7. SOIL MICROMORPHOLOGY

Clare Ellis

7.1 Introduction

Eleven kubiena samples were taken in stratigraphic succession from the west section across the Mesolithic house (Illus 6) and one further sample from an internal hearth. These samples were subject to full analysis (see site archive), the summary results of which are given below.

A series of broad research questions were formulated regarding the nature of the occupation on the site, the type of structure present and the function of these. Specifically, the objectives were to:

- determine the nature of the basal deposit (C2544), Samples 12, 11 and 9 – formation hypothesis is that the natural silt was excavated to form a sunken floor
- determine the sedimentary characteristics and mode of formation of Deposit 2573, Samples 11, 12, 9 and 8 – formation hypothesis is that this deposit is the burnt remains of some form of organic walling/covering to the house superstructure
- determine the sedimentary characteristics, mode of formation and mode of deposition of Deposit 2550, Samples 7, 6, 5, 4, 12, 13 and 14 – formation hypothesis is that these deposits are colluvial in origin
- determine the sedimentary characteristics and mode of formation of the fill of Deposit 2677, Sample 2678B – formation hypothesis is that this deposit is the remnants of an internal hearth.

7.2 Results and discussion

7.2.1 General characteristics

The basal, natural semi-disturbed sediment was a silt while all the archaeological contexts ranged from fine to coarse, poorly to moderately sorted sands. The microstructure of nearly all the contexts was generally complex, with a major element of each the result of post-depositional bioturbation and infiltration/compaction. All the matrices, except that of Sample 2678B were brown to dark reddish brown in colour, with high levels of amorphous organic matter and extensive masking of the fine mineral and clay content by iron oxides (various types). The matrix of Sample 2678B was black, being dominated by disseminated charcoal.

The mineralogy of all the sample contexts is very similar, being derived from drift deposits with a mixed lithology including sedimentary rocks (sandstones, siltstones, cementstones/limestones, cherts), metamorphic rocks (quartzites) and igneous rocks (mainly basic volcanics). All the rock fragments are well rounded and range in size from coarse sand to gravel, set within silt to coarse sand.

Amorphous organic matter occurred within the matrix material of all the sampled contexts, with the highest content occurring in Samples 4, 5 and 2678B. Wood charcoal was very rare and charred hazelnut shells were few in occurrence. All the larger charcoal fragments had been rounded by physical attrition, presumably caused by the reworking of the deposits and ingestion of smaller fragments by soil biota, but it is possible that there may have been some aeolian erosion of these immediately after the abandonment of the structure. Disseminated charcoal occurs within the matrix of all of the contexts but is particularly concentrated in C2573 and the various elements of C2550. Surprisingly, biogenic silica is extremely rare in all the contexts.

All the contexts have been subject to post-depositional bioturbation, which has totally or partially destroyed the original sediment fabric; the lower fills tend to exhibit less physical disturbance than the upper ones. In addition, all the contexts have been affected by translocation, where rainwater has penetrated the deposits, carrying with it locally eroded clay and soluble iron resulting in limpid and occasionally dusty clay coatings/infillings in nearly all the contexts and are particularly associated with roots, soil biota channels and densities of organic matter. The crescentic shape of many of the infillings is a good indication of sedimentation relating to gravity (Courty et al 1989). The clay and silt translocation was probably caused by seasonal disturbance of the soil surface through cultivation. However, the completeness of many of these coatings indicates that these were formed after most of the bioturbation had occurred and are therefore likely to be a consequence of recent land-use history rather than ancient cultivation.

7.2.2 Basal Deposit 2544

Basal Deposit 2544 comprises a compact, fine sand with a silt matrix, much of which is masked by iron oxides; the prevalence of iron oxide is thought to be largely inherited from the nearby Old Red Sandstone bedrock, although the sediments may have been subject to limited and seasonal rubefaction (Courty et al 1989). This unit has been subject to episodes of wetting and drying, which has resulted in the gradual accumulation of iron oxides but also accounts for the slight alteration and compaction of the fabric. The boundary between this unit and the overlying destruction deposit (C2573) is indistinct and this seems largely due to post-depositional bioturbation. Although it cannot be stated categorically that the basal fine sand was partially removed and remodelled prior to the construction of the Mesolithic house, the cumulative micromorpological evidence, comprising an irregular line of rounded rock fragments, a horizontal line of voids and a dramatic colour change in the matrix, does intimate a deliberate cut. Furthermore, the physical disturbance of Deposit 2544 by soil biota and the presence of amorphous organic matter, including minuscule charcoal fragments, would probably not have been so pronounced if the sediment had not been disturbed during house construction. Compaction of the deposit has occurred post-depositionally; a component of the compaction is likely to be a consequence of pore-water movement but it is also likely to be the result of trampling within the house.

7.2.3 Occupation Deposit 2573

Around the edge of the house was an overlying deposit (C2573). This comprises a poorly sorted medium sand which has been much disturbed by post-depositional bioturbation and the later effects of pore-water movement and illuviation; the latter may be a consequence of more recent cultivation, although there are many broken clay coatings in one sample. However, traces of the original fabric appear to survive in Sample 12, in which many of the rock fragments, mineral grains and hazelnut shell exhibited a dip of approximately 35° in one direction. This preferred orientation could have been brought about if the deposit accumulated on a slope, for example, or if the material was gradually dumped up against a barrier or into a hollow. This unit has a silt matrix which is largely masked by iron oxides and amorphous organic matter. It is unclear whether all the amorphous organic matter is charred because it is extremely decomposed and also masked from view by iron oxide impregnation. Given the depth of burial of this deposit and the undisturbed nature of the majority of clay coatings it is probable that much of the bioturbation took place prior to its burial, although some was observed during excavation.

Disseminated charcoal occurs frequently within this silt, and because of its density and even distribution is interpreted as the remnants of ash. The source of the charcoal cannot be positively identified, but is likely to be a combination of hazelnut shell and highly weathered wood charcoal; the general lack of biogenic silica, which is often the only surviving portion of ash, is a strong indication that grasses were not utilised. The few to frequent larger fragments of charcoal are predominantly burnt hazelnut shell, with a minority appearing to be wood charcoal. There is no micromorphological evidence for burnt turf, burnt soil clasts, burnt mud or a mud/grass type mixture, which could be expected to survive in some form if this destruction layer was the remnants of a turf wall or a 'wattle and daub' type wall construction. One minute piece of possible peat and one small fragment of clay were observed, but these had not been burnt. There are two plausible explanations for the occurrence of burnt hazelnut shells in this deposit. The first is that the lack of wood charcoal, relatively high mineral content of the deposits, frequent disseminated charcoal and extremely decomposed nature of the organic matter is indicative of the remnants of ash midden (domestic refuse) in which burnt hazelnut was an everyday addition. The second is that the unit is the collapsed burnt remnants of the house, ie a destruction horizon, in which post-depositional pore-water movement has all but destroyed the soft wood charcoal, leaving only minuscule particles within the matrix. However, the harder hazelnut shell had a greater survival ratio, its presence in the deposit perhaps explained if these were stored in bags suspended from the wooden superstructure of the house. It is also plausible that the deposit is actually comprised of domestic refuse piled immediately on the exterior of the house structure which was subsequently destroyed by fire.

7.2.4 House infill Deposit 2550

The centre of the house hollow is infilled by a silty sand (C2550) with a large grit-sized component; the unit has been subject to intensive bioturbation, which has imparted a granular fabric. The organic content is similar to, but of less density than, that observed in Deposit 2573, with burnt hazelnut shell accounting for the larger charcoal fraction and frequent disseminated charcoal dispersed within the matrix. The large rock fragments (0.5cm to 1.5cm) show no preferred orientation and mirror the unstructured nature of the finer material; consequently, it is not possible to identify the mode of deposition of this unit. However, the relatively high proportion of anthropic material is unlikely to be derived solely from the underlying deposit, rather it probably formed an integral part of the deposit prior to deposition. Interestingly, all the clay coatings in this context had been disturbed and fragmented but are not so in the overlying deposits, indicative perhaps of an earlier phase of post-depositional bioturbation.

7.2.5 Colluvial deposits

Overlying Deposit 2573 was the primary post-abandonment deposit (C2550), which comprised silt with a mixed lithology of rock fragments, burnt hazelnut fragments and charcoal; these were interpreted in the field as colluvial deposits. In thin section the individual contexts identified during excavation were not readily distinguishable. These deposits have been subject to pedogenic processes, including extensive bioturbation that has largely reworked their original fabrics, imparting a channel to granular microstructure; the degree of bioturbation increases towards the top of the unit. Unfortunately, the intensity of bioturbation has prevented distinguishing the mode of formation of these deposits. Like Deposit 2573, these layers have been subject to post-depositional illuviation, resulting in the accumulation of clay coatings rich in iron oxides. In addition, pore-water movement resulted in probable replacement of a small bone fragment by microquartz. The similarity in composition between Deposit 2573 and the overlying deposits fosters two possible explanations. Firstly, the charcoal and hazelnut shell were gradually incorporated by the activities of soil biota after the deposits had entered into the extended hollow, or secondly, the deposits already contained these anthropic elements, the latter having been incorporated from some form of remnant midden material located outwith, but very local to the house. The latter explanation is the preferred one, especially as Samples 5 and 4, located on the southern side of the house, exhibited zones partially rich in charred hazelnut shells and disseminated charcoal, which appears identical in nature to Deposit 2573.

7.2.6 Burnt Deposit 2678

Feature 2677 was an irregular scoop with a coarse sand to fine gravel fill (Deposit 2678) rich in charcoal dominating the upper two thirds of the slide. The lower third of the slide appears to be the remnants of substrate (compacted floor?) directly upon which a fire was burnt. Despite its disseminated nature, the high charcoal content of the matrix distinguishes it from all the other deposits from East Barns which have been subject to micromorphological examination. This disseminated charcoal cannot be identified to a specific source, although the clear lack of biogenic silica may indicate that the major source was wood as opposed to peat or turf. The larger surviving charcoal fragments all comprise hazelnut shell, which has been affected by the activities of soil biota, as have all the smaller organic components of the deposit. Biological activity was concentrated in the upper two thirds of the slide, presumably because of the higher organic content of the ash. The survival of charcoal and a few fragments of burnt bone are interpreted as the remnants of a low-temperature fire, such as would be used for cooking and grilling. The presence of charred hazelnut shell may be explained by either their deliberate roasting or perhaps spent shells were discarded in the domestic fire. The concentration of clay coatings in the upper portion of the slide is indicative of post-depositional weathering in ash rich in potassium, because the latter encourages local clay movement (Courty et al 1989: 113).

7.3 Summary conclusions

1. The basal silt is natural in origin (presumably fluvial/glacial), although it has

been mixed with elements of the overlying contexts by the activities of soil biota.

2. The basal silt appears to have been deliberately truncated prior to the accumulation of the overlying contexts.
3. The formation processes of Deposit 2573 are unclear, although its composition (including poorly to moderately sorted sand-sized mineral matter, amorphous organic matter, disseminated charcoal, rare wood charcoal and a few charred hazelnut shells) is indicative of domestic refuse, rather than being solely derived from the construction timbers and any roofing material.
4. There is no micromorphological evidence in the samples of Deposit 2573 for a turf or wattle and daub type wall.
5. The house infill Deposit 2550 is very similar in composition to Deposit 2573, and elements of its composition are thought to be derived from domestic refuse. Unfortunately, extensive bioturbation prevents identification of its mode of deposition.
6. The overlying deposit (2550) is interpreted as in situ patches and spreads of mixed midden and natural material, the former so similar in character to Deposit 2573 that it is assumed to be derived from much earlier deposits associated with the occupation of the main structure.
7. The fill of an internal scoop (Deposit 2677) is interpreted as in situ mixed ash from low-temperature burning such as would be necessary for cooking.