, although primarily a factor of sample size, particularly since for some contexts less than half the assemblage has been studied.
>
> Sample size and bone density: individual layers have large numbers and a fairly high bone density, which suggests 'relatively' rapid filling of the pits.
>
> Differences between assemblages in different fills (*ie* age structure, size or carcass representation) suggest episodes of disposal from the slaughter of different groups of animals, possibly also for different purposes, *ie* for sale as fresh meat or for curing.
>
> The species-specific assemblages suggest disposal of mainly one taxon.

Even though these deposits do not match what has been viewed as a typical 'primary butchery' assemblage it is difficult not to conclude that these pits were receiving butchers' waste, including that from slaughter and primary butchery, secondary butchery and probably further processing such as fat extraction. Where large numbers of animals were being processed it is probable that the butcher exploited a range of resources on the carcass as well as selling on the skin and horn, for which there is some evidence in this assemblage, and possibly other parts. Furthermore if the 'rows' do reflect property divisions then this limited evidence might even suggest that butchers might have specialised in one animal, although it could equally reflect short-term purchase or availability of a particular species.

To return now to the questions posed at the beginning of this section. The evidence suggests that this site may reflect the existence of butchers as a trade in the Middle Saxon 'wic', and also the possibility that this trade may already have specialised with some butchers dealing with pork, while others mainly traded or distributed beef or mutton. If this were to be true then the distribution of pits at the Lyceum might imply a butchers' quarter, with three or four butchers occupying adjacent tenements.

Does the evidence throw any light on whether the settlement was supplied through food renders and re-distribution, an exchange or market system, or a commodity based system (O'Connor 2001)? O'Connor considered that the commodity hypothesis required spatial variation, patterns in the distribution of skeletal parts that might reflect activities and large scale processing. The definition of large scale is problematic but an estimate of perhaps 85 individuals of cattle, sheep and pig represented in the six pit assemblages so far studied does imply fairly large scale processing. This combined with the spatial pattern of species distribution and fairly marked patterns of skeletal part representation must presumably bring this site within O'Connor's commodity hypothesis. The argument in favour of the redistribution of food and control of the food supply is based mainly on the low diversity of the bone assemblages, particularly the absence of those species that might be raised in 'urban backyards' and wildfowl that might be opportunistically marketed or exchanged, as well as a general lack of evidence for large scale butchering activities. While the bones from the Lyceum show a very similar diversity to other *Lundenwic* sites, and those 'wic' sites used by O'Connor, the samples clearly show that shellfish, a variety of local freshwater, estuarine and marine fish, wild nuts and fruits (and possibly cultivated fruits), cereals and pulses were available in the vicinity of the Lyceum site. The shellfish and fishes were clearly available in abundance, although obviously much less important than the domestic meat supplies, and the wild fruits and nuts may also have been very much more abundant than our surviving evidence might indicate. Many of these can be found in the list of items required as a food render for ten hides in the Anglo-Saxon Laws of Ine (*see* box text), except for some of the fish and wild fruits and nuts, so a redistribution of tribute could certainly account for much of the food remains. Nevertheless at least four of the pits contain butchered waste from a relatively large number of animals, and one is suggestive of breeding as well as slaughter on site. Therefore unless the Lyceum area was a focus for the processing and redistribution of the food renders and tribute to the population (*ie* a precursor of the butchery trades in the settlement), it may already have been operating within a commercial or exchange framework.

THE LAWS OF INE (AD 688-694)

These laws, laid down by the West Saxon King, Ine (AD 688-726), in order '*that true law and true statutes might be established and strengthened throughout our people, so that none of the ealdormen or of our subjects might afterwards pervert these our decrees*' have survived as a supplement of the laws of Alfred (*c.* AD 885-889) who refers to them and adds them to his own laws. The 76 surviving laws include the following:

70.1 As a food rent from ten hides:

10 vats of honey,
300 loaves,
12 'ambers' of Welsh ale, 30 of clear ale,
2 full-grown cows, or 10 wethers,
10 geese,
20 hens,
10 cheeses,
an 'amber' full of butter,
5 salmon,
20 pounds of fodder
and 100 eels.
(Whitelock 1979, 406)

To analyse this food render in more detail: *honey* was not represented at the Lyceum site, though honey production was clearly indicated at James Street by the rare discovery of charred honeybees; preserved cereal grains, predominantly wheat, barley and oats signify *loaves* as well as *fodder*; *cows* and *wethers* are represented by cattle and sheep bones; and similarly bones of *geese, hens, trout* or *salmon* and *eels* were also all recovered.
Clearly the two remaining items, *butter* and *ale*, whether clear or Welsh (*wyslic,* or foreign, and probably stronger and sweeter than ordinary, clear ale), would be unlikely to survive into the archaeological record, though charred barley grains may be a sign of brewing.

Chapter 4 **Maiden Lane Revisited: Excavations at 21-24 Maiden Lane and 6-7 Exchange Court**

Jim Leary and Kevin Wooldridge

Archaeological excavations were carried out between October 1996 and July 1997 by Wessex Archaeology (site code ECT96) and Pre-Construct Archaeology (site code EXC97) at 21-24 Maiden Lane and 6-7 Exchange Court (Fig 41). The adjacent site in Maiden Lane (site code MAI86), along with Jubilee Hall, was amongst the first in *Lundenwic* to be excavated (Cowie *et al* 1988) and its significance was mainly due to its rarity rather than the quality of either the archaeological features or finds. The findings from later *Lundenwic* excavations have promoted a much greater understanding of the development, layout, economy, use and decline of the Saxon settlement. The purpose of this chapteris to supplement the findings of the original MAI86 publication in order to update the story of the Maiden Lane site by incorporating the results of the 1996/1997 excavations. Where possible, or necessary, cross-reference is made to archaeological features recorded during MAI86 excavations using the numbering system used in the LAMAS publication (Cowie *et al* 1988). These numbers are shown enclosed {} thus, while context numbers from the recent excavations appear in square brackets [ ] thus. The three sites will also be differentiated in this chapter by their site codes (MAI86, ECT96 and EXC97).

THE ARCHAEOLOGICAL SEQUENCE

Phase 1 and 2: Soil Horizon

Phase 1 represents the natural geology of the area and is discussed in Chapter 1. A layer of silty clay [133] measuring between 0.1m and 0.15m thick was recorded directly

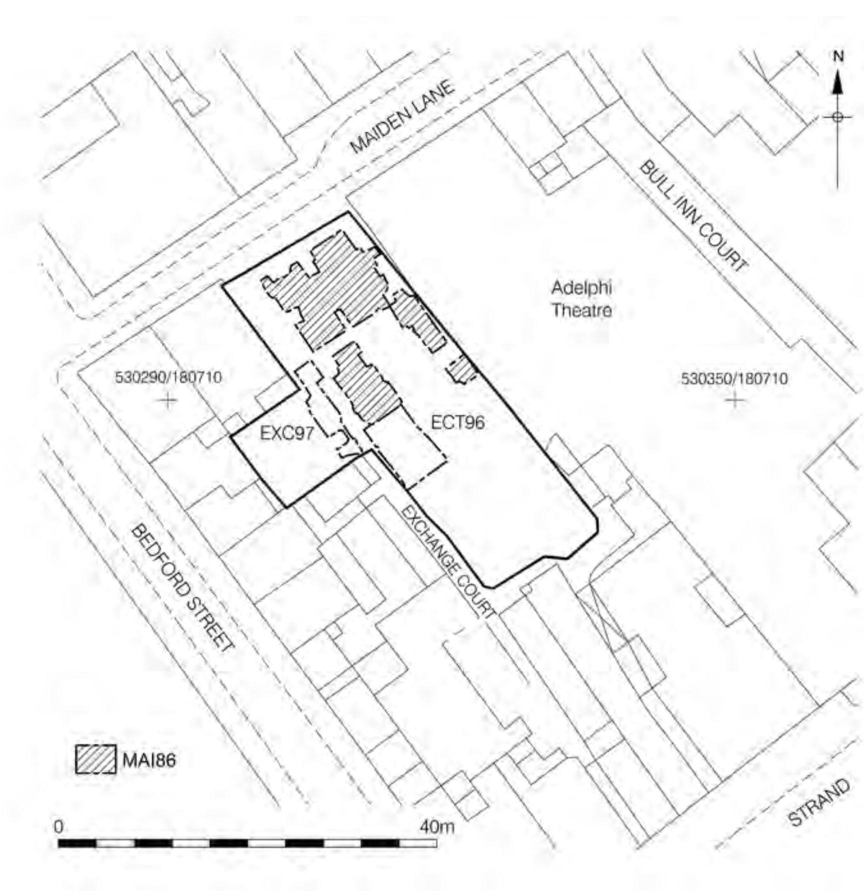


Fig. 41 Maiden Lane site location. Scale 1:800

Fig. 42 Excavations at Maiden Lane, ECT 96

overlying the brickearth on the ECT96 excavations, and may be similar to layer {165} and {196} from the MAI86 excavations, which contained a flint blade and a sherd of prehistoric pottery. Flint flakes were also recovered from the ECT96 layer, although these may be residual and do not necessarily indicate a prehistoric date for the formation. Indeed, a similar deposit recorded at the Royal Opera House is dateable to the Middle Saxon period (Malcolm *et al* 2003). The evidence of low quantities of charred grain suggests a limited amount of cultivation, whilst the evidence of a tree throw [153] indicates that the landscape was largely unoccupied.

Phase 3: Mid 7th century

Cutting the brickearth on the EXC97 site were 21 stakeholes [1122 – 44], three postholes [1116], [1121] and [1119] and a north - south, linear feature [1117], measuring 2.8m long and between 0.2m and 0.5m wide (Fig. 43). Two of the postholes were located at the ends of linear feature [1117], possibly suggesting a post and timber sill type structure, although it could equally represent a gully. The stakeholes formed two parallel alignments, approximately 1.2m apart, either side of this feature, and may represent fence or hurdle lines. These stakeholes followed the same alignment as the gully/beamslot, implying contemporaneity, and together they anticipate later alignments. Two sherds of chaff-tempered ware, including the shoulder from a jar-shaped vessel, were recovered from the linear feature; these probably date to between AD 600-750.

These features may be comparable to a series of stakeholes recorded in MAI86 (Fig. 43).

Phase 4: Late 7th Century

At EXC97 the Phase 3 features were overlain by a layer of silty clay, [1056/1011], which may be similar to the 'grey layers' recorded from other Middle Saxon sites, interpreted as midden deposits (Malcolm *et al* 2003, 20, 21, 211, 213). Thirteen sherds of pottery were recovered, and comprised a single abraded rim sherd from a Roman Samian bowl, as well as sherds of sand-tempered ware, however the assemblage comprised predominantly chaff-tempered ware, mostly jar-shapes, including one with point decoration, dated to the late 7th century. Also recovered was a quantity of animal bone

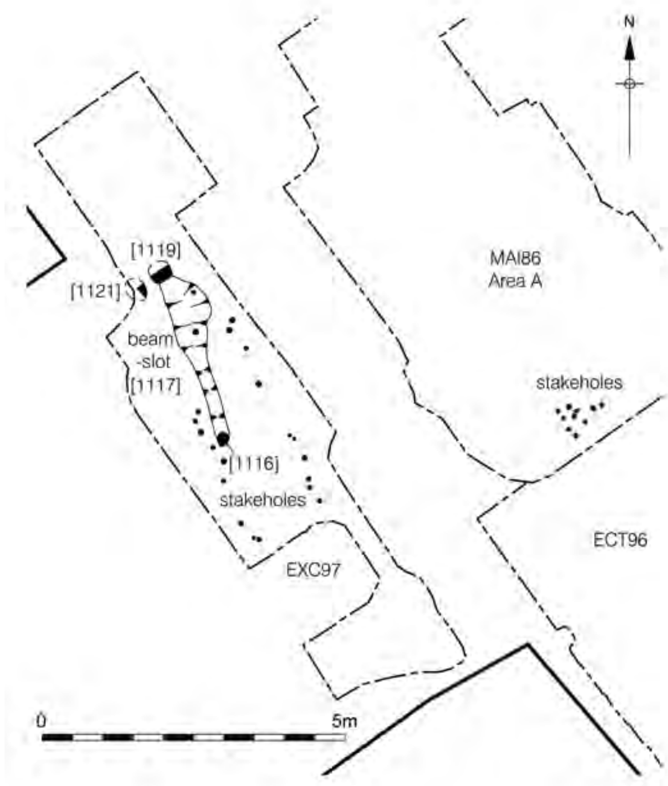


Fig. 43 Plan of Maiden Lane Phase 3 features. Scale 1:125

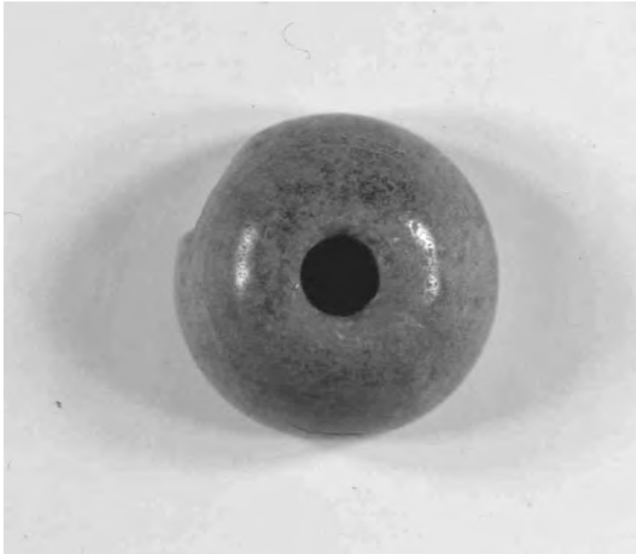


Fig. 44 The Maiden Lane spindle whorl

and an antler spindle whorl (Figs. 44, 49.1) of Early to Middle Saxon type, indicating that some craft activity occurred during this early period, as well as a fragment of blue-green glass, probably from a folded rim, which had been fire distorted. This layer was not recorded at ECT96, but it may have been present in MAI86 Area B as grey silty clay layer {235} and {236}, which contained chaff-tempered pottery sherds and in Area D as grey silty clay layer {358} (Cowie 1988, 70; Blackmore 1988a, 98).

Phase 5: Early to Mid 8th Century

This phase represents intensive building activity, which is evident across all three sites and reflects an expansion of the Saxon settlement (Fig. 45). EXC97 contained a small and truncated area of surviving stratigraphy, comprising three separate building episodes overlying one another. The earliest episode comprised a heavily truncated beamslot [1107], measuring just 1.2m long and 0.2m wide, and containing burnt organic material, possibly representing the timber, [1055]. Associated with this beamslot was a brickearth floor, [1108], recorded at a height of 15.21m, and measuring 1.55m by 0.5m, indicative of an internal surface. This floor was overlain by a layer of burnt daub, and this, together with the burnt timber within the beamslot, suggests that the building had burnt down. It was, however, rebuilt, and an occupation horizon was recorded overlying the sequence. A layer of burnt daub again sealed this sequence, suggesting that another house fire had taken place. This was in turn overlain by another brickearth surface [1102], recorded at a height of 15.33m OD, which again burnt down, as testified by the overlying layer of burnt daub. Overlying this sequence was dump layer [1051], which contained sherds of chaff-tempered wares, including a lugged rounded bowl of a late 7th century date.

Building activity from ECT96, mostly took the form of cut features (Fig. 45). The earliest features from this phase were a linear alignment of postholes, [126], [124], [122], [120] and [144], which were aligned northwest to southeast, and could be projected into MAI86 Area A. This could be interpreted as either part of a building or an enclosed area, such as a stockade, although fragments of daub from some of the postholes may indicate that the structure was a building. Further postholes [128], [143], [149] and [152], approximately 2m to the east, can also be projected into MAI86 Area A and may represent a second phase of construction or possibly a contemporary building wall. A linear feature [119/130], which contained sherds of sand and chaff-tempered wares, followed the same alignment as the postholes and may represent a beamslot, as indicated by the fragments of burnt daub recovered from the fill, and may also be associated with the cobbled surface [136], representing an external surface. Both this surface and beamslot [119/130] were overlain by a layer of redeposited brickearth [137], possibly representing unfired daub (*see* Hughes, Chapter 6, this volume), which was cut by another beamslot [140]. Pits [146] and [134] date to this period and most probably represent rubbish disposal associated with the buildings, and contained sherds of chaff-tempered ware.

Parallel and perpendicular to the beamslots and posthole alignments from ECT96 and EXC97 were four linear features in the Area A and D of the MAI86 excavations. These were described as gullies in the 1988 publication (Cowie 1988, 67, 75), but may also be interpreted as similar structural elements of buildings, while thin layers of sandy clay may have represented brickearth floors. Beamslot {180} was recorded in Area A and adjacent to this, to the east, was beam slot {191} and a possible internal brickearth floor recorded on an isolated area of surviving stratigraphy to the north, {196}. Another two linear features {329} and {370}, in Areas C and D, may also have also represented construction slots, that in Area D was associated with an external surface made from reused Roman tiles (Cowie 1988, 75; fig 17).

A well [114] within pit [110] also produced evidence of building activity in the form of fragments of burnt daub, presumably derived from nearby buildings, sherds of chaff- and sand-tempered ware, a sherd of crucible and a fragment of pale blue translucent vessel glass of an unknown form. Although the backfill of well {199} from MAI86 Area A contained 8th- to 9th-century pottery, it may also have been constructed during this phase of building activity.

Associated with the building activity in the EXC97 excavations were two metalled surfaces [1101] and [1151], recorded at a height of between 15.20m to 15.30m OD and measuring 1.22m by 1.39m and 0.5m by 0.5m respectively. These probably represent external surfaces. The only dating evidence is a sherd of chaff-tempered pottery from [1101], but the absence of Ipswich ware could point to a date of pre AD 730/750 for this activity. These surfaces may be contemporary with {285} and {286} (recorded at a similar height of between 15.31m and 15.38m OD) in Area B of MAI86, also dated to between AD 650-750, {333} in Area C, {380} in Area D (recorded at a height of between 15.23m and 15.28m OD) and [136]. In MAI86 Areas C and D, metalled surfaces {333} and {380} were recorded overlying beamslots and therefore may post-date the main phase of building activity.

Phase 6: Late 8th to Mid 9th Centuries

By the late 8th century the area had been given over to the disposal of rubbish, which continued into the late 9th century, indicating either a change in landuse or a contraction of the settlement. The rubbish disposal took the form of pits [1081], [1084], [1091], [1093], [1096] and [108], as well as areas that appear to have been used as middens [1100] and {337-348} from Area C (Fig. 46). Pits [1096] and [1081] together contained 120 fragments of fired clay daub, indicative of demolition debris from wattle and daub structures. Pit [1081] contained seventeen sherds of chaff-tempered ware as well as the flat base of a fine Ipswich-type ware vessel and a sherd of imported North French greyware, indicating deposition between *c.* AD 730/750 - 870. Pit [1096] contained chaff-tempered wares, whilst [1091] contained North French greyware and [1093] contained a single sherd of Ipswich-type ware. Pit [1084] contained two pale green fragments of glass, one from a green thickened rim and the second from a simple rim, both probably from beakers or cups, as well as a sherd of North French blackware and Badorf-type ware. Pit [108] produced 31 sherds of pottery, comprising mostly chaff-tempered ware, but also including sand-tempered wares, Ipswich-type ware (present in *Lundenwic* from AD 730/750) and imported North French black and grey wares. A further 350 fragments of burnt daub were also recovered from this context and again indicate building destruction. Several pits were also excavated in the MAI86 excavations, and the finds from these pits also suggest a date range from the late 8th to 9th century.

This activity occurred at the same time as the excavation

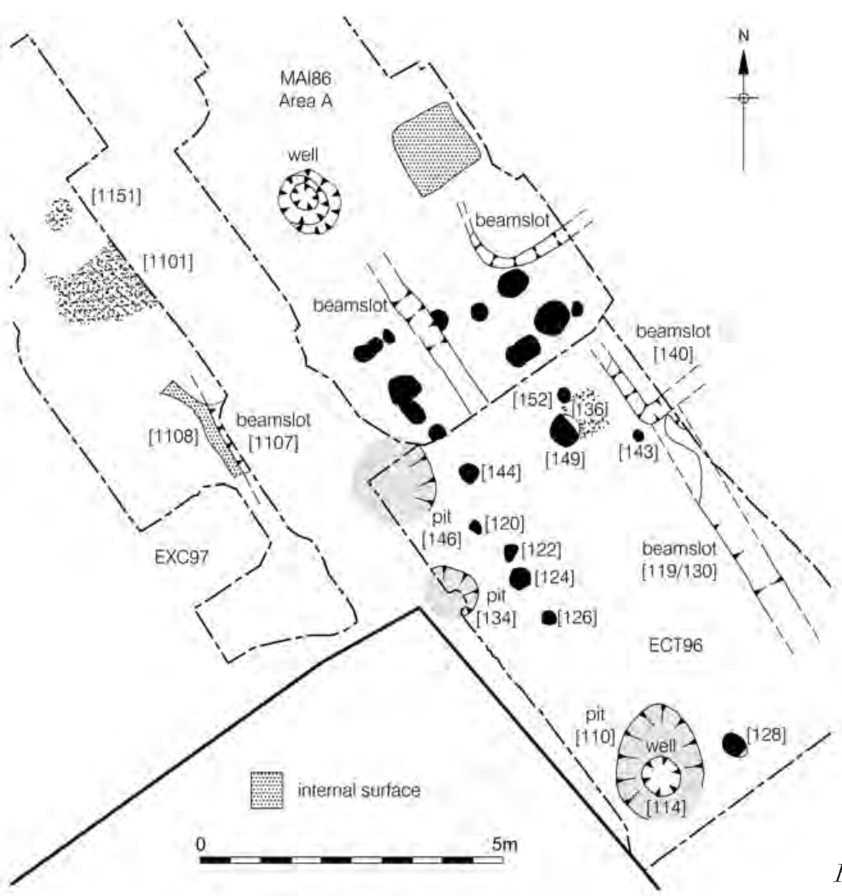


Fig. 45 Plan of Maiden Lane Phase 5 features. Scale 1:125

of a north-east to south-west defensive ditch, recorded to the north of the site in MAI86 Area B (Fig. 46), and may suggest that the late 8th century settlement was focused to the north of the ditch. The original publication suggests that the ditch was defensive, but only in use for a short period before being backfilled, although there was evidence for it being recut suggesting two phases of use (Cowie 1988, 71; Cowie *et al* 1988, 79). The ditch, therefore, may have been intended to defend the area to the north, exploiting the river terrace in commanding the approach from the river towards the centre of the *Lundenwic* settlement. This would suggest that any potential attack was perceived as coming from the River Thames (although *see* Leary, Chapter 7, this volume).

Phase 7: Late 9th Century

Deposits of a dark silty loam material recorded on both the ECT96 and EXC97 sites may be comparable to deposits generally described as dark earth. These deposits extended throughout EXC97 sealing all the Phase 6 pits, but were less

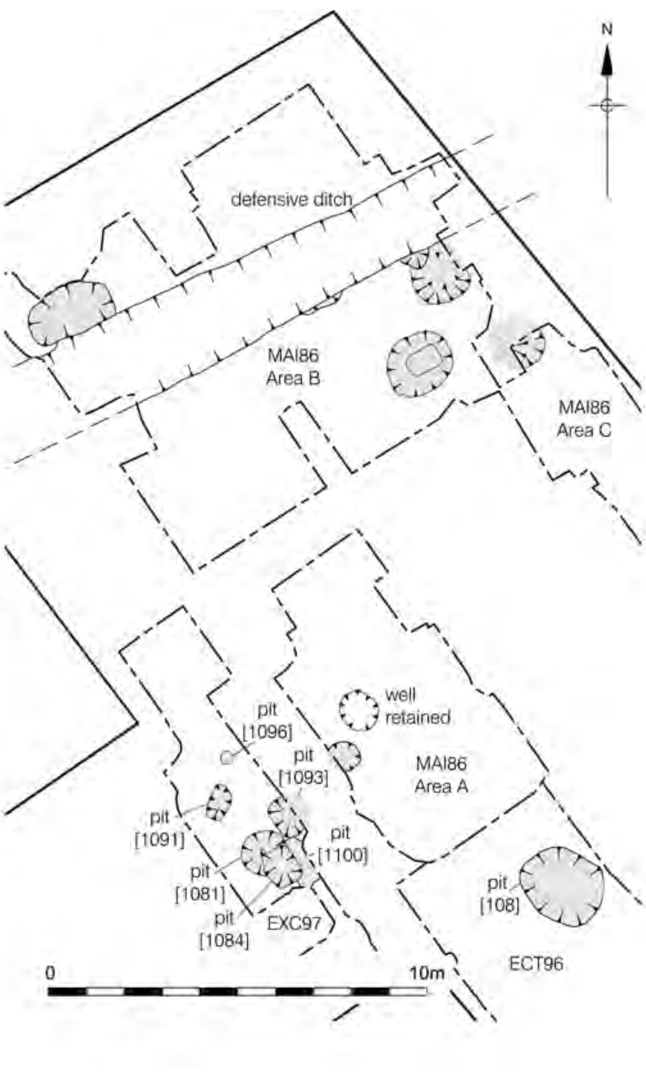


Fig. 46 Plan of Maiden Lane Phase 6 features. Scale 1:200

extensive at ECT96, probably due to later truncation. The pottery recovered from these layers included mostly chaff- and sand-tempered wares and Ipswich-type wares, but also shell-tempered ware, indicating deposition after *c.* AD 775/810. The dark earth at EXC97 was not a homogeneous deposit but an accumulation of several layers with a maximum combined thickness of 1.20 metres. The lowest levels of these deposits were virtually indistinguishable from each other in their composition and in the finds they produced, although two lenses within these deposits contained 66 fragments of burnt daub probably derived from wattle and daub structures. These lower deposits were sealed by darker layers, more easily distinguished from each other by differing gradations of sand or silt content. This clear stratification appears to be contrary to the often-recorded homogeneity of this deposit; seemingly one of the main indicators of the biological reworking of the mass of such deposits.

Both the lower and upper levels of dark earth contained pottery: sand-tempered wares, Ipswich-type ware, North French wares and a shell-tempered ware, the latter introduced into *Lundenwic* between AD 775/810, but more common in the 9th century (Blackmore 2001, 40; 2003, 38). A few pits were recorded cutting the dark earth deposits at EXC97, and were filled with a similar material.

THE POTTERY

Chris Jarrett

The Saxon pottery recovered from the 21-24 Maiden Lane and 6-7 Exchange Court excavations consists of 53 sherds weighing 504g from the ECT96 site and 61 sherds weighing 851g from the EXC97 site. The assemblage from ECT96 is the more informative of the two, since the material consists of larger sherds and more diagnostic forms. The pottery fabrics were classified according to typologies established for the first Saxon pottery assemblages to be examined in detail (from Jubilee Hall and the previous excavation at 21-22 Maiden Lane) and developed for other sites in *Lundenwic* (Blackmore 1988; 1989; 2003). The dating of the *Lundenwic* ceramic sequence is discussed by Blackmore (1999; 2001; 2002) and described elsewhere (*see* James Street pottery, this volume). Both the ECT96 and EXC97 pottery assemblages were dominated by chaff-tempered wares, which include some less common forms, but the presence of imported pottery and Ipswich-type or shell-tempered wares aided the definition of the chronological development of the site.

Fabrics and Forms

Chaff-tempered wares *(CHAF, CHFI, CHFS, CHSF)*

Organic-tempered pottery, containing varying amounts of chopped vegetation, was the main pottery type to be found in the *Lundenwic* settlement from *c.* 600/650 until its decline between 730-750 AD (Blackmore, 2001, 40). These handmade wares usually have surface treatment either as wiping, using the hand or possibly leather, or burnishing using a pebble. The main fabric found in the settlement contains abundant chaff with no other obviously added inclusions (CHAF). The present assemblages, however, include only nine sherds of CHAF (84g). These are from jar-shaped vessels, with one simple everted rim (Fig. 47.1). Most sherds have burnished surfaces and one sherd has lines of point decoration made with either a comb or a tool made either from antler or possibly bone (Riddler 1986). This small, decorated sherd recovered from layer [1056] has a horizontal line of point marks on the neck of the sherd and evenly spaced diagonal lines on the body, but the tool used to make the impressions had slightly missed on the overlapping (Fig. 47.2). Such decoration is seen as belonging to an Early Saxon potting tradition in the Thames Valley and in *Lundenwic* it is dated to the late 7th century (Blackmore 2001, 34). The small number of chaff-tempered sherds with comb decoration indicates that this is rare in *Lundenwic*, the first being identified at Maiden Lane (MAI 86), more at the Peabody site (PEA87) and a sherd at the Lyceum Theatre (*see* Blackmore 1988, 85, fig 24.1; 1989, 74-6, fig 29.20-22; Jarrett this volume).

The variants of chaff-tempered ware usually have sand inclusions, either with sparse chaff and fine sand (CHSF) or with more abundant chaff and coarser sand (CHFS) and both fabrics occur in similar proportions in these assemblages. Fabric CHSF amounts to 31 sherds (430g); no rims were present, but the presence of shoulders shows that most sherds are probably derived from jar-shaped vessels (Fig. 47.3). A bowl or open-shaped vessel, regrettably unstratified, is finely burnished and has a rounded profile and a simple rim, defined by running a finger around the top of the exterior of the vessel and so forming a neck (Fig. 47.4). The coarser fabric (CHFS) totals 34 sherds (435g) mostly from jar-shaped vessels with simple rims, usually rounded and slightly everted (Figs. 47.5-6). Body sherds of a thin-walled, burnished, small rounded jar-shaped vessel occurred in layer [1056].

The most important vessel recorded in the CHFS fabric is a lugged bowl (Fig. 47.7) found in layer [1051], which has a flared profile with a rounded rim. The lug was formed from an applied vertical strip and the centrally placed piercing is polygonal in shape; it measures 5mm by 4mm and was formed by a tool with a rounded cross-section. On one side of the applied strip it can be seen that the tool was used twice to enlarge the hole and the action left a horizontal scar on the body of the vessel. Evidently the vessel was intended to be suspended, but its function is uncertain. There are no internal deposits to indicate that it was a hanging lamp and no external sooting to show that the vessel was used for cooking or heating. It may, therefore, have been suspended from the roof and used to keep foodstuffs off the floor and out of the reach of some pests. This form of vessel probably belongs to the Early Saxon potting tradition; Myers dates them to the 5th and 6th centuries (Myers 1977). However, similar examples are present at Mucking, Essex, in particular a grass-tempered bowl with a footring recorded in Pit 7811 and dated to the late 6th or 7th century (Hamerow 1993, fig. PIT 7811.2, 307). With the exception of one particular type of lug (the 'swallow's-nest' form), no clear pattern in the temporal differences in the four lug types was found at Mucking (Hamerow 1993, 41-42). Given that the *Lundenwic* settlement may have been established in the 7th century, it seems likely that the lugged bowl from [1051] dates to the 7th century, although it could be residual or had a long period of use. It was found in Phase 5 (dated early to mid- 8th century) with other chaff-tempered ware vessels and a single sand-tempered sherd.

Two other chaff-tempered fabrics were present as single sherds, the first burnished with an iron-rich matrix (CHFI) and the second a fine fabric with sparse red sandstone and calcareous inclusions (CHFST), the surface of the vessel being wiped ([1051]).

Sand-tempered wares *(SSANA, SSANB, SSAND)*

The coarse sand-tempered ware with a pinkish brown core and black surfaces (SSANA) is sparsely represented on the site, with only two small sherds weighing 6g. Three sherds (44g) are in the medium-sand-tempered ware SSANB, fired grey-black throughout); these include the shoulder of a jar-shaped vessel recorded in layer [1061]. More common is the fine sand-tempered fabric with occasional organic tempering (SSAND), of which 10 sherds (61g) were found; these are from jar-shaped vessels with simple upright rims (Fig. 47.8) or with an externally beaded rim (Fig. 47.9).

Sandstone-tempered wares (SSTC)

A possible crucible fragment was also found, the sherd coming from a straight-sided vessel with a carination for the base. This best fits into the SSTC fabric code, although is not identical to other known examples. It also falls within the Early Saxon sandstone fabrics (ESSTD), also found in *Lundenwic*, however it is not known how long the latter continued to be made. The fabric consists of abundant sandstone up to 1.5mm, as clusters of ill-sorted, angular clear quartz ranging in size from 0.2mm-2mm. The vessel has a dark grey core, grey and light reddish-brown (heat altered) external surface that is cracked and a light grey inner surface. Unfortunately, there are no surviving metallurgical deposits.

Ipswich-type ware (IPSF, IPSM, IPSC)

Ipswich-type wares appear in *Lundenwic* between *c*. 730-750 and were the main pottery type used in the settlement between the late 8th century and its abandonment in the late 9th century. The ware represents the first pottery type after the Roman period to have been fired in permanent kilns found in Ipswich; the technology was reintroduced possibly by migrant Frisian potters. The ware is identified as a hard, sandy greyware (Blackmore 1999, 39; 2001, 26, 40; 2003, 234-5). All three of the standard sub-classes of this ware are present here: fine (IPSF: two sherds, 70g), medium (IPSM: two sherds, 24g) and coarse (IPSC: four sherds, 78g). All the forms appear to be jar-shaped vessels, hand-built but finished on a wheel and the fineware only occurs as two base sherds. The rim sherds are fairly typical for the ware, with a bevelled everted rim in IPSC (Fig. 47.10) and another in IPSM that is slightly thickened on the exterior, with a slight bevel (Fig. 47.11). All the shoulder sherds from jars also have the characteristic horizontal ridges.

Shell-tempered wares (MSSE)

Although more common in 9th century *Lundenwic*, shell-tempered wares may have appeared first in the settlement from *c*. 775, but are more common in the 9th century, after *c*. 810 (Blackmore, 2001, 40), but the only example recovered from the excavation was the most common type (MSSE), with abundant bivalve shell, found in a layer of dark earth [1061]. Current research into the sources of the shell-tempered ware indicate that most are made of Woolwich Beds clay, which extended through Kent and outcrop in south east London. They also occur to the north of the Thames. The source of the London fabric is, therefore, uncertain, but a Kentish source seems most likely (L Blackmore, pers comm).

Imported Pottery

North French blackwares (NFBWC, NFBWE/NFGWA)

Merovingian-type black and grey wares were being traded to, or appear in, *Lundenwic* by *c*. 650 when the 'wic' had become truly established, and many continue to appear until *c*. 800/850. The fine example (NFBWC), one of the fabrics associated with Tating decoration, first appeared *c*. 750 and production may have continued into the early 9th century (Blackmore 2001, 40). Most sherds in both the black and greywares are probably from spouted pitchers as this was the most common vessel type found in English settlements (Blackmore 2001, 34), but no highly diagnostic sherds, rims or handles were present on these sites. A very small sherd of the fineware (NFBWC) was noted in fill [1084] of cut [1080]. Assigning sherds to the black or greywares was sometimes difficult because of overlaps in the two fabrics, one such burnished sherd (NFBWE/NFGWA) was similar to but coarser than NFGWA and softer than some NFBWE sherds.

North French greywares (NFGWA, NFGWA/E, NFGWB, NFGWC, NFGWD)

The coarse sand-tempered ware NFGWA occurred as a single sherd in layer [1097], and a coarser version of either NFGWA or NFGWE occurs in fill [105] of feature [108]. The single sherd of fine sandy ware NFGWB, present in fill [1050] of feature [1080] was notable for the presence of an oversized angular fragment of chert/flint, 11mm in size. From fill [1089] of feature [1088] there are two very thin walled sherds in the NFGWC fabric, but it was so highly fired it could be classed as stoneware. The micaceous, fine sand-tempered ware (NFGWD) is present as two sherds in fill [105] of pit [108], but both vary from the typical fabric in having slightly more iron-ore inclusions, and although both sherds were burnished, one was additionally decorated with an incised wavy line.

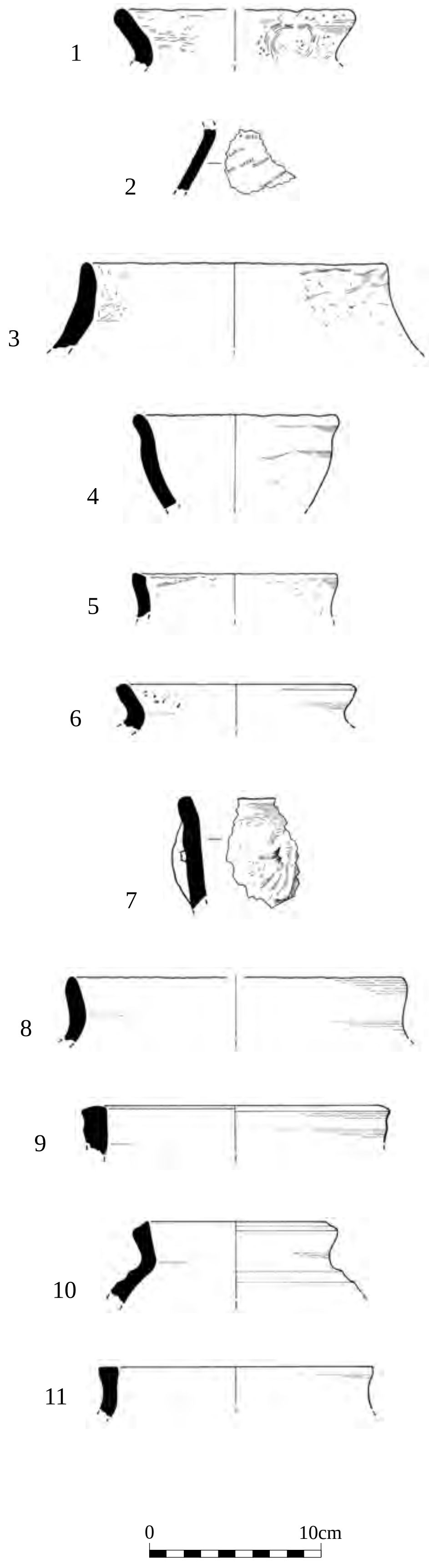


Fig. 47 The Maiden Lane pottery (1-7) chaff-tempered wares; (8-9) sand-tempered wares; (10-11) Ipswich-type wares. Scale 1:4

Badorf-type wares (BADOB, BADOC)

A single sherd of the hard, coarse Badorf-type ware fabric (BADOC) with prominent internal throwing lines was present in the fill [1080] of pit [1091], Phase 6, but this sherd also has affinities with a fabric associated with the Meuse Valley-Rhineland fabric (MSSWF). The only other Badorf-type ware on the sites was a single sherd of the hard, fineware BADOB, which occurred residually in a medieval or later deposit. The first 'classic' Badorf-type wares occurred in *Lundenwic* from *c.* 750, but are more typical of the 9th century settlement. This pottery continued to be imported into London until the 12th century.

The Distribution of the Pottery

Phase 3: Mid 7th century

The only pottery recovered from this phase came from the gully [1117], which comprised two sherds of CHAF and CHFS, including the shoulder of a jar-shaped vessel. The chaff-tempered wares are characteristic of the period *c.* 600/650-750 in *Lundenwic.*

Phase 4: Late 7th century

Sealing the features in Phase 3, layer [1056/1011] produced thirteen sherds of pottery including an abraded Roman Samian bowl rim (RPOT), but the rest of the pottery consists of chaff-tempered wares (CHAF, CHFS and CHSF), mostly as jar-shapes including the small rounded, thin walled vessel. Additionally there was a sherd of sand-tempered ware (SSAND). The most datable item was a CHAF sherd with point decoration (Fig. 47.2) and the small number of occurrences of such sherds found in *Lundenwic* indicates a late 7th century date, but comb-point decoration belongs more to the Early Saxon potting tradition in the Lower Thames Valley (Blackmore 2001, 34, Hamerow 1993, 45).

Phase 5: Early – mid 8th century

A single sherd of chaff-tempered ware (CHFS) was recovered from the metalled surface [1101]. The dump layer [1051] produced chaff-tempered wares (CHFS and CHFX) that include a lugged rounded bowl (Fig. 47.7), probably of a late 7th century date, but a sand-tempered (SSAND) jar rim was also present (Fig. 47.8). On the ECT96 excavation single sherds of CHFS were found in pit [146] and the gully

[119/130], but also the rim of a SSAND jar (Fig. 47.9) while the fills [115], [116] and [138] in the well shaft [114] all produced sherds of either chaff- (CHAF, CHFS and CHFI) or sand-tempered (SSAND) pottery. The sherd of a possible crucible in the SSTC fabric was also present in fill [115].

Phase 6: Late 8th - mid 9th century

The earliest pit in this phase at EXC97 was [1081]. In its fill [1050] were seventeen sherds of pottery, mostly sherds of CHFS and CHSF, but including an imported sherd of NFGWB and the flat base of a vessel in IPSF; the latter indicating deposition between *c.* 730/750-870. Pit [1096] truncated the latter feature and contained sherds of jars in CHAF, CHFS and four sherds of CHSF, including the shoulder of a jar shaped vessel,(Fig. 47.3). A single rim sherd of a medium-tempered Ipswich-type ware jar (Fig. 47.11) was recorded in pit [1093]. The small sherd of fine North French blackware (NFBWC) and a sherd of probable Badorf-type ware (BADOC) were present in pit [1084]. Pit [1091] contained two sherds of North French greyware, both from the same thin-walled vessel.

On the ECT96 area of excavation one large pit [108] produced in its fills the largest group of pottery (31 sherds, 383g). The pit's lowest fills [106], [107] and [117] produced mostly chaff-tempered wares, CHAF, CHFS (Fig. 47.6) and CHSF as well as very small sherds of sand-tempered wares SSANA, SSANB and SSAND and may represent an earlier backfilling of the pit. The latest fill [105] contained later pottery: an IPSF flat base sherd, IPSM and jar sherds in IPSC (Fig. 47.10), but five sherds of chaff-tempered ware were present, including a CHAF jar rim (Fig. 47.1). There are also four body sherds from Merovingian wares and include North French black ware (NFBWB and NFBWD), the latter fabric decorated with an incised wavy line and North French greyware as NFGWB and NFGWD.

Phase 7: Late 9th century

The dark earth formed during this phase may have incorporated occupation deposits associated with the final activity in *Lundenwic*, before its abandonment in the late 9th

Table 28 Distribution of the Maiden Lane pottery

Fabric	**Phase 3**		**Phase 4**		**Phase 5**		**Phase 6**		**Phase 7**	
	SC	**WT**	**SC**	**WT**	**SC**	**WT**	**SC**	**WT**	**SC**	**WT**
BADOC/MSWWF							1	2		
CHAF			1	10	1	2	7	72		
CHFI					1	6				
CHFS	2	16	5	100	13	159	10	110	4	50
CHFST					1	8				
CHSF			5	100	1	2	24	258	1	6
IPSC							2	40	2	38
IPSF							2	70		
IPSM							2	24		
MSSE									1	6
NFBWC							1	1		
NFBWE/NFGWA							2	24		
NFGWA									1	4
NFGWA/E							1	10		
NFGWB							1	16		
NFGWC							2	4		
NFGWD							2	26		
PMR									1	12
RPOT			1	12						
SSANA							1	2	1	4
SSANB							1	1	2	46
SSAND			1	14	6	33	1	4	2	10
SSTC					1	1				
Total	**2**	**16**	**13**	**236**	**24**	**211**	**60**	**664**	**15**	**176**

SC = sherd count and WT = weight (in g)

century. The earliest dark earth layers *(EXC97 [1010], [1061], [1079]) produced sherds of chaff (Fig. 47.5) and sand-tempered wares (SSANA, SSANB and SSAND), but a sherd of Middle Saxon shell-tempered ware (MSSE) was present indicating activity from *c*. 775/800. Above it layer [1049] notably contained the base sherd of a coarse Ipswich-type ware vessel. On the ECT96 excavation area, the dark earth [132] produced mostly residual sherds of chaff or sand-tempered wares.

Discussion

The pottery from these excavations appears to have been mostly used for storage. Only three sherds, one sand-tempered (SSAND) and two chaff-tempered ware vessels had external sooting and had definitely been used for cooking or heating water. This seems slightly unusual, as it would be expected that more vessels, particularly jar-shaped examples, would have been used as cooking pots. However, indirect sources of heating may have been used for cooking where there was no need for pots to become sooted; this may have involved placing pots on hot stones or in boiling water, like a *bain marie* (L Blackmore, pers comm). The only other deposits noted were on a chaff and sand-tempered vessel in Phase 4, layer [1056], which had a internal pale deposit, possibly lime scale and an Ipswich ware vessel base with a possible food deposit, found in Phase 9, layer [1049]. The possible crucible sherd found in the Phase 5 well [114] indicates metallurgy in the vicinity. Crucibles have now been found on several recent excavations in *Lundenwic*, for example the Royal Opera House, James Street), and the Lyceum (Blackmore with Dennis 2003, 271-3; Jarrett, Chapters 2 and 3, this volume) possibly indicating that there was a concentration of non-ferrous metalworking at the heart of the Covent Garden area, but further excavation in the Saxon settlement may show this industry to be more widespread.

The original excavation on the Maiden Lane site (MAI86) produced a larger assemblage of Saxon pottery, 672 sherds compared to that of the 113 sherds from the ECT96 and the EXC97 excavations, but both show the same chronological ceramic developments as elsewhere within *Lundenwic*. Initially, the period *c*. 650-750 was dominated by chaff-tempered wares, which were superseded by Ipswich–type wares in the mid- 8th century. The MAI86 assemblage was part of the initial fabric type series established for *Lundenwic*, and was important in confirming the ceramic sequence proposed for the Jubilee Hall, The Peabody and National Gallery extension sites (Blackmore 1988a, 103, 106; Blackmore 1989, 105-107). However, since then this has been further refined by analysis and synthesis of the Royal Opera House and continental sites (Blackmore 1999; 2001; 2002; 2003). Unfortunately the pottery from the ECT96 and EXC97 excavations only allowed for the basic chronological dating based mainly upon the presence of chaff-tempered ware (and some of their datable forms and decoration) or Ipswich-type wares. Closer dating was not so possible on these sites because of the fragmentary nature of the pottery and an absence of types that allow for a more refined dating framework, such as Walberberg ware (present from *c*. 670), the shell-tempered wares (and the imports of Badorf and Beauvais wares that are mostly associated with the 9th century settlement). Their absence from these sites may be due to chronological factors, but could also reflect other factors such as supply and demand. The MAI86 excavation also produced some important Middle Saxon forms, such as the largely complete North French bossed and stamped jar and a chaff-tempered melon-ribbed bottle or vase (Blackmore 1988a, Plate 5, 103 and fig 28.6, 110, fig 27. 46, 110) and a good range of chaff-tempered bowls or more open forms, as well as lugged bowls and a comb point decorated sherd (Blackmore 1988a, fig 24). Fewer readily identifiable forms were found at the ECT96 and EXC97 than at MAI86, and they are in a more fragmentary state. Most sherds are from jars and imported pitchers, but chaff-tempered bowls are also present, including a lugged example, and so similarities do exist between the assemblages of the different excavations on the sites.

THE SMALL FINDS

Moira Laidlaw (Wessex Archaeology)

The Loomweights

Three loomweight fragments were recovered from the EXC97 dark earth layers and one from a large Phase 6 pit at ECT96 (a probable fragment of a spindle whorl was also recovered from this pit). The loomweights are comparable in terms of both fabrics and forms to those already recorded from MAI86 (Blackmore 1988a, 114); The fabrics are similar to the broad fabric group 1 and all appear intermediate in form, while diameters tend towards a standard size range (120mm diameter by 40-45mm thick) (*ibid*, 112).

As at MAI86, no context produced more than two loomweights, which further confirms the suggestion that although wool and possibly other fibres were prepared on site, cloth was mainly woven in another area of the settlement. However, as West notes (1985, 138), looms may have been free standing and could well have been moved around.

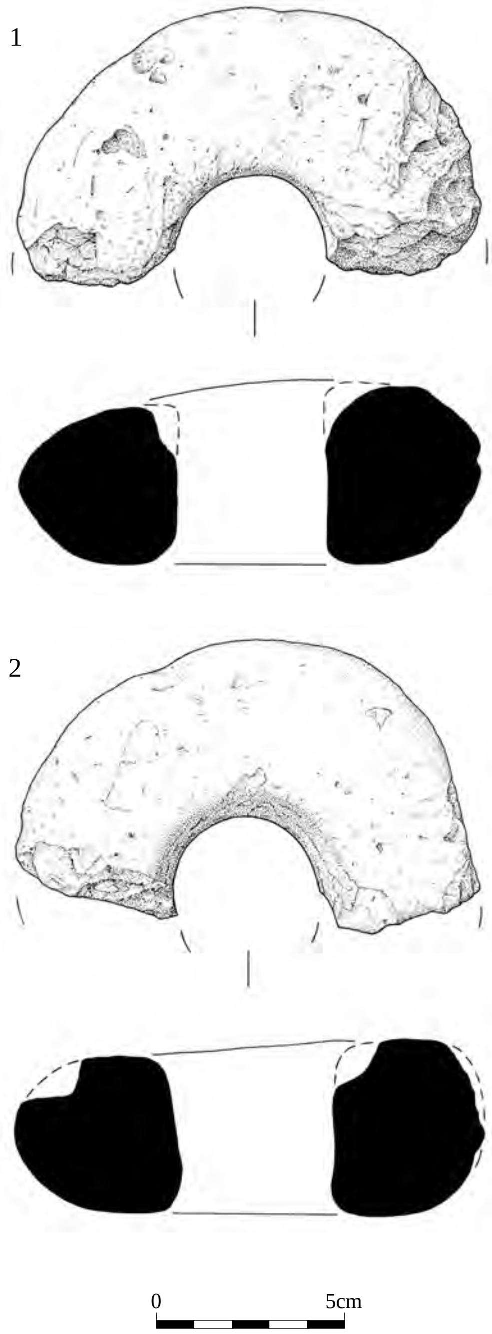


Fig. 48 Examples of Maiden Lane loomweights. Scale 1:2

The Fired Daub

Large quantities of fired clay fragments were recovered from both of the 1990s excavations. The majority from ECT96 are small and abraded and show signs of having been burnt subsequent to their original use. As with the larger fragments recovered from EXC97 these are most probably structural in origin, the larger fragments revealing wattle impressions. The impressions fall within the size range recorded for those from the 1986 excavation (Goffin 1988), mainly between 10-15 mm in diameter with a small number of larger impressions up to 24 mm in diameter. One fragment with two impressions at right angles to each other, one 24 mm in diameter the other 12 mm, may possibly represent a wattle panel similar to that discussed in the Jubilee Hall report (*ibid* 117, fig 30, 1). The fabrics are also comparable to those identified at Jubilee Hall and Maiden Lane (*ibid* 115), being sandy with occasional rare flint and varying coarseness of quartz inclusions.

The largest concentration of fired clay fragments from ECT96 was recovered from the Phase 6 pits, with smaller quantities recovered from deposits associated with the disuse of the earlier buildings and from a dark earth layer. The bulk of the fired clay from EXC97 was also recovered from Phase 6 deposits and the dark earth.

Most of the fired clay was recorded from pits and dumped deposits, where it appears to be redeposited, some was recovered from the postholes, and from the construction slots of buildings, and is likely to derive from the destruction of these buildings. The traces of burning on the fragments from ECT96 may be significant here: the vulnerability of such structures to fire has already been noted (*ibid* 119) and these deposits may therefore represent the clearance of buildings destroyed by fire.

The Glass

The glass fragments from EXC97 comprise one blue-green fire distorted fragment, probably from a folded rim, recovered from the Phase 4 layer [1056/1011] and two pale green fragments from a Phase 6 pit, [1084], one from a green thickened rim and the second from a simple rim. The two latter rim fragments are probably derived from beakers or cups and are similar to rim fragments recorded from both Jubilee Hall and Maiden Lane (MAI86) (Evison 1988, fig 34, 6, 7). The distorted fragment from layer [1056/1011] is less easily identifiable and could be a residual Romano-British piece or another Saxon fragment (*ibid* fig 34). A fragment of pale blue translucent vessel glass from the Phase 5 well [114] at ECT96 is almost certainly of Saxon date, although of unknown form.

The very small number of Saxon glass fragments suggests that no glass working activity was taking place on the site but rather represents domestic use. The fire-distorted fragment is interesting, but does not necessarily result from manufacturing activity.

The Stone

Four fragments of lava quern, none with surviving surfaces, were recovered from the Phase 5 well and Phase 6 pit. Another stone fragment is perhaps part of a quern in moderately coarse sandstone with one worked surface found in a dark earth layer. The source for the quernstone fragments is likely to be the same as the majority of quernstone fragments from MAI86, which were identified as volcanic rock from the Mayen-Niedermendig area of the Eifel Hills of Germany (Blackmore & Williams 1988). The likelihood is that these represent Saxon querns rather than reused Roman examples.

The Worked Antler and Bone

A spindle whorl was recovered from the Phase 4 midden deposit at EXC97 (Figs. 44 and 49.1). It is a lathe-turned spindle whorl manufactured from the burr of a red deer antler. It is of conical form and undecorated, although there are several concentric circles on the rounded face, which in all probability result from the turning process. Whorls of this material and form are largely of early or Middle Saxon date. The form declined in use during the 10th century and antler whorls were replaced, over the 9th and 10th centuries, by lighter whorls of bone. It is likely that this example is of 8th or 9th century date, although it could conceivably go back to the 7th century.

The bone objects from ECT96 comprise a needle (Fig. 49.2), part of a decorated catchplate from a composite, single sided comb (Fig. 49.3), an antler tip from Phase 5 features and another cut antler tip from a Phase 6 pit.

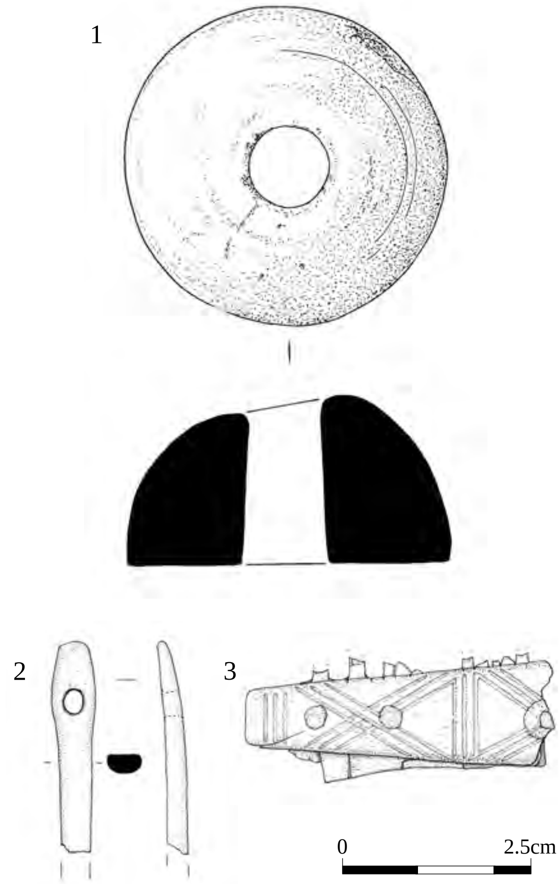


Fig. 49 The Maiden Lane antler and bone objects (1) antler spindle whorl SF8; (2) bone needle; (3) single-sided composite comb. Scale 1:1

THE ANIMAL BONE

Sheila Hamilton-Dyer (Wessex Archaeology)

The animal bone assemblages consist respectively of 1704 (ECT96) and 3084 fragments (EXC97), although the bone from EXC97 is better preserved and includes larger fragments. Bone came from features of Saxon date and from the overlying dark earth deposits.

On both sites the expected main domestic ungulates (cattle, sheep, and pig) are present, and form the bulk of the assemblage. A few bones of red deer (antler), horse, dog, cat, fowl, goose and duck are also present. There is a notable paucity of sheep and again, as with the 1986 excavation (MAI86), a high proportion of pig (West & Rackham 1988, table 21). Although skull and foot bones are well represented in the cattle, sheep and pig remains there are no dumps solely or largely of this material; horn cores are also present but at a very low level. The material does not, therefore, represent a concentration of primary slaughter waste, hornworking or tanning, but a mixture, which includes these amongst the predominantly domestic waste.

In comparison with the Saxon features, animal bone from the dark earth deposits contains a higher proportion of sheep at the expense of cattle; the level of pig, however, remains high and pig bones continue to be more frequent than those of sheep. Bird bones also seem to be more frequent. The EXC97 dark earth assemblage also includes several bones of a small dog. While these differences between dark earth and underlying features may be noted, however, the sample is really too small for meaningful comment.

No fish bones were noted during the initial scan of the EXC97 bulk assemblage but were recorded in most environmental samples. Fish remains were relatively frequent in the 1986 assemblage where extensive bulk sieving was undertaken, and form 13% of the total fragment count (Locker 1988). In contrast, only one fish bone was recovered from ECT96 despite extensive sieving.

The impression gained from the ECT96 and EXC97 material is that these assemblages are similar to those from the 1986 excavations. However the distinct difference between the MAI86 bones, where many represented pre-trimmed joints, and those from the Treasury site near Whitehall (Chaplin 1971), where a high proportion of jaws and feet were recovered, was not noted in the 1990s assemblage. Although there does appear to be a high proportion of bones from good meat joints at EXC97 and ECT96, there are also bones from those areas normally regarded as poor quality and waste, *ie* head and feet. The difference in the two possibilities is an important one as it implies a different economy and lifestyle. It is possible that the animals supplied to *Lundenwic* are dissimilar to those supplied to contemporary settlements such as *Hamwic*. However, the butchery style, mainly of chopping, appears similar to that reported from other sites.

The relatively small sample sizes preclude in-depth analysis of ageing. In the 1986 assemblage it appeared that many animals had been killed at prime meat age rather than at the end of their useful lives (West & Rackham 1988, 152-3), as was the case at *Hamwic (*Bourdillon & Coy 1980). It may be noted that several bones of calf were identified at EXC97.

THE PLANT REMAINS

Mike Allen (Wessex Archaeology)

Both sites produced high numbers of charred grain from features such as building postholes, the well [114] and the large Phase 6 pit [108] from ECT96, and the dark earth deposit from EXC97. Lower quantities were recorded from the early soil horizon, a beamslot and another Phase 6 pit.

A large number of charred weed seeds was observed at EXC97 in a Phase 6 deposit and a few, including charred

Table 29 Distribution of animal bone from Maiden Lane

Feature/Context	horse	cattle	sheep/ goat	pig	red deer	cattle size	sheep size	mammal	dog	cat	fowl	other bird	totals
Phases 2 - 4													
[133]	-	11	-	2	-	11	1	-	-	-	-	-	25
Gully [1117]	-	6	-	2	-	13	4	4	-	-	-	-	29
Layer [1011/1056]	1	148	27	31	1	219	43	8	-	-	-	-	478
Total	**1**	**165**	**27**	**35**	**1**	**243**	**48**	**12**	**0**	**0**	**0**	**0**	**532**
%	**0.2**	**31.0**	**5.1**	**6.6**	**0.2**	**45.7**	**9.0**	**2.2**	**0**	**0**	**0**	**0**	
% cattle, sheep, pig		**72.7**	**11.9**	**15.4**									214
Phases 5 - 6													
Posthole [122]	-	-	1	1	-	4	2	-	-	-	-	-	8
Posthole [124]	-	3	1	5	-	2	4		2	-	-	-	17
Posthole [126]	-	1	-	-	-	-	1	-	-	-	-	-	2
Posthole [128]	-	1	-	-	-	3	-	-	-	-	-	-	4
Posthole [146]	-	1	1	-	-	1	1	-	-	-	-	-	4
Posthole [149]	-	1	-	-	-	-	-	-	-	-	-	-	1
Posthole [1150]	-	24	3	4	-	15	1	-	-	-	-	-	47
Well [110]	-	32	6	19	3	60	52	56	-	-	1	1	230
Gully [119/130]	-	19	1	3	-	13	6	5	-	-	-	-	47
Gully [140]	-	5	-	-	-	7	4	-	-	-	-	-	16
Pit [108]		87	10	26	1	95	63	42	-	1	8	7	376
Pit [134]	-	7	-	-	-	2	-	-	-	-	-	-	9
Pit [1084]	-	48	42	56	2	120	108	8	-	-	3	7	394
Pit [1091]	-	7	-	8	-	15	2	6	-	-	1	-	39
Pit [1093]	-	11	3	5	1	18	6	-	-	1	2	-	47
Pit/posthole [1096]	-	53	5	28	-	97	47	10	-	-	1	1	242
Pit/posthole [1106]	-	28	7	7	-	38	6	-	-	-	-	-	86
Pit [1146]	-	50	7	27	-	62	15	1	-	-	-	-	162
Layer [1088]	-	2	-	-	-	4	7	3	-	-	-	-	16
misc. layers	-	184	44	95	-	219	39	9	1	-	3	-	594
Total	**0**	**714**	**221**	**474**	**7**	**1111**	**567**	**140**	**3**	**2**	**19**	**16**	**3274**
%	**0**	**21.8**	**6.7**	**14.5**	**0.2**	**33.9**	**17.3**	**4.3**	**0.1**	**0.1**	**0.6**	**0.5**	
% cattle, sheep, pig		**50.7**	**15.7**	**33.6**									**1409**
Phase 7													
dark earth	-	786.5	243.4	522.1	6	1144.9	584.3	23	26	-	9	15	24
Pit 1072	-	4	5	3	1	6	3	-	-	-	-	-	22
Total	**0**	**174**	**102**	**122**	**7**	**310**	**194**	**23**	**26**	**0**	**9**	**15**	**982**
%	**0**	**17.7**	**10.4**	**12.4**	**0.7**	**31.6**	**19.8**	**2.3**	**2.7**	**0**	**0.9**	**1.5**	
% cattle, sheep, pig		**43.7**	**25.6**	**30.7**									**398**
OVERALL TOTAL	**1**	**1053**	**350**	**631**	**15**	**1664**	**809**	**177**	**27**	**2**	**28**	**31**	**4788**
Overall %	**0**	**22.0**	**7.3**	**13.2**	**0.3**	**34.8**	**16.9**	**3.7**	**0.6**	**0**	**0.6**	**0.6**	
% cattle, sheep, pig		**51.8**	**17.2**	**31.0**									**2034**

hazelnut fragments, was noted from the Phase 4 layer. Possible silica replaced weed seeds were also observed. Lower numbers of charred weed seeds were recorded in the features that produced charred grain at ECT96. Charred pea/bean fragments were also seen in high numbers in Phase 6 deposits.

The charred plant remains appear similar in nature to those previously reported (Davis & de Moulins 1988) although these revealed no obvious pattern of refuse disposal (*ibid* 147).

Chapter 5 A Middle Saxon Suburban Farmstead: Excavations at the National Portrait Gallery

CHRIS PICKARD

Pre-Construct Archaeology carried out five phases of work at the National Portrait Gallery, which were conducted in the skylight – yard area between the National Portrait Gallery and National Gallery, where a four-story extension was to be erected. As part of the mitigation strategy a series of 'observation pits' (OP1- 20) were excavated in pile locations (Fig. 50). Of the observation pits investigated nine, OP3, OP4, OP5A (hereafter OP5), OP11, OP14, OP15, OP16, OP17 and OP19, produced significant Saxon remains (*see* Fig. 50).

THE ARCHAEOLOGICAL SEQUENCE

Phases 1 and 2: The Earliest Activity

Phase 1 represents the natural geology and is discussed in Chapter 1. The earliest activity on site is interpreted as probably early Middle Saxon in date and consists of the heavily truncated remains of a possible slot for a timber building with clay and gravel packing. Located in the eastern part of OP5 [138] was a shallow east-west aligned cut, extending beyond the eastern limit of excavation and truncated to the west by a later pit (Fig. 52).

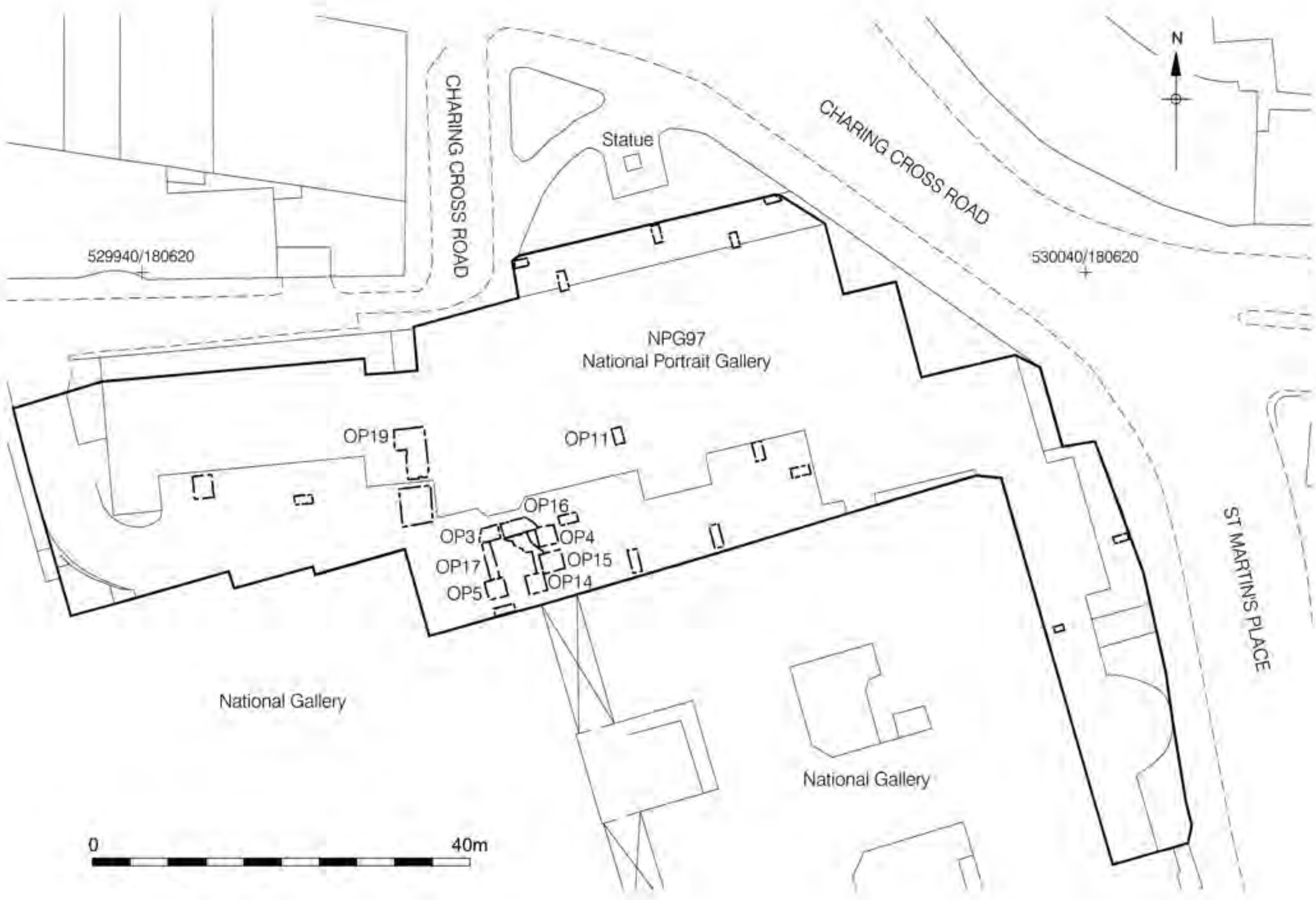


Fig. 50 National Portrait Gallery site location. Scale 1:800

Fig. 51 Excavations at the National Portrait Gallery

Phase 3: Ploughsoil/abandonment Horizon

The linear cut [138] was sealed by a 0.20m thick clay silt deposit [132], with occasional inclusions of charcoal, daub, animal bone and pebbles. Similar deposits in OP14 and OP16 were located at the same relative height as [132], and as no evidence for agricultural activity such as plough marks was noted in the underlying natural brickearth this horizon probably represents a temporary abandonment of the area.

Phase 4: Undated Stakeholes, Ditch Cut and Pitting Activity

In OP16 a group of sixteen stakeholes was located, cut into the disturbed brickearth horizon [377]. The stakeholes were mainly vertically driven and pointed, and no discernible pattern could be made of their layout. A further nine vertically driven stakeholes were also recorded in OP4,

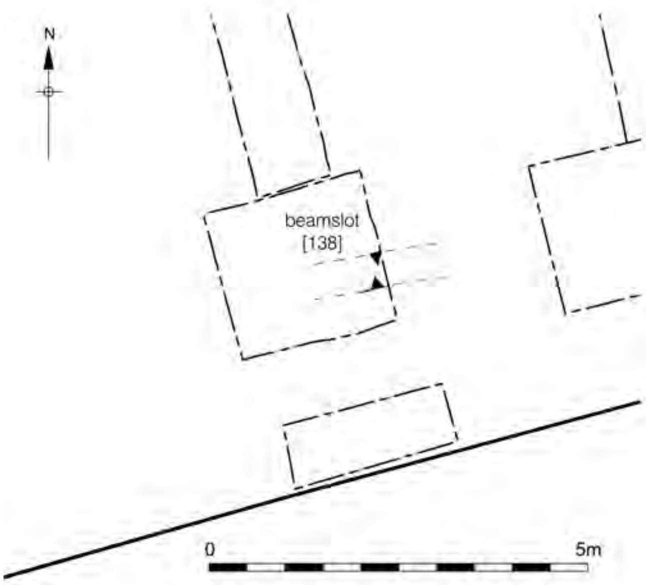


Fig. 52 Plan of National Portrait Gallery Phase 2 beamslot. Scale 1:100

whilst three stakeholes were revealed in OP3 at a similar height. The stakeholes may represent the scanty remains of a succession of wattle structures or fences, possibly for the temporary stockading of animals away from the brickearth quarries and rubbish pits. A significant variation in the depth of the stakeholes may reflect differences in function for the stakeholes, with the deeper holes possibly being for a more permanent wattle fencing and the shallower holes being for lighter, portable wattle hurdles, possibly for the penning of livestock (Fig. 53).

In OP4 an east-west aligned ditch [234/264] was located, with a north-south return [494] in OP15, associated with five stakeholes (Fig. 53). It appears that the ditch may have replaced a fence line on the same alignment since a brickearth downwash deposit was located at the side of the cut sealing three stakeholes, whilst two fairly substantial stakeholes were also located at the base of the ditch.

When ditch [494] fell into disuse it appears to have been deliberately backfilled with [492]/[493], from which several sherds of Middle Saxon pottery were recovered including North French greywares, chaff- and sand-tempered wares. A heavily corroded coin was found in the uppermost fill [488] identified as a silver second series sceatta type K 20/18 dating to the first half of the 8th century. This is one of the earliest Middle Saxon coins found in *Lundenwic* to date and provides a good *terminus ante quem* for the ditch (Gaimster this chapter).

A large sub-circular pit cut [130], truncated the underlying disturbed brickearth horizon in OP5 (Figs. 53 and 55). The pit measured at least 3.00 m north-south by at least 2.00m east-west and was 3.14m deep. It had steeply sloping sides and a flattish base (Fig. 55), at 10.20m OD just above the natural sandy gravels, which suggests that it had originally been dug to quarry brickearth.

Following extraction of the brickearth the pit was backfilled with a series of well-defined fills of alternating mixed silts and silty brickearth. The presence of Ipswich-type wares in the earlier fills of the pit suggests the backfilling commenced *c.* AD 730/750-870. The presence of structures on site is supported by the large quantity of daub fragments recovered (Hughes, below and Chapter 6, this volume) indicating that wattle and daub buildings must have been constructed on or near the site.

A heavily truncated cut [277] in OP11 contained at its base two surviving backfill deposits of silty and sandy brickearth [275] and [276] and was also interpreted as a brickearth quarry of contemporary Middle Saxon date (Fig. 53).

Two further truncated rubbish pits were located in OP19 (Fig. 53). The more complete [526] measured at least 2.00m north-south by 1.20m east-west being 1.34m deep with

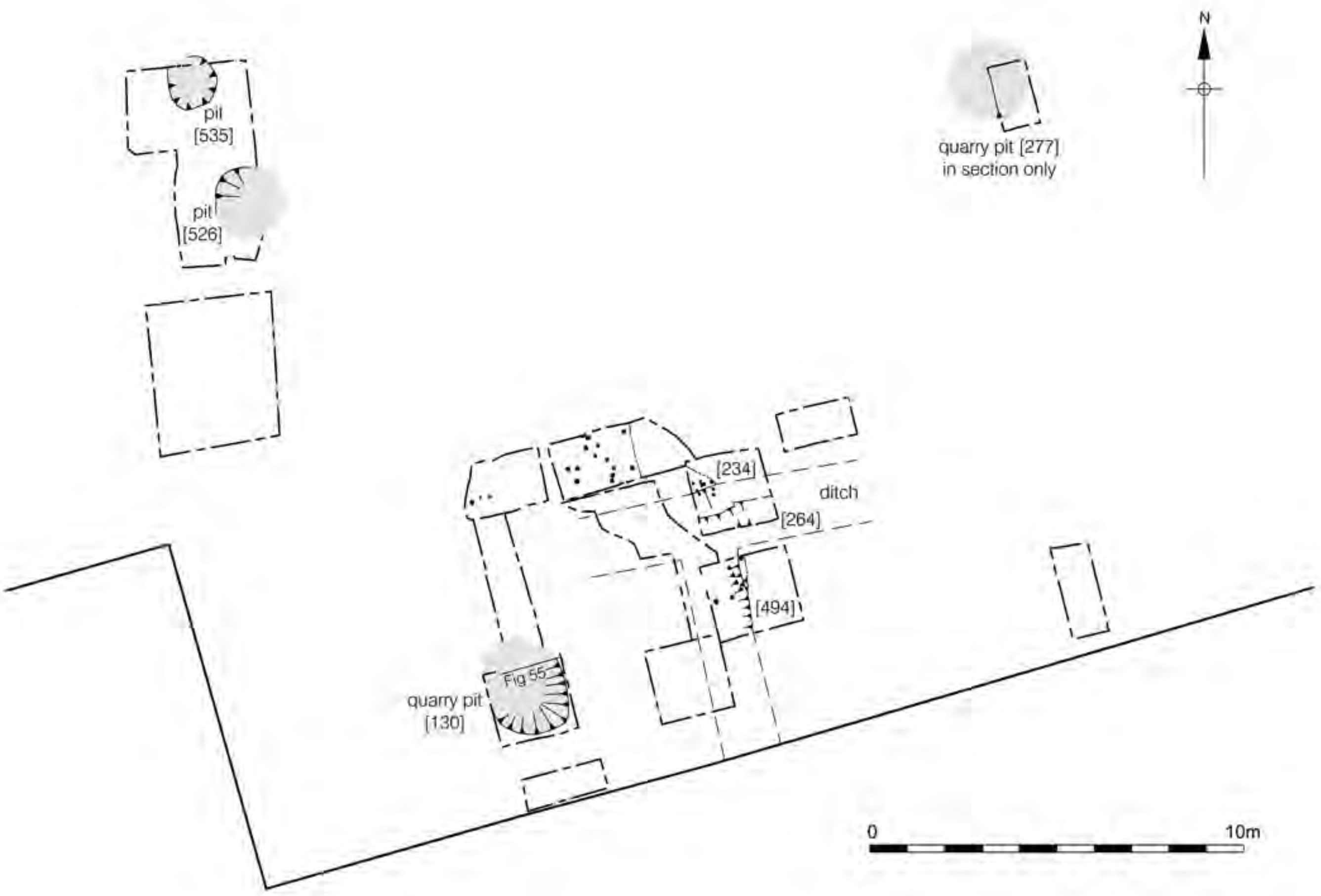


Fig. 53 Plan of National Portrait Gallery Phase 4 stakeholes, pits and ditch. Scale 1:200

steeply sloping sides and a flat base (at 11.84m OD). The primary deposit [525] had a cess like appearance and was largely sealed by a very clean layer of redeposited brickearth. The pit was filled by further dumps comprising relatively clean brickearth layers and sandy silt deposits containing frequent inclusions of animal bone, oyster shell and daub fragments.

Two of the fills in pit [526] produced material derived from structural activity; considerable quantities of burnt and unburnt daub. Fill [516] included four fairly substantial lumps of unburnt and partially burnt sandy daub that had not been fired but were scorched to a reddish orange and grey in places. The largest piece was 55mm thick and had two equal layers of daub with a surface and base of cream lime paste or mortar. Two of the pieces had a core showing construction with mud balls. It has been suggested that this material formed part of a collapsed wall surface or the slightly cemented sweepings from floors or yards (*see* Hughes, Chapter 6, this volume).

Seventeen lumps of a moderately compacted creamy brown brickearth deposit, varying in size, from 15g to 890g were recovered from fill [518]. The largest piece had a cream lime surface, scorched black on its upper side, with organic ashy residues adhering. Hughes interprets this latter material as either being the result of the cementing of soil residues collecting around a hearth and being considered for reuse, or a burnt floor surface with rush matting.

The uppermost fill [509] of the pit contained large amounts of cultural and non-cultural material including animal bone, oyster shells, charcoal flecks, CBM fragments and three sherds of Ipswich-type ware, one sherd of sandy ware and rim sherds of a Middle Saxon shelly ware jar.

The second pit [535] (Fig. 53), located 1.90m to the northwest of pit cut [527], had steep sides and a flat base, measured 1.32m in diameter and was 1.33m deep. A similar sequence of backfilling with clean brickearth deposits

Fig. 54 Excavation of stakeholes at the National Portrait Gallery

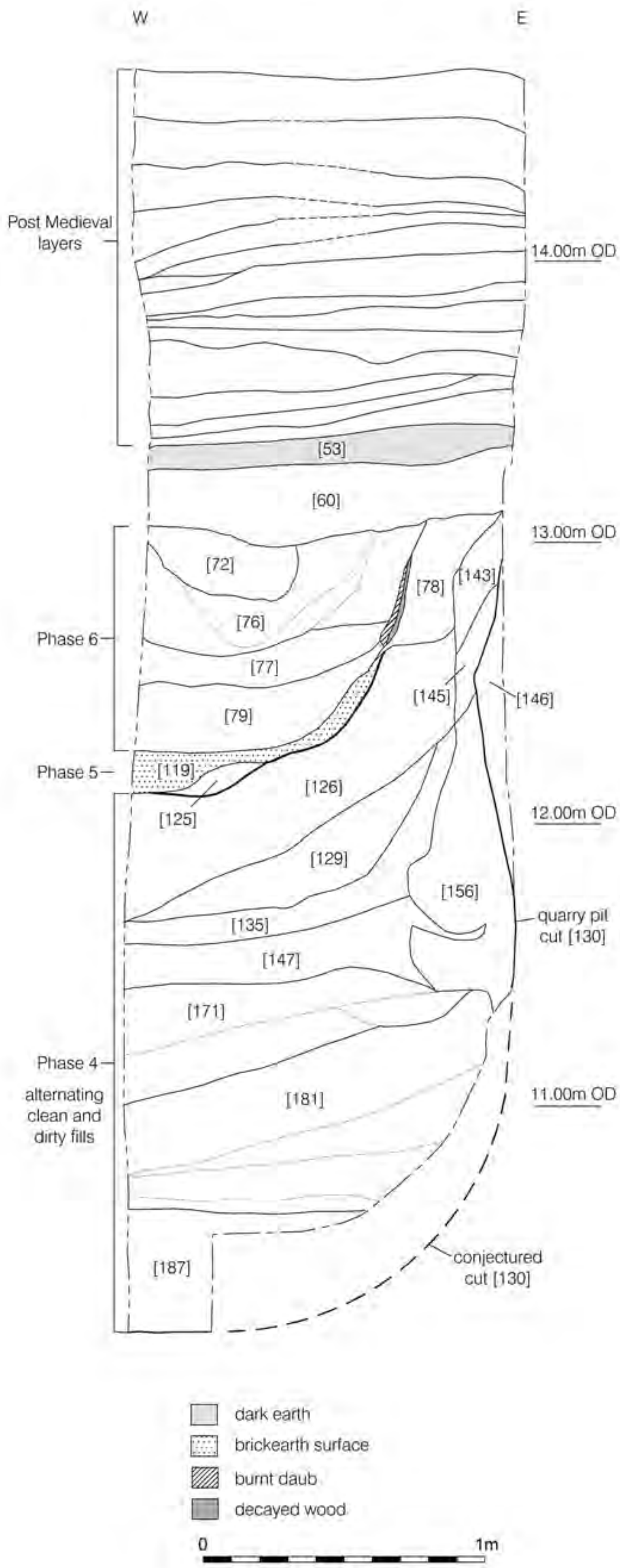


Fig. 55 Section through pit [130] at the National Portrait Gallery. Scale 1:25

interleaved with mixed sandy silt deposits was revealed. Pit cut [535] produced only a single sherd of Ipswich-type ware decorated with a band of gridded triangular stamps above a band of gridded circular stamps (Jarrett this chapter). The paucity of cultural material from this pit is likely to have been a product of the extensive modern truncation rather than a different functional attribute. It contained a comparable amount of animal bone to other pits on site, the bone showing similar butchery evidence and small-scale on site processing including the working of antler. No contemporary ground surfaces were located for either pit as a result of modern truncation.

Phase 5: Collapsed floor with stakeholes

Within the quarry pit [130] and overlying the sequence of apparently structured deposition of clean and dirty fills were two brickearth deposits [125], and [119] (Figs. 55, 56). From the upper surface [119], only a single sherd of sand-tempered ware was recorded.

Cutting through the brickearth were twenty-four stakeholes (Fig. 56). The compaction and general clean nature of the brickearth layers, and the presence of the stakeholes suggests that this constituted the remains of a brickearth floor which had collapsed into the soft fills of the deep pit [130] (Butler 1997). Unfortunately the limited size of OP5 and the extent of the pit within it meant that no structural remains of the associated building, such as postholes, were discovered. It is probable that contemporary levels had been truncated, and the collapsed brickearth slab is the only record of this structural phase. It also suggests considerable compaction of the fills.

Phase 6: Backfilling of the Hollow Caused by Collapse

The collapsed brickearth floor occupied the base of a depression some 0.80m deep in the top of pit [130]. The depression was backfilled with various deposits of clean silty brickearth and silty deposits, which contained artefactual material of a domestic nature and frequent charcoal inclusions, animal bone, burnt daub and oyster shell.

The pottery from these deposits comprised sherds of chaff-tempered, shelly and Ipswich-type wares including the rim sherd of a bowl with faint thumb or finger decoration. The backfilling of the depression also produced evidence for bone working of a sophisticated nature with at least two bone combs recovered from fill [77] (Riddler, this chapter) and a sheep's thoracic vertebra bearing two Anglo-Saxon

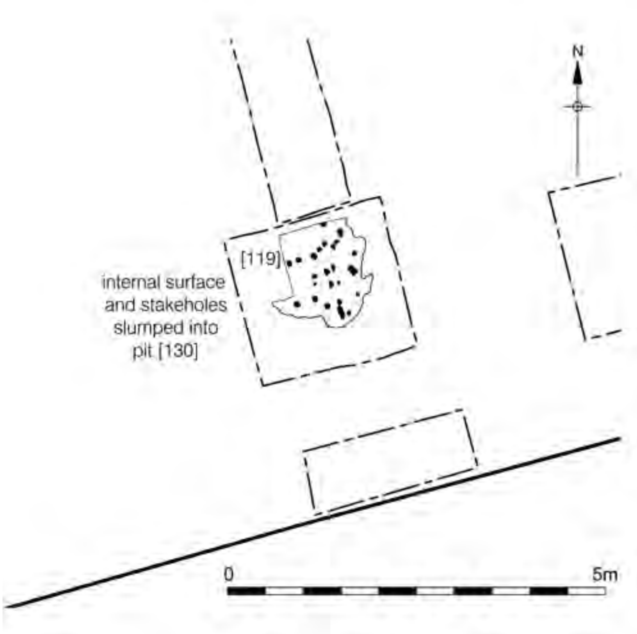


Fig. 56 Plan of National Portrait Gallery Phase 5 surface. Scale 1:100

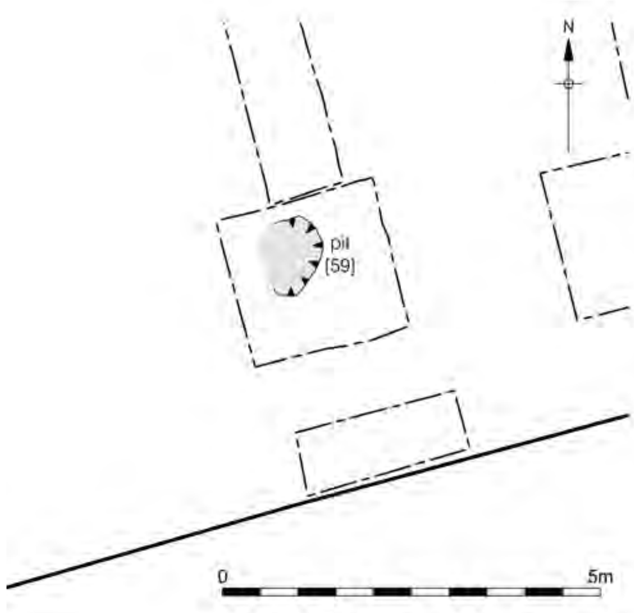


Fig. 57 Plan of National Portrait Gallery Phase 7 pitting. Scale 1:100

runic inscriptions from an overlying slumped deposit [73], excavated in plan, though not extending as far as the section shown in Fig. 55 (Page, this chapter; Brown *et al* 2001).

The backfilling appeared to represent continuous refuse deposition and a possible levelling off of the area perhaps in preparation for a later phase of rebuilding, which due to the small size of the trench left no trace and may have occurred outside the limits of excavation.

Phase 7: Second Phase of Saxon Pitting

A truncated semi-circular pit [59] (Fig. 57) represented a later phase of pitting cut through layer [60]. All the fills of the pit contained inclusions of charcoal, animal bone, burnt daub, oyster shell and sherds of Ipswich, shell-and sand-tempered wares suggesting the pit was for the disposal of domestic rubbish rather than a structural posthole.

Phase 8: Dark Earth

In OP5 dark earth layers [53]/[54] sealed pit [59] and were composed of a mottled light to mid grey brown sandy silt which contained daub fragments, oyster shell, animal bone and sherds of exclusively Middle Saxon pot (Fig. 56). Layer [469] in OP17 corresponded to layer [53] in OP5, and contained a sherd of Saxon sand-tempered ware. A similar dark earth deposit [194] in OP3 and [341] in OP16 [341] sealed the exposed stakeholes and as with [53]/[54] contained similar material. The pottery was exclusively Middle Saxon in date, indicating contemporaneity.

In OP14 only fragmentary dark earth deposits [407], [408] and [409] were located, due to extensive post medieval truncation, with layer [408] being a dump of oyster shells. A slight greenish hue was noted in all the dark earth layers, which is possibly a consequence of organic/cess material being introduced into an agricultural soil as manure.

In OP15 the upper fills [488] and [489], of ditch [494] may represent dark earth deposits, slumped into the top of the cut.

THE POTTERY

CHRIS JARRETT

The site produced a total of 287 sherds of pottery, with a fragment of Dressel 20 Amphorae from the Phase 3 brickearth horizon [381] and Saxon pottery deriving from Phases 4 to 8. It was quantified using sherd counts (with fresh breaks discounted); additionally weights and estimated vessel equivalents (eves), based on rims were recorded. The Saxon wares comprised 93 sherds, and the fabrics were defined using the descriptions of Blackmore, (1988a, 1989) (*see* Jarrett, Chapter 2, this volume).

The Saxon pottery is fragmentary; the degree of post-depositional wear variable, with large unabraded sherds indicating deposition soon after the breakage of the vessels, while abraded material was probably secondary or tertiary deposition. Sherd links between vessels tend to occur within fills of the same phase and the material is therefore discussed by pit or as in the case of the quarry [130] by phased fills.

Fabrics and Forms

Chaff-tempered wares
(CHAF, CHSF)

A total of six sherds of chaff-tempered pottery were recovered, in fragmentary and abraded condition. Four of the sherds were simply chaff-tempered (CHAF) including the rim of a bowl with a rounded thickened exterior (Fig. 58.1). Two sherds with sparser organic vegetable and fine sand tempering (CHSF) were also recovered although no distinctive forms were recognised.

Ipswich-type ware
(IPSF, IPSM, IPSC)

Ipswich-type ware was the most common Middle Saxon pottery type recovered from the site and consists of 62 sherds weighing 1657g. The forms in this usually reduced, coloured, hand-made, wheel finished, sand-tempered ware can be most readily recognised as closed shapes, either as jars or pitchers. The rims are typically thick, simple and everted sometimes with a bevel (Figs. 58.2-3) and the shoulders are often noticeably rilled (Fig. 58.4) while the bases (Figs. 58. 5-7) are flat, sometimes with a notable internal 'step'. Twenty-nine sherds of the fine fabric (IPSF) were recovered in decorated closed forms (Figs. 58.3, 5-6, 8-10) at its simplest with an incised horizontal line around and below the neck and short vertical incised lines beneath (Fig. 58.8). Two stamped vessels were recovered, the first (Fig. 58.9) with opposed triangular gridded stamps (12mm by 19mm) around its shoulder. This stamp has been recorded at Maiden Lane (MAI86) (Blackmore 1988a), Barking Abbey (Redknap 1991) and the Royal Opera House (Malcolm *et al* 2003). The second vessel (Fig. 58.10) has smaller sized opposed triangular stamps (8mm by 14mm) of the same design as above, but with the addition of circular gridded stamps. The medium tempered Ipswich-type ware (IPSM) (Figs. 58.2, 7), as 20 sherds, could only be recognised as closed forms and includes a small rounded jar (Fig. 58.2) and an oxidised shoulder sherd with decorative rilling. There are only thirteen sherds of the coarse ware (IPSC) mostly from closed forms including an example with shoulder rilling (Fig. 58.4). Some of the Ipswich-type ware vessels show evidence for use in cooking such as (Fig. 58.8) with one vessel having an internal soot deposit, possibly resulting after the vessel's breakage or as a result of a cooking accident; while two vessels (including Fig. 58.7) have an internal white deposit, possibly lime scale from boiling water.

Sand-tempered wares
(SSANB, SSANC, SSAND)

Sand-tempered wares were present as six sherds. There is a single sherd of medium sand-tempered, reduced ware (SSANB) as a thin walled vessel and three sherds of white firing fabric, possibly from Surrey (SSANC) including the shoulder of a closed form. A single body sherd of finely sand and chaff-tempered ware (SSAND) possibly comes from an open form.

Shell-tempered ware
(MSSE)

The shell-tempered ware present (MSSE) is the most common type to be found in *Lundenwic*, possibly originating in Kent (L Blackmore, pers comm), with abundant shell and sparse organic temper. Eight sherds of this pottery type, were recovered and the forms have simple, rounded rims, probably from jar-shaped vessels, one with a cylindrical profile (Fig. 58.11-12).

Imported pottery
(NFBWC, NFBWD, NFGW, NFRW)

The five sherds of imported pottery, all derive from a source in Northern France. Two sherds of fine black wares were recovered; one with a bluish-white body, and the other, probably from a pitcher, decorated in the Tating style with glue residue surviving, but its associated tin-foil decoration now missing. Tating ware in this fabric (NFBWC) is generally found in late 8th century contexts, possibly continuing into the early 9th century (Blackmore 2001, 40). A third North French black ware sherd, of coarse fine brown/pink fabric (NFBWD) of uncertain shape, was also recovered along with a possible sherd of a pitcher in a North French greyware (NFGW) fabric and an unknown vessel form in a North French redware (NFRW).

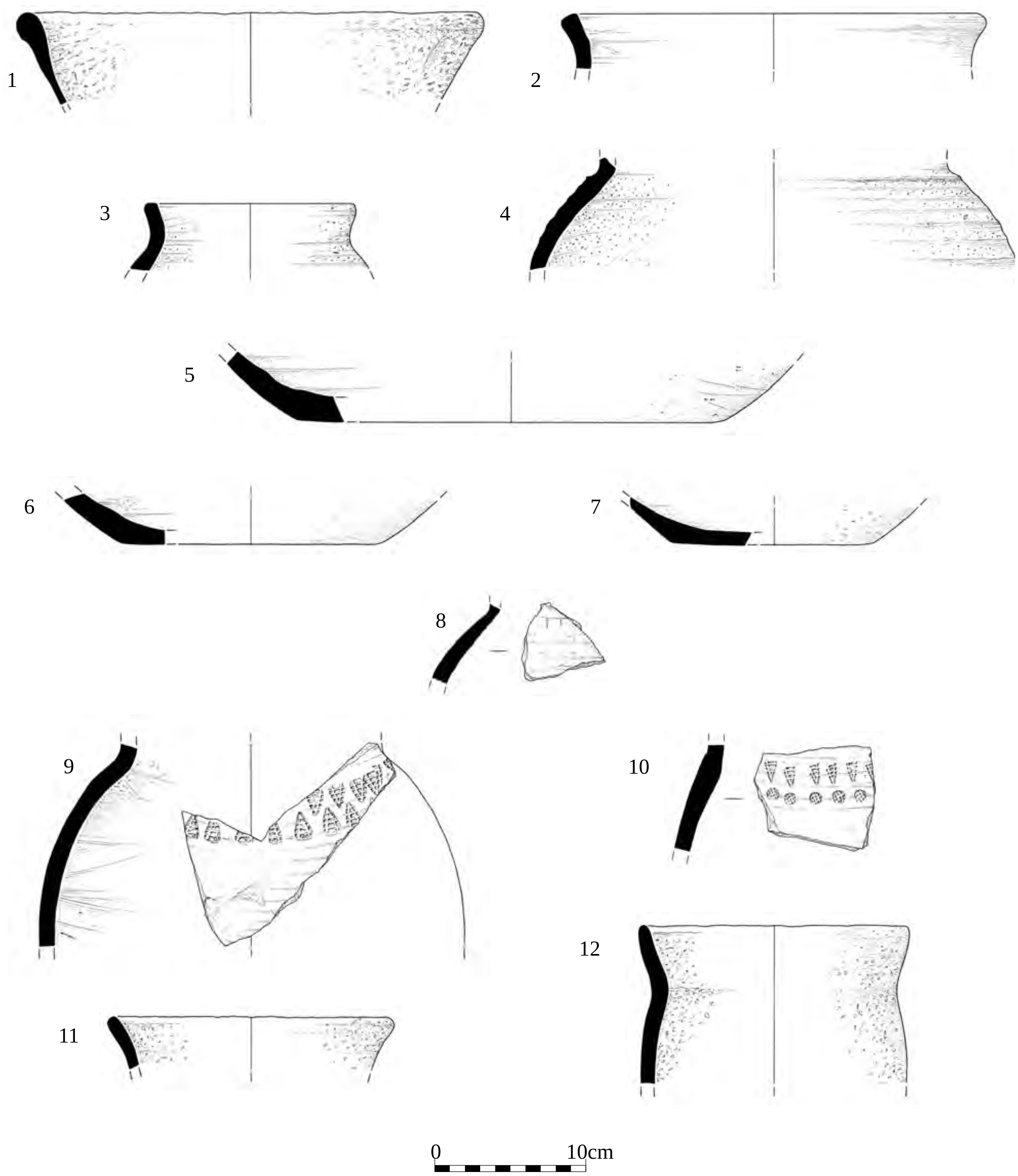


Fig. 58 The National Portrait Gallery pottery
(1) Chaff-tempered ware; (2-10) Ipswich-type ware; (11-12) Shell tempered ware. Scale 1:4

The Distribution of the Pottery

Of the Saxon features, four pits, [59], [130], [526], [535] and the ditch, [494] all contained Ipswich-type ware or Saxon shelly wares, indicating deposition from *c.* 775/810. Table 30 shows the quantification of the pottery in the pits by sherd count and weight. The earliest of the three phases of infilling of pit [130] contained chaff-tempered wares (CHAF and CHSF), Ipswich-type ware (IPSC, IPSF and IPSM), (Fig. 58.4), shelly ware (MSSE), sandy wares (SSANC and SSAND), imported North French Black ware (NFBWC) and North French Redware (NFRW). Pottery was sparse in the Phase 5 fills of pit [130] with only a sherd of SSANB present, as the result of a brickearth floor which had slumped into the pit, separating the two major periods of infilling. The Phase 6 pit infilling again contained chaff-tempered wares (CHAF) (Fig. 58.1), Ipswich-type (IPSF and IPSM) (Fig. 58.2-3) including a stamped example (Fig 58.9) and shelly ware (MSSE). A small sherd of intrusive Coarse Border ware was also present in this pit.

The recut [510] of Phase 4 pit [526], contained Ipswich-type ware (IPSF and IPSM) (Fig. 58.5) and the rim of a shelly ware (MSSE) jar (Fig. 58.12), indicating a date from *c.* 775, if not *c.* 810. Pit [535] contained one sherd of Ipswich ware (IPSF) with gridded triangular and circular stamps (Fig 58.10). From the Phase 4 ditch, [494], the earliest fill producing pottery was [493] which contained single sherds of chaff-tempered ware (CHAF), sand-tempered ware (SSANC) and three sherds of Ipswich-type ware (IPSC and IPSF) as well as an intrusive sherd of early medieval sand and shell ware (EMSS). The latter had an applied band of thumbed decoration, more characteristic of the Saxo-Norman period. The latest and only other fill with pottery [492] produced an IPSM vessel base and a North French grey ware (NFGW).

The Phase 7 pit, [59] contained four sherds of Ipswich-type ware (IPSF and IPSM) (Fig. 58.6) and two sherds of shelly ware (MSSE), with no chaff-tempered or imported wares. The dark earths of Phase 8 also contained Middle Saxon pottery. Layer [54], which overlay pit [59], contained a sherd of a IPSC with a sherd link to a vessel in fill [126] of pit [130], and above this layer [53] contained three sherds of IPSF (Fig. 58.8), the base sherd of an IPSM vessel (Fig. 58.7), a sherd of NFBWD, and shell-tempered ware (MSSE) bowl (Fig. 58.11). The dark earth [469] in OP17 contained a body sherd of (IPSC), and overlying gravel layer [465] produced single sherds of a mixed grit Saxon ware with abraded surfaces, chaff-tempered ware, and a vessel base (IPSC). In other trenches the dark earth material appeared to be much more mixed with Late Saxon, medieval and post-medieval pottery present.

Discussion

The Saxon pottery from the National Portrait Gallery bears comparison with that recovered from adjacent excavations at the National Gallery Basement and Extension (Blackmore, 1989) and both sites appear to be similarly dated although a larger assemblage was recovered from the earlier excavations (186 sherds as opposed to 93 sherds from the National Portrait Gallery). Ipswich-type ware was present in the earliest features on both sites, but no 9th-century foreign imports; Badorf or Beauvais-type red painted wares were found at both.

Prehistoric pottery was present at the National Gallery Extension and a single rim sherd in a coarsely flint-tempered ware was recovered from the National Portrait Gallery in a similar fabric to that identified at the Extension site, and assigned to the Iron Age. Only two sherds of Roman pottery were recovered from the National Portrait Gallery site, a Dressel 20 Amphorae in the Phase 3 brickearth horizon [381], and a small Roman grey ware sherd from fill [78], pit [130].

Blackmore (1989) suggested that at the Peabody and National Gallery basement sites the presence of residual wares was the result of discarded pottery collecting on the land surrounding the earlier Saxon settlement. With the expansion of *Lundenwic* in the mid- 8th century, residual pottery became incorporated into new settlement features. Blackmore (1989) demonstrated at the National Gallery that the ratio of Ipswich-type ware to chaff-tempered ware increased through the phases of Saxon activity and this is also true at the National Portrait Gallery. In pit [130], the ratio of Ipswich-type ware to chaff-tempered ware in the Phase 4 fills was 1.25:1 (by sherd count) which increased to 7:1 in the Phase 6 fills of the pit. The ratio of Ipswich-type to chaff-tempered ware (by weight), increasing from 1.68:1 in the Phase 4 fills to 5.72:1 (weight) in the Phase 6 fills of pit [130]. Chaff-tempered wares were absent in the Phase 7 pit [59], which truncated the latest fill of [130].

Blackmore has proposed the theory that *Lundenwic* spread westward and northwards from the Strand on the evidence of the pottery (Blackmore 1989) from the Peabody site, approximately 200m to the east and the National Gallery Basement site adjacent to the National Portrait Gallery to the west. The main occupation of the Peabody site dated to the late 8th and 9th centuries, and the National Gallery Basement to the early 9th century. The presence of shell-tempered ware at National Portrait Gallery suggests a date after *c.* 770 and probably after *c.* 810, supporting the identified trend, though 9th-century decorative styles, such as lattice burnishing, were absent from the National Portrait Gallery.

Table 30 Distribution of the National Portrait Gallery pottery

	Phase 4						**Phase 5**		**Phase 6**		**Phase 7**		**Phase 8**	
Fabric	**Pit [130]**		**Ditch [494]**		**Pit [510]**		**Pit [130]**		**Pit [130]**		**Pit [59]**		**Dark earth [53]**	
	SC	WT	SC	WT	SC	WT	SC	WT	SC	WT	SC	WT	SC	WT
CBW									1	1				
CHAF	2	16	1	12					1	50				
CHSF	1	4												
IPSC	6	138	2	12										
IPSF	3	24	1	8	2	174			13	370	3	106	3	54
IPSM	2	16	1	34	2	114			11	181	1	26	1	78
MSSE	1	4			2	270			1	20	2	16	1	14
NFBWC	1	2												
NFBWD													1	6
NFGW			1	42										
NFRW	1	2												
RPOT									1	2				
SSANB							1	4						
SSANC	1	4	1	4										
SSAND	1	32												
total	**19**	**242**	**7**	**112**	**6**	**558**	**1**	**4**	**27**	**623**	**6**	**148**	**6**	**152**

sherd count (SC) and weight (WT) in grams.

THE LOOMWEIGHTS

CHRIS JARRETT

The Fabrics

The loomweights are in Fabrics 1a and 1b with Fabric 2 absent. A loomweight (Fig. 59.1) present in fill [77] was a slight variant of fabric 1b and contained sparse shell fragments, less than 3mm.

Fabric type 1a - London clay, soft, fine with some organic content

Fabric type 1b - As 1a but hard with some organic content

The Types

Flattened/annular type with horizontal U-section.

Intermediate type, rounded with D-shaped profile (Figs. 59. 1 + 2)

Bun-shaped, approximately biconical with a C-section (Figs. 59. 3 + 4).

No annular type loomweights are present, two examples are of an intermediate form, with a diameter of 90 and 120mm. One of the loomweights (Fig. 59.2) had its base removed during excavation and had a surviving height of 31mm, whilst the height of the other intermediate loomweight was 46mm (Fig. 59.1). There were two bun-shaped loomweights both with diameters of 120mm and surviving heights of 42mm and 57mm (smaller than the average height of 60mm for this type). The latter loomweight, although biconical, has an asymmetrical profile with the upper part of the loomweight greater in height than the lower part (Fig. 59.4). Projected weights were estimated for complete loomweights from the surviving fragments, they were calculated using a rim chart and the percentage of the surviving weight's diameter. This gave an estimated weight for the intermediate loomweights of *c.* 420g and *c.* 540g and for the bun-shaped loomweights of *c.* 500g and *c.* 880g, which suggests in the case of these loomweights they were under the *c.* 1000g weight limit indicated by Blackmore (1988a).

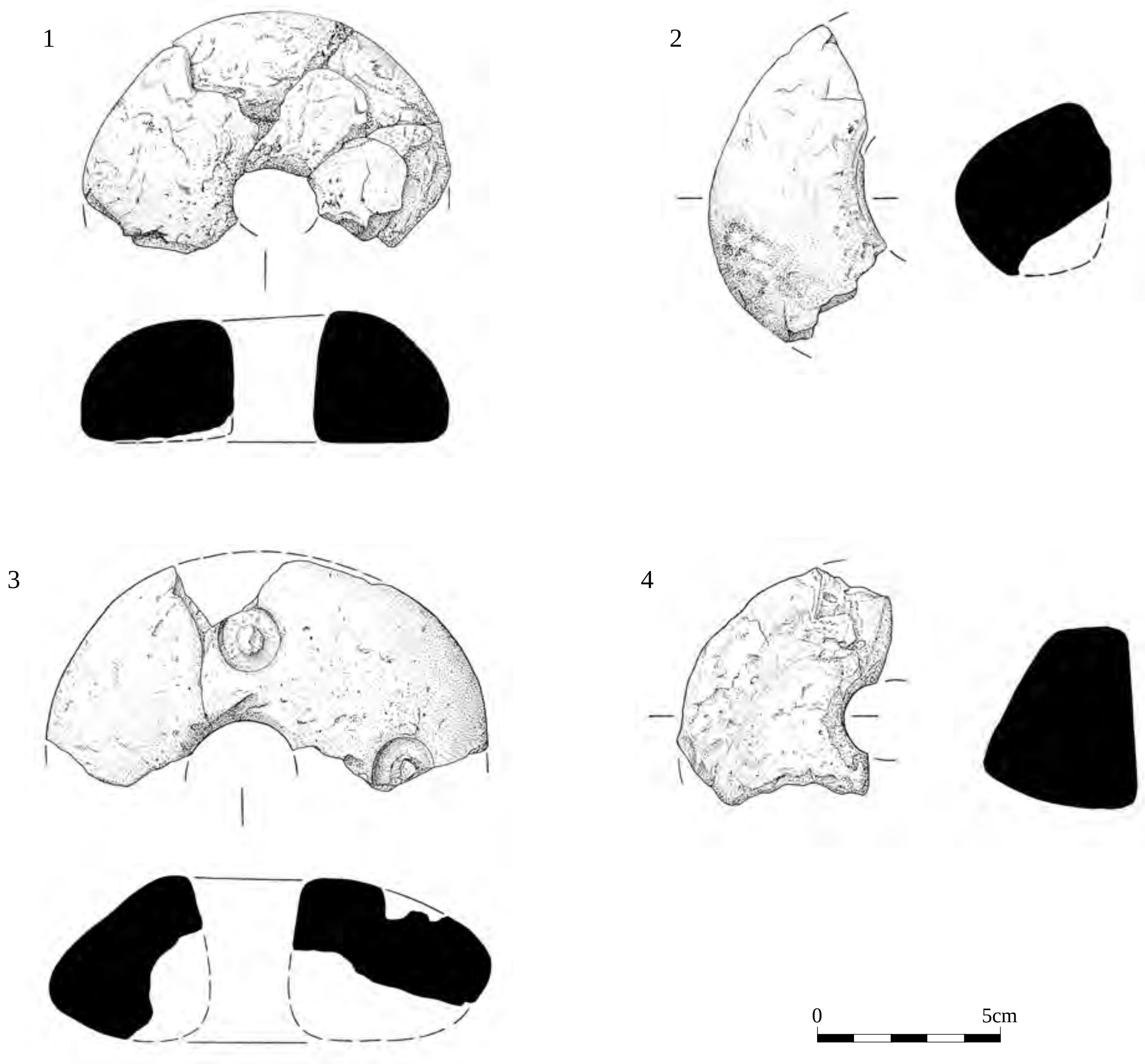


Fig. 59 The National Portrait Gallery loomweights
(1-2) intermediate loomweights; (3-4) bun-shaped loomweights. Scale 1:2

The Stratigraphic Distribution of the Loomweights

The site produced twenty fragments, weighing 704g, representing the equivalent of five loomweights. In Phase 4, fill [126] of the quarry pit [130], produced a small fragment, in fabric 1b, with only its central hole surviving and no form type could be assigned. In the Phase 6 fills of [130], two intermediate loomweights were present, both in fabric 1b. Above this, fill [68] of pit [130] produced a bun-shaped loomweight, in fabric 1a, with two surviving 'ring and dot' stamps (18mm in diameter), which possibly could have been made with an animal bone (Fig. 59.3). The asymmetrical bun-shaped loomweight occurs as a single fragment in fill [509] of recut [510] of pit [526] in Phase 5 (Fig. 59.4).

Discussion

The loomweights were found discarded in pit fills and therefore cannot be related to any evidence for buildings or rooms associated with looms and weaving. The ratio of loomweight fragments to Middle Saxon pottery sherds (20:93 or 1:4.65) at the National Portrait Gallery was higher than that at the adjacent National Gallery Basement site (5:186 or 1:37.2), where the weights at the latter site were more fragmentary, an unfired weight was found at the Basement site (Williams, C 1989).

It is possible that weaving in the area of the National Portrait Gallery site was more prevalent than at the National Gallery Basement. Simply decorated loomweights have been noted at Jubilee Hall with marks from the teeth of combs, an incised cross, and stab marks with triangular impressions

Table 31 Catalogue of National Portrait Gallery Loomweight fragments.

Phase	Context	Type	Fabric	No	Weight	Diameter	Height	Comments
4	[126]	-	1b	1	10	-	-	fragment
6	[68]	Bun-shaped	1a	2	180	120mm	42mm	circular stamps
	[77]	Intermediate	1b	1	126	120mm	46mm	
	[77]	Intermediate	1b	15	246	90mm	31mm	base missing
	[509]	Bun-shaped	1b	1	152	120mm	57mm	conical shape

(Blackmore 1988a). Stabbed loomweights were present at the Peabody site (Williams, C 1989). At the Royal Opera House, decorated loomweights include twenty fragments with deep impressions, whilst ten fragments had comb teeth marks (Goffin 2003c). These marks were additionally interpreted as decoration and indicators of personal items, besides helping water vapour to escape during firing. The loomweights from the National Portrait Gallery, like the ones from Jubilee Hall and Maiden Lane (MAI86), generally fit within the dating framework set out by Hurst (1959), in that the annular type weights mainly belong to the Early Saxon period, the intermediate ones are of Middle Saxon date and the bun-shaped examples of Late Saxon date. The small sample of four loomweights from the National Portrait Gallery which could be assigned to a form type fitted to the stratigraphic sequence; with the intermediate loomweights being from a Phase 6 backfill of pit [130], and the bun-shaped weight from a later fill of the same phase of the pit. The asymmetrical bun-shaped weight in pit [510] occurs with Middle Saxon shelly ware pottery, suggesting a *c.* AD 775-870 date, but both intermediate and bun-shaped weights occur on the site during this period. At the Royal Opera House it was suggested that different weight forms could be used on the same loom (Goffin 2003c).

THE CERAMIC BUILDING MATERIAL

John Brown

Stone weighing a total of 96.178kg along with 725 fragments of ceramic building material were recovered from 102 contexts.

Residual Roman material was recovered, the majority deriving from a source in Greater London, with additional fabrics from Kent and Hertfordshire. The majority of the assemblage was representative of bricks, tegulae, imbrices, and box flue tiles. As the fragments were small the types of bricks represented could not be discerned. The predominance of brick compared with imbrex and tegula fragments may suggest that some of the material was deliberately brought into the area of the site for reuse in Saxon or later structures, as brick would have been of more use in walls and post pads than thinner roof tiles.

THE FIRED DAUB

Richard Hughes

Quantities and Weights of the Fired Daub

The fired daub and redeposited brickearth, the latter possibly representing unburnt daub, were principally found in two pits, [130] and [526], and ditch [494] and dated to the second ceramic phase of Middle Saxon pottery as defined by Vince (1983, 1990) and refined by Blackmore to the period *c.* 730-850 (1988a, 1989, 1997, 1999). The National Portrait Gallery excavations recovered 22,549g of fired daub from 35 contexts, with approximately 85% of the resource, 18015g, coming from just six contexts [76] [77] [126] [129] [171] [178].

In 25 contexts the fired daub ranged from 4g to 500g, representing 71% of the total, suggesting a highly residual character - perhaps stray material from a wide variety of sources casually reworked into the soil many times. 20% of the fired daub ranged from 500 to 2000g, probably relating to a second phase of discard but still with mixing of fired daub from various sources. 9% of the fired daub weighed over 2000g, and here the material may be a primary discard - an action to deliberately get rid of a soil or dump containing the fired daub.

Table 32 The distribution of the National Portrait Gallery daub

Weight (g)	Number of contexts
0-500	25
500-1000	3
1000 - 1500	2
1500-2000	2
2000-2500	1
2500+	2

Table 33 Fired daub resources from the National Portrait Gallery

Context	Phase	Feature	Nos	Weight (g)
136	2	fill of beam slot	6	27
137	2	fill of beam slot	6	12
132	3	ploughsoil	-	22
126	4	burnt deposit, fill of pit [130]	334	1422
129	4	fill of pit [130]	164	1057
135	4	fill of pit [129]	4	64
147	4	fill of pit [130]	104	1000
148	4	fill of pit [130]	3	8
152	4	fill of pit [130]	78	613
153	4	fill of pit [130]	-	4
171	4	fill of pit [130]	233	1578
181	4	fill of pit [130]	358	4131
491	4	fill of ditch [494]	4	13
492	4	fill of ditch [494]	2	6
493	4	fill of ditch [494]	20	81
119	5	collapsed floor	2	6
60	6	dump over collapsed surface in pit [130]	9	36
68	6	dump over collapsed surface in pit [130]	172	756
69	6	dump over collapsed surface in pit [130]	126	619
71	6	dump over collapsed surface in pit [130]	7	62
73	6	dump over collapsed surface in pit [130]	5	49
76	6	dump over collapsed surface in pit [130]	370	2399
77	6	dump over collapsed surface in pit [130]	1075	7428
78	6	dump over collapsed surface in pit [130]	-	139
79	6	dump over collapsed surface in pit [130]	80	313
56	7	fill of pit [59]	2	4
57	7	fill of pit [59]	25	58
53	8	dark earth	22	332
54	8	dark earth	4	41
486	8	occupation layer	3	6
509	undated Saxon	Pit fill	7	27
36	9	surface	1	53
80	9	dump layer	1	29
237	9	fill of linear cut	3	20
18	post med.	cellar	24	134
total			**3254**	**22549**

Most of the fired daub came from the fills of pit [130] with 43% coming from the six basal fills [126], [129], [147], [152], [171] and [181]. One of the upper fills [77] had a large fired daub content (7428g) and this may derive from another source to that in the deeper fill, as the upper levels post-date a collapsed floor (Phase 5).

The second major pit [526], contained substantial amounts of a very light density grey soil which may have been a discard from cleaning floors and which could have been reused for making daub or even loomweights. For a fuller discussion and comparison *see* Hughes in this volume.

THE NON-CERAMIC FINDS

Ian Riddler

A total of 30 non-ceramic finds of Middle Saxon date have been considered here. They have been described by material, rather than functional category, in part because only a few items can be ascribed to any category but also because, if considered by material, they can be compared directly with objects published from other excavations in Middle Saxon London (Green 1963; Cowie *et al* 1988, 111-38; Whytehead *et al* 1989, 107-32). It is also possible to make initial quantitative statements about some of the object types on the basis of the corpus published to date and this has been attempted for the combs, which have been placed in a broader Middle Saxon context.

Copper Alloy

Pin

A complete, cast copper alloy pin, context [469], has a globular head above a small cordon (Fig. 60.1). This is one of the most common types of copper alloy pin of the Middle Saxon period, which has been found at numerous sites of that date although, interestingly, the type is relatively scarce in London, where copper alloy pins with biconical heads are more common. This particular example does not have a hipped shaft, which may possibly be an indicator of a date later than the early 8th century.

Strap-end

A copper alloy strap-end, (SF5), (Fig. 60.2), has two rivet holes at its split end, which allow it to be placed within Hinton's type C or D, albeit for that characteristic alone (Hinton 1996, 40-3). Its sinuous, amphora-like shape is a little redolent of the amphora form of strap-end identified by Simpson, lacking any bifurcated, 'nail cleaner' end or any perforated decorative device (Simpson 1976, 198-200 and fig 4.7-10). It has the basic lanceolate shape of the relatively plain examples of this type, which have been found in England at Cassington and Milton-next-Sittingbourne, which also have two lateral rivet holes (Hawkes and Dunning 1961, fig 23f; Böhme 1986, abbn 19.14 and 21.10). Equally, however, it is noticeably elongated in form, and is much more slender than late Roman forms; and it is undecorated.

There is a slight resemblance with one of the flatter, single-rivetted strap-ends from Six Dials at *Hamwic*, but the shape of this example and the absence of decoration both distinguish it from conventional forms of 7th to 8th century date, which generally have baluster-like shafts and straight sides (Hinton 1996, fig 15.169/397; Whytehead *et al* 1989, 121 and fig 41.208-9; Rogers 1993, 1350 and fig 652.5318; Evison 1980, 35). There is a sense in which it represents a development beyond the single-rivetted copper alloy shoe tags of flattened or keeled section found both in 7th century graves and in settlement contexts, as at Shakenoak, for example (Hawkes in Brodribb *et al* 1972, 70-1 and fig 30.139). The example from Horndean serves to illustrate the variety in form of the object type (Knocker 1956, fig. 11.S18). Closer parallels lie with the sheet-metal strap-end from Mill Hill Deal, grave 71 and the cast example from grave 105 (Parfitt & Brugmann 1997, 74-5 and figs 39g and 56Cn). The London strap-end is larger than these single-rivetted forms, some of which were clearly used on shoes, and it is likely that it formed the end of a more substantial belt (Hawkes 1973, 194-5).

Iron

Strap fitting

An iron loop stems in all probability from a strap fitting which has lost its accompanying plates and paired rivets (Fig. 60.3). The junction of the loop and the sheet metal plate forms a point of weakness and in some cases, as with an example from Shakenoak, the object can fracture at this point (Brodribb *et al* 1972, fig 39.174). The object type has been discussed by Rogers, who notes that they occur in 7th century graves as well as Middle Saxon settlements and they were secured to belts, usually in association with rings, which allowed objects to be suspended (Rogers 1993, 1352-3). A pair of iron strap fittings, together with an iron ring, came from the Peabody site (Whytehead *et al* 1989, 124 and fig 42.242).

Knives

Two knives, (Fig. 60.4) have whittle tangs and both are reasonably complete, which allows them to be classified to type and compared with other examples of a similar date. The tang of a third knife was also recovered. Knife forms were generally in use over a long period of time and they cannot be dated with any precision. More work, in terms of both technology and typology, is needed on Middle Saxon knives, as also on those of earlier date (Härke 1992, 91).

One example came from fill [126] of the Middle Saxon pit [130]. Its tang is clearly distinguished from its blade, and the blade would have acted in effect as a bolster for the knife handle, which was made of an organic material, probably horn. The cutting edge runs in a straight line, as does the back of the blade and both narrow to a point. The form is similar to an example from Fishergate, York that, unfortunately, could not be ascribed to a specific type (Rogers 1993, 1464 and fig 628.5029).

The second knife came from occupation debris [77] over the brickearth surface. It is of a different form, the junction of the blade and the tang being much less overt and the tang itself, which is complete in this case, being somewhat longer. The cutting edge and back are curvilinear and largely parallel, before tapering to a point. It belongs to a familiar type, classified by Ottaway as type C1, which can be seen at Fishergate and Coppergate in York, and occurs in both Middle and Late Saxon contexts (Rogers 1993, fig 628.4985; Ottaway 1992, 568-70).

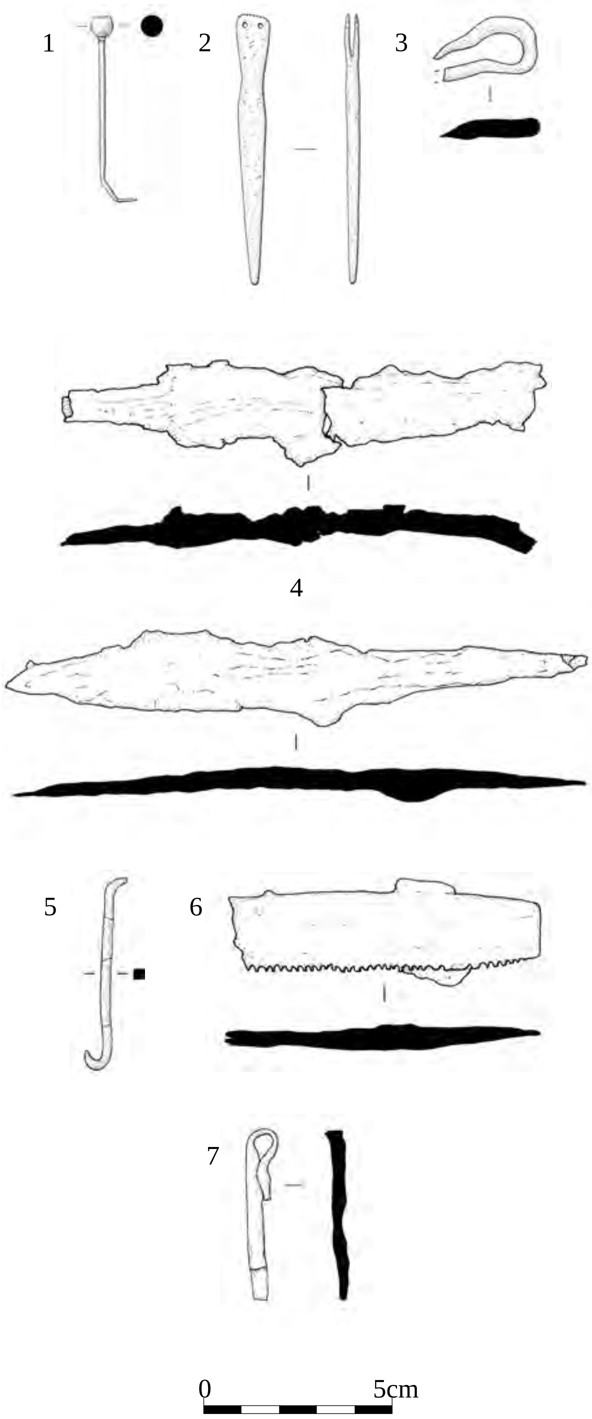


Fig. 60 The National Portrait Gallery small finds (1) cast copper alloy pin; (2) copper alloy strap end SF5; (3) iron loop from strap fitting; (4) two knives with whittle tangs; (5) iron fish hook; (6) iron saw blade SF11; (7) shaft and splayed loop SF 16, Scale 1:2

Fish hook

The fishhook, context [129], (Fig. 60.5), has been formed from a small iron rod of square section which tapers to a point at the curved end. There is no barb and neither is there any obvious means of attachment at the other end and it is likely that the line was simply wrapped around the rod at this point. It can be assigned to Rulewicz's Group 1 (Rulewicz 1994, 99).

Fishhooks are rarely found in early and Middle Saxon contexts and they are more commonly seen at a later date, although they remain scarce even then, outside of a certain number of sites (Ottaway 1992, 600-1; Riddler forthcoming c). This is the first example of a fishhook from Middle Saxon London to be published. Four examples were retrieved from Fishergate at York, whilst the series of twelve from *Sandtun* are likely to be of late Saxon or early medieval date (Rogers 1993, 1317-9; Riddler forthcoming c). They have been found in greater numbers in early medieval contexts at Great Yarmouth and Dover (Rogerson 1976, 166; Riddler forthcoming c).

Saw

A sufficient fragment survives of the iron saw blade, context [147], (Fig. 60.6), from the fill of pit [130], to establish that it has five teeth per centimetre, which are small and relatively fine. Middle Saxon saws are comparatively rare, as Wilson has noted, although their use during the Middle Saxon period can be inferred (Wilson 1968; 1976, 257 and fig 6.3a and b; Addyman & Hill 1969, 65).

Iron saws are known from several Scandinavian contexts and their occurrence in Viking period contexts as well as their comparable anthropological use in Lapland have been eloquently summarised by Ulbricht (1978, 33-6). Anglo-Saxon examples include a double-sided saw blade of iron from Thetford and a less certain piece from Icklingham, which may be of Roman date (Wilson 1976, fig 6.3; & Dallas 1984, 77 and fig 117.13).

Saws have been associated with bone and antler working, as well as woodwork (Ulbricht 1978, 33; Wilson 1976, 257). Both the initial dismemberment and the secondary working of bone and antler was undertaken by saw, in contrast to animal butchery, which utilised knives and chopping implements (Bourdillon & Coy 1980, 96-7). A fine saw like this might have been held in a curved wooden frame, as seen in the early post-medieval illustration of a comb maker by Jost Amman (Ulbricht 1978, 33 and abb 5).

Iron Object

A fragmentary iron object from the fill of pit [130] includes a shaft of square section, which leads to a splayed loop, Fig. 60.7). It may be a part of a suspension loop for a key or a girdle-hanger, object types which have come from previous excavations in Middle Saxon London, but too little survives for the object to be identified with any certainty (Whytehead *et al* 1989, 124 Nos 243-6).

Quern Fragments

Two small fragments of basalt lava querns came from contexts of Phases 4 and 6. No original dimensions can be taken for either piece. Basalt lava querns occur in southern England in some quantities from the early Roman period onwards. They have been recovered from practically all previous excavations in Middle Saxon London, including Jubilee Hall, Maiden Lane (MAI86), the National Gallery, Exeter Street, James Street and the Royal Opera House (Cowie *et al* 1988, 133-4; Whytehead *et al* 1989, 130-1; Riddler this volume; Malcolm *et al* 2003, 204-209). They are equally common at the other pre-Viking 'wic' sites and few other stone types were utilised for querns in southern England during the Middle Saxon period (Dunning 1956, 232; Addyman & Hill 1969, 79; Riddler forthcoming c; Rogers 1993, 1322 and fig 639).

The Bone and Antler Waste

Ten fragments of antler were retrieved from nine separate contexts, all of which are of Middle Saxon date. Three sawn metapodial epiphyses came from two contexts of the same period. The material is described in detail below (Armitage this chapter) and it is considered here in the context of bone and antler working in Middle Saxon London.

The bone and antler waste comes from different contexts but there can be little doubt that the two materials were worked in conjunction, and possibly with horn also. It was previously felt that antler and bone should be distinguished as raw materials and that they could be considered as separate entities during this period (MacGregor 1989, 107-13; 1990, 355-64). Evidence from Fishergate at York and *Hamwic* shows, however, that the two materials were used together by the same craftsmen (Rogers 1993, 1245-7; Riddler 2001b). The presence of both bone and antler waste in small quantities at the National Portrait Gallery conforms with the situation seen also at Jubilee Hall, Maiden Lane (MAI86) and the Royal Opera House, where both materials were also present (Cowie *et al* 1988, 135; Malcolm *et al* 2003, 170-175). In that sense, therefore, the evidence from London reflects that to be seen elsewhere in the Middle Saxon period.

The bone waste stems exclusively from cattle metapodia, which were the preferred skeletal elements for boneworking from the Roman period onwards (Deschler-Erb 1998, 69-71 and abb 123; Riddler 2001b). The antler waste is confined to red deer. Roe deer antler occurs sporadically in small numbers at *Hamwic* and other Anglo-Saxon sites but not in London, as yet (Riddler 1993, fig 62.74; Riddler *et al* forthcoming). The quantities of waste are small and they suggest that the principal areas of bone and antler-working did not lie in this area of the settlement. At both *Hamwic* and Ipswich, concentrations of waste have been found in specific parts of the settlement, suggesting that zones of working may have existed, and that some crafts were clustered together (Riddler 2001b).

The Comb Fragments

All of the comb fragments stem from double-sided composites, which are made of antler and are fastened by iron rivets. They all come from the same context and they stem from a minimum of two combs. The two antler tooth segments come from a comb, which originally had five to six teeth per centimetre on either side, context [77], (Fig. 61.2). The comb was quite slender with teeth, which are finished with rounded, rather than pointed ends. This is a particular characteristic of double-sided composite combs of Middle Saxon date from southern England, which include examples from Canterbury, *Hamwic*, Ipswich, London, Maidenhead and *Sandtun* (Riddler forthcoming c; Green 1963, fig 5; Cowie *et al* 1988, fig 38.11).

Generally, there is little wear on these teeth but in some cases there is sufficient to indicate that this was a characteristic of finished combs, rather than a reflection of those which had not been completed. As a style of comb tooth design, it enjoyed only limited success, although the practice was widespread during the Middle Saxon period.

The tooth segments of this comb extend to 37mm in width, which allows them to be defined as a part of a small and narrow double-sided composite, comparable in size to examples from Maiden Lane (MAI86) and the National Gallery (Cowie *et al* 1988, fig 38.11; Whytehead *et al* 1989, fig 45.287). The teeth are of similar length and fineness on either side of the comb, five or six per centimetre being a typical value for the Middle Saxon period.

The fragmentary comb includes five tooth segments, an end segment and parts of two connecting plates, which are fastened together by five iron rivets, SF 6, (Fig. 61.1). A small fragment of a connecting plate may also belong to this

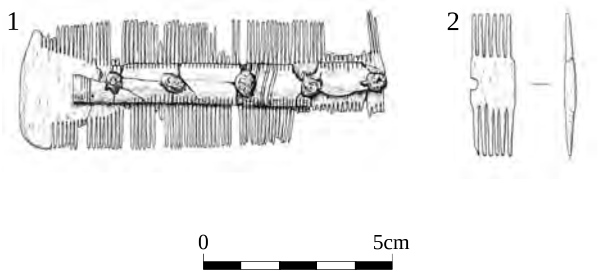


Fig. 61 The National Portrait Gallery combs. Scale 1:2

comb. The comb is decorated on one of the connecting plates by two sets of vertical incised lines; the other one is blank. This characteristic, which extends to combs of various types, can be seen on those of 8th and 9th century date from England and the North Sea littoral (Tempel 1972, 57; Riddler *et al* forthcoming).

There are ten teeth per centimetre on either side of the comb and one side shows a greater degree of wear. The comb has an elongated form, which is emphasised by its short teeth and by the way in which the end segment is set well beyond the line of the connecting plates. It has two sets of fine teeth and it is one of the first Middle Saxon combs with this particular characteristic to have come from London. Those published to date from Maiden Lane (MAI86), Jubilee Hall, the National Gallery and Whitehall have had between three and six teeth per centimetre on either side, and this comb clearly stands out from those for the fineness of its teeth. Both the fine teeth of the comb, and its rivetting system, distinguish it from other double-sided composites from Middle Saxon London. Whilst they were used to comb hair (and it appears to have been human hair) the presence of fine teeth suggests that this was a lice comb, produced for this specific purpose.

Double-sided composite combs with nine or more teeth per centimetre are known from contemporary contexts at both *Hamwic* and Ipswich. Those with fine teeth from *Hamwic* are generally undecorated and they have noticeably wide tooth segments, which is not the case here. In this respect, the comb has more in common with those of similar date from Ipswich, which includes one example from the Buttermarket that has nine teeth per centimetre and similar decoration to the connecting plates, although it is otherwise different in design (Riddler *et al* forthcoming).

The comb is fastened by five iron rivets, which are evenly spaced at 15-20mm intervals. They fasten each tooth segment on both edges, rather than one, which is the customary system for double-sided composite combs of Middle Saxon date. The extra rivetting employed here may be related to the fineness of the teeth, in the sense that it could reflect an attempt to produce a sturdier and more durable comb than was normally the case. To some extent, this was successful, and around half of the comb is still fastened together.

Most of the combs to have come from Middle Saxon London are double-sided composites, which currently outnumber contemporary single-sided composites and handled combs in a ratio of roughly 7:1. The situation in London is reflected also at *Hamwic* and *Sandtun* (in Romney Marshes in Kent). To the north of the Thames, however, single-sided composite combs are more common, both in East Anglia and Northumbria (*see* Riddler, Chapter 7, this volume).

THE COIN

MÄRIT GAIMSTER

A Middle Saxon silver coin (Fig. 62) was retrieved from the upper fill of the linear cut [494]. It provides a *terminus ante quem* for this probable boundary ditch and fully supports the Middle Saxon settlement phase indicated by other finds from the site. The coin was badly corroded, but subsequent cleaning and conservation enabled a clear identification of type.

The coin (SF 37) is a Series K Type 20/18 Sceat weighing 0.99g. Its obverse shows a diademed bust facing right with a cross in front of the face and hand holding chalice to the lips. The reverse shows a standing figure facing right above a curved line (?boat), holding a bird in the left hand and a cross in the right. Below the left hand is a "T" shaped feature.

The coin belongs to the more prolific secondary phase of *sceattas* (c. AD 710-760). Among the secondary *sceattas*, Series K is acknowledged to fall relatively early (Blackburn 1984, 168; Metcalf 1994, 305).

The *sceat* from the National Portrait Gallery belongs to a type with a handful of previously known issues. Like the majority of *sceattas* the coin carries no legend with reference to king, moneyer or minting place. Mints may nevertheless be recognised on basis of the geographic distribution of a type, and on comparative stylistic and iconographic features in different groups of coins. During the secondary phase of

Fig. 62 The National Portrait Gallery Sceatta SF 37. Scale 1:1

sceattas some two dozen mints may be postulated (Metcalf 1994, 297).

That London had a mint already during the 7th century at the time of the Anglo-Saxon gold coinage is indicated by the rare inscription of LONDVNIV or LONDENVS on some coins in the hoard from Crondall (*c.* AD 640), on the border of Surrey and Hampshire (Archibald 1991, 62-64). Late in the secondary phase, some *sceattas* of Series L carry the legend LVNDONIA (Metcalf 1994, 409). Although widespread and overlapping, the allocation of Series L to London and Series K to East Kent is generally borne out in the distribution of types (Metcalf 1994, 368-83). Both minting-places may be identified also during the primary phase of *sceattas* (Grierson & Blackburn 1986, 164; Metcalf 1994; cf Vince 1990, 109-17).

Within the closely related Series K and L, however, several small eclectic groups, borrowing elements from both series, may be allocated to mints either in Kent or London. Both the distribution and stylistic features of Type 20/18, while belonging to Series K, suggest a London mint. Provenanced coins of this type are previously known from Tilbury, north Essex and Royston in Hertfordshire and the find from the National Portrait Gallery harmonises with their circulation in the region north of the Thames. The relatively low weight of 0.99g also fits well with the London coins at this time (Metcalf 1994, 373, 404 and note 37).

The significance of coin-finds for our understanding of Middle Saxon London has long been recognised (Biddle 1984; Metcalf 1986). Numerous *sceattas* have been known from London, both in collections and through metal-detecting on the Thames foreshore (Metcalf 1986, 1-5; Stott 1984). However, it is not until recent years, with the publication of finds from controlled excavations that *Lundenwic* has appeared also on the map of coin finds. Since the 1980s, the number of *sceattas* has increased significantly and sites from the Middle Saxon settlement on the Strand include Bedfordbury, Covent Garden, Kemble Street (Bruce House), Maiden Lane (MAI86), and the Royal Opera House (Cowie with Blackmore 1999; Stott 1991; cf Cowie 1988; Malcolm *et al* 2003, 285-287) whilst excavations in connection with the National Gallery Extension in 1987 yielded a Series-T *sceat* (Cowie 1988, 41).

The *sceattas* undoubtedly represent a large-scale currency and reflects the increasing use of coins in trade; their use in social and political transactions continued to play an important role in the early Middle Ages. This is evident from documentary sources where coins figure predominantly in contexts such as dowries, wergelds and tributes (Grierson 1959).

THE RUNIC INSCRIPTION

Ray Page

The nationally significant find of a sheep's thoracic vertebra bearing two Anglo-Saxon runic inscriptions (Fig. 63) was recovered from a dumped deposit overlying the collapsed brickearth floor and associated occupation, slumping into quarry pit [130]. The inscriptions were discovered and initially translated by Philip Armitage.

There are two discrete inscriptions, one on each of the flat surfaces of the vertebra. The rune forms used are of the Anglo-Saxon (as opposed to the Scandinavian) type. Both texts are clearly cut, probably by different hands and with different implements. Inscription **A** is more delicately and carefully formed than **B**, which is coarser and looks as if made with a blunter blade. There are no ambiguities in any of the rune forms.

Inscription **A** reads: 't a t b e r h t'. It is some 37mm long and rune height varies from *c.* l2mm (rune 2) to 6mm (rune 8). The runes are quite carefully formed, though there are a number of overcuts, as in the upper twig of 'a', the bows of 'b', the top of 't' (rune 8) and the upper cross-stave of 'h'. Staves are occasionally double-cut, as in part of the vertical of 't' (rune 1), the left-hand twig of 't' (rune 3) and the vertical of 'b'. This is presumably intentional and decorative; there are occasional other English examples of this practice, as on the Loveden Hill urn.

Inscription **B** reads 'd r i c'. The runes slope down left to right, so that the final rune cuts the lower edge of the bone. Length of inscription is *c.* 19.5mm, and rune height 10-11 mm. Again, joins are overcut or sometimes not completed, as in the cross-staves of 'd' and the top of 'r'.

Inscription **A** presents no problem of interpretation. *Tatberht* is a recorded Old English masculine personal name, though not a particularly common one. **B** is more problematic. There is no name *Dric*, a second element -ric occurs in a number of common masculine names, and in theory -dric could be part of a name such as *Godric* or *Eadric*. There is, however, no sign of any letter(s) before 'd', though space is available. It is tentatively suggested that the first rune, 'd', represents its rune-name d; e.g. 'day'. This is a practice that occurs from time to time in manuscripts as in the Lindisfarne Gospels gloss, which occasionally translates the Latin *dies* by the rune 'd' (Elliott 1950). A parallel in a personal name would be the use of 'm' for its name *mon* 'man' in the scribal signature Farmon in the Rushworth Gospels gloss (Ker 1957). It is also used as the last syllable of the name Salomon in the Corpus Christi College, Cambridge, MS 41 text of the First Poetical Dialogue of Solomon and Saturn. Inscription **B** then gives a masculine personal name *Dagric*. The difficulty here is that there is no

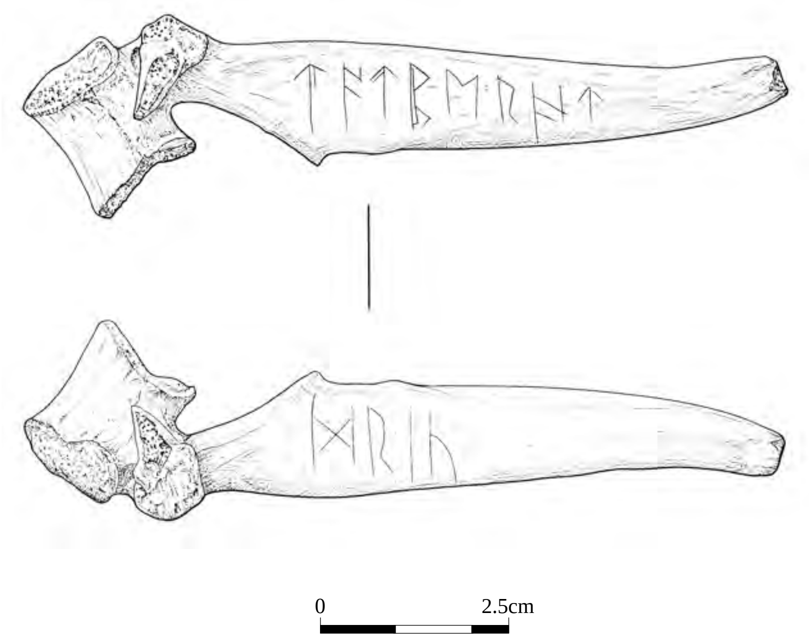


Fig. 63 The National Portrait Gallery runic inscription. Scale 1:1

clear example of such a name recorded in Old English, though Searle (1897) quotes the form *Dairic* from a Continental source, presumably interpreting it as Old English on the evidence of its palatalised g (> i) in the first element. There are several examples of the name in Continental Germanic, as *Dagarihchus, Tagerich*, though even there the name does not look to be very common (Förstemann 1900).

Nothing in either rune or name forms helps to date this piece, though it would appear to post- date AD 650 and its stratigraphic position supports this. The inscriptions have all the appearance of casual work produced for fun rather than information. Since the vertebra has been cooked, this suggests two colleagues cutting their names on a piece of bone taken from the dinner table, perhaps vying with each other over their sophistication in runic technique, the one by cutting double staves, the other in using the rune-name. Casual runic inscriptions like these have been rare up to now in England, but are common enough in later Scandinavian examples often from town sites. This is only the third runic inscription to be recovered from central London, runes carved onto a bone object from the Royal Opera House were also interpreted as possibly representing a rune name (Blackmore 2003b, 313). The National Portrait Gallery runes may be an indication that there was a more extensive use of the script for demotic purposes in Anglo-Saxon England than has hitherto been known.

THE IRON SLAG

Lynne Keys

The National Portrait Gallery produced 3.27kg of material identified as iron slag. Slag was present in the following categories; coal (26g), ferruginous concretion (334g), smithing hearth bottoms (780g), smithing slag lumps (1972g), undiagnostic slag (146g) and vitrified hearth lining (12g).

There was no smelting slag present in the assemblage and the amount of undiagnostic slag present is small. Most of the slag is representative of secondary iron smithing - the hot working of an iron shape by a smith to turn it into a utilitarian object, with the slag being dumped material which had been subject to secondary deposition and it is therefore likely the activity which produced the slag was taking place some distance from the site. The smithing slag lumps from the Saxon levels were from the fill of pits with the absence of hammerscale from this period suggesting the slags were not in primary deposits near a smithy. It is however unlikely they would have been carried very far for primary disposal.

THE ANIMAL BONES

PHILIP ARMITAGE

The bones presented below represent hand-collected specimens as well as those recovered from sieved samples.

Mammal bone

A total of 10,304 mammal bone specimens were submitted for study. Of these, 4,387 (42.6% of the total) are identified to species and part of skeleton, and 5,917 (57.4%) remain unidentified. Note that the category of unidentified bone includes 2,255 minute pulverised fragments extracted from the sieved residues of the environmental samples.

The total weight of the combined bone is 76,012g; of which 65,116g (85.7% of the total) is the weight of the identified material, and 10,896g (14.3%) the unidentified (which includes minute fragments from the sieved residues of the environmental samples, weighing 2,074g).

The species represented are as follows: *Equus caballus* (domestic) horse, *Bos* (domestic) cattle, *Ovis* (domestic) sheep, *Sus* (domestic) pig, *Capra* (domestic) goat, *Cervus elaphus* red deer, *Capreolous capreolus* roe deer, *Canis* (domestic) dog, *Felis* (domestic) cat.

Bird bones

A total of 226 bird bones were recovered. Of these, 196 (86.7% of the total) are identified to species and anatomy, and 30 (13.3%) remain unidentified. Of the 196 identified bones, 108 (55.1% of the total) are from domestic goose *Anser anser* (domestic), 87 (44.4%) from domestic fowl *Gallus gallus* (domestic), and a single bone element of house sparrow *Passer domesticus*. The preponderance of goose bones over those of domestic fowl is also reflected in the weights of bones from these two species; respectively, 334.1g (69.3% of the total) and 184g (30.7%).

Fish bones

Twenty three fish bone elements were recovered, representing the following marine and freshwater species: freshwater Eel *Anguilla anguilla*, Roach *Rutilus rutilus*, Salmon *Salmo salar*, and Cod *Gadus mothua*.

Amphibian bones

There are ten amphibian bones, all identified as common frog *Rana temporaria*.

Methodology

Bone assemblages from the Saxon phases are defined by associated groups of contexts as identified in the Archaeological Evaluation and Excavation reports by Butler (1998) and Pickard (1998). For infill levels within excavated pit features, these contexts are combined and treated as integral units (single assemblages) for analysis.

Preservation and Condition of the Bone

Apart from the eroded/leached bone elements noted and discussed below - and excepting the pulverised fragments from the sieved residues of the environmental samples - the overall state of preservation is fair to good, indicating that the majority of the bone debris had been buried or incorporated into the excavated deposits within a relatively short period after being discarded.

Table 34 Bone assemblages at the National Portrait Gallery

	Contexts with bone assemblages
Phase 4 Saxon ditch cut [234] [494]	[232], [233], [261] [488], [489], [490], [492], [493]
Fills of Saxon quarry pit [130]	[126], [126] (20), [129], [129] (21), [135], [135] (23), [147], [147] (26), [148], [148] (27), [152], [152] (28)
Fill of pit [526]	[509]
Fills of circular pit [535]	[536], [537]
Brickearth deposit	[119]
Phase 6 Backfilling of hollow	[67], [67] (8), [68], [69], [71], [72], [73], [76],
Collapse into pit [130]	[76] (14), [77], [78], [79], [79] (17)
Build-up of sandy silt	[60] (7)
Phase 7 Fills of pit [59]	[55], [56], [56] (4), [57], [57] (5), [58], [58] (6)
Phase 8 'Dark earth'	[53], [53] (1), [54], [54] (2), [194], [341]

Out of the 4,387 identified mammal bones there are 63 specimens that exhibit the effects of prolonged exposure to the effects of weathering and leaching, and/or in association with biological degradation. These presumably had been left lying on the ground for some considerable time before eventual burial. While the overall incidence of such modified bones is relatively low (1.4% of the total identified bones from the entire site) two assemblages have noticeably comparatively higher proportional concentrations than the others; comprising those from Context [129] (Phase 4: infill to quarry/refuse pit [130]) and from Contexts [194] and [341] (Phase 8: dark earth layers).

Predepositional Damage to the Bones

Gnawing by dogs: only a very few of the food bones (0.3%) show evidence of this in the form of destruction of the ends of the bone and/or tooth marks.

Butchering of marrow bones: 451 (10.3%) of the total identified cattle, sheep, and pig bones from the site (Phases 4 - 8) comprise pieces of the shafts of the larger limb-bones (humerii, radii, and femora) exhibiting spiral fracturing and/or straight edged breaks. These are recognised as the debris from the opening and smashing of food bones for the purpose of extracting the marrow (= tertiary butchering), and were found throughout the site with no discernible concentration in any particular context or phase.

The nine "singed" (*see* terminology proposed by Albarella *et al* 1997:13) bone elements shown in Table 35 may be the result of roasting meat on the bone or represent discarded food debris thrown near open fires. In addition to these bones many of the unidentified fragments also exhibit evidence of burning (classified as extensively "burnt" and "calcined" according to the system of Albarella).

Patterns of Butchering

Inspection of the tables compiled for the anatomical distributions for each of the principal meat-yielding species (cattle, sheep/goat and pig) reveals no discernible spatial/temporal pattern. For all phases/assemblages there is proportional representation of all body parts (head, neck, trunk, limbs and feet), and the bone debris is recognised as discarded waste from primary and secondary butchering (from on-site/ home-killed animals) mixed in with tertiary (kitchen and table) waste.

Table 35 Burnt mammal bone from the National Portrait Gallery

Contexts	Elements represented
Phase 4 Quarry/refuse pit [130]	cattle vertebra, cattle carpal bone, sheep humerus, sheep innominate bone, sheep ribs (2 specimens), pig metatarsus IV, pig radius
Phase 8 Dark earth layer	pig radius

Table 36 Percentage frequency of the combined burnt & calcined mammal bone from the National Portrait Gallery

	Assemblage	NISP	WT
Phase 4	Ditch [234]	0%	0%
	Ditch [494]	9.6%	5.3%
	Pit [130]	16.1%	18.4%
	Pit [526]	6.8%	4.5%
Phase 5	Context [119]	0%	0%
Phase 6	Backfilling pit [130]	10.3%	13.6%
	Context [60]	17.6%	25%
Phase 7	Pit [59]	10.1%	7.5%
Phase 8	Contexts [53] & [54]	9.5%	7.7%
	Contexts [194] & [341]	0%	0%

Division (cutting up) of the cattle, sheep and pig carcasses at the National Portrait Gallery site was performed using axes and cleavers; saws would only have been used in bone-working owing to their higher price and tendency to leave bone bits in the meat (Audoin-Rouzeau 1987, 35). Knives were employed in severing tendons (disjointing) and also in skinning. Of particular significance is the absence in the cattle, sheep and pig vertebrae from the National Portrait Gallery of any evidence for the splitting of the carcass in half. None of the vertebrae has been chopped through the sagittal axis, a common pattern of butchering found at other London sites dating after the Saxon-Norman period and indicative of the introduction of specialist (standardised) techniques associated with the preparation of cuts of meat specifically for the wholesale and retail trades associated with urban meat markets. This technique continues in modern butchery practices. Instead, all of the vertebrae from the National Portrait Gallery are bilaterally chopped through their transverse processes showing that the cuts had been directed to either side of the spine, leaving the centre intact. Transverse chopping through the occipital condyles (of skulls) and cervical vertebrae of cattle and sheep at the National Portrait Gallery site indicates removal of the head from the rest of the carcass, while the presence of crania split in half provides evidence for the removal of the brain.

Table 37 Antler-working offcuts/waste from the National Portrait Gallery

	Phase	Context(s)	Parts represented
Saxon quarry/refuse pit [130]	4	[129], [147], [152], [171]	3 tines and 1 beam
Pit [526]	4	[509]	portion of crown from fully grown antler (cf. 5th head)
Backfilling of hollow caused by collapse into pit [130]	6	[68], [77]	2 tines and 2 pieces of beam
Pit [59]	7	[57]	1 basal portion of beam

Waste products from Antler-, Horn-, and Bone-working

The sawn parts of antler from the National Portrait Gallery parallel those documented for the 11th century comb making waste at Hedeby, Schleswig-Holstein (*see* schematic drawing: fig 42 in MacGregor 1985, 68 & 69; also Riddler this volume).

Owing to the fragmented condition of the few cattle horn cores found it is not possible to establish whether or not cattle horn was being used as a raw material at the National Portrait Gallery site. Nevertheless, there is clear evidence for the utilisation of sheep horns, provided by the specimens indicated in Table 38.

Bone-working waste was represented by three sawn portions of cattle metapodial bones from two contexts. From Phase 7 the sawn end of a metatarsus, which also has knife cuts possibly from skinning, and a sawn proximal end of a metatarsus, with a large hole in the proximal articular surface, were recovered from context [57], fill of pit [59] within a semi-circular rubbish pit whilst the dark earth horizon, Phase 8 context [194], produced the sawn distal end of a metacarpus.

Similar specimens are frequently encountered in refuse deposits excavated in London, dating from the Roman, medieval and post-medieval periods. The long straight shafts of cattle metapodia, with their relatively thick walls, made these bones ideal raw material in bone-working crafts.

A single roe deer metatarsal bone from context [69] (Phase 6) possibly also represents discarded bone-working waste; an interpretation supported by the absence of any associated meat-bones from this same species.

Descriptions of the Animals

Cattle

Type and stature

Very few cattle horn cores were found at the site, and these are from young (juvenile) individuals and a newborn calf (represented by a horn bud attached to a cranial fragment from context [147] Phase 4). In the absence of sub-adult and adult cores it is not possible to say with absolute certainty whether the cattle on the site were of the long-, medium-, or short-horned type(s). The presence of at least one example of the tiny, small-horned (scrub) cattle reminiscent of those found in the Iron Age, is suggested by the very small metatarsus from context [147] (Phase 4) with an estimated withers height of 95.9 cm (*see* below). The majority of the other cattle seem to be of much taller stature and sturdier build and it may therefore be tentatively suggested that these were probably of the medium-horned type. The National Portrait Gallery site did not produce any evidence for the presence of polled (naturally hornless) cattle.

Withers heights (in cm) were calculated from the lengths of the ten complete metapodial bones, using the factors of Fock (1966) (6.13 for metacarpals and 5.45 for metatarsals); producing a mean of 116.2 cm, with a range 95.9 to 126.4 cm, standard deviation 9.98. The National Portrait Gallery mean matches that of the cattle from the National Gallery Basement site (116.4 cm) documented by West (1989:160) but falls below the higher mean values established for the cattle from the more central *Lundenwic* sites: such as the

Table 38 Worked sheep horns at the National Portrait Gallery

	Phase	Context	Parts represented
Ditch cut [494]	4	[490]	horn core, adult male, chopped through the base
Saxon pit [130]	4	[126], [129]	sagitally split cranium with horn core removed (chopped through base) and another similar specimen
Saxon pit [535]	4	[536]	right & left horn core pair attached to portion of cranium, chopped; sub-adult/adult male.
Backfilling of Hollow in pit [130]	6	[79]	three horn cores, all chopped through just above the base: right sub-adult/adult male or castrate; right sub-adult/adult castrate; left young adult male or castrate (this last specimen has the tip of the core removed).
Saxon pit [59]	7	[58] (6)	right horn core of young male chopped through just above the base

Royal Opera House (116.4 - 118.4 cm) Maiden Lane (MAI86) (117.9 cm) and Peabody site (also 117.9 cm) where the size-range extended up to 133.4 cm (*ibid*). Inter-site comparisons reveal similarities in mean stature between the National Portrait Gallery cattle and those from Middle Saxon Southampton (*Hamwic*) (116.2 cm) (Bourdillon & Coy 1980: 105), while those from the earlier (6th-century) Saxon rural site at West Stow, Suffolk, were apparently of somewhat smaller stature (114.0 cm) (Crabtree 1991: 36).

Table 39 Age profile of the National Portrait Gallery cattle:

Suggested age range		No. jawbones	(%/total)
Under 1 yr	juvenile	6	27.3%
11/2 to 2 yrs	immature/sub-adult	2	9.1%
21/2 to 3 yrs	sub-adult/adult	2	9.1%
more than 3 yrs	adult/elderly	12	54.5%

Age profile

The age profile of the National Portrait Gallery cattle is shown in Table 39.

Sex ratio

In eight innominate bones (sub-adults and adults) sex can be determined using diagnostic characters (depth of medial rim of acetabulum, appearance of ilio-pectineal eminence) described by Grigson (1982), as follows: - 3 female and 5 male/castrate.

Sheep

Appearance and stature

No polled crania were identified and from examination of the horn cores recovered the National Portrait Gallery sheep appear to have been horned in both sexes (and also in the castrated individuals). In respect of size and shape of horn the Saxon sheep resemble the primitive Soay sheep found today running feral on the island of Hirta (St Kilda), Outer Hebrides.

Age profile

Age at death in 57 sheep (represented by their jawbones) is shown in Table 40. The National Portrait Gallery also provided evidence of the presence of neonate sheep in Phase 4 with a metacarpus from context [493] in Saxon ditch cut [494] and a humerus, femur and first phalanx from context [181] from quarry/refuse pit [130].

Table 40 Age profile of the National Portrait Gallery sheep

Suggested age range	Wear stage	No. mandibles	(%/total)
0 - 2 months	A	1	(1.8%)
2 - 6 months	B	2	(3.5%)
6 - 12 months	C	15	(26.3%)
1 - 2 yrs	D	12	(21.0%)
2 - 3 yrs	E	6	(10.5%)
3 - 4 yrs	F	9	(15.8%)
4 - 6 yrs	G	11	(19.3%)
6 - 8 yrs	H	1	(1.8%)

Sex ratio

In 26 innominate bones sex can be determined using the diagnostic characteristics documented by Armitage (1977: 75-79): 12 females, 1 male, 5 castrates, and 8 males/or castrates are identified.

Young adult and adult horn cores are sexed on the basis of appearance (size and form) and extent of the internal cavity (sinus) using descriptions published by Hatting (1975) and Armitage (in Clutton-Brock *et al* 1990): 1 female, 5 males, 5 castrates, and 2 males/or castrates are identified.

Goat(s)

Two elements are positively identified as goat (one or two individuals), a horn core and first phalanx; both specimens are from Phase 8: dark earth horizon context [194]. The shape of the horn core, long, straight with well-developed keel on the anterior edge, is typical of the unimproved Old English goat (which became extinct in 1930) an illustration of which is given in Werner (1981: fig. 1, p.117). The National Portrait Gallery horn core compares with those from Melbourne Street, Southampton (*Hamwic*) (*see* Bourdillon and Coy 1980: fig. 17, 11e, p. 99).

Pigs

Size

A single metatarsus IV from context [76] (Phase 6) with GL 86.8 mm compares in size with its counterpart from a modern wild sow (GL 87 mm) referenced by Noddle (1980: 407). It may represent an extra large domestic male rather than a hunted wild animal. All the other pig bones from the

National Portrait Gallery fall within the size ranges of domestic stock, and compare with specimens from other Middle Saxon sites, including North Elmham Park, East Anglia (Noddle 1980) and Melbourne Street, Southampton (*Hamwic*) (Bourdillon and Coy 1980).

Table 41 Age profile of the National Portrait Gallery pigs

Suggested age range	No. mandibles	(%/total)
less than 1 year	2	11.8%
1 yr - 2 yrs	10	58.8%
over 2 years	5	29.4%

Age profile

On the basis of the patterns of eruption and wear in the premolar and molar teeth, seventeen pigs are aged (using the criteria of Bull and Payne 1982) from examination of their mandibular dentition, as shown in Table 41.

Additionally the pig bones from the National Portrait Gallery produced the following elements from foetuses/neonates: phalanx III (2 specimens) from context [488] (Phase 4), femur from context [129] (Phase 4), femora (4 specimens) from context [181] (Phase 4), radius, ulna, both from context [79] (Phase 6).

Sex ratio

Analysis of sex ratio (see Table 42) gave an overall ratio of 1 male: 1.33 females

Table 42 Sex ratio of the National Portrait Gallery pigs

	Context	Male	Female
Phase 4 Saxon ditch cut [234]	[233]	1	
Saxon quarry/refuse pit [130]	[126]	1	
	[129]		1
	[171]	3	2
	[181]	1	4
Phase 6 Backfilling of hollow caused by collapse into pit [130]	[79]		1

Horse

A single Equid bone element (from Phase 4: Saxon quarry/refuse pit [130]) is identified as a phalanx II, of small size this nevertheless is believed to be from a horse.

Dogs

Domestic dog is represented by four elements at the National Portrait Gallery all from Phase 4 with 1 mandible from Saxon ditch cut [494], 1 humerus from Saxon quarry/refuse pit [130] and 1 skull and 1 humerus from Pit [526].

Age at death

Using information on the pattern of dental eruption given in Silver (1971) the mandible from cut [494] is identified as the remains of a young individual aged less than 5 - 7 months (permanent canine not yet erupted, P3 visible in the crypt). Based upon tables of epiphyseal fusion in the limb-bones of dogs (data: Sumner-Smith 1966) both of the humerii from the National Portrait Gallery are from animals aged greater than 5 - 8 months.

Cat

Domestic cat is represented by a single mandible from Phase 4: Saxon quarry/refuse pit [130] aged over 5 - 6 months at time of death (based upon time of eruption of the third lower molar given in Berman 1974). Metrical comparison with other London sites reveals the National Portrait Gallery specimen falls into the lower size-range documented for medieval and early Tudor cats, all of whom were (overall) very much smaller than their modern counterparts. Interestingly, the National Portrait Gallery specimen is noticeably very much smaller and more gracile than the robust cat jawbone from Roman London (2nd century Billingsgate Buildings, City of London) (Armitage 1980: 155).

Geese

On the basis of the size and robust appearance of the *Anser anser* bone elements, they are all assessed as domestic geese rather than wild greylag geese. Measurements taken of the National Portrait Gallery geese bones compare favourably with there counterparts identified as domestic geese from other Saxon/early medieval sites, including Melbourne Street, Southampton (Bourdillon and Coy 1980), Flaxengate, Lincoln (O'Connor 1982) and Exeter (Maltby 1979).

Domestic Fowl

Two of the National Portrait Gallery domestic fowl carpometacarpi (GL 33.0 and 35.3mm) were diminutive and scraggy (comparable in size to modern bantam chickens). All the other fowl from the site are comparable in size with the larger (average and above average sized) birds from 8th to 10th century Melbourne Street, Southampton (Bourdillon and Coy 1980) and Middle Saxon North Elmham Park, Norfolk (Bramwell 1980).

House Sparrow

A single house sparrow was represented by a tarsometatarsus from pit [130] (context [135], SF23).

Interpretation and Discussion

This section provides an overview of all the faunal evidence from the National Portrait Gallery, incorporating the findings of the studies carried out in the bird, fish, and amphibian bones. Supporting data is given in the Assessment Report on these faunal taxa (Pickard 1998).

Site environment

There is a surprising absence in the National Portrait Gallery faunal assemblages - even in the sieved environmental samples - of bones from small terrestrial vertebrate (non-synanthropic) species (e.g. field mice, voles and shrews). In reviewing the faunal evidence for the Jubilee Hall and Maiden Lane (MAI86) Middle Saxon sites, Rackham (1994, 128) noted a similar pattern, with the explanation that perhaps the high densities of humans and associated livestock precluded suitable habitat for these taxa - a valid model given that both these sites (today located on the Strand) would at that period have been situated in the central core of the settlement forming *Lundenwic*. The National Portrait Gallery site is believed to have been on or near the periphery of this main settlement and therefore not so densely peopled, functioning as a farmstead with close association with the surrounding rural areas. A semi-rural setting, including relatively undisturbed overgrown wasteland is suggested by the presence of several frogs (Phases 6, 7 and 8). Any such overgrown areas would also have served as ideal habitat for small wild mammals; which makes their absence all the more puzzling.

The only wild bird represented, the house sparrow, has also been recorded from 8th to 9th century York (Eoforwic) where its presence is explained by O'Connor (1994, 139) as "incidental to the human settlement", the bird filling a niche as "anthropic scavenger".

Livestock husbandry

Except for the variety of marine and freshwater fish eaten (*see* below), the faunal (taxa) spectrum for the National Portrait Gallery indicates a narrow subsistence base. There apparently was no exploitation of wild food resources (wild pig, hare, red deer, roe deer, and wildfowl); instead the inhabitants seem to have been almost entirely reliant on their domestic livestock. It is important to recognise that the National Portrait Gallery site represented a net livestock producer rather than an urban consumption site (applying the terminology of O'Connor 1994: 139). Evidence of this is provided by the presence among the mammalian bones of elements identified as neonates (sheep and pigs), by the calf bones, and age-sex profiles of the cattle, sheep and pigs (which include surplus young animals killed for their meat as well as older females culled after they had exceeded their optimal breeding age).

In sheep the kill-off pattern suggests the production of lambs for meat as well as the maintenance of older wethers (castrated sheep) for wool production. From the age profile of the cattle mandibles over 50% of the animals kept at the National Portrait Gallery apparently had reached full maturity (over 3 years of age) before being slaughtered, and it may be suggested that this older group includes castrates (oxen) employed in ploughing and haulage - important roles in the site economy especially given the apparent absence of horses.

The percentage frequencies of the livestock based on fragment (NISP) counts have been calculated for Phases 4 - 8 combined:

Cattle	37.0%
Sheep	42.9%
Pig	15.6%
Geese	2.5%
Domestic fowl	2.0%

In numerical terms sheep predominate, with cattle second in importance and pig third, while geese and domestic fowl were kept in small numbers. Goat only makes an appearance on site during Phase 8 dark earth accumulation, and has been omitted from these data.

Overall, the range and composition of the National Portrait Gallery livestock is consistent with a well-organised, largely self-sufficient farmstead(s). The keeping of domestic geese is particularly significant given these are "splendid foragers" well able under free-range conditions to fend for themselves (*see* Brown 1950, 212-213). Pigs with their omnivorous diet are likewise efficient scavengers. Together these animals with their lower husbandry requirements would have well balanced the more demanding (labour-intensive) cattle and sheep enterprises.

Except for evidence of work-related stress in several of the first phalanges (shown by moderate exostoses of the proximal articular surface) and one of the metapodials (shown by abnormal distension of the distal condyles) of cattle - consistent with these animals having been employed in ploughing and/or haulage - there is a remarkable absence of pathologies and traumatic injuries in the National Portrait Gallery livestock. Apart from the smallest individuals the National Portrait Gallery cattle and sheep appear generally sturdy, well-built animals indicating that the Saxons were maintaining the general trend towards the improvement of livestock (in Britain) first started by the Romano-British farmers (*see* Armitage 1982, 51; Crabtree 1991, 37: Bourdillon 1994, 123).

The above reconstruction (model) provides an overview of all the phases at the National Portrait Gallery whilst an intra-site analysis reveals a significant shift in the composition of the livestock (*ie* the principal meat-yielding species) by Phase 6. This is best demonstrated using the frequencies of the combined NISP counts of pig/fowl/geese bones, expressed as a percentage of the total number of bones for all the principal meat-yielding species (cattle + sheep + pig + geese + domestic fowl) (after the method of O'Connor 1994:145). Percentage frequencies of pig/fowl/geese relative to the other livestock in Phase 4 were 23.8 % in comparison with 11.4% in Phase 6 (Note: Phase 5, 7 and 8 have been omitted owing to insufficient sample sizes).

From the data collected, pig/fowl/geese show a combined decrease by almost half their numbers by Phase 6. The cattle seem to remain virtually constant - or at the most experience a very slight increase in numbers (with percentage frequencies of 36.3% Phase 4 and 38.1% Phase 6) while the sheep exhibit a noticeable increase (percentage frequencies: 39.9% Phase 4 to 50.5% Phase 6). While this could perhaps be explained with reference to a change in dietary regimen (*ie* greater preference in Phase 6 for eating mutton and lamb) it probably is a reflection of the increasing national importance of sheep as wool producers - with the National Portrait Gallery farmer(s) responding to this by expanding their flock(s) at the expense of the minor livestock (comprising the geese and pigs).

Table 43 Kill-off patterns in the National Portrait Gallery sheep from Phase 4 and Phase 6

		Number of jawbones	
Suggested age range	**Wear stage**	**Phase 4**	**Phase 6**
0 - 2 months	A	0	1
2 - 6 months	B	1	0
6 - 12 months	C	11	3
1 - 2 yrs	D	9	3
2 - 3 yrs	E	6	0
3 - 4 yrs	F	7	1
4 - 6 yrs	G	10	1
6 - 8 yrs	H	1	0

The available sample from Phase 6 proved insufficient to ascertain whether or not the sheep were being kept primarily for their wool. The pattern for Phase 4 indicated the sheep were dual-purpose (kept for both meat and wool production). The question of whether or not the inhabitants of Phase 6 were involved in commercial-scale wool production remains unresolved.

Dietary regimen of the National Portrait Gallery inhabitants

While the fragment (NISP) counts provide insight into the frequencies of the different livestock kept on the site, it is the weight of the bones which give the best means for determining the contribution each of the meat-yielding species made to the overall diet of the inhabitants (in terms of meat consumed):

Cattle	62.8%
Sheep/goat	22.9%
Pig	13.6%
Geese	0.5%
Domestic fowl	0.2%

By far the largest contribution to the overall diet came from cattle in the form of beef and veal, with sheep making the next largest contribution (in the form of mutton and lamb). Lesser amounts of pig meat were consumed, and even smaller quantities of flesh from geese and domestic fowl. The National Portrait Gallery produced no evidence for the consumption of venison, hare, wild boar, or wildfowl. There was evidence for the eating of freshwater and marine fish: comprising freshwater eel *Anguilla anguilla*, roach *Rutilus rutilus*, salmon *Salmo salar*, and cod *Gadus morhua*.

With the exception of the cod, all of these fish were probably caught (using hook and line, net or trap) in the freshwater reaches of the tidal Thames or in its tributaries. According to Wheeler in his discussion of the fish bones from Billingsgate Buildings site, City of London (Wheeler 1980, 162), cod could be "caught in shore-line kiddles towards the mouth of the river" (Thames) in winter. This might also be the source of the National Portrait Gallery cod. Whether or not the National Portrait Gallery inhabitants themselves were responsible for catching the roach, eels, and salmon, or traded/purchased these either from itinerant fisherman or from markets in *Lundenwic* is open to speculation. The recovery of a fishhook from context [129] suggests that at least one of the inhabitants was more directly involved in fishing. Cod would have had to be specially procured and brought in from some distance, as there was no local source.

Of the freshwater fish species, roach predominates the National Portrait Gallery assemblages and it is of interest that even today it is common in the rivers of the London area - and that in later Victorian times it was said that the "finest roach are caught in the Thames" (Beeton 1880:129).

Relationship of the National Portrait Gallery to other Middle Saxon London sites

The frequencies of meat yielding species from the National Portrait Gallery site have been compared with other published *Lundenwic* sites (see Table 44). Inspection of these data reveals the disparities between the centralised sites along what is today the Strand and Covent Garden area (comprising The Royal Opera House, Jubilee Hall, Maiden Lane (MAI86), and Peabody site), representing the core of the *Lundenwic* settlement, and the peripheral sites beyond the western edge of the main settlement (comprising the National Portrait Gallery and National Gallery Basement sites). The centralised sites are all dominated by cattle while those on the periphery are characterised by the preponderance of sheep, with cattle of secondary importance, and pig third. It is believed the peripheral sites represent farmsteads (*ie* net producers of livestock) while those in the centre were consumers of the surplus animals from these (*see* West & Rackham 1988; West 1989; Rackham 1994).

Table 44 Frequencies of meat-yielding species from Lundenwic

	Cattle	Sheep	Pig
National Portrait Gallery	38.7%	45.0%	16.3%
National Gallery basement	38.2%	49.2%	12.6%
Jubilee Hall	64.7%	23.7%	11.6%
Maiden Lane (MAI86)	65.7%	22.8%	11.5%
Peabody site	56.3%	29%	14.7%
Royal Opera House	46.7-70.6%	6.9-33.5%	15.8-26.1%

based on fragment (NISP) counts (calculated from data in West & Rackham 1988 and West 1989 and Rielly 1997)

THE PLANT REMAINS

WENDY CARRUTHERS

Samples were taken from all Saxon deposits where possible (mainly *c*.30 litres in volume) in order to recover environmental evidence. The nomenclature and much of the habitat information are taken from Stace (1995). The remains were mainly charred, although a single mineralised elder seed from the base of pit [526] in OP19 indicated that some cess or mineral-rich organic waste had been present in this feature. The uncharred elder seeds from OP15 and OP16 may represent contamination, although tough-coated seeds of this type can survive in soils for several centuries.

Cereal Identification

Because of the absence of well-preserved chaff the level of identification of wheat, barley and oats was limited (*see* Jacomet 1987). The wheat was probably a bread-type according to the morphology (*Triticum aestivocompactum*), and the barley was likely to be mostly (if not all) 6-row hulled barley (*Hordeum vulgare*), according to the results from other sites of this period. The oat may have been a weed or infrequent crop.

Discussion

Charred plant remains were extremely sparse in all of the samples with the concentration exceeding 1 fragment per litre in only two samples; context [126] in pit [130] = 3.77 fragments per litre, and context [509] in pit [526] = 2.07 fragments per litre. The state of preservation of the cereals ranged from good to poor, although a few well-preserved cereals were present. Where the cereals were too poorly preserved to allow identification to species level, this was probably due to erosion during redeposition, e.g. context [79], a floor levelling layer. Even poorly preserved indeterminate cereal grains were sparse in all of the samples, which is thought to be an original property of the site, rather than being the result of destructive taphonomic processes.

The main components of the assemblages were cereal grains. Free-threshing bread-type wheat (*Triticum* sp.) was the predominant cereal in virtually all of the samples, although one sample in pit [130] (context [147]) contained mainly rye. Rye (*Secale cereal*) and barley (*Hordeum vulgare*) were recovered in roughly equal quantities from a similar number of samples, but oats (*Avena* sp.) were only tentatively identified once. The presence of glume wheat (emmer/spelt) is tentative because only one poorly preserved grain and one glume base were recovered from pit [130]. It is possible that this represents redeposited material. Rackham (1994) reported that glume wheat had been recorded from early but not Middle Saxon London sites.

Cereal chaff fragments were virtually absent, although small weed seeds were fairly common. The absence of chaff fragments in the assemblages is typical of sites of this period as even rural Saxon and medieval sites rarely produce quantities of chaff and large weed seeds, such as are indicative of early stages of crop processing. The main reason for this is the cultivation of primarily free-threshing wheat for human consumption from the Saxon period onwards, but it may also be due to chaff being used as fodder and temper rather than being burnt as waste, and to differential preservation. At the National Portrait Gallery the general paucity of charred cereal remains indicates that semi-cleaned or fully cleaned cereals were being brought onto the site.

The narrow range of primarily small-seeded weed taxa may represent crop contaminants that had slipped through the various cleaning stages. Alternatively, some of the weed seeds may represent burnt hay, perhaps from floor sweepings or fodder. Many of the weed taxa have a fairly wide habitat range, and can grow in grasslands or soil disturbed by cultivation. This includes the small-seeded grasses (*Poaceae*) and clover-type legumes (*Trifolium/Lotus* sp.), which were particularly ubiquitous in samples from pit [130]. The presence of spike-rush (*Eleocharis* subg. *Palustres*) and marsh bedstraw (*Galium palustre*) in samples from this trench suggests that some hay may have been brought in from damp meadows. The fact that burnt waste other than cereal debris was present in the samples was demonstrated by the presence of small quantities of charcoal, hazelnut shell and elder seeds. Charred elder seeds and hazelnut shell were only recovered from trench OP5.

The significance of all of the observations made in this report is reduced by the fact that so few remains in total were recovered. Some differences in the weed taxa can be observed between the pits in, pit [130], and, pit [526]. Although 24 samples were examined from [130], and only 4 from [526], two notable arable weed taxa were only found in the latter; the large seeded corn cockle (*Agrostemma githago*), and stinking chamomile (*Anthemis cotula*), an indicator of heavy soils and that the crops had originated from different soil types.

Comparisons with other Middle Saxon sites from Lundenwic

The assemblages from the National Portrait Gallery fit in well with the description of the Middle Saxon agricultural economy in London summarised by Rackham (1994). Bread-type wheat and in some cases barley predominate on the sites examined to date, with only a small amount of evidence for the use of rye and oats (*ibid*). In comparison, the National Portrait Gallery produced slightly less barley and more rye than some of the London sites, although the total quantity of remains was too small for this observation to be of much significance.

Rackham proposes that the evidence from London to date indicates market buying of semi-cleaned cereals rather than local cereal growing. The findings from the National Portrait Gallery fit in with this theory. Primarily the overall scarcity of charred cereal remains in all of the samples, rather than the absence of chaff fragments, supports the theory that this was a commodity that had to be purchased and therefore would be more highly valued and less likely to become accidentally charred. It is also possible that the cereals were considered to be fully processed (rather than semi-cleaned) when bought at market, as the few small weed seeds recovered from this site could easily have slipped through the processing and were generally too small to have been picked out by hand prior to cooking. The only taxon poisonous and large enough to warrant hand-picking was the corn cockle seed found in pit [526]. It is also clear that other types of waste such as burnt hay had been deposited in these features, which could have accounted for many of the weed taxa.

There are a number of similarities between the assemblages from the National Portrait Gallery and those from other Middle Saxon sites in the area (Davis & de Moulins 1989); such as the very low density of charred plant remains, and the high incidence of small-seeded grasses and clover-type legumes. Middle Saxon samples from the Peabody site and the National Gallery Basement and Extension (Davis & de Moulins 1989) produced very similar, sparse assemblages to the National Portrait Gallery. The recovery of mineralised straw and grass seeds demonstrated that hay and/or cereal straw had been deposited in cess pits (de Moulins 1993). Charred clover-type and grass seeds were also numerous in pits at the National Gallery Basement site (Davis & de Moulins 1989). This demonstrates the importance of hay and perhaps cereal straw as a resource. Presumably this would have to have been bought at the market, and was probably used as a floor covering and possibly for animal fodder. The presence of hazelnut shell fragments and elderberry seeds is also a common factor on these sites. Elder seeds were present as charred, uncharred and mineralised remains at the National Portrait Gallery, which indicates the importance of this food and/or dye plant, especially since fruit remains are less likely to become charred than cereals.

The National Portrait Gallery samples lacked the additional economic plants found elsewhere in Middle Saxon London such as flax, possible lentil, Celtic bean and a few fruits that were present in waterlogged and mineralised cess deposits (apple/pear, strawberry, blackberry/raspberry, plum/sloe, figs, grapes). Possible peas have also been recovered from Saxon sites in London, and a possible pea was recovered from pit [526].

The general paucity of charred remains and the similarities between sites of this period suggests that the Middle Saxon diet may have been fairly restricted, with fruits and nuts being gathered from local hedgerows and woodlands to provide some variety.

Table 45 Plant remains from the National Portrait Gallery

Trench	**OP3**	**OP4**	**OP5**				
Phase	**1**	**4**	**1**	**2-3**	**4**	**4**	**5-8**
Feature/ Context	**201**	**232** **233** **239** **261**	**TN**	**138**	**Ditch** **234/** **264**	**Pit** **130**	**FC**
TAXA							
Triticum sp. (Free-treshing bread-type wheat)		1		2		52	9
Triticum sp. (Free threshing wheat rachis frag.)							1
cf.*Triticum dicoccum/spelta* (cf. emmer/spelt grain)							1
cf. *Triticum dicoccum* (cf. emmer glume base)				1			
cf. *Triticum* –type (wheat-type grain)							10
Triticum/Secale sp. (wheat/rye grain)						1	
Secale cereale L. (rye grain)				1		18	3
cf. *Secale cereale* (cf. rye grain)							2
Hordeum vulgare (barley grain)			1			15	1
cf. *Avena* sp. (cf. oat grain)					4	1	
Indeterminate cereal grain		1	1	5		50	18
Ranunculus repens/acris/bulbosus (buttercup achene) CDG						2	
Corylus avellana L. (hazelnut shell frags) HSW				1		14	2
Chenopodium album L. (fat hen seed) CDn				1			
Atriplex patula/prostrata (orache seed) CDn						1	1
Chenopodiaceae (no seed coat)						4	2
Agrostemma githago L. (corn cockle seed) AC							
Persicaria maculosa/lapathifolia (red shank/ pale persicaria achene) CD							1
Rumex acetosella L. (sheep's sorrel achene) CGEa							
Rumex sp. (dock achene) CDG						8	4
Viola sp. (violet seed) wide							1
Vicia /Lathyrus sp. (c. 2mm vetch/tare seed) C & wide						2	1
Vicia/Lathyrus sp. (c. 4mm vetch/tare seed)						2	
Trifolium/Lotus sp. (clover/bird's-foot-trefoil seed) CG	1					9	2
cf. *Pisum sativum* (cf. pea) *							
Fabaceae frags							2
Galium palustre L. (common marsh-bedstraw nutlet) GdMP							1
Sambucus nigra L. (elder seed) HSW						1	1
Anthemis cotula L. (stinking chamomile achene) Adh							
Eleocharis subg. *Palustres* (spikerush nut) MP						8	
Cyperaceae (sedges etc.)			1		Cf.1	1	
Bromus (chess caryopsis) AD						4	1
Poaceae (small-seeded grass caryopsis) DG	1	1	1		5	3	14
TOTAL	2	3	4	11	1	196	78
No. of samples examined	1	4	2	2	?	10	6
Total volume of soil Sampled	?	?	60	45		300	190
Frags per litre soil			0.07	0.24		0.65	0.41
Fish						+	++

+ = present, ++ = several, +++ = frequent, * = food plant, A = arable, C = cultivated, D = disturbed, E = heath, G = grassland, H = hedgerow, M = marsh, P = ponds, ditches etc., S = scrub, W = woods, d = damp soils, h = heavy soils

Chapter 6 Wattle and Daub: A technical and experimental study based on materials from the National Portrait Gallery

RICHARD HUGHES

> As for 'Wattle and Daub' I could wish that it had never been invented. The more it saves in time and gains in space, the greater and the more general is the disaster that it may cause; for it is made to catch fire, like torches. It seems better, therefore, to spend on walls of burnt brick, and be at expense, than to save with Wattle and Daub, and be in danger. And, in the stucco covering, too, it makes cracks from the inside by the arrangement of its studs and grits. For these swell with moisture as they are daubed, and then contract as they dry, and, by their shrinking, cause the solid stucco to split. But since some are obliged to use it either to save time or money, or for partitions on an unsupported span, the proper method of construction is as follows. Give it a high foundation so that it may nowhere come in contact with the broken stone-work composing the floor; for if it is sunk in this, it rots in course of time, then settles and sags forward, and so breaks through the surface of the stucco covering.
>
> (Vitruvius, IIIV, 20).

In England wattle and daub has been an important construction element from the Neolithic period onwards. It was commonly used in Iron Age and Saxon huts and in Roman and medieval houses. There are many post-medieval standing structures with original wattle and daub still in place. In many developing countries wattle and daub is still important.

Wattle and daub construction utilises two common building materials; soil and wood (the term 'soil' is used in this report in its civil engineering sense). In simple types of building wattle and daub may provide the total wall structural system. However, the typical use today is as an infill, and shear plate in a timber frame structure. The quality of wattle is well demonstrated by the strength and durability of hot air balloon baskets. Daub is soil similar to that we see in buildings that may be more than 200 years old and still highly durable. The main advantages of wattle and daub construction are that of cheapness and quickness to use. It is not too heavy and is fairly robust. The main disadvantages are poor durability, related to soil-wood interaction, and a tendency to structural distortion. As the Roman writer Vitruvius notes (*see* box text above), it can be burnt down (Granger 1931).

The main evidence for wattle and daub construction in Middle Saxon London derives from the survival of 'fired daub'. Ordinary or only lightly 'burnt daub' was either reused or reabsorbed back into the ground. Here the organic content in the daub and the wattle are good sources of micro-organism food. The soil can literally 'melt' back into the embedment soil horizon. Fired daub has been found on most archaeological sites that have been excavated in the Covent Garden region. It is generally found here as a residual material and represents but a small percentage of the daub that would have been needed, even for a simple hut.

The first part of this study reports on the analysis of Middle Saxon fired daub excavated from the National Portrait Gallery site (Pickard, Chapter 5, this volume). More than 22kg was archaeologically recovered, mostly from two large rubbish pits. The resource is important because of the amount recovered from a small development site and its ability to be used for the study of source soils and building technologies in *Lundenwic*. It can also be compared with some Late Saxon resources found in the City of London. The second part of the study examines the brickearth source material from a geotechnical point of view. It then reports on experiments and engineering analysis undertaken to help interpret the findings reported in the first part. Particular attention is given to understanding construction and performance technologies. This approach offers the best opportunity to rediscover long-forgotten engineering processes. The study also includes the modelling of a typical Middle Saxon wattle and daub hut based on various features found in *Lundenwic*. For example, there are important remains of a possible collapsed wall from Shorts Garden and building remains from the Royal Opera House site. Elsewhere, evidence for *in situ* wattle and daub structures is rare. Finally, a glossary aims to fully define the description and technical terms that have been used, and therefore to establish a documentation methodology for archaeologists, in order to improve on data recovery, innovative interpretations and a reporting consistency.

'FIRED DAUB' ARCHAEOLOGICAL RESOURCES

Fired daub from *Lundenwic* sites is generally found in two contexts: firstly, as dense formation spreads and significant deposits within pit fills, and secondly, occasionally as a minor resource within general soil layers, representing an abraded/residual material that was probably lying around for a long time.

Both these types of fired daub resource are waste material and there is no evidence for it having been purposely manufactured. Natural disasters may have been responsible for some fires whilst others may have been acts of violence. The character of the fired daub suggests it was from part of a far larger daub resource with most having been naturally reworked into the burial soil formations.

Most daub would not have been burnt to a 'fired' state, say above 650ºC, but would have been oxidized to red and then discarded. The daub that was just substantially scorched could have been remoulded and reused. To reach the 'fired' state would require there to be a heat source for a long burning period, roofing thatch may have provided a fuel for just a short time but this may have been slightly extended by dried fibre and straw within the daub fabric. Burning of the internal wattles (especially when old and very dry), and perhaps the creation of updraft channels, could have led to conditions where high firing temperatures were locally achieved. The burning of a hut should be compared with kiln conditions, a very efficient heating system taking more than a day to heat up and maintain the temperature and then cool down.

Some *Lundenwic* huts had their ovens located in room corners and therefore built adjacent to daub walls. This could have led to the local slow creation of burnt daub patches, or if unlucky, to a disaster burning down the whole structure!

In Middle Saxon contexts, the only reuse functions that can be suggested for fired daub are as an additive to midden deposits, as a moisture retention agent or in very small quantities ground-up and used as an additive in the making of metal casting moulds. Lime-based mortar was not much in use at this time and therefore there would have been little need for the more sophisticated hydraulic 'Roman' cements using fired daub for its podzolanic effects.

Geology and Hydrology

An engineering investigation of the National Portrait Gallery (NPG) site shows the underlying stratigraphy comprises a sequence of made ground, brickearth, and gravel overlying London Clay (*see* Chapter 1 for a description of the geology and topography of the area). The basal made-ground formations are of Middle Saxon date. A perched water table occurs towards the base of the gravel and seasonally fluctuates. Related to the gravel formation and the topography, there is a spring-line on the south side of Trafalgar Square. Before 17th century development the 'Seven Dials' area of Covent Garden was a well-known marshy landscape.

Location of the Fired Daub Discoveries

The fired daub and some redeposited brickearth, the latter probably representing unburnt daub reworked into the natural soil profile, were principally found in two Middle Saxon pits and a similarly dated ditch (Pickard, this volume). The size and depth of the pits indicate that they were probably excavated for obtaining brickearth and not solely for the underlying sand and gravel. The pits were then slowly backfilled; the complex composition and layering of fills illustrates the deposition of wastes from various sources, principally domestic refuse and light industrial residues. The layering and slumping of pit sides suggests they were left open for a long time, sufficient for weathering and softening of the faces.

The quarries found on the National Gallery Extension site to the west (Cowie 1988), thought to be on the periphery of the Middle Saxon settlement, have been interpreted as supplying gravel for road metalling but clearly would have been good places for obtaining building sand. Some sand may have been used occasionally for lime mortars but more likely it was mixed with brickearth to form daub.

Character of the Fired Daub

The NPG fired daub is predominantly of small fragments, each of just a few grams and highly worn into sub-rounded shapes. The overall character of the resource is suggestive of a long exposure time where it was crushed and abraded. Most of the fired daub has a light-orange 'oxidized' colour, which has more of a rusty-orange colour on fresh breaks. Less than 10% has a patchy grey-black scorching and a 'reduced' fabric. Two small fragments have a vitrified black fabric.

There are three distinctive resource 'forms' but all are of one fabric type. Firstly, there are very small and numerous little lumps of a sandy fired daub with some occasional larger lumps; comprising most of the NPG resource these have no fossil structural wattle details. Secondly, there are a few large lumps with withy and wooden post impressions, illustrating wattle and daub construction. Finally, there are occasional large lumps of a slightly silty variation of the typical sandy fabric. These have face surfaces and some are whitewashed but with no withy or post impressions on the backside.

All of the NPG resources have the same sandy fabric, irrespective of context, frequency within the context, and size. There are fabric variations responding to the brickearth's source, the amount of sand additive, thoroughness of mixing, and the emplacement processes. There is a complete absence of straw or grass additives (as fossil voids) and therefore no evidence for two distinctive fabric types as identified on other *Lundenwic* sites. Hardness and colour are also highly variable, reflecting on the changeable character of the material as manufactured and following burning.

Samples of the fired daub have been examined as thin sections, confirming that the overall character is of a very sandy fabric, which has been purposely manufactured by mixing brickearth with a clean sand (an essential additive to brickearth for making a low-plasticity mix, as demonstrated below). The mix carefully avoids fine gravel inclusions and the addition of organics, neither of which are needed for modifying the brickearth. An internal flow texture is noted by colour, striation whorls, and by the simple to complex, loose, sandy, curvilinear laminations, which are no more than one to two grains of sand thick and up to 15mm long. This texture would suggest the material was used in a rather dry state, whereas excessive moisture would help to make a smooth and uniform blend. The very clear internal 'flow' or 'moulding' structures strongly indicate superficial mixing and/or reworking of the first application layer. Here, the daub would be pushed on to the wattle with fingertips resulting in a knobbly texture onto which a sub-flat skim coat is added. This technique is still common today throughout Asia (personal observations). The dryness, sandiness and air voids of the mix may also account for the poor impressions of withies and posts seen on the fossil casts.

Most of the NPG resource has a relatively low dry density and is therefore characteristically rather porous. Most fragments contain a significant number of 'vugs' and cavities, the former resulting from removal of water droplets and the latter left during incomplete mixing. The examination shows no cavities are left as a result of organic inclusions having decayed or burnt out. Samples of daub were found to have an average dry density of 1.6g/cm^3 and this matches well with the mixing and application techniques discussed later on in this study. Because of the significant sand component this general fabric type can, when more compacted, have a dry density up to 1.8 - 2.0g/cm^3. The samples of the fabric were determined to have something like 25 to 35% air voids. This implies that the mix contained a lot of moisture when made and later on when drenched by rain or animal urine. The air voids also mean the NPG daub fabric was a reasonably thermally efficient wall material.

The occasional slightly more silty fired daub found in just context [181], has a dry density of 2g/cm^3 and is highly indicative of having been compacted or significantly reworked when drying out. Here, the water and air voids have been driven out during the emplacement. The resulting material can have a dry density of up to about 2.65g/cm^3, with only *c.* 5% air voids, which is comparable to some limestones densities.

The Microscopic Examination of Typical NPG Fired Daub

Fired daub samples from contexts [76] and [77] have been made into petrological thin sections and examined with a geological microscope, (Fig. 65). The fabric illustrates:

I) A mixed density and variable fabric structure material resulting from the poor blending of the soil and sand mix. In thin section brickearth pellets and lumps of unworked brickearth are evident. The original wet mix shows in the resulting voids. There are patches of more sandy fabric where there is poor sorting and distribution of the sand additive; here there are grain contacts and pores between them.

II) Changes of density resulting from construction techniques. For example, there is greater compaction on the face and where the mix was pushed against withies. There is some evidence of fabric stretching where squashed through the withies and then subsequent shrinking of the fabric around them.

III) Flow textures resulting from contorted pellets of silty/clayey and sand laminations in an otherwise 'smooth' textured brickearth.

IV) Sand inclusions identifiable from the brickearth ground mass, including large sub-angular and very transparent grains with no surface etching. This compares with the natural brickearth sand which is small to medium sized sub-angular to sub-round translucent, with clay sticking to surfaces, very small grains clumped together; and with sandy patches comprising greyer areas with well graded clear sand grains. Overall there are minimal amounts of dark 'exotic' minerals (for example glauconite), and no mica minerals has been recognised.

The Character of Fired Daub 'Finish' Surfaces

Where lumps of fired daub retain an original wall surface this illustrates finishing-off techniques. Generally the surfaces have a gently undulating character and are suggestive of hand finishing using both the palm and finger-edges. Surfaces have resultant shallow grooves generally parallel to the underlying withies, illustrating the surface smoothing was laterally, and not vertically, done (this probably minimising the chance of disturbing the keying mechanism while hardening up). The general lack of surface striations suggests the finishing was undertaken with clean and/or wet hands, this avoiding 'dragging' of sand grains across the surface. There is no evidence for additional surface layers that could have been applied during original daub emplacement, or done as part of later improvement and repairs.

It has been possible to determine full wall thickness from only two lumps of daub. This was recorded at a wattle mid-panel cross-over [77] as 110mm and near to a post [77] as 75mm. The withies and posts, and the daub coverings, indicate comparatively thin-sectioned walls and therefore lightweight structures.

Sources of the Fired Daub

The abraded and dispersed character of all the fired daub on the site strongly supports it being finally buried a considerable time after being detached from a structure. The residual character of the resource, with an average weight of just a few grams, raises the possibility that it was purposely broken down and reused. For example, it may have been added to a flowerbed, perhaps to create a base level and good drainage in a clayey, poorly draining soil. In a similar way fired daub at the Shorts Garden site appears to have been reused to form a track, acting as a well draining gravel-ballast sub-base material. From discussions with gardeners, fired daub is apparently not the sort of material that would have been purposely added to a midden formation to produce better quality compost. However, if accidentally added, or added when a yard was cleaned up, it could have slightly aided with moisture retention, in the same way as bits of flowerpot are placed in the base of new ones.

It is not possible to define the character of the firing process, or the type, size and duration of the fire that generated the fired daub. There is no evidence from the resource to indicate whether it was accidentally produced when a structure was burnt down, was purposely manufactured to make a stronger and more durable wall, or whether it originated as a wattle and daub hearth surround. Likewise, there is nothing to suggest it being fired after it had been removed from a structure. Furthermore, it contains no clues as to the type or size of structure from which the daub came.

However, the total quantity of fired daub is significantly high when considering the size of the excavation and in comparison with other *Lundenwic* sites, though it should be stressed that the fired daub resource is but a minuscule amount that would have covered a typical small Middle Saxon hut. The total weight from the site (including context [516]) represents a volume of $16855cm^3$, calculated at field density of $1.7g/cm^3$. If the daub thickness was 50mm then the volume represent a surface 'patch' of just over $0.5m^2$. The daub in test pits OP5-OP17 would cover less than $0.25m^2$. The deeper Phase 6 fired daub resource, potentially representing a single source, would provide a $30cm^2$ area. This raises a question as to what happed to the rest of the wall material and this is further addressed in this article. No unfired daub was recovered from the pit contexts, suggesting that it was reused in some way or has been 'reabsorbed' into the local topsoil near to the structures.

The small average weight of the fragments is considerably different from that found on other sites in the Covent Garden area, which are assumed to be nearer to the centre of *Lundenwic*.

EXAMPLES OF WATTLE AND DAUB RESOURCES FROM OTHER ARCHAEOLOGICAL SITES IN LONDON

Structural wattle and daub features and daub artefacts have been found on a large number of Middle Saxon sites in London and examples are discussed for the City of London and *Lundenwic*.

City of London

Saxon wattle and daub construction appears to be rare in the City of London . Where it is found it is mostly associated with 'surface-laid' buildings, but may just be absent as a result of Saxon levels having being heavily truncated. Horsman *et al* (1988) report three examples of wattle between earth-fast posts, and two where posts are supported on base plates. The archaeological remains suggest that most Middle to Late Saxon structures used staves or plank walls. This understanding must be cautiously treated as in some cases the remains could represent supports to vertical soil cutting faces and the superstructure having different construction between the structural posts.

In the City of London, wattle and daub may have been more related to sheds, stores and huts rather than large houses. Wattle is more commonly found as latrine pit linings, where an open fabric would have allowed for liquid dispersal into the surrounding ground. The 10-11th century wattle river revetment found at Billingsgate Lorry Car Park in 1982-3, was perhaps used as a silt trap before becoming an earth retaining wall, suggesting its structural capability was well appreciated. For example, in many mountain regions large stone-filled wattle baskets are used for stopping river erosion (personal observation in the Himalayas). The same types of baskets were used in the American Civil War for military defences.

Two Late Saxon wattle structures were found in the Guildhall excavation. Structures to the east appeared to be formed with post and planks. The main structure was 5m by 10m and formed with wattle woven in-place panels set between large upright timber posts. There were no foundations, with the roof substantially loaded onto internal earth-fast posts and overall braced with buttressing props. The wattle was covered with a mix of animal dung and straw.

The latest structure in this area, found as partial remains, was an aisled building, possibly an animal byre, with rounded corners measuring 5.5 by 7.5m. The wattles were covered with animal dung. To the east there were features of two small wattle-built structures, possibly chicken coops.

All of the wattle and daub structures illustrated evidence for what must have been nearly continuous repair, probably reflecting, dampness, micro-organism infestation, rampant wood decay and the use of dung. The use of animal dung may reflect on the absence of brickearth locally and it is interesting to note that in many countries, including India, cow-pats are moulded into pancakes and stuck on soil walls to dry out prior to being used as fuel.

Lundenwic

At Shorts Garden, in Areas 1 and 5, where the main 8th century remains were excavated, natural gravel was encountered at +18.40m OD. Covering this was a 0.5m thick layer of blue silty clay containing butchered animal bones, oyster shells and tiny fragments of charcoal and burnt daub. The formation may have been waterlain and part of the marshy area that was finally drained by Cock and Pye Ditch in the 17th century. The top 100mm was especially rich in charcoal and oyster shells. Above this formation were substantial Middle Saxon remains related to a cluster of wattle and daub buildings and associated with iron smithing. The buildings were surrounded by compacted gravel surface yards. Some evidence suggested the daub hut walls were whitewashed.

In Area 5, key features included an arrangement of hearths, with one in particular being the base of a domed structure, 1.7m x 1.0m and 0.25m high. To the west of this lay a truncated degraded, ditch possibly for a timber beam for uprights with wattle and daub or planks. A beaten floor with associated stakeholes stopped immediately east of the hearth. The hut was considered by the excavators to have measured 4.5m by 5m. Another structure and hearth complex was estimated to have been 8m by 6m. At the eastern end of Trenches A and B in Area 5 was a slot for a timber beam, the base being noted by a layer of oyster shells possibly acting as a damp proof course. To the north lay further postholes of another possible wattle and daub hut. Running through to Area 1 was evidence of a collapsed wattle and daub wall, but without any evidence for associated brickearth floors or gravel surface. In Area 1, the main feature of interest was an east-west linear spread of burnt daub and ash some 0.9m wide and 15m long. It was associated with postholes, possibly representing a fence or a very large hut or possibly a hall. A shallow ditch followed the same alignment as the burnt daub suggesting some sort of relationship; possibly being a plot boundary.

At the Royal Opera House Middle Saxon east-west trending buildings were excavated fronting both sides of a north-south orientated street and with east-west alleys between them. The buildings were generally 6m wide and 16 to 18m long. They were replaced variously between three and six times and with slight changes in realignment and internal arrangement. The external walls were made of several materials including planks, earth-fast posts and wattle and daub. Floors and a hearth were formed with brickearth. Many of the buildings had been burnt down and numerous fragments of burnt daub were recovered, many with withy and timber impressions and some with lime-wash coated surfaces (Malcolm *et al* 2003).

The walls of one early timber structure were constructed of wattle and daub panels secured between pairs of split, halved, round-wood posts in simple postholes and had burnt down and remained *in situ*. In the sample evaluation area the earliest East Building was slightly sunken and presumably abandoned when burnt down. Some walls were formed with planks but there were collapsed burnt daub deposits. The West Building also produced burnt wattle and daub resources (Malcolm *et al* 2003).

A Discussion of Fired Daub Fabric found on Lundenwic Sites

Two types of fired daub have been visually recognized on *Lundenwic* sites based on geological thin sectioning and petrological analysis (Williams, D 1989). The two fabrics have the following characteristics:

Fabric Type 1

This shows a groundmass of frequent angular to sub-angular quartz grains predominantly under 0.20mm, with a scatter of large grains ranging up to 1.20mm across. Also present are a few pieces of flint (generally small but on one site with at least one fragment being over 2mm in length), flecks of mica, some iron oxide, a few well-rounded reddish to light brown and opaque grains of glauconite, and occasional elongated voids suggesting vegetable matter, probably chaff or grass. At least one fragment from Maiden Lane (MAI86) shows evidence of a seed or seed casing from a cereal or grass. Here, pieces of shell were also observed in a few fragments, and in one instance a piece of bone 18mm in length was found. Type 1 Fabric is often uniformly brick red in colour and baked quite hard. Some examples have buff and/or dark grey patches and tend to be more crumbly.

Fabric Type 2

This is characterised by closely-packed grains of angular and sub-angular quartz in the range 0.10mm - 0.60mm, with fragments of flint ranging up to 2mm in length, flecks of mica, iron oxide and some well-rounded reddish to brown opaque grains of glauconite. An important feature of this variant is the lack of organic voids and impressions that are so common in Fabric 1. One fragment from Maiden Lane (MAI86) had a scatter of clay pellets up to 5mm in length. The daub is brick red to light brown in colour, although some fragments also have grey patches.

Williams indicates that the daub has the same range and sizes of minerals as the local brickearth. The role of organic additives is discussed in detail in the second part of this study, which concludes that it reduces cracking once the daub has dried.

It is highly probable that the two fabric types merely represent variations in a highly variable natural soil, where a considerable quantity of sand has to be added to aid with workability, the control of shrinkage and for compaction. Minor variations of moisture creating the daub mud accounts for differences in resultant fabric texture and density. The use of organic additives, to modify the workability and performance of the daub, and with otherwise poor mixing would significantly stand out, as in the case of 'Cob' fabric used in southwest England.

The National Portrait Gallery fired daub is different from other sites in being all of Type 2 Fabric, with no organic inclusions and with well-graded sand. Also, it is different from the central *Lundenwic* sites in respect of these having typical average fragment weights of 13 to 27g. At NPG the average fragment weight is about 7g, and these lower resource fragment weights are likely to reflect on resource dispersal in the landscape beyond the centre of occupation.

One of the most important conclusions is that the total weight/quantity of daub on the sites is 'nominal', representing but a small fraction of that required to construct a very small hut.

WATTLE AND DAUB MATERIAL RESEARCH

This section of the chapter reports on a technical study of London brickearth soil used for making daub. It also summarises simple experiments showing how wattle and daub walls are typically constructed and discusses the engineering character and structural performance of a Middle Saxon type of structure.

National Portrait Gallery Brickearth Analysis

It is clear that the source material for the Middle Saxon daub found at the NPG site is the local brickearth and therefore that there was no need to import it as a 'bought' building commodity. However, freshly dug brickearth had to be changed and manipulated, and this is considered in detail below via material and construction testing and experimentation. The brickearth used for geotechnical analysis was derived from the NPG geotechnical site investigation samples and from the base of the engineering excavation pits. The soils were laboratory tested to British Standards (BS 1377). Terms and definition of the soil parameters are provided at the end of the chapter.

Description and Test Results of Brickearth from the National Portrait Gallery and other London Sites

The brickearth from Borehole 1, Sample 6 (+11.75m OD to +11.05mOD) was recorded as soft to firm, fissured red-orange brown clay (26%), sand (35%) and silt (39%) with occasional sub-angular to rounded fine to coarse flint gravel. The Liquid Limit was 32%, Plastic Limit 16% and Plasticity Index 16%. It had an initial Bulk Density of 2.06Mg/m^3, Natural Moisture Content 23% and Initial Dry Density 1.67Mg/m^3.

The brickearth from Borehole 1, Sample 11 (+11.05mOD to +9.75m OD) was recorded as firm indistinctly thickly laminated fissured orange brown and light grey brown sand (27%), clay (30%) and silt (43%) with a little flint gravel below 4.5m. The Liquid Limit was 60%, the Plastic Limit 25% and Plasticity Index 35%. The initial Bulk Density was 2.08Mg/m^3, Natural Moisture Content 25% and Initial Dry Density 1.66Mg/m^3.

The brickearth from Borehole 2, Samples 2, 3, 4 (+10.65m OD to +10.25m OD) was recorded as soft to firm yellow-brown silty clay, over brown and orange sandy, silty clay with some rounded fine and medium flint gravel. The Natural Moisture Content was 18%, the Liquid Limit 47%, the Plastic Limit 21% and Plasticity Index 26%.

The brickearth from Observation Pit 16, Sample 1 was recorded as sand (50%), silt (35%) and clay (15%). The Natural Moisture Content was 18%, the Liquid Limit 25%, the Plastic Limit 14% and Plasticity Index 11%. The Maximum Dry Density with 2.5kg rammer = 1930 Kg/m^3 at Natural Moisture Content = 12%.

Brickearth has been geotechnically tested from only a few other development sites in the *Lundenwic* area. This is because it is generally obtained from engineering boreholes and is either not encountered, is passed through before recognition, or because the material is not of significance for foundation designs.

An overall assessment of London brickearth indicates that throughout its distribution it is all of an excellent quality for use as a building material. It can nearly be used as found, with just a simple puddling to make it mouldable for daub or making into adobe bricks and pisé. The particle grading of brickearth is variable within a local area but overall it is a clayey-silt. The limited data available at this time suggests no regional distribution trends greater than the recorded local variations. The Atterberg Limits indicate that the soils are generally found with a natural moisture content slightly above or below the Plastic Limit, this being locally related to the season and burial depth. It has variable plasticity properties within a local area and throughout its outcrop in London. The Plastic Limits are all generally low, requiring very little moisture to transform a naturally compacted or dried-out hard soil to a smooth-mouldable one. The brickearth has a moderate Liquid Limit and therefore is not too sensitive to turning rapidly from a plastic soil to a sloppy one. The Plasticity Index indicates that the brickearth is mouldable over a good range of moisture contents and therefore is useable without having to constantly further wet-up or dry-out. However, it is clear that the brickearth placticity changes with the addition of sand, enough to reduce the shrinkage but still keep it malleable.

Overall, it requires but a few simple 'tricks', such as adding sand or straw, to slightly improve it (*see* the following experiments). There is no evidence that more sophisticated alterations were made, for example, to stabilise the soil or make it water resistant. There was therefore in Saxon times no need to go prospecting, no requirement for it being treated as unique on each site and no need for specialised technologies or well-trained craftsmen.

WATTLE AND DAUB CONSTRUCTION EXPERIMENTS

Summary

To understand how *Lundenwic* brickearth was likely to have been used in wattle and daub construction, eight experimental soil mixes were made and four of these applied as a daub to wattle panels. The panels were made to be a small-scale reconstruction, based on wattle impressions found on the fired daub at NPG site. The brickearth was obtained from the NPG site, where its geotechnical *in situ* properties had been predetermined. The main aims of the experiments were to determine daub manufacturing, application technique, performance and likely decay processes. Samples of the daub mixes were also kiln-fired to compare with the two types of fired daub identified on several *Lundenwic* sites.

Wattle Panel Construction Notes

The withies used for the sample of the wattle panel were typically 2 to 3m long, straight and without offshoots. The withies were chosen to minimize wastage, to allow for rapid collection and trimming and for easy 'weaving'. Cutting withies is a seasonal activity in many cultures and they are specially grown. During the making of the wattle structure short withy lengths (1m or less) do not span between enough posts to keep them securely in position and too many have to be used for an efficient construction operation. Longer withies are more difficult to weave. The withies needed for a whole structure are therefore best produced from woodland coppicing.

The withies used for the wattle panel sample were Silver Birch (Willow and Hazel were not locally available), typically 8 to 20mm diameter but ranging from 5 to 25mm. The withy thickness aimed to match those seen as impressions in fired daub materials excavated at the National Portrait Gallery. Thicker withies were found to be too stiff to bend easily around the posts and thinner ones too soft and non-springy for keeping the post in a vice-like grip. It is noted that in common with making wattle fences the thicker withy ends are not cut off unless they terminated just after a post, as there they would jut-out and affect the overall thickness of the panel. The thinner withies are not trimmed as they can be compensated for by overlapping with the next withy. In new panels where the withies are cut at a post, it is common to see axe marks in the post. Withy joints are typically staggered from their start point so not to focus stiffness/looseness in one zone within the panel. The withies can also be used for adjusting the vertical alignment of a post, as the withies are naturally bent or locally rotated around distortions to increase or reduce stiffness of the wattle work.

The experimental wattle structure was constructed to be 0.5m high by 1.2m long and used 26 withies and 4 posts, enough to create three sample panels. There were fourteen withies on the front and twelve on the back and these held two end posts and two intermediates. Due to the wall sample length there was a lot of wastage, as commonly 1m or more was chopped off the withy ends.

The bark was left on the withies, as this is in keeping with impressions found in the National Portrait Gallery fired daub resources. This is principally because the bark is dryer and rougher than the sapwood and also because there would be no positive construction and performance advantage for the time invested (although, for example, in Northern Pakistan the bark is sometimes stripped off to remove micro-organisms and providing fodder for goats). In keeping with the wattle impressions from National Portrait Gallery site no withies were half-split, a common technique in wattle fence making.

It was estimated, as a result of making the wattle structure, that it requires 50 to 60 withies per m^2. However, depending on their coppiced lengths and diameters, this same number of withies can cover a $2.5m^2$ area. It was calculated that the withies accounted for about 75% of the surface area of the wattle wall sample. About 25% of the surface area was air gaps resulting from the openness of the weave and the distortions in the withies.

Comments on Withy Weaving (based on a small Saxon type of hut)

Based on impressions found in the NPG fired daub, from calculating total wall thickness (including daub), and from the withy weaving experiments, the posts were made to be typically three times the maximum thickness of the withies, about 30 to 50mm diameter. The posts for supporting the withies aimed to be just about robust and stiff enough for driving into the ground. This sort of post size is probably too small to justify digging postholes or foundation trenches. During the making of the experimental panels it was found that the post diameter affects their spacing. Very close spacing (200mm) and large diameter (80-100mm) means weaving of withies is too difficult or is very slow, due to springiness and their long lengths. Large spacing (500-800mm) and small post diameters (15-25mm) results in a wattle and post structural looseness. The post diameter also affects the size of the internal wattle cavity. Where the cavity is too large it can detrimentally affect daub keying process.

When withies dry out they become naturally stiffer and permanently take on the bowed shape. However, as the elements shrink the wattle structure can also develop a looser weave. For this reason the daub has to be immediately added so the panel retains an in-plane shear stiffness.

In theory, the non-keyable central panel zone is 1/4 to 1/5 the full panel width but in practise is 1/6 to 1/8. For the experiment the sample panel was 500mm wide with a control poor keying zone of only 95mm. The withy maximum cross-over angle was 5°. The wattle work had a minimum thickness of 25mm at the mid panel cross-over, and a maximum thickness around the post of 60mm. One square metre of wattle-work measured 10,435 cm^3 of wood determined when fresh and with a maximum moisture content (wood density of withies = 1.09 to 1.15g/cm^3). An old or dried-out wattle structure would be under half of this value, perhaps 4 to 5kg/m^2.

Fig. 64 Experimental wattle structure

The Experimental Daub Mixes

A range of daub mixes was made using the brickearth found on the NPG site. This soil was variously hand worked with water and some with sand and dung additives to make a range of experimental daubs:

Sample 1: Soil Source from National Portrait Gallery - Context [146] Sample 34.

Sample 2: Wet brickearth mix for panel experiment - sticky on the hands.

Sample 3: Dry brickearth mix for panel experiment - clean on hands.

Sample 4: Fresh dung from a Wimbledon Common horse (the assumption is that fresh dung and animal pen waste would have been available in *Lundenwic*).

Sample 6: A mix made for panel experiment - brickearth 75% and dung 25% (fresh weights).

Sample 8: A mix made for firing - brickearth 62%, sand 25%, dung 13% (fresh weights).

Sample 9: A mix made for firing - brickearth 71%, sand 29% (fresh weights).

Sample 10: A very wet brickearth mix made for firing.

Sample 11: A mix for panel experiment and for firing - brickearth 75%, sand 25% (fresh weights).

Sample 12: A very sandy mix (30% coarse to medium angular sand). The brickearth started off at 17% moisture content with a dry sand additive. No extra moisture was added to the blend.

Table 46 shows the properties of the various daub mixes that were made for the experiments. For a consideration of overall workability the main interest is with moisture content and plasticity. These parameters affect the ability to make a smooth mix, the forming of 'clean' mud balls, and the ease of pushing the mix onto and through the wattle weave. Furthermore, the mix quality affects the speed of the daub setting firm and the resultant dry density. These factors are important when considering structural weight and strength, and the shrinkage, which would cause reworking of the applied daub or loss of performance through cracking and detachment.

Samples 2, 3, 6, 11 were used in the wattle panel experiments (Fig. 66-69). Samples 6, 8, 9, 10, 11, and 12 were kiln fired for fabric matching to fired daub found on the National Portrait Gallery site and in several other *Lundenwic* archaeological excavations (Fig. 70).

The Experimental Use of Daub

The main aim of constructing wattle and daub panels was to see if and how the brickearth could have been directly used as a Saxon hut daub, or if it would have been modified with sand and/or dung additives, responding to the two types identified (Williams, D. 1989). The use of brickearth in *Lundenwic* would have to take account of the fact that the source material is variable in composition and soil properties, and that working the source material with just the addition of water results in a highly variable quality of plastic material. Too little water, results in an incomplete breaking down of the blocky soil to produce a stiff 'rubbly'

Table 46 Daub test results

No	Sample	Density as found g/cm^3	Dry Density as found g/cm^3	Daub mix Moisture Content	Shrinkage %	Bulking%
1	Source Soil	1.959	1.635	16.5	0	112 (big lumps)
2	Wet Soil Mix	2.212	1.800	18.6	7.8	
3	Dry Soil Mix	1.928	1.568	18.7	5.6	
4	Source Dung	1.060	0.218	79.4	1	
6	Soil/Dung Mix	1.743	1.328	23.8	3	
8	Soil/Sand/Dung Mix	1.915	1.498	21.5	5	
9	Soil/Sand Mix	1.924	1.563	18.6	6.5	
10	Wet Soil Mix	2.104	1.652	21.3	9	
11	Sand Mix 1.921	1.612	16	5		
12	Sand Mix 2.460	2.123	14	3.5		

paste, whilst too much water makes it a 'soup'. If not well blende addditives such as sand and dung/straw can form an even more highly variable daub material.

Since there is no standard formula for 'best mix' a large range of mix quality would have been produced, and would have been acceptable for meeting the needs of the time. The same mix could have been used for pisé, cob or adobe wall construction techniques. However, as the brickearth is sensitive it would have often been used in an inferior way. For such reasons, four experiments explored the potential of making brickearth into a workable daub and the ways that brickearth could have been modified by 'tricks of the trade' to improve it.

Panel 1 – Wet Mix using Sample 2 (Fig. 66)

The natural brickearth broke up into a 'rubbly' crumb and had no moulding quality. The crumb did not stick to the hands but left a slight orangey-brown stain. Only a small amount of water then turned the soil to very sticky mud containing small, dryish soil lumps (unworked pellets). The very sloppy soil mud then had to be left for several hours, for the moisture to be absorbed into the residual lumps. In this condition the soil was still very sloppy, and even then contained residual lumps that had to be puddled into the mix. The stickiness decreased as the mud-lump mix was further worked and extra powdered soil was added and worked to further reduce the sloppiness. The mix was then left for a day before being used.

The mud was formed into sticky hand-sized balls of approximately 100mm diameter. It was important that the balls were thrown or slapped on to the wattle, cleanly detaching from the hand. This reflects on the moisture content and the degree to which the mix is pre-worked into the balls. If the balls are too sticky they tend to keep attached to the hand and also pull off the wattle.

The application of the daub balls was done in two ways, in both the aim being to get the mud to wrap around the wattles to form rigid and well-attached lobe keys. Bonding before key drying-out is also created by a pore suction between daub and wood. This bond is maintained when the system dries out, as long as shrinkage and post-application disturbance do not occur. The first method applied the mud balls on one side only. This was allowed to dry-out before the daub was applied to the other side and thrown against the dried daub to further help in spreading the daub into remaining keying points. A second technique has both wattle sides applied with daub precisely at the same location and at the same time. Here, the intention is for the two sets of keys to join together to form a more monolithic mass and to fully infill the wattle gaps.

In the first application technique the mud balls were always vigorously applied on to the wattle, as it is essential that the mix penetrate through the wattle gaps to hit the wattle on the far side, thereby spreading out to form the attachment keys. Near to posts most of the daub went through the gaps and a second mud ball was thrown on top. Towards the mid span, the balls mostly ended up on the surface because here there are no gaps in the wattle. A second layer was added here to produce the overall uniform daub panel thickness. The reworking was only to the surface 10 to 20mm of the daub and therefore not affecting the deeply-set keys. However, at 1/4 and 3/4 span locations the mud was not reworked, as the keying to wattle is at a shallow depth and any reworking would have caused the keying to become loose or creating positive pore pressures, causing more open fabric and shrinkage later on.

Generally, the throwing of a mud ball on to the wattle resulted in it spreading out to form a round 'pat' with keys behind. Further penetration of the wattle and spreading out of the pats was then done with hand working. The experiments showed that fingers are better for pat spreading than the palm and this is consistent with construction practices seen in many developing countries. Reworking the surface with additional mud balls, to form the overall flat face, was initially done with the fingertips. This helped to work-in the new balls without damaging the integrity of materials previously placed. The aim is to bond the two layers together and to fill in depressions and spread out high points. The final surface smoothing was then done with washed or clean hands, using the outside edge of the palm. Using the flat of the palm can suck out some of the daub from the wattle. Smoothing tended to leave gentle undulations and striations. Clean wet hands produced a slightly clayey polished surface without striations.

Panel 2 – Dry Mix using Sample 3 (Fig. 67)

Much of the breaking down of the brickearth into mud was identical to that for the wet mix (*see* above). Extra soil powder was added to the sloppy mix and then left to obtain a uniform firm blend. The mix was then worked for a longer period than for Sample 2, to produce a thicker paste that did not stick to the hands. Variability in the mix required each ball to be individually worked to obtain roughly the mouldability required at the time.

With this mix, the balls were not thrown, but rather firmly pressed onto the wattle. The pressing was done with the palm, not fingers, and this produced areas that were flattish. Fingertips were not used, as they tended to press the soil into small depressions, with the resulting surface being highly irregular.

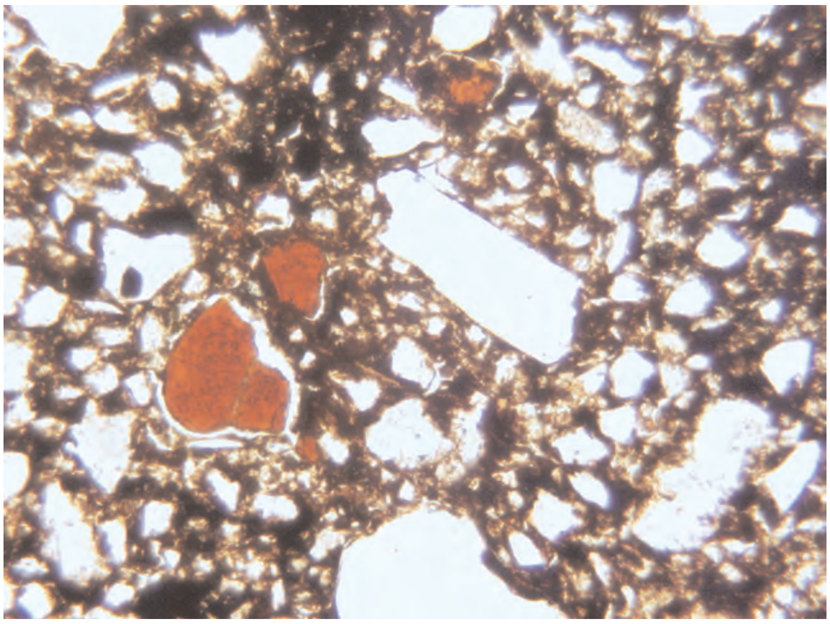


Fig. 65 Petrological thin section of fired daub [76]

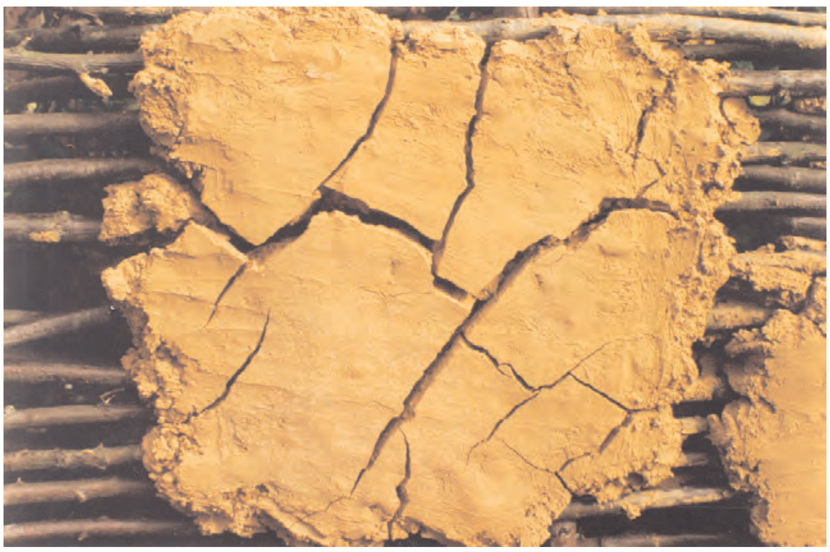


Fig. 66 Panel 1. Soil mix Sample 2 (unmodified wet mix brickearth)

Fig. 67 Panel 2. Soil mix Sample 3 (unmodified dry mix brickearth)

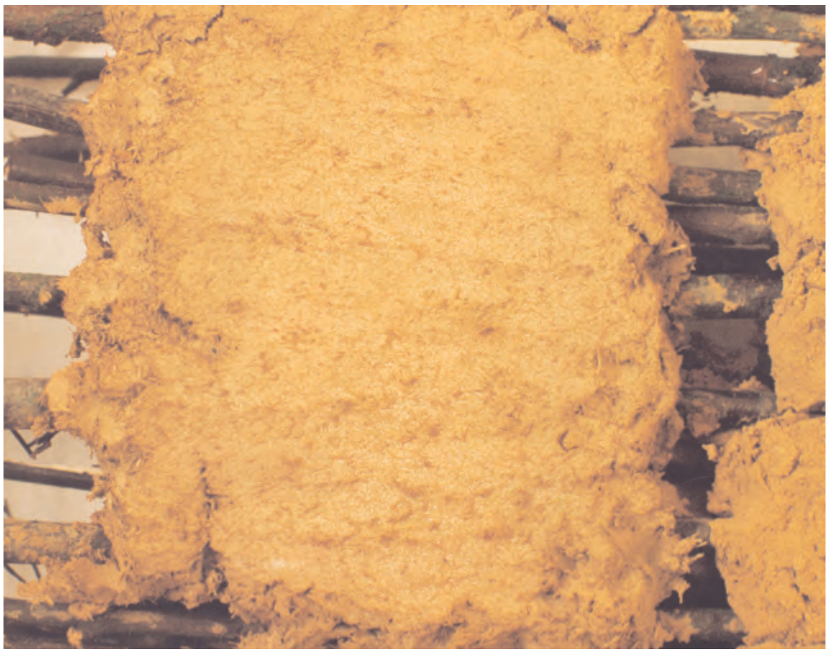


Fig. 68 Panel 3. Soil mix Sample 6 (brickearth - dung)

Fig. 69 Panel 4. Soil mix Sample 11 (brickearth - sand)

Fig. 70 Fired bar samples of daub mixes 6, 8 - 12 (red) with unfired top (brown)

When the balls became too dry they developed cracks when pressed on to the wattle. Often the mix did not produce good internal keys and the balls pulled away from the wattles. There was no evidence of dried daub lobes falling off and dropping down the internal wattle cavities.

The smoothing of Panel 2 surface was done without water, to compare the finish with that of Panel 1. The smoothing was undertaken with a clean hand and with the flat of the palm, which left very noticeable striations caused by small lumps and inclusions being dragged out and along the daub fabric. The surface was therefore much rougher than that produced in Panel 1, but with much the same degree of undulation.

Panel 3 – Soil/Dung Mix using Sample 6 (Fig. 68)

It was hard to start off the mixing of soil and dung, as no water was added. This became progressively easier as the moisture in the dung was absorbed into the soil fabric. To achieve a workable daub paste the mixing time was longer than for the pure soil mixes. This mix was very sticky and it was often difficult to produce nice balls.

The balls were semi-thrown on to the wattle, as usually it was difficult to get them to detach off the hand. The mix was easy to push into the wattle gaps and the finger ends also helped with getting the mix through them. The balls appeared to join together very well and a second layer of balls was added without problem. With this technique, there was a tendency to fill up all of the wattle cavities from one side.

The mix was smoothed with wet clean hands, since muddy hands tended to drag the mix off the wattle. It was noticeable, and somewhat surprising, that smoothing did not drag out the dung fibres and no surface grooves were created.

Panel 4 – Soil-Sand Mix using Sample 11 (Fig. 69)

The sand was added to a soil already made into a daub mud. When using a wet or dry daub mix there was surprisingly no need to add extra moisture to compensate for the added sand - the workability was mostly maintained. The addition of sand reduced the stickiness and therefore hands were kept relatively clean.

With the proportion of sand used in this panel there was still a good level of plasticity but the mud balls did not crack and were easily squashed onto the wattle. When the pats were spread out and pushed between the withies no daub lobe cracking occurred.

It was noticeably harder with this panel to produce a finished flat surface. It was hard to use fingertips to even spread out the daub and palms had to be very wet so the additional moisture could be used for surface remoulding.

Discussion

From the daub application experiments it is possible to make some general observations:

Moisture

The *in situ* moisture content of brickearth is clearly related to the prevailing climatic conditions and hydrology. It will change from winter to summer and vary relating to the extraction depth and duration of exposure. Generally, the 'as-found' moisture content is high, fluctuating above and below the Plastic Limit. To create a working mixture requires just a small addition of moisture (2 to 5%) just enough to help break-up the structure and help with puddling. The two panel mixes using unmodified brickearth required only moisture as a lubricant, for blending the mix and then for surface smoothing. Within the plastic state the more that moisture is added to the source soil the greater is the resultant daub drying time and shrinkage, and lower the dry density.

The addition of sand, in the percentages used, slightly reduces the shrinkage at any given moisture content and increases the daub's dry density. The use of dung, due to the very high organic content, considerably reduces the shrinkage at any given initial moisture content and the dry density is considerably reduced. The use of fresh dung provides additional moisture and extra water is not needed to convert the source material into a useable daub. By adding dung, the workability is maintained at a very high moisture content.

Plasticity

The main influence of the brickearth plasticity is on how well the daub is mouldable and therefore on the ease of application and finishing. The soil and soil/sand mixes had high plasticity that caused significant cracking in the dried-out panels. It was found that a small addition of sand increased crack propagation, as the sand filler reduced strength. Considerably more sand would be needed to significantly reduce plasticity and limit shrinkage/consolidation. The addition of large amounts of sand would increase the potential for surface particle detachment.

Shrinkage

Soil shrinkage is significantly reduced by the addition of organic fibres and this practice is consistently used in many places around the world. The effect of reducing micro cracking also results in an overall stronger and longer-lasting soil fabric. Micro-shrinkage cracks can be useful if there is a good network that can be used for keying in a second daub layer. However, it must be remembered that shrinkage also adversely affects the daub contact with the withies, resulting in looseness of wattle structure.

Shrinkage Limits of 3% or less leaves the panel intact with no macro-cracking (those wider than 2mm). Shrinkage micro-cracking (generally 0.1 to 0.5mm wide) can be modified by slowing down the rate of drying and therefore wall manufacture is better where there is less direct summer sunlight, where the daub is formed in a cool and damp climate, and where there are no strong winds.

During the early drying of Panel 1 daub, two shrinkage cracks were formed half way between post and mid-span. In the wattle cavity, cracked lobes were formed by shrinkage and were not the result of lobe forming and drying out distortions. Towards the end of the drying-out process long, deep wide, cracks with clean edges were formed and here the daub surface warped, with large outward bowing of the crack sides.

In Panel 2, the drier and lower density fabric allowed the daub to dry-out faster and the fabric noticeably developed shrinkage cracks all over, into forms that mirrored the squashed out daub balls. These ball pats appeared not to fully join together when the daub was placed, and this may be a result of small strain patterns and variations in soil particle distribution/moisture content. Smoothing the surface just masks these joins. Towards the end of the drying process there was some distortion along cracks, although not as pronounced as in the Panel 1 dried-out wetter mix. In Panel 3 no shrinkage cracks were formed during the drying-out period. The shrinkage cracks in Panel 4 were similar to those in Panel 1, with long clean cracks reflecting on the wattle structure behind and also illustrating distortions in the crack faces.

Density

In the working state, where there can have been very little compactive effort applied during construction and where there is a high moisture content, the dry density is low (1.3 to 1.5g/cm^3). This compares with a situation where a moderate compactive effort and 12% moisture content could result in a dry density of 1.9g/cm^3, and where a large effort and 8% moisture contents could result in 2.1g/cm^3 (both with approx. 5% air voids retaining). This compares with a maximum possible density of perhaps 2.7g/cm^3. The lower densities resulted in high air void content (but this can be useful in providing a better thermal performance). The addition of dung considerably reduces the dry density, and hence weight, of a wall. These types of mixes are consistently as strong as the more heavy ones.

Comparison of Brickearth Daub with Cob Experiments at Plymouth University

Cob, a mix of soil with straw, is piled up in layers and trimmed off to form a 'free build' monolithic wall. At Plymouth University, experiments on cob sample cylinders have been taking place for a few years (Saxton 1995). Cob is nearly identical to daub in the respect of it being a modified soil, hand placed with little compaction, and requiring a hand surface finish. The experiments were undertaken to assess the following factors and these are similar to those used in this wattle and daub study: ease of mixing, suitability for placing, rate of drying, shrinkage and cracking when drying, modes of deformation, weathering, and strength characteristics.

The cob comprised a local Devon soil with organic additives ranging from 0.2% to 3% dry weight, of fresh wheat straw. The experiments showed that with increasing amounts of straw more moisture is needed in the soil mix, to allow the wet soil to stick to the straw and to form a homogeneous mass. Straw may also allow the clay to form internal fabric structures. Where the soil is dryer than the best working condition, the straw inhibits compaction, in which case it remains loose and the density is lower. Further, with differing straw contents, the rate of mix drying out is identical, down to the Linear Shrinkage limit. Drying is then faster the greater the straw content. With increasing straw, and therefore mixing moisture content, there is greater drying-out shrinkage. Straw inhibits the propagation of shrinkage cracks. The more straw the smaller and less frequent are the cracks, even though the overall shrinkage is greater. At the same moisture content the addition of straw does not decrease the compressive strength, indeed it seems to slightly increase it.

Creating Fired Daub

To better appreciate the qualities of the fired daub artefacts found at the National Portrait Gallery site a number of the experimental daub mixes have been fired (samples 6, 8, 9, 10, 11, and 12). The kiln-fired samples are illustrated in Fig. 70.

The six daub samples were fired in an electric kiln in one firing regime. From air temperature the samples were taken up to 162^0C and maintained for a two-hour period. Only one bung was used, to allow for the evaporation of moisture. The temperature was then increased to 325^0C and was maintained for 1.5 hours, and at this time three more bungs were inserted to seal the kiln. The final firing temperature of 650^0C was reached after four hours and this was maintained for a half an hour. The kiln and samples were then allowed to cool down for one day. The firing temperature was low, producing a fired material that does not 'melt' to a mud slurry when immersed in water.

The six fired daub samples hav the same brick red-orange colour, irrespective of variations in composition and density. All surface textures are maintained, and the firing does not cause the samples to further shrink and distort. The broken ends between fired and unfired portions can still be married together. Internally, not all the organic additives were burnt out of samples 6 and 8. The samples maintained the daub dry densities, as determined prior to firing:

Sample 6	1.6g/cm^3
Sample 8	1.8/cm^3
Sample 9	2.0/cm^3
Sample 10	2.1/cm^3
Sample 11	2.1cm^3
Sample 12	2.1 cm^3

To relate this to the burning of a Saxon daub wall: the character of a fire and temperature regime when a hut burns down would be highly variable. This would be the result of fuel supply (thatch, organic additives and internal wattle), exposure, wind, and daub condition. Cavities and cracks in the wall would help create chimney flue effects, aiding with firing and burning within the timber core structure. Wet or damp daub walls could shatter due to steam pressures within the daub pores. An old hut, with dry or decaying wattle and more surface exposure of organic inclusions, would be more prone to a burning process. Given the character of the fuel and fire the resultant colours of the fired daub would be highly variable with areas of oxidation and reduction. Undoubtedly, there would be extensive areas where the daub would not have been fired.

The General Performance of Wattle and Daub Materials

Based on fieldwork over the last two decades, the wattle and daub panel experiments, and excavation findings it is possible to make some general observations about the performance of wattle and daub;

- Daub keys are hard to break, so detachment is more observed at the mid span location. There can be some sliding of daub along withies, reflecting the fact that withies get thinner towards one end.
- Moulds and green slimes, forming on withy bark, provide a mechanism for the daub keys to become loose. The organic additives are also very prone to decay and overall the production of spores can affect the health status of the inhabitants. The materials can last for many decades but are often prone to biological rapid decay. Even where there are significant amounts of decay the deformed structure can still be habitable. The general approach is to repair daub but not the wattle, as here it is usually simpler to replace the whole wall or the structure.
- Structural Base plates help to reduce the rise of moisture, and external drip trenches not only help to direct rainwater away from the base of walls but also help to dry out the foundation soils. When seasoning withies can both stiffen up and shrink, making the wattle tighter or looser than at the time of construction.
- Posts and struts can significantly loosen from the withies, so the whole panel may cease to be an effective shear plate. The daub can significantly keep loose wattles in place and so the panels remain whole.
- The internal cavities are good air traps and inhibit moisture movement.
- Following construction, most daub face cracking occurs in the mid-span where there is most flexibility but also occur near the posts where the daub cover is thinnest.
- Surface decay is mostly from the outside as a result of moisture but can also be from the inside where rodents and insects can live. Decay occurs towards the bottom where there is a variable moisture condition. Here, the withies mostly decay with the result that walls tend to bow outwards rather than inwards. Whole wall tilting is commonly assisted by the thrust forces of the roof structure.
- Decay also occurs around the edge of panels where there is contact with exposed timber frames and maximum potential for the expression of the daub's original shrinkage.
  "The wood out of which the wattle is often woven is generally attractive to wood-boring beetles and other decay vectors and often disintegrates completely but leaving the daub fabric in place as the sole structural component. Local softening firstly results in the keys being broken as here they are often in tension. Daub lumps and the soil mass forming at the base of the wall are used for

building maintenance, along with other debris, but lumps falling well away from the structure tend not to be reused as it is too labour-intensive to collect and the material becomes highly contaminated. Repair, if it is necessary, can be done by copying the old methods" (Feilden 1982).

"Displacement of Wattle and Daub panels is caused by excessive deterioration resulting from the failure of the external protective coating such as lime wash or coal tar. Internally the damage may be caused by animals and vermin. Water penetration is usually at open joints around the panels. Shrinkage may be more noticeable on south facing elevations. Cracking to panel, increasing the risk of water penetration, draughts and loss of thermal insulation. Fungal attack of posts struts, withies or laths. Beetle infestation of posts, withies or laths" (Watt & Swallow 1996).

A number of observations are made below about the decay products of wattle and daub walls:

- Daub lumps are very resilient to just falling off, since keys are very durable even if cracked. Most decay occurs from the exposed outside and when the structure has already significantly failed. Large lumps of daub are most likely to result from deliberate dismantling or wall collapse.
- Fabric disintigration decay mostly results in an amorphous mass forming at the base of the wall – the spread away from wall base is in a narrow scatter zone. Often the base of the wall becomes buried.
- There is normally a basal collection of powders that form mounds when damp, which can harden when dry, or blow away if in powder form. Wet base lumps tend to squash into each other to form a mound with decreasing cavities with time. Features of the daub are lost as the lumps are remoulded. Base mounds deform easily if walked over by animals and humans - this tends to laterally spread the mound out.
- Where lumps fall with key to the bottom they tend to retain the withy impressions, as they press in to the underlying soils and the withy impressions fill up. Where the lumps fall with key uppermost the withy impressions are worked out by erosion or feet action. Lumps in contact with soil and left undisturbed in wet conditions commonly form green mould surfaces.
- Worm mixing of daub into surrounding organic soil may be limited, since daub is very clayey and worms/insects will bypass it. Organic daubs provide a food for worms and insects and so could encourage the absorption of the daub back into the ground soil column. Animals bypass clean clayey soil lumps and therefore they will be slowly submerged/buried under surface soil litter.
- Buried daub lumps tend to be laterally squashed out to form lenses (and these are often found but not recognised as such in archaeological excavations).
- Re-applying daub onto old wattles, even if loose, is common and provides a strong panel. It is just about impossible to differentiate a totally new panel from a reinstated one.

THE STRUCTURAL CHARACTERISTICS OF A WATTLE AND DAUB BUILDING

The principal aim of the wattle is to provide an effective mesh on which daub can be hung and this is done by the keying mechanism. The wattle may or may not provide a hut's structural system. Several forms of wattle construction are discussed in this study.

The daub provides the cladding to the wattles, so creating a double skin system. The wattles also allow for a considerable entrapment of air, a good thermal insulator. Withies also aim to anchor the structural posts and panel struts, providing a vice-like clamp to the structure. The completed panel then acts as shear plate, giving lateral rigidity to the whole. The rigidity also allows structural loads to be transferred from roof to foundation and for the daub to be held in place without cracking and detachment. In a simple hut it is possible for some load sharing with the posts through the wattle work, thereby more evenly distributing the loads to the ground and reducing the size of the posts. In larger structures the wattle may reverse this action by causing panel loads to be transferred to the structural posts, creating a frame system.

The advantage of using a wattle and daub wall over a monolithic soil one is that it is a rapid building system using far less soil. Many types of soil can be used. Further, not many skills and 'tricks of the trade' are needed, construction does not require an investment of equipment and lots of labour, and it can be used for a wide variety of building types where only the surface finish is required to differentiate occupant status. Daub is easy to repair and is reusable, although it is normally easier to replace decayed wattle.

The disadvantages of wattle and daub are:

- there is a soil-wood interaction that causes both materials to decay, and therefore affects the structural integrity and durability.
- The soil and wood decay products can harbour vectors causing poor health and loss of stored food.
- The wood can burn, organic additives within a daub can be a fuel, and the panels are prone to vandalism and destruction by humans and animals.

Structural Form of Walls

There are several ways that wattle and daub has been traditionally used and these are assessed technically below.

Free standing wattle and daub

This structure is made by driving a series of small diameter posts into the ground, around which the withies are then woven (Fig. 71). The wattle and daub both contribute to the structural support to the roof. The advantages are that it is a cheap form of wall construction and fast to build without specialist craftsmen. It can be easily replaced rather than having to carry out maintenance. Major structural timber posts are not needed and therefore there is no need to dig post pits. There are no joins in the wattle as the withies are continuously woven. The wattle is highly ductile where there are live loads (e.g. wind, earthquakes, animal impacts, or soft ground conditions). It is excellent for forming non-load bearing partition walls.

The disadvantages of this type of structure are that the system can only be used for making simple structures. It can be difficult to drive the small diameter 'flexible' posts into the ground. Large diameter wattle posts, which can be driven into the ground, make the panels very thick. The structure only stiffens up when the withies are fully in place. Often the post positions are distorted as the withies are woven. There is a short life expectancy to the posts as they are formed of young wood, normally just sapwood, and are in contact with the ground.

The daub is prone to cracking. The roof structure and cover has to be relatively lightweight. Unless there is some bracing to the roof, dead and live loads can cause walls to easily tilt. Replacing wattle is difficult and the withies have to be cut out.

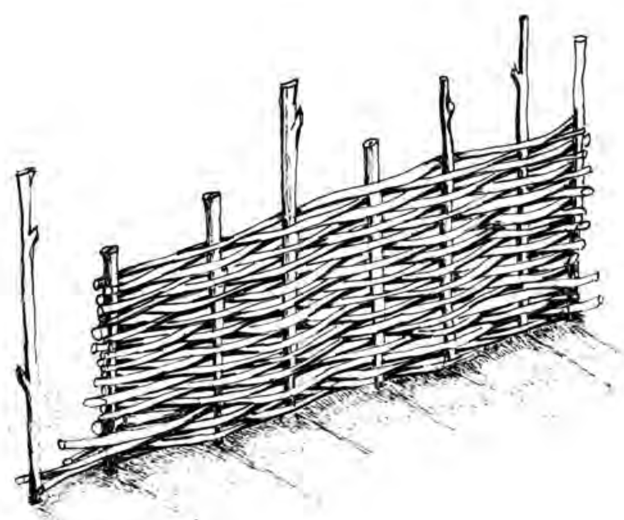


Fig. 71 Free standing wattle panel

Wattle formed within a structural frame

In this type of structure the withies are woven around a series of wattle struts that are formed between structural posts or are held in a timber frame (Fig. 72). Usually the wattle and daub is a panel infill system but the daub can be very thick, effectively becoming load bearing. The advantages are that the wattle work is not part of the primary structural system so the structure can be complex. The wattle struts do not necessarily have to penetrate the ground. The end of the withies can be put into compression by springing them into holes in the wattle frame. The structural posts do not have to be located at pre-defined and fixed locations. The wattle work can be replaced without affecting the whole structural system. The wattle strutss can be small in diameter to make the overall wattle a thin infill system. The overall structural system is robust against live loads and substantial roof loads.

The disadvantages are that it requires a supply of large structural timbers and it requires a strong and skilled labour for cutting, embedment and forming the structural system.

Pre-formed wattle panels strapped to posts

For this system the posts are erected first and provide the structural system. Pre-formed wattle panels are attached between (Fig. 73) or to the front or back of the posts (Fig.

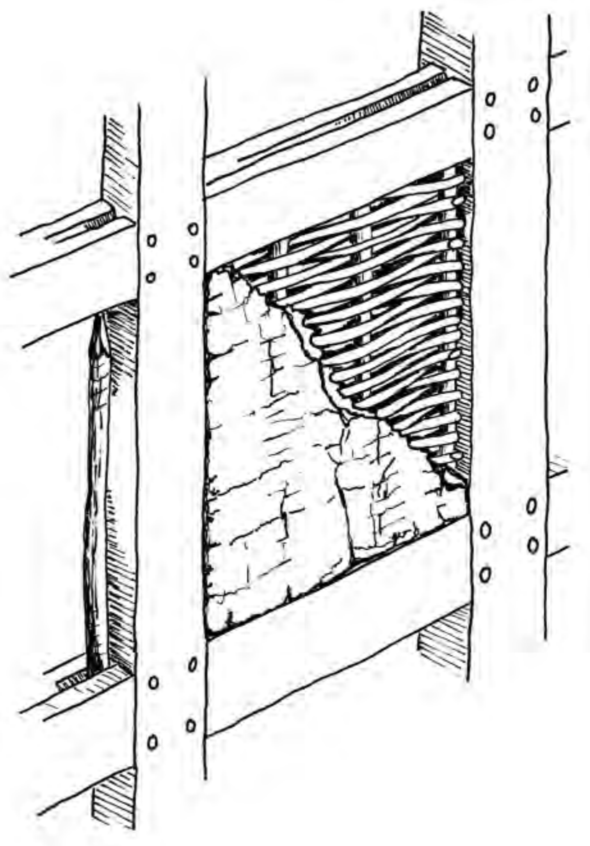


Fig. 72 Wattle panel held in a timber frame

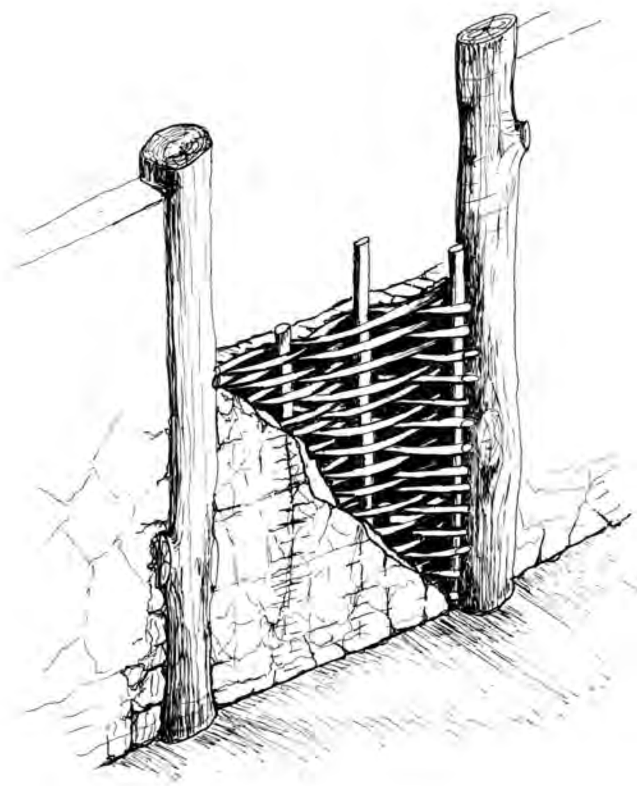


Fig. 73 Pre-formed wattle panels between posts

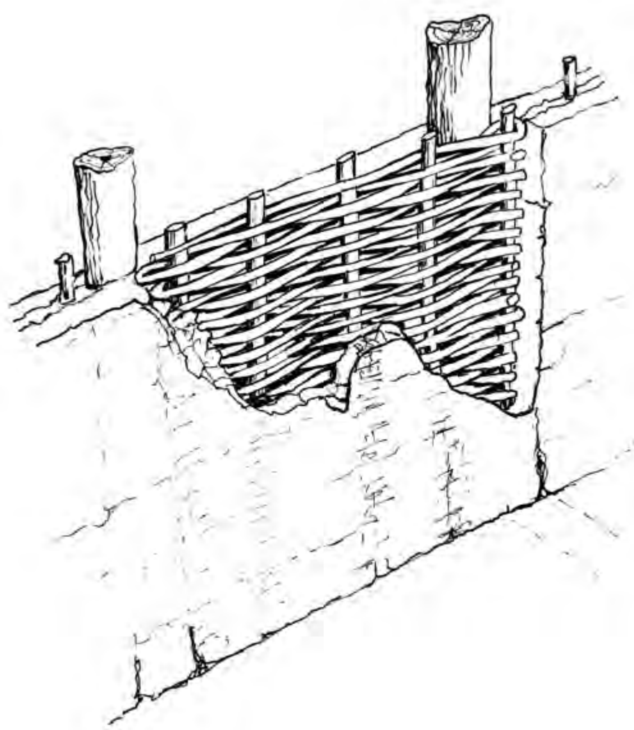


Fig. 74 Pre-formed wattle panels in front of posts

74). Advantages of this system include the fact that the structural element can be built first and the wattle panels can be separately made at the same time or later. The panels can be modular and the wattle struts do not have to be driven into the ground. The structural posts can be well spaced, responding to the wattle panel length and the roof morphology, and the wattle panels can be replaced if decayed. However, the building requires a supply of large structural timbers. The structural posts have to be precisely located when the panels are fitted between them. The structural posts may stand proud of the wall face and the daub may therefore not be a continuous membrane. The wattle panels can become loose from the structural system.

Saxon builders could have had a preference for implementing one or other of the three options, perhaps dictated by past trends, economics, fashion, and forward planning. There is no reason why hybrid structures could not be constructed and why a settlement could not incorporate examples of all three types.

Material Estimation for a Wattle and Daub Hut

Archaeological evidence of Middle Saxon buildings in *Lundenwic* allows for a 'reasonable' reconstruction of them. From this it is possible to determine the structural parameter and material quantities for the walls. Reconstruction factors of a structure are presented in Table 47.

Discussion

Table 47 illustrates some points regarding the structural character of two simple Saxon structures:

1) Quarrying

The daub material could have been provided from the footprint of the building without the need for a deep or extensive quarry pit. An external shallow excavation for just one hut would not dramatically modify the topography within a settlement. The surface soil would be just about ready for use without weathering down. The ground stripping would have been so shallow as not to need retaining walls around the base of the building's footprint or to affect the ability to insert the foundations. The newly exposed deeper soils would be stronger and have a better bearing capacity for shallow foundations, resulting in less chance of differential foundation movement.

The size of a quarry pit needed for the daub supply is relatively small, so 'pits' as found on most *Lundenwic* sites

Table 47 Daub material and structural character-assumptions for a small hut and long house

PARAMETER	SMALL HUT	LONG HOUSE	COMMENT
Plan Size (m)	5x3*	16x6+	Includes 1 door , no window * as suggested by sunken floored huts in the Late Saxon City + as typically found on Royal Opera House site
Wall height (m)	1.75	2	Assumed
Building height (m)	3	4	Assumed
Volume of daub (m3)	2.75*	12+	Based on experimental panels *100mm total daub thickness +140mm total daub thickness
Weight of daub (kg) @1800kg/m3	4950*	21600+	* 80% of building wt. +74% of building wt.
Borrow Pit volume (m3)	2.2	9.6	Excludes for floor material. Takes into account bulking factor of excavated brickearth
Borrow pit size (m)	5x3x0.15	16x6x0.13	
Structural wood volume (m3)	1*	7+	* assumes driven posts 100x100mm + assumes frame, sleeper beam and wall plate 150x150mm
Structural wood weight (kg) @600kg/m3	600	4200	
Wattle weight @12kg/m3	315	1040	Includes posts and close weave withies
Thatch weight (kg)	300*	2400+	* assumes 200mm thickness + assumes a 400mm thickness
Total Building weight (kg)	6165	29240	
Foundation Pressure assuming narrow 'strip' loading (kPa)	40	50	load taken on both posts and walls

would have the capability to provide the soil. Bigger pits could service several huts or just one larger house. A deep pit would allow for descending to a sand stratum, to allow for soil blending to form a daub mix. Deep pits left open could cause some ground softening and if located next to structures induce differential foundation movement.

2) Structural loads

The superstructures were probably designed for dead loads and possibly animal impacts – but not other live loads such as strong winds and snow. Posts would have been driven to a 'driving' resistance depth. Given the low strength of shallow soils, posts of all sizes would have functioned through end bearing. Skin friction and post-packing would not have contributed much in either the short or long term support of the structural loads or resistance to lateral loads. There would be a big advantage to the hut's stability by spreading structural loads in the ground on post base-plates such as a stone, and also through the wattle work. This would be the same effect as in the house where the loads are distributed along sleeper beams. In the short term, driven posts would have lateral stability from the compacted surrounding soil but lateral movements would loosen up the building's stiffness. In the house this stability and frame stiffness would be provided by the structural timber connections. In the hut wattle and the daub would also provide significant shear plate stiffening for resisting shearing forces.

3) Building weight

Most of the building's weight would come from the daub. The buildings are relatively lightweight but because the foundations would be narrow the ground bearing pressure is similar to a small modern brick house, 40kPa for the hut and 50kPa for the house. In the case of the hut it is considered that the loads would concentrate quite quickly on to the walls or be all removed from them. In the former case the foundation pressure would considerably increase, up to +350kPa. In the latter case, the driven posts would loose some compressive stiffness that had been provided by the wattle. In the case of a house, the loads would continue to be spread along the full sleeper beam.

In the case of the hut, a reduction in post cross-sections by 15mm of decay on all four sides would further increase the foundation pressure, up to +500kPa and there would be far less lateral post support. Decay of the house sleeper beam, by the same amount, would only marginally increase the pressure on the ground, to +550kPa, but some slight uniform settlement would occur. Given the long-term performance changes, if foundations are set in brickearth, it would have been a considerable advantage to set the posts or sleeper beams in the underlying medium-dense to dense gravel.

4) Daub strength

As a panel infill, daub does not require a high strength for load carrying purposes, the timber frame or main posts providing this function. The timber frame is required to resist a significant tendency for tilting distortions, and this is often achieved by diagonal bracing. However, a good daub strength is desirable for maintaining the internal attachment keys and so keeping the wattle in place. Here, the panel also resists slowly developing tension and shear stresses, and also those resulting from sudden impacts. It must be noted that broken lobe keys cannot be mended or deformed ones reworked. A good strength is also desirable, along with a good density, for soil particle pore suctions and bonding, the latter withstanding any surface abrasion. A good strength also aids in limiting deformation cracking, whence the openings then allow insects to penetrate into the wattle core. While the daub can, and does, readily break up, the wattle work continues to absorb complex compression and tension forces.

Low strength of a soil wall, of whatever construction type, has always been a concern for builders and lots of tricks are used to keep a wall dry, for example, at 2 to 5% moisture content. This is done, for example, by a roof overhang and by having a raised plinth. Generally, better strength results from there being more clay and a denser fabric, but here it should be noted that an increase in the former makes the fabric more prone to shrinkage-swelling-cracking and the latter reduces thermal efficiency. Soil strength is most affected by its moisture content. A soil with moisture approaching its Plastic Limit has just about no compressive strength and it has maximum strength when it is extremely dry. Tensile and shear strength, irrespective of moisture and fibre content, is low; often 2 to 5% of the compressive strength and can be virtually disregarded as a performance factor.

Control over the moisture content during the working life of a building, as a means of maintaining strength, is achieved by the building morphology and siting. It can be assumed that a soil wall will at some time be significantly wetted and here maintaining strength and limiting plastic deformation results from rapid drying out. Clay soils take noticeably longer times to absorb moisture and indeed the platy particle structure inhibits moisture penetration. More clayey and compacted soils are slower to dry, whereas coarser soils with an open fabric are faster to dry out. The use of Damp Proof Course and lime renders can resist moisture penetration but these imply more advanced building technologies.

The addition of fibre principally aims to aid with improving shear and tensile strength but also with workability. While small quantities of organic fibre can increase shear strength, larger amounts usually result in a significant loss of compressive strength. As most usable soils, when dry, have an adequate compressive strength for simple load bearing purposes additives are not always required.

The more cohesive the soils are the more resistant they are to abrasion and this can be enhanced by secondary working of the surface, a form of surface compaction and clay plate polishing. Accelerated abrasion often results from moisture-induced density relaxation and moisture-induced salt migration. These can be controlled by sacrificial harder renders and by whitewashing.

Generally, best construction practices look for compromise solutions. In daub, small shrinkage and good keying are of paramount importance and to generate these requires a compromise in strength, by the adding of large amounts of organic and sand aggregate. Another compromise would be in speed of construction, as fresh wooden posts and withies are prone to shrinkage, mostly after the application of the daub, and this can result in panel looseness and even fabric cracking.

5) Material maintenance

From an engineering point of view the upkeep of wattle and daub is dependant on the behaviour of the fabric decay and structural system. The main forms of distress for wattle relates to decay of wood at damp prone locations (wet rot), for example at the base, eaves, and on top of horizontal frame members. These may cause knock-on effects to the structural timbers and the end result is commonly seen as a structural 'looseness', for example, with the increasing ability of the structure to sway and have a permanent lean and for the daub shear panels to distort.

The main forms of distress of daub include breakage of attachment keys within the wattle structure, fabric cracking due to impact and lateral loading and abrasion, water runnels and other forms of surface disintegration. Commonly, the decay of the daub is a combination of these processes. Initially, the decay is observed as a local feature - bulging, hairline cracking and flaking. Often the decay starts at original shrinkage cracks and at locations where decay vectors such as insects are inadvertently incorporated. The end result is commonly the exposure of the internal wattle panel and a reduction in the stiffness of the structure. Wattle exposure then can result in accelerated decay.

Based on existing practices repairs would have consisted of the following tasks: adding of a new soil skim or whitewash finish; patching a hole with new daub; the application of an additional layer of daub; local removal of the daub covering to expose the wattle panel and application of new daub.

6) Structural life expectancy

Saxon sunken buildings, and other simple 'hut' structures, were probably never built for longevity. Conservation of historic buildings today suggests that it was easier to replace them than to substantially repair significant structural distress. In many respects, maintenance would have been a short-term expediency not dealing with the cause of distress and basically masking structural problems. The primary aim would have been to replace obvious missing bits, making the surface resistant to water and wind penetration, inhibiting rodent and insect infestation, and stiffening the structure so that lateral deformation was not made worse.
Structural repairs could consist of some or all of the following methods:

- bracing and strutting tilting walls;
- buttressing walls;
- adding an external and internal plinth to the sides of a wall;
- hacking out the base of a panel and the base of posts and replacing with soil to effectively create a monolithic soil plinth to the wall;
- local weaving-in of withies and replacement of daub;
- and replacement of part or the whole wall.

GLOSSARY

Adobe: Mud brick, unbaked but sun-dried, and often containing added straw and pounded earth for reinforcement.

Base Layer: Normally the daub is applied as a single layer and is rapidly worked to give the required surface finish. The aim is to not disturb the keying mechanisms, which if detached in the drying plastic state are hard to reform. Second layers can be added after the first layer is hard, is cracked or decayed. Adding wet soils to the dry one requires attention to details not to soften it and crack off the keys.

Burnt Daub: Daub that has been subject to fire effects below 'firing' temperatures and the fabric either oxidised to a red colour or reduced and black. The soil fabric can be remoulded by the addition of water.

Cob: Clay mixed with straw, gravel and sand and used as walling material with or without formwork (*see* pisé).

Crack Remoulding: During construction drying out and as a result of minor movements daub is prone to cracking, due to shrinkage and because it has a negligible shear strength respectively. For such reasons it is has a short life expectancy and requires frequent repair.

Cracking: Soil is a building medium that has reasonable compressive strengths when dry. Soil used as a daub has no structural capability and is prone to cracking: responding to shrinkage of the drying out mix and structural movements and readjustments in the wattle panels. Surface cracks usually do not impair the performance of the panel but the cracking of lobe keys can cause the daub to fall off in sheets or lumps.

Daub: An earth mixture with various amounts of added moisture and organic/inorganic additives, aiming to improve on workability of the mud, its application and then dried durability. The daub forms a rigid cover to the wattle and effectively gives an impermeable membrane to wind and rain, extremes of temperature and animals. The daub is manipulated to have minimal shrinkage upon drying out, can be reused or reworked if developing defects such as cracking.

Daub Decay: Unlike that of a monolithic soil wall daub can decay from:

- The outside inwards, normally related to surface abrasion (from animals), and from local softening (from water or humidity).
- The inside out: related to soil-wood interaction and the breakage of lobe keys from flexural movements.
- Decay of organic additives.
- Within cracks related to animal infestation and fabric crumbling.

Fired Daub: Daub of whatever mix that has been burnt to form a weak pottery-like fabric. The firing may have been variably to low or high temperatures and in oxidising or reduction conditions depending on the burning environment. The assumption is that the burning was of the internal wattle or attached wood/thatch structure. The fabric cannot be remoulded and does not disintegrate in water.

Hurdle: Hurdles made today are generally 54 inches long (with 10 sails) and 48 inches high. They are slightly curved to facilitate staking and may have a central hole for lifting on a pole.

Key: The rear part of a lobe where it naturally surrounds or is pushed behind the withies to form, when dry and hard, an attachment between the daub face and the wattle work.

Lobe: A tongue of mud that squidges through the wattle gaps. The lobes reflect on the mud ball impact locations.

Lobe Base Impression: Where the lobe is pushed through the wattle cavity it intersects with a withy on the other side. At this location the lobe is deflected sideways or squashes out leaving a basal impression of the rear withy.

Lobe Interlock: Where the lobes are deflected or squashed sideways they effectively form single or double locks around the withies. Rarely is the core fully filled or the locks fully surrounding the withies.

Lobe Lateral Spread: A measure to which the lobes are reformed within the cavity and often related to the degree that the daub is reworked.

Lobe Length: The measure of the depth to which the lobe penetrates through the withies or into the cavity. A short length results in a natural shape but the aim is to turn the lobe into a key (*see* above).

Lobe Neck: The thickness of the lobe where it passes between two adjacent withies. A narrow neck is a zone of weakness where the daub face can shear off from the internal keys.

Maintenance: The frequent repair of decay, surface abrasion and local cavities and the replacement of surface treatments such as whitewashing and mud renders. In severe cases detached and missing daub patches are replaced onto original wattle. Most problematic is the replacement of wattle work resulting from wood decay. The panel may be replaced if set within a structural timber frame. Often the wattle is ignored and daub is laterally compacted within the decay cavity. This treatment is most common along the wall base and here the whole basal zone may be replaced with daub (in the archaeological record this then takes on the character of a solid soil wall built up with vertical layers e.g. early Roman period Leadenhall Market, City of London).

Mid Pitch Angle: The angle at which the withies cross-over at the mid-pitch point. This reflects on the post/stake diameter and their spacing and to a little extent on the bowing of the withies. Generally a cross-over angle of 1° to 2° indicates a wide post spacing and 3° to 5° indicates a narrow spacing.

Mud Balls: The mud is formed into balls for applying onto the wattle. The balls are hand-sized and generally up to 100mm in diameter. This provides a manageable weight and size for semi throwing or thrusting onto the wattles. The ball shapes help the mud to penetrate through the wattle and form attachments.

Panel: A wattle panel consists of as series of struts/battens and woven withies and may be formed *in situ* or free standing and then inserted between structural uprights.

Panel Span: The distance between the structural posts or stakes. The span responds to the size of posts/stakes and the withies. Where these members are small the panel may typically be 300mm to 2m wide.

Pisé: Clay or earth kneaded and mixed with gravel, and rammed between boards, or formwork, which are removed as the mix hardens, to form walls etc.

Pitch Mid Point: The location mid-way between the strut- or post-spacing, where the woven withies cross-over.

Post: One of a vertical set of straight timbers generally 50mm to 250mm diameter, in wattle and daub construction, between which wattles panels are woven or which support preformed 'hurdles'. The timber may be unworked, split or squared and is usually part of the structural system of the building and therefore can range from 0.5m to 3m in height. Where posts bear directly into the ground they are part of 'earth-fast' structures. The posts may be well-or-poorly spaced, well or poorly aligned and may occur in a single row or be paired. Posts may also be jointed into base plates or above ground timber frames.

Remoulding: Sensitive wetting can make the daub a plastic medium capable of being remoulded. Care has to be given not to disturb the key lobes. Remodelling can introduce artistic detailing.

Sails: A south of England term for posts in wattle fences (those traditionally used for sheep pens).
Other regional terms for the posts, stakes or sails: *bats, sticks, spars* (Grendon, 1500), *studs, splentes* (Cambridge, 1532)

Sapling: A single (long and thin) shoot of a 1 to 2 year old tree resulting from a seed or coppice growth.

Secondary Layer(s): A finishing or repair coat added after the first layer is hard and form a rigid base on which the coat can be worked. The material can be different from the base layer and is often a finer grade of soil

Secondary Work: A surface finishing undertaken during or after drying and without the disturbance of the internal daub keys on to the wattle. It may comprise the reworking of the daub previously placed by the addition of new soil. The aim is to produce a flatter and smoother finish more resistant to abrasion and water or animal ingress and may involve:

- covering up exposed stones;
- increasing surface;
- enriching the surface clay content;
- polishing the clay particles;
- closing up and infilling micro shrinkage cracks.

Shear Plate: A panel, or often a whole external or internal wall, that stiffens-up the frame of a building to resist in-plane distortion (i.e. tilting resulting from lateral forces applied along its length).

Skim Coat: Thin layers of mud applied to give a new surface and infill defects and irregularities.

Stake: One of a vertical set of timbers generally 30 to 80mm diameter that are generally round or split. The bottom end bears into the ground and may or may not be sharpened. Stakes are generally part of the structural system and are generally 1.5 to 3m in length corresponding to wall height.

Stave: The word stave has been used for stakes or sails, but should not be used unless applied to a local tradition. Stave is commonly used by archaeologists to define wooden planks or split timbers forming a continuous or semi-continuous wall.

Stool: The base of a tree that has been repeatedly cut to ground level (coppicing) to produce saplings or withies.

Strut: Also known as stave or batten, these are general terms used to describe vertical or occasionally horizontal timbers inserted by wedging into a frame and around which the withies are woven to form a wattle panel. They are usually not structural.

Surface Finish: A skim coat of slurry mud applied to produce a fine texture. Lime washes can be applied to aid in cementing the surface particles and lime coatings can be applied to give a white surface, which inhibits erosion.

Wattle: A set of sub-straight withies, each alternatively woven over posts, stakes, struts, staves, battens, or sails to form a wattle panel. There are a variety of weaving patterns and these are defined below. The weaving aims to infill a panel ready to support a daub covering and to provide a stiffening to the stake positions. The wattle work may have a tight or open weave and this reflects on the wood availability, the straightness of the withies and the daub keying techniques. The struts may be widely spaced (1.0m) or tightly spaced (0.3m) and this generally responds to their diameter and the weavability of the withies.

Other regional names for Wattle: *watyll* (Bath, 1473), *waldando* (Winchester 1223)

Alternative Uses of Wattle:

- Fence or hurdle panels for animal pens.
- Silt trap for creating riverbank - called Kesh work in Ireland.
- Breast work for military and river bank defences.
- Pit linings.
- Form work for casting pisé.
- Support bails of hay off the ground.
- Spanning soft spots in muddy roads.
- Support for sub make-up of hut floors in soft ground.

Wattle and Daub: A general term for a method of wall construction consisting of branches or withies (wattles), often set between vertical members and roughly plastered with mud or clay (daub). Other names for wattle and daub: *mud and stud, ruddle and dab.*

Wattle Cavity: The gap between the woven withies located between the strut/post and the mid pitch zone, therefore roughly forming a set of alternating triangular prisms. The cavity may be totally or partially infilled by the application of daub.

Wattle Decay: The internal decay of the wood under the daub, resulting from the very complex moisture interactions between soil and wood and the micro-organisms built into the system or later introduced through cracks etc.

Wattle Groove: A 'V' groove in sides and bottom of a timber frame to hold the wattle struts or daub.

Wattle Nailing: The ad-hoc pushing of small stones or bit of pottery through the wattle, on each side, to provide additional keys for the daub. This tends to provide a more open withy weave and create large core cavities.

Wattle Pitch: The distance between two struts or posts around which the withies are woven.

Wattle Thickness: The thickness of a wattle panel/pitch is minimal at the pitch mid point cross-over point, where it is not much greater than the withy thickness (5 to 15mm). The maximum thickness is at the strut/stake, where the withies bows round it and here the total wattle work can be more than 100mm. The considerable variation is compensated for in the application of the daub.

Withy (Withies): A branch, osier or coppiced shoot that is generally 5mm (small) to 15mm (large) diameter and up to 3m long and used for weaving in and out of the posts or stakes to form a wattle panel. Smaller diameter withies are not very springy and are apt to move whereas larger diameter ones are too stiff and difficult to weave and can move the posts during the operation.

Other names for withies: *frithyng roddes* (Bath, 1535), *ad waldurum* (Winchester, 1223), *wreathing + watelrys* (1349), *wyndend* (Monmouth, 1370), *wyndyng* (Penhurst, 1470), *byndes* (York, 1327), *ryss* (Durham, 1472), rods, weavers.

Withy Bow: The curvature of the withies around the post/strut/batten. The shape of the bow reflects on the post diameter, their spacing and the diameter and springiness of the withies. Generally the tighter bow results from larger diameter post and a smaller pitch. An important role of the bow is that three are required (two one side and one the other) to form an effective clamp to the strut or post - so keeping it in position. It is therefore important that the withies have a common diameter so as a whole they keep the strut/batten or post/stake in an upright position and the panel, globally, as a flat surface.

Withy Cross-over (Zone): An area to either side of the mid pitch point where the withies effectively form a single thickness wattle pitch. The width of the zone reflects on the cross-over angle of the withies and can be from 150 to 300mm.

Withy End Loop: A loop formed when a withy is twisted back or turned around the end post and spliced down into earlier woven withies. Essential for keeping the end stake in position if the panel is free formed.

Withy Morphology:

1. Regularity

A general descriptive term to describe the form of withy:

- Straight: generally resulting from young shoots from coppicing or open environment, and best allows for a tight packing.
- Bowed: with one or more noticeable curves that can often be bent-out while weaving a panel or which may result in locally open packing.
- Staggered: where there are 'knuckles' or angles formed by buds or shoots off the main withy and producing a zig-zag effect.
- Distorted: irregular shape and usually resulting from using prunings from thickets or hedges and where otherwise there has been a confined and variable growing environment. This results in an irregular panel weave.

(To each of the above can be applied 'very', 'moderately', 'slightly', e.g. very bowed, moderately distorted, slightly staggered).

2. Taper

A term to describe the change of thickness and estimated in a whole panel or over a 0.50cm length:

- Slight: 1mm to 5mm change in withy diameter.
- Moderate: 6mm to 15mm change of withy diameter.
- Major: 16mm and above.

3. Surface Texture

A description of the withy surface - usually reflecting on the tree type and bark:

- smooth
- rough
- pitted
- budded
- trimmed

Where a large split branch has been used there will be a split wood grain. Sometimes the woven withies can split or crack - especially where bent around the staves.

4. Withy End form

A term applied to how the end of the withy is created before or after weaving:

- clean or rough break
- split grain
- diagonal or cross cut
- loop

These treatments may be partial or through the full withy thickness and may or may not be the same on both ends. Each withy may be different.

Withy Packing A general descriptive term to describe the relative compactness of the withy weave - best determined at the mid panel cross-over:

- Tight: the withies touch each other. Most commonly seen where a wattle wall panel is formed *in situ* - may be called heavy wattle,
- Open: where there is an average small gap between withies ranging from a few mm to the average diameter of the withies. This commonly found in hurdles and is referred to as light wattle.
- Wide: The gap between withies is more than the average diameter of the withies.

Withy Weave: There are a variety of weaves:

- Alternating 'in and out' rows of single withies between the struts or posts.
- Alternating rows of double/triple withies between the struts or posts.
- Alternating rows of bundles of thin (2-3mm diam) withies between the stuts or posts.
- 'S' or 'Z' twist of two withies between the struts or posts.

These forms of weaving may vary in quality and emplacement technique, responding to materials, speed of construction and the construction effort.

The following are some comments on weave character:

- A pair of twists is more instantly stable than simple 'in and out' weave. Here, the two strands act as clamp that is less prone to unstressing, otherwise a minimum of three strands are needed. Twist pairs are good for bottom and top of panel providing a stiff frame.
- A twist technique ensures a closed weave between them, though can result in an open weave gap with the next twist pair of withies.
- A closed consistent twist weave creates the same key gaps as with the simple 'in and out' weave.
- The twist texture can not be easily seen in daub lump impressions, because of natural growth distortions in the withies.
- S and Z twists applied next to each other do not create a good texture for daub keying.

STANDARD DEFINITION OF SOIL COMPOSITION AND ENGINEERING PROPERTIES

Definition of Terms from BS 1377:Part 1:1990 and other Sources where not defined (as defined by BS 1377 Part XX, Parts 2 to 9 describing methods of soil testing)

Bulk Density: The mass of material (including soil particles and any contained moisture) per unit volume including voids.

Compaction: The process of packing soil particles more closely together, thus increasing the density of the soil.

Dry Density (DD): The density of the soil after the soil's moisture has been removed by drying at 105ºC for 24 hours.

Dry Soil: Soil that has been dried to a constant mass at a temperature of 105º to 110º C.

Erosion: Removal of soil particles by the movement of water, wind or physical abrasion.

Linear Shrinkage (LS): The change of length of a bar sample of soil when dried from near its Liquid Limit, expressed as a percentage of the initial length.

Liquid Limit (LL): The moisture content at which a soil passes from the liquid to the plastic state, as determined by the Liquid Limit test.

Maximum Compacted Dry Density: The dry density obtained using a specified amount of compaction at the optimum moisture content.

Moisture Content (M/C): The mass of water which can be removed from the soil, usually by heating at 105^0 C, expressed as a percentage of the dried mass. The term water content is also widely used.

Non-Plastic: A soil with a plasticity index of zero or on which the plastic limit cannot be determinedas it is granular.

Optimum Moisture Content (OMC): The moisture content at which a specified amount of compaction will produce the maximum dry density.

Particle Density: The average mass per unit volume of the solid particles in a sample of soil, where the volume includes sealed voids contained within the solid particles.

Particle Size Distribution: The percentages of the various grain sizes contained within a soil, as determined by sieving (see BS 410) and sedimentation.

- Gravel:2mm to 60mm diameter.
- Sand: 0.2mm to 2.0mm diameter.
- Silt: 0.002mm to 0.2mm diameter.
- Clay: less than 0.002mm diameter (Note: each of these particle grades can be further subdivided into Coarse, Medium and Fine).

Plastic Limit (PL): The moisture content at which a soil becomes too dry to be in a plastic condition, as determined by the plastic limit test.

Plasticity Index (PI): The numerical difference between the Liquid Limit and the Plastic Limit of a soil and a good indicator of soil workability.

Pore: Micro-air voids within a soil and often resulting from the evaporation of soil moisture. The pores are to be found between the soil particles - generally between clay peds and the coarser silts and sands. Pores are of various type: channel; loop; blind alley; pocket; and sealed. In loose granular soils or low density cohesive soils the pores can be large and are better termed voids.

Porosity: The volume of voids (air and water) expressed as a percentage of the total volume of a mass of soil.

Shrinkage Limit (SL): The moisture content at which a soil on being dried ceases to shrink. The linear shrinkage is the percentage age shortening of the mix from its working condition to its Shrinkage Limit.

Unconfined Compressive Strength: Strength of a soil under axial loading, with no confining lateral pressures.

Voids: The spaces between solid particles of soil.

Chapter 7 **Facets of Tatberht's Lundenwic: A Discussion**

THE SEQUENCE IN LUNDENWIC

JIM LEARY

Earliest Middle Saxon Activity

A soil horizon, containing residual prehistoric flint flakes, was recorded directly overlying the brickearth at Maiden Lane (ECT96), and represents the earliest deposit recorded from any of the excavations. Analysis of a similar deposit at the Royal Opera House site, recorded as 'dirty brickearth', has indicated that it may be a remnant of a buried soil horizon, dated by pottery sherds to the beginning of the Middle Saxon period. Pollen analysis from the Royal Opera House excavations suggests that the soil horizon formed in an open and unoccupied landscape with some trees and a limited amount of cereal cultivation (Malcolm *et al* 2003, 15, 19, 211, 213). The layer from Maiden Lane supports this view since it was cut by a tree throw and contained low quantities of charred grain.

The Burial

Cutting the brickearth at the James Street site was a burial containing a spearhead and a mid- 7th century buckle. The grave cut was filled with a clean re-deposited brickearth, suggesting the area was largely open ground when it was backfilled. The burial is contemporaneous with other burials in the Covent Garden and Long Acre area and recent excavations at the adjacent site of Cubitts Yard produced a similar, though east-west aligned inhumation accompanied by a spear, knife and possible shield, as well as the truncated remains of a second, north-south burial. (A Telfer, pers comm). One of the Long Acre burials was dated by a buckle to the second half of the 7th century, another at Jubilee Hall was ^{14}C dated to the mid- to late 7th century (Cowie with Harding 2000, 189), while two fragmented burials at the Royal Opera House site dated from the early to mid- 7th century and the mid- to late 7th century respectively (Malcolm *et al* 2003). Excavations at Floral Street provide the best evidence yet of a cemetery, having revealed six graves dating from the 7th – 9th centuries, one of which was accompanied by a rare 7th-century brooch, while another contained an iron knife (Humphrey 2001). A spearhead also came from a coffin at St. Martin-in-the-Fields, which is probably contemporary with other nearby coffins dated by two glass palm cups to the 7th century (Biddle 1984, 25; Evison 2000, 68). A burial from the Peabody estates, Bedfordbury, was inhumed within a sequence of occupation layers and initially dated to the 8th century (Whytehead *et al* 1989, 49), although an earlier date (late 7th century) has recently been suggested (Blackmore 2002, 278). A burial accompanied by a spear, thought to pre-date AD 650, has recently been recorded further east at the Inner Temple (Butler forthcoming).

These dispersed burials have been interpreted as representing cemeteries or zones of burials; one to the north of the modern day Covent Garden Piazza, another to the south around the church of St. Martin-in-the-Fields (Malcolm *et al* 2003, 27; Scull 2001), and a possible third east of the *Lundenwic* settlement (Butler forthcoming). These burial areas may have been located on the outer limits of the settlement in the 7th century, in a largely open landscape with evidence for limited agriculture, and therefore possibly on the periphery of the cultivatable land.

The presence of grave goods within these burials has often led to the interpretation that they were pagan. In this way the burial at the Peabody site is suggested to be "a pagan trader excluded from the town cemeteries." (Whytehead *et al* 1989, 58). For this reason the rapid expansion of the settlement over the burials is seen to reflect changing religious attitudes from pagan to Christian (Malcolm *et al* 2003, 27). However, interpreting these burials as pagan may be misleading, and it is now generally accepted that the burial of grave goods does not necessarily reflect pagan beliefs but may represent cultural identifiers (Boddington 1990, 188). Objects and personal belongings may have identified groups of people representing social structure, wealth, age, family relationships or ethnicity, and may have been important on a regional, local and individual level (Härke 1989; Geake 1997). The approximately west-east orientation of a large number of burials in *Lundenwic* (Blackmore 2002, fig. 3) suggests that they were at least nominally Christian, and more probably the rapid expansion of the settlement over the burial areas reflect pressures on the landscape from the settlement, rather than religious change. As Boddington notes: "The Anglo-Saxon cemetery should be seen as a unit of landscape. Burial grounds must be expected to, and indeed do, relocate in response to the development of the landscape." (Boddington 1990, 197).

The James Street burial is strikingly similar to the burial from the Peabody site, with the right arm resting on the pelvis/stomach region and the left tightly flexed at the elbow and clutching a spear (although the two spears were quite different) (Whytehead *et al* 1989, 58). The Peabody deceased appeared to have been rolled into the grave, although the positioning of the arms suggests that he had been carefully arranged and displayed prior to interment, presumably long enough for rigor mortis to occur. The similarity of the arrangements of the two skeletons suggests that the same or a similar burial rite was undertaken prior to burial, and may even imply contemporaneity.

The Mid to Late 7th Century

Evidence of the expansion of the settlement is indicated at James Street first by a midden deposit followed by post- and stakeholes, representing fence lines and plots of land. Post- and stakeholes were also recorded from the earliest phase at the Lyceum Theatre site, representing a similar activity. A series of stakeholes were also recorded from Maiden Lane (EXC97), and these formed two clear alignments that were associated with a linear feature, backfilled sometime in the latter half of the 7th century. Similarly, at the National Portrait Gallery, on the western boundary of *Lundenwic*, a possible beamslot, as well as a group of stakeholes, were recorded. The stakeholes from all the sites clearly represent similar ephemeral activity, such as one would expect from the temporary penning of livestock, indicative of a rural lifestyle.

At James Street the area appears to have once again been used as a midden, indicating a period of abandonment, and this seems to be the case with the other three sites (although similar deposits were interpreted as a ploughsoil from both the Lyceum and the National Portrait Gallery – *see* Brown, Chapter 3, this volume and Pickard, Chapter 5, this volume). Animal bone was recorded from these deposits at both James Street and Maiden Lane (EXC97) and pottery was recovered from Maiden Lane, dated to between AD 650-700, as well as an antler spindle whorl.

The Late 7th to Early 8th Centuries

At James Street the midden deposit was overlain by a road and associated drainage gully, which may have been flanked by buildings as indicated by the faecal waste within the gully. The road was well maintained, having been re-metalled at least five times, and was clearly swept clean prior to remetalling, indicating a degree of organisation. This road ran parallel to the main road (R1) recorded at the Royal Opera House, and if, as is suggested for the Royal Opera House site (Malcolm *et al* 2003, 145-148), the lines of both roads are extended to the north of the settlement and south to the waterfront they join the retained Roman roads, presently New Oxford Street and the Strand. Combined with the evidence of perpendicular minor roads from the Royal Opera House (Malcolm *et al* 2003, 145-148), this could be taken to indicate a formal road grid. This suggests that by the late 7th century a road grid overlay the earlier open middens, implying that the original infrastructure of *Lundenwic* did not develop organically, in a piecemeal fashion, but was conceived and organised as a single development, presumably by a central authority. As more of *Lundenwic* is archaeologically excavated further elements of this grid will presumably be exposed.

A series of pits dating from the early 8th century further represent domestic activity. One of these truncated the road, suggesting that it had gone out of use relatively rapidly, indicating the level of pressure that was being placed on the settlement, although the evidence of beekeeping within the core settlement suggests that open areas did exist, possibly between dispersed buildings. Red deer antler waste, recovered from the pits, and inter-mixed with household refuse, suggests that antler working occurred nearby. Evidence of weaving came from a pit containing a homogeneous group of 31 loomweights.

Beekeeping within *Lundenwic* is rarely evidenced in the archaeological record. Documentary evidence suggests that honey was an important part of the Saxon economy. It would have been a valued foodstuff as well as a food sweetener, and was often exacted by landowners as part of their rent (Hagen 1995, 156; Blinkhorn 1999, 16), and the late 7th century Laws of Ine record that ten vats of honey form part of the food rent from ten hides (Whitelock 1979, 406). Honey had medicinal value, and could be used on wounds as an antiseptic or as a salve to speed healing. Honey is also an excellent preservative and could have played a role in the transportation of other foodstuffs. Another important use was to produce the alcoholic drink mead (*see* Chapter 1, this volume). Honey was also a common component of bait for freshwater hook and line fishing. In addition, beeswax would also have been an important economic resource and excavations at North Raunds in Northamptonshire have recovered a large quantity of Ipswich Ware containing beeswax (Blinkhorn 1999, 16). Beeswax would have had many uses, for example with the addition of herbs or essential oils it could be used as an ointment base, as well as for sealing and for candles. Metalworkers used wax moulds (the lost wax method) when casting delicate pieces, whilst woodworkers may have used it as a polish and to condition the wood. Leather workers may have used beeswax on their thread to lubricate it to draw more easily through the leather and it could also be used to waterproof the seams of leather bottles. Finally, beekeeping would have aided the pollination of crops and orchards.

The Mid to Late 8th Century

James Street provides evidence of a more intensive occupation of the site during the mid 8th century than had occurred in the 7th and earlier 8th centuries and the previously open ground was soon built over, suggesting that space was becoming restricted. This is also reflected at the Royal Opera House site, where space between buildings was infilled with new structures (Bowsher and Malcolm 1999; Malcolm *et al* 2003). The fragmentary remains of brickearth and gravel surfaces at James Street, as well as a beamslot and post- and stakeholes, represented the locations of timber-framed buildings. The adjacent site of Cubitts Yard also produced structural evidence in the form of hearths, gravel surfaces, possible beamslots and stakeholes (A Telfer, pers comm.).

Activity was revealed at the Lyceum by thirteen pits, their contents providing evidence that butchery processes were being undertaken at, or very close to, the site, and suggesting that this part of *Lundenwic* may have been used as a butcher's quarters. The linear arrangements of these pits may reflect specific property boundaries, perhaps to individual butcher processors. At Maiden Lane building activity was recorded during this phase, as evidenced by truncated beamslots with associated brickearth and metalled floors as well as layers of burnt daub. Parallel alignments of postholes may represent parts of buildings or enclosed areas.

The National Portrait Gallery site, located near the proposed western limits of *Lundenwic*, is characterised by several pits initially used for brickearth extraction. The pits would have produced considerable quantities of brickearth, presumably excavated to supply the rapidly expanding settlement with the raw material for building construction work as well as for loomweight and pottery production, and it is possible that a market for brickearth developed. The quarries were probably backfilled soon after they had become exhausted, and pottery evidence suggests that this had started by the mid 8th century. The large size of the pits suggests that they were excavated in a largely open landscape, whilst the faunal assemblage indicates that they were backfilled within a farmstead environment.

The presence of structures at the National Portrait Gallery is supported by the large quantity of daub fragments recovered, indicating that wattle and daub buildings must have been constructed on or near the site. One of the pits contained evidence for a slumped brickearth floor and cut through this were twenty-four stakeholes. These were overlain with a layer containing domestic artefacts, and dumps producing evidence for bone working as well as a sheep's thoracic vertebra bearing two Anglo-Saxon runic inscriptions. Fragments of loomweights were recovered from the fills of two of the pits, suggesting that weaving took place close to the site. Several fragments of lava quernstones were also recovered, reflecting the localised grinding and milling of cereals.

Although craft activites, such as ironworking, weaving (as evidenced by the loomweights from James Street and the spindle whorl from Maiden Lane), coopering (the cask well from James Street) and beekeeping, were recorded from the 7th and early 8th centuries, the impression is that by the mid 8th century *Lundenwic* saw an increase in manufacture, probably related to a rise in the population. The evidence includes more antler, horn and bone working, recorded at all the sites and comprising chopped/sawn horn cores, sawn pieces of red deer antler, antler shavings and an antler comb blank, as well as two knives and a saw; leather working, as evidenced by the awl from James Street; ironworking, including large quantities of iron slag, smithing hearth bottoms and flake hammerscale, indicating the presence of smithies at James Street and the Lyceum, whilst secondary ironworking was indicated at the National Portrait Gallery; textile manufacture, which is evidenced predominantly by loomweights, as well as bone and antler needles recovered from the Lyceum, it is also possible that a number of clay-lined pits at James Street had been used for dying cloth, although this remains speculative; and non-ferrous metalworking, as evidenced by the crucibles from James Street, the Lyceum and Maiden Lane.

Although these activities clearly represent production in *Lundenwic* they do not necessarily indicate that *Lundenwic* was a production centre, indeed these craft activities and their scale are similar to those recorded on most rural Anglo-Saxon sites, albeit within an urban setting. The ubiquity and relatively even spread of loomweights across the sites suggests that weaving remained a domestic activity, conducted at a household level, although not necessarily carried out in every house. Antler, horn and bone working, were probably carried out in specific properties, indicating a level of specialisation. One such property was identified at

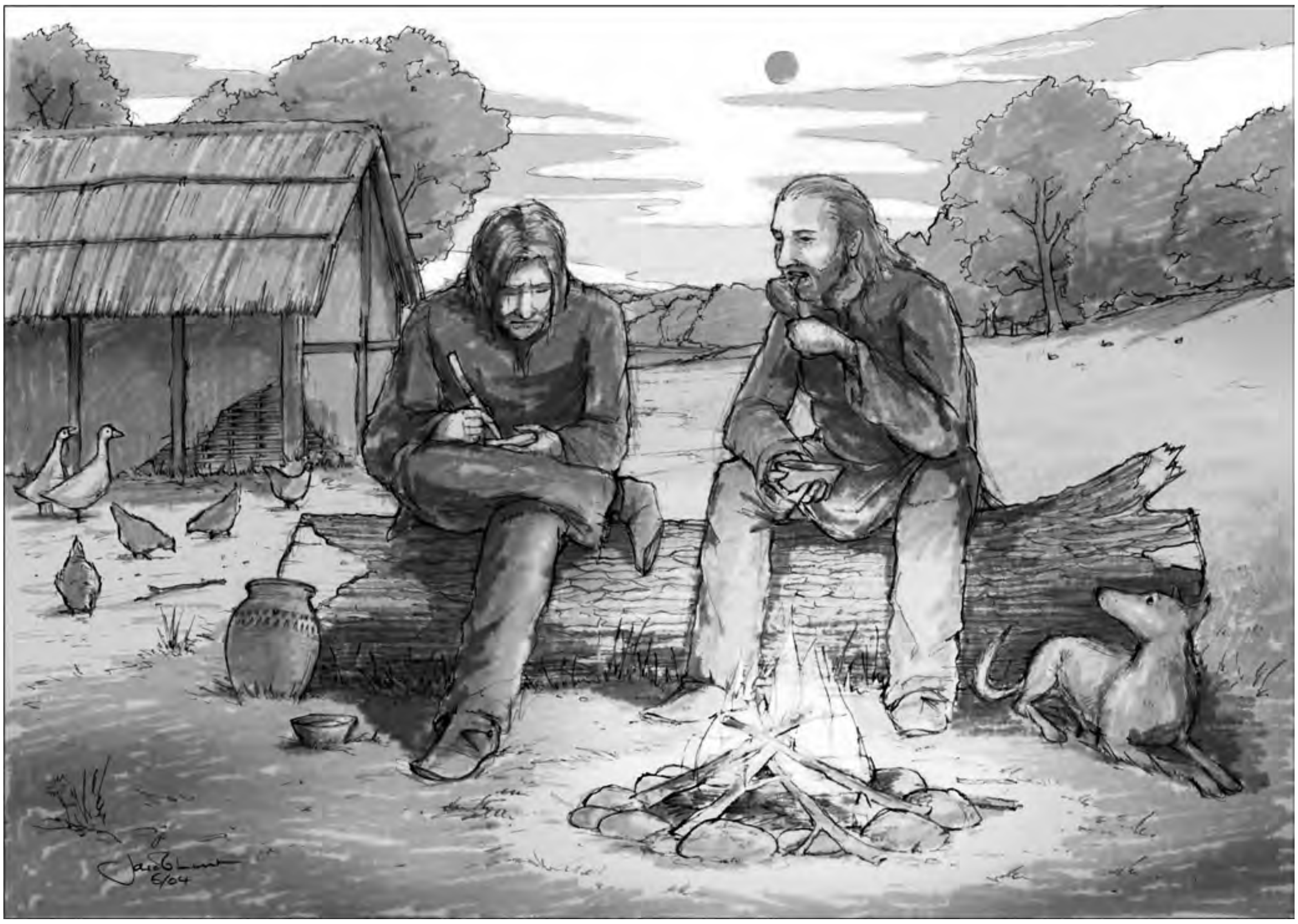


Fig. 75 Carving the runes; looking west out of Lundenwic towards the rural hinterland

the Royal Opera House site (Malcolm *et al* 2003, 170), whilst another probably lay close to the Lyceum, as indicated by the high concentrations of waste recorded on the site. Waste from the other sites reported in this volume probably indicates deposition a short distance from the workshop (Riddler 2001b and below). Since the waste does not occur to the exclusion of evidence for other crafts it would appear that there were no large-scale industrial quarters in *Lundenwic*, but that specific properties carried out specific tasks in different crafts (Riddler 2001b). However, there may have been zones of specialisation within the settlement since some of these crafts were reliant on one another and may have grouped together, for example bone and antler workers needed to be near to butchers and leatherworkers for the raw materials. Butchers may also have been clustered together since it is a distinctly noxious activity (Riddler 2001b).

Even less evidence has been recovered for the conduct of trade or the goods traded in *Lundenwic*, which include imported pottery and/or their contents, as well as quernstones imported from the continent. Although the imported pottery has been recovered in relatively large quantities, taken as a whole the evidence for trade is far less than one would expect from a 'trading centre'. A similar situation is reflected in the Middle Saxon coins, with only some 20 recovered from London in comparison with over 100 *sceattas* from both Hamwic and Ipswich (Newman 1999). To some extent this is bound to reflect the qualitative variation of sites in terms of the preservation, size of investigation and recovery methods (Cowie 2001). At the same time, a range of non-urban sites is yielding large numbers of both Middle Saxon coins and metalwork (Gaimster this report). This situation reflects the increasing number of Middle Saxon sites with evidence of trade and production outside the conventional range of 'wic' sites, including both ecclesiastic communities and more temporary fairs and trading places (Hinton 1986; Blinkhorn 1999). Undoubtedly, further studies will yield more and new information both about trade and production and the development of urban settlements in the Middle Saxon period.

The Late 8th and 9th Centuries

Building activity, represented by occupation layers at James Street and a hearth and brickearth surface at the Lyceum, continued into the 9th century. However, by the late 8th century the structural elements at Maiden Lane had vanished and the area had been given over to the disposal of rubbish, which continued into the late 9th century, possibly indicating a contraction of *Lundenwic* or at least a realignment of parts of the settlement. Rubbish disposal was in pits, as well as areas that appear to have been used as middens. This activity occurred at the same time as the construction of a north east - south west defensive ditch. This ditch may have been intended to defend the area to the north, exploiting the river terrace in commanding the approach from the river towards the centre of the *Lundenwic* settlement, and suggesting that any potential attack was perceived as coming from the river. If this was the case, however, the ditch would have cut off access to the river and the movement of goods would have become difficult. The ditch may therefore have demarcated a small southern enclave from the hinterland beyond. Similar encircling defences over small areas can be seen at a number of other settlements at this time, including Haithabu, Birka, Ribe and Dublin. Viewed in this context, therefore, it is perhaps better seen as a 9th century trend to demarcate areas than necessarily a response to a threat.

Dark Earth

Dark earth layers sealed the stratigraphy recorded at James Street, Maiden Lane and the National Portrait Gallery. At James Street two layers were recorded whilst at Maiden Lane several layers, with a maximum combined thickness of 1.2m, were recorded. The stratification at James Street and Maiden Lane is contrary to the often-recorded homogeneity of dark earth, one of the main indicators of the biological reworking of the underlying deposits. The presence of large quantities of burnt daub fragments from Maiden Lane, possibly building debris, suggests that the dark earth derived, at least in part, from dumped deposits. The dark earth from all three sites produced pottery, mostly of 9th century date, whilst James Street produced a late 8th century Offa coin. A few pits were recorded cutting the dark earth from Maiden Lane, and were filled with similar material.

PRODUCTION IN LUNDENWIC: ANTLER, BONE AND HORN WORKING

IAN RIDDLER

Waste of Antler, Bone and Horn

Antler waste was recovered from each of the sites (Table 20). In addition, worked bone waste was retrieved from the National Portrait Gallery. The quantities of antler are small and consist of less than twenty-five fragments in each case; and the total amount of antler (excluding shavings) from the sites in this volume comes to just fifty pieces. At first sight, this might suggest that the craft was scarcely practiced in *Lundenwic* and that it was merely a small household diversion. That is clearly at variance, however, with the quantity of combs recovered from the settlement, all of which are made of antler. Combs have been recovered from most of the *Lundenwic* sites published to date. Examples from James Street, Exeter Street, Maiden Lane (ECT96 and EXC97) and the National Portrait Gallery are described above and they can be considered alongside assemblages from Jubilee Hall, Maiden Lane (MAI86), the National Gallery Extension, Peabody Buildings, Whitehall and the Royal Opera House (Cowie *et al* 1988, 134-5; Whytehead *et al* 1989, 131-2; Green 1963; Blackmore 2003, 310-13). Moreover, unfinished fragments of combs are recorded from Exeter Street, as well as from excavations at Maiden Lane (MAI86) and the Royal Opera House (Blackmore 1988b, 137; Malcolm *et al* 2003, 174, 302 and tables 67 and 68).

An alternative view of the waste is to see it as material dispersed a short distance away from comb makers' workshops, rather than viewing it as the focus of activity (Riddler 2001b). This image of the dispersal of waste appears to be the case at the Royal Opera House, for example, 463 pieces of antler were recovered from that excavation, with groups of twenty or more fragments stemming from Buildings 3 and 11 in period 4, and Building 24 in period 5, which also produced over 1kg of antler shavings (Malcolm *et al* 2003, table 67). The remaining material was spread across several road surfaces and within Open Area 12 in period 7 (*ibid*, table 68). Within period 4, Building 3 and its successor Building 11 formed the main focus for antler working, and small quantities of waste were dispersed across nearby features (*ibid*, 36). In period 5, the principal structure for antler working was Building 24, on the other side of Road 1 from Buildings 3 and 11, although a quantity of waste came from an open area in the northernmost part of the site (*ibid*, 93 and 99-100). Across the Middle Saxon period in Lundenwic, therefore, comb making was initially focused on one building complex, and was subsequently practised nearby, at two separate locations, and small quantities of waste were dispersed from these locations.

Similar situations prevail across a number of Middle Saxon 'wic' sites, particularly at *Hamwic* (Riddler 2001b; Riddler & Trzaska-Nartowski forthcoming a). Large assemblages of antler and bone waste (i.e. of 500 or more fragments) are confined to a small number of properties and in each case there is a dispersal of material across a number of pits, with the majority confined, however, to a single pit or to a small group of features in the same area. On a smaller scale, this is the situation seen at the Lyceum Theatre.

Table 48 Comb Types from Lundenwic Excavations

Comb Type:	Double-Sided Composite	Single-Sided Composite	Handled
Exeter Street	1		
James Street	3		
National Portrait Gallery	2		
Maiden Lane (ECT96)		1	
Maiden Lane	2	2	
Jubilee Hall	3		1
Peabody Buildings	3		
National Gallery Extension	1		
Royal Opera House	17	1	
Whitehall	3		1
Total:	35	4	2

Note: The table excludes fragments of connecting plates, unless they have been securely identified to comb type

There is little direct evidence for bone working (as distinct from antler working) at *Lundenwic*. It has been observed, nonetheless, at Jubilee Hall and Maiden Lane (MAI86), as well as the National Portrait Gallery (Cowie *et al* 1988, 135). The evidence from both *Hamwic* and Ipswich suggests that one of the principal uses of worked cattle bone lay in the production of handled combs (Riddler *et al.* forthcoming). With both antler and bone, therefore, production was centred on combs and comb making.

At the Royal Opera House, attention was drawn also to the presence of horn working. The largest concentration of cattle horn cores came from a pit close to another that included antler waste, suggesting that the two activities were closely related (Malcolm *et al* 2003, 184). Cattle and sheep horn cores were recovered from the same features as antler waste at James Street, and one of the cores had been removed by sawing (Tables 11, 12 and 20). As noted above, the saw was a tool of the antler and bone worker, and not the butcher. Horn cores and antler waste were also associated also at the National Portrait Gallery (Tables 37 and 38). Antler, bone and horn working are associated in early Irish sources (Dunlevy 1988, 345).

Horn working was a sedentary craft, requiring time for the horn to be removed from the core. MacGregor has questioned how it could ever have been practised on an itinerant basis (MacGregor 1992, 165). Horn cores from the Royal Opera House were linked with comb making but there is no evidence to suggest that horn was used for combs before the 9th century. Horn and bone (or antler) composite combs are a feature of the late Saxon period and horn combs are known from sites of 10th to 12th century date, but not from earlier deposits (Biddle 1990, 678-90; Riddler *et al* forthcoming). During the Middle Saxon period horn was principally used for the handles of knives, seaxes and swords (MacGregor 1990, 364-5; Watson 1988; Cameron & Filmer-Sankey 1993). The presence of horn spoons in 9th and 10th century contexts at Elisenhof allows for the possibility that they might also have been produced at an earlier date (Westphalen 1999, 112-3 and taf 22.8-15).

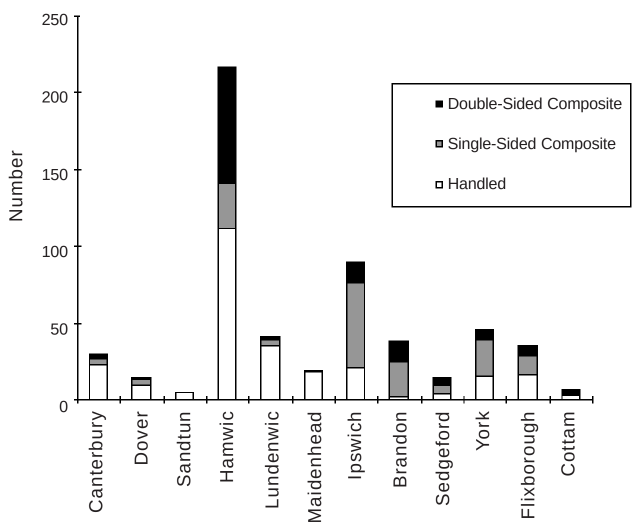


Fig. 76 Middle Saxon comb types

Lundenwic Combs

Most of the combs recovered from *Lundenwic* are double-sided composites, and other comb forms are particularly rare (Table 48). The latter consist merely of a handled comb fragment recovered from Jubilee Hall and an example from Whitehall, as well as two tooth segments stemming from one or more single-sided composite combs from Maiden Lane (MAI86) and part of a connecting plate (ECT96), as well as a further tooth segment from the Royal Opera House (Cowie *et al* 1988, 135, fig 38.6 and 137; Blackmore 2003, 312 <B124>).

The pronounced preference for double-sided composite combs at *Lundenwic* is not unusual and it reflects a general trend for southern England (Fig. 75). North of the Thames,

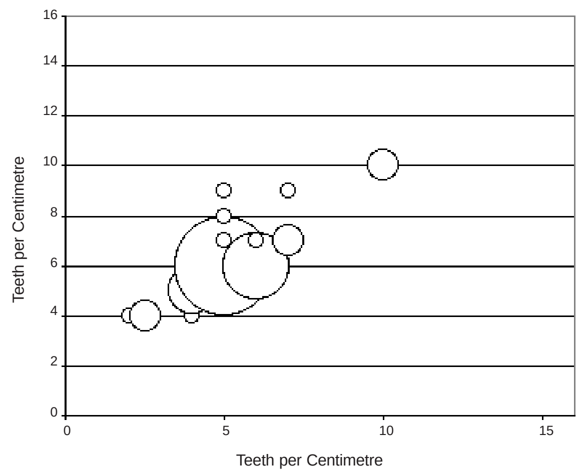


Fig. 77 Lundenwic comb teeth per centimetre

within East Anglia and Northumbria, single-sided composite combs were much more common at this time. Virtually all handled combs of 7th to 10th century date are single-sided and if they are combined with other forms of single-sided composite comb (including both winged and doubled connecting plate combs) three groups of Middle Saxon sites can be distinguished:

1 Double-Sided Composites predominant
Lundenwic, Canterbury, Dover, Maidenhead, *Sandtun*

2 Double- and Single-Sided Composites in equal measure
Hamwic

3 Single-Sided Composites predominant
Brandon, Ipswich, Sedgeford, York, Flixborough, Cottam

Lundenwic can be set alongside Canterbury, Dover, Maidenhead and *Sandtun* in terms of its overwhelming preference for double-sided composite combs. The scarcity of handled combs at *Lundenwic* is matched at Canterbury and

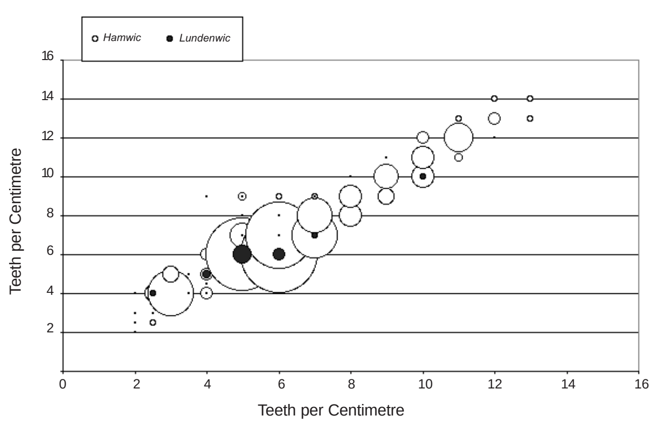


Fig. 78 Hamwic and Lundenwic comb teeth per centimetre

Dover (Philp 2003). Double-sided composite combs dominate the assemblage from Maidenhead and the only example of a handled comb is likely to belong to the Late Saxon period, rather than the Middle Saxon deposits (Riddler 2002, 40-1). All of the combs from *Sandtun* are double-sided composites (Riddler 2001a, 229-31).

Hamwic is exceptional for the quantity of waste relating to the manufacture of handled combs and it remains one of the few Middle Saxon sites to have produced copious evidence for comb manufacture (Riddler & Trzaska-Nartowski forthcoming a). Although this evidence does tend to place undue emphasis on the handled combs, *Hamwic* also retains a good collection of single-sided composite combs, some of which have been published (Addyman and Hill 1969, plates VIa and VIIa; Holdsworth 1980, fig 15.1.1; MacGregor 1985, fig 49d; Riddler 1993, 115-6; 2001a, 66). It differs, therefore, from the sites of Group 1 and the quantity of its double-sided composite combs separates it from the sites of Group 3.

Blackmore has identified three types of double-sided composite comb from *Lundenwic*, two of which she describes as 'stubby' and 'chunky' (Blackmore 2003, 310-2). In reality, the *Lundenwic* assemblage echoes the situation seen at Canterbury, Flixborough, *Hamwic*, Ipswich and Maidenhead, where the double-sided composites fall into several groups within an overall range extending from narrow to broad combs (Riddler 2002, 39-40 and archive; Riddler *et al* forthcoming). At all of these sites it is possible to distinguish between broad and narrow combs, with a number of examples also lying between these extremes, in a middle group.

Blackmore rightly noted that the larger combs from the Royal Opera House reflected forms of the early Anglo-Saxon period and she suggested that they might not have continued in production into the 8th century. Rather, they may have been heirlooms, or have served a specialist function (Blackmore 2003, 311). A similar argument concerning a comb retained possibly as an heirloom over several centuries has been made for Wharram Percy (Dickinson in Milne and Richards 1992, 56). There is no doubt, however, that these large combs continued to be made during both the 8th and the 9th centuries. Unpublished examples of large Middle Saxon double-sided composite combs are known from *Hamwic* and Ipswich (Riddler *et al* forthcoming), although a rare commodity at these sites. Moreoever, the comb from Wharram Percy is unlikely to be an heirloom (Riddler forthcoming d). Indeed, there is very little evidence to suggest that combs were valued sufficiently to be treasured as heirlooms. In some cases they were repaired, but generally they were discarded when the teeth were worn and broken. They may have lasted for most of the lifetime of an individual (Ambrosiani 1981,

14) or for a lesser period, of five to ten years.

The terms 'chunky' and 'stubby' refer not only to the widths of combs, but also to the fineness of their teeth. Double-sided composite combs from *Lundenwic* are centred on four to eight teeth per centimetre (Fig. 76). A few combs, from the Royal Opera House and the National Gallery Extension, have fewer than four teeth per centimetre on at least one side of the comb. At the other end of the scale, two fragments from the National Portrait Gallery, conceivably from the same comb, include teeth with a width of just one millimetre. The range extends therefore from coarse to fine teeth but with most combs demonstrating values of five to seven teeth per centimetre, on at least one side of the comb. The sample from *Lundenwic* fits neatly within the domain established for the much larger assemblage from *Hamwic*, in this respect (Fig. 77).

The difference between double-sided combs from one part of *Lundenwic* and other sites lies not in the fineness of the teeth, but in the contrast seen between coarse and fine teeth on the same comb. It is difficult to quantify this aspect of comb design, but it is clear that a number of the *Lundenwic* combs include relatively coarse teeth on one side of the comb, with noticeably finer teeth on the other. Other examples include a comb from Jubilee Hall as well as a series from the Royal Opera House (Cowie *et al* 1988, fig 38.5; Malcolm *et al* 2003, figs 96 and 175.B211). They formed the most common type of double-sided composite comb from the Royal Opera House (Blackmore 2003, 311) but they are not, as yet, common elsewhere in *Lundenwic*. They may possibly, therefore, be a characteristic of a particular comb workshop, which operated in that specific part of *Lundenwic*. In this sense, therefore, both the combs and the waste materials can be used to isolate particular workshops within *Lundenwic*.

THE ENVIRONMENTAL EVIDENCE FROM LUNDENWIC

JAMES RACKHAM

The problem with drawing together a series of site reports in a publication of this kind has been noted above in the introduction. The level of environmental analyses have been variable, for a variety of reasons. Therefore it is both difficult, but also necessary, to try and draw together the results from the four different excavations reported here. Some of the different elements of the environmental data therefore are summarised below with some possible implications for the interpretation of the sites and the *Lundenwic* settlement in general.

An important element of the evidence from the samples is the charred plant material that was recovered. None of the sites produced any waterlogged deposits, so information relating to the degradable organic deposits can only be studied through the bits that became charred or carbonised in fires. The origin of these types of assemblages in Middle Saxon *Lundenwic* has recently been discussed in the context of the Royal Opera House (Malcolm *et al* 2003) and need not be reiterated here. It is sufficient to say that minimal numbers of chaff fragments and a dominance of cereal grains, pulses and hazelnut shells among the charred remains from all except one of those samples studied reflects a probable origin as food for humans, with the grain already semi-cleaned before its arrival on the sites. Perhaps not surprisingly the incidence or density of these remains was low since, except for the nutshells, most reflect the accidental loss of material originally intended for consumption. In only one of the samples do cereal grains exceed a density of four grains per litre and in most, including those not studied and reported above, it is less than one. The single sample where grain is abundant (present in the thousands) is from the primary fill of pit [271] at James Street. In this context there are also abundant fragments of *palea* and *lemna* but not *rachis* fragments indicating that the grain had been cleaned elsewhere. The interpretation of this is problematic (*see* Hunter, this volume) but the deposit clearly reflects a single event, perhaps the intentional burning of a deposit that was spoilt or contaminated. Wheat is the most abundant grain throughout the sites (excepting context [331]), and barley next, although individual contexts may be dominated by the latter and rye was more common than barley in a pit at the National Portrait Gallery. Unfortunately the results of the samples from the sites reported in this volume cannot match the results from the Royal Opera House, that have suggested that particular buildings and their successors are associated with samples rich in rye grain, which might conceivably have had a cultural link. A few mineralised seeds from the Lyceum and James Street indicate apple/pear and brassica seeds that also could have derived from food material. The poor level preservation from the Maiden Lane (ECT96 and EXC97) sites prevents any comments except to note that peas or beans occurred with greater frequency than in any of the other sites. As has been noted by the individual authors above, these results appear to follow the pattern suggested by earlier published work (Davis & de Moulins 1988; Davis & de Moulins 1989) although both the Lyceum and National Portrait Gallery sites had very low densities of grain and weed seeds.

Another important element of the samples, although poorly represented from all the sites except the Lyceum, is fish bones. The Lyceum produced 1790 fish bones from 29 of the 37 samples processed (nearly 80%), in which herring dominated, followed by eel and shad, with cyprinids a poor fourth equal with flatfish. The relative volumes of sediment

Table 49 Fragment numbers of the major taxa among the hand collected bone from the individual sites.

	Cattle	*Sheep/goat*	*Goat*	*Pig*	*Chicken*	*Goose*
James Street JES99	935	230	2	517	10	4
Lyceum Theatre ERT95	2479	632	4	866	20	17
Maiden Lane ECT96	324	111	-	250	9	?
Maiden Lane EXC97	729	239	-	381	19	?
National Portrait Gallery NPG97*	1599	1860	2	674	87	108

* figures include identified material from the sieved samples;
? probably present but not taken to species.

processed for these were 727 litres from the 29 samples, compared with just over 600 litres for the 24 samples with fish bones from the Royal Opera House, indicating that fish bones were between four and five times as abundant in the Lyceum samples. The relative absence of fish from the 45 samples processed from the National Portrait Gallery would seem to be real since a mesh size of 1mm was used to catch the residues. Nevertheless, with over 250 identified fish bones from twelve samples from the National Gallery Basement site, (Locker 1988) nearby, amongst which eel, herring, twaite shad and cyprinids (all small fish bones) dominate, 23 fish bones from National Portrait Gallery is remarkably low, and, as with James Street and Maiden Lane, this must either reflect a real lack of fish at these sites or differences in the recovery efficiency of the fish bones. This makes it difficult to conclude whether there is any significance in the relative absence of fish bones from the sites reported here. There do appear to be major differences between sites, not just in quantity but also in species proportions, and access to freshwater fish, eels, herring and estuarine and tidal fisheries, let alone sturgeons, later a royal fish, may have some significance for an understanding of the structure of society in the settlement.

Bird eggshell is only recorded from the Lyceum Theatre and then in only three samples. Its absence from the other sites may be an omission due to recovery, but it does seem to occur much less frequently than in medieval urban samples. For instance, only seventeen samples out of 249 from the Royal Opera House are recorded as containing eggshell (Sidell & Scaife 2003). Although both goose and chicken were identified at the Royal Opera House, the eggs of both species seem likely to have made a smaller contribution to the diet of *Lundenwic* inhabitants than in later periods.

One very unusual find from the samples was a number of charred honeybees from a pit at James Street. As Robinson has suggested these may have derived from a colony kept in a skep and suggests that colonies were maintained in the settlement for the supply of honey. This is a very rare attestation of a foodstuff that does not survive in the archaeological record.

The hand collected animal bone has had the most comprehensive study across the sites. Although collectively the sample size reported above does not add up to more than the assemblage from the 1986 excavations at Maiden Lane (MAI86) (West and Rackham 1988), it does exceed the size of sample studied in detail by Rielly (2003) from the Royal Opera House. Different methodologies were used by the various authors and the data sets are not necessarily directly comparable, but in contrast to the material discussed above the animal bones do show variations that reflect the original bone assemblages, rather than any recovery or other post-depositional bias. Fragment numbers are the only measure of abundance common to all the reports and comparisons between the sites must use these despite their problems (Table 49).

It is apparent from these data that cattle dominate the assemblages from the Covent Garden area, with pig the next most abundant taxa, while sheep bones are more abundant at the National Portrait Gallery site. Furthermore, chicken and goose bones occur with much greater frequency at the latter site. This is a pattern noted previously (Rackham 1994) and presented above by Armitage (this volume). The National Gallery Basement (West 1989) and National Portrait Gallery sites, located at the western extremes of the *Lundenwic* settlement, both show a dominance of sheep bones and a much higher proportion of chicken and geese. This contrast with the 'central' *Lundenwic* sites appears to reflect a difference in the available resources, the two National Gallery sites having greater access to sheep, domestic fowl and geese. This would be consistent with an interpretation already offered (Rackham 1994) that these western sites are associated with farms raising their own stock, but this pattern is not universal at the National Portrait Gallery and appears to be mainly associated with specific pits. For the present, until further evidence is available from other sites in this locality, this pattern is assumed to be a reflection of a more rural part of the settlement, perhaps a farmstead on the margins of the main 'urban' occupation. This has interesting implications in that it indicates access to different resources to those available in the settlement, which may reflect a lack of the control postulated by O'Connor (2001) and Saunders (2001) for the main 'wic' settlements. Alternatively it might be that the sheep were less marketable or were not acceptable as a tribute or food rent and were therefore consumed on the farmsteads where they were managed. The considerable evidence for textile manufacture noted at the Royal Opera House (Malcolm *et al* 2003, 168-170) indicates the demand for wool and sheep must have been a significant element of the agricultural economy despite their relative lack of exploitation for meat within the centre of the settlement. There are a number of ways in which this difference between the bone assemblages in the centre of the settlement and those on the periphery could be interpreted and other archaeological evidence may be pertinent to this discussion. Rielly (2003, tables 77 and 78) notes an increase in the contribution of sheep to the bone assemblages in Phase 6 at the Royal Opera House and establishing the relative chronology of the deposits across the different sites may be important before we get too involved in interpreting these differences.

The other anomalous bone assemblage is that from the Lyceum Theatre. Although overall it is similar to the assemblages from the other central *Lundenwic* sites the individual pit groups vary and the bone densities in the deposits are greater than any other assemblage from the settlement. The conclusions drawn above (Rackham and Snelling) have suggested that this debris was the waste from butchers and, perhaps, bone processing for marrow and fats. Until the reporting of the Royal Opera House this was the only evidence in *Lundenwic* for a butcher's quarter, but the recent publication of this latter site has highlighted the possibility of a butcher's shop along one of the excavated alleys (Roads 10 and 15) adjacent to Buildings 11 and 26-31 (Malcolm *et al* 2003, 161) based on the presence of bone assemblages dominated by head and foot bones. This evidence spans Periods 3, 4 and 5 suggesting some longevity for the trade at this location and associated deposits of metapodial and foot bones and horn cores suggests this shop may be linked to other trades nearby, such as tanners and horners that exploit the by-products of the meat market. Interestingly the Lyceum bone samples do not match these 'butchers' assemblages (*see* Rackham and Snelling above), but their size and character suggest processing on a fairly large scale indicative of a commercial rather than domestic context.

Initially the first few bone assemblages studied from *Lundenwic* showed a remarkable consistency with very little variation (*see* Corke *et al* 1994) and the settlement appeared to fall within the class O'Connor (2001) has remarked for the 'wic' sites around England. Namely, a low diversity of fauna, the lack of any great variation between groups, and little or no evidence for large-scale butchery. The hypothesis that these settlements were supplied by an elite through food renders and from estates was proposed to explain these features. The sites in *Lundenwic* now collectively show quite marked differences. These differences include deposits with distinct evidence for butchery and large scale processing; bone deposits with clear evidence for craft working at least at a small scale; deposits with marked variations in the proportion of species present; deposits that suggest animals may have been obtained from different sources; deposits that suggest that some stock (specifically pigs at the Lyceum) was being kept in the settlement; and sites with marked variations in the proportion of species, and not just cattle, sheep and pig, but also birds and fishes. The settlement is beginning to produce bone assemblages that have more of the character of those collected from early post-conquest towns where such a mode of supply has not been suggested.

Clearly as more excavation is undertaken in and around the *Lundenwic* settlement the picture of the character of this settlement expands. The sites discussed above, the Royal Opera House, and those under study at present at the Museum of London should afford a much clearer view of how the settlement functioned, its structure and how it was supplied with its food and manufacturing raw materials. The domestic animal bones from the sites and the birds, fishes, plant remains, and manufacturing debris that can be recovered from environmental samples afford an essential resource for tackling these questions, often the only resource. It is imperative that extensive sampling on new excavations is undertaken with appropriate subsequent processing and the samples and animal bone already collected from past excavations as yet unreported is fully studied if these questions are to be tackled effectively.

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Tatberht lived on a farmstead on the outskirts of Lundenwic between the 8th and 9th centuries, an area now occupied by the National Portrait Gallery. He was clearly a literate man since he elegantly inscribed his name into a sheep bone taken from the dinner table. Although he was largely self-sufficient, his relationship with the core settlement would have been central to his life. He would have brought in livestock on the hoof to be slaughtered and consumed within Lundenwic, as well as supplying the residents with other goods produced on his farm.

During his lifetime Tatberht would have seen first-hand the thriving and bustling settlement of Lundenwic and may even have witnessed the first Viking raids and experienced the impact this had on his and the community's livelihood.

This book introduces the results of four archaeological excavations in and around Lundenwic and presents new perspectives on Tatberht's London.

PCA

PRE-CONSTRUCT ARCHAEOLOGY

MONOGRAPH 2

The excavations were located at 28-31 James Street, the Lyceum Theatre, 21-24 Maiden Lane and the National Portrait Gallery. The book also includes a technical study of Middle Saxon fired daub together with experiments reconstructing wattle and daub.

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