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The excavation of Neolithic, Bronze Age and Early Historic features near Ratho, Edinburgh

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ABSTRACT

Excavations near Ratho in early summer 1993 yielded evidence for Neolithic, Bronze Age and Early Historic activity on the site. Neolithic features consisted of a small number of pits containing fragments of carinated bowls; the Bronze Age funerary remains were more extensive, including a ring-ditch which enclosed two cremations in cordoned urns, and one unurned cremation. There were also additional dispersed cists and pits containing burnt bone, and a number of truncated features of uncertain date. The remains attributed to the Early Historic period consisted of a two-phase palisade alignment enclosing a small sunken-featured building which contained a large number of clay loomweights, with the possible addition of two rectilinear post-in-trench buildings.

INTRODUCTION

The village of Ratho (illus 1) lies in undulating countryside, approximately 10 km west of the centre of Edinburgh. The area is pockmarked with numerous small and some very large quarries, exploiting the dolerite bedrock, which, although of little use for building, is utilized as road hardcore. The area of excavation was sited immediately to the north of the disused 19th-century Ratho Quarry, to the north-west of the village (illus 2). The site occupied a hollow on the side of a low, rounded hill, at roughly 105 m above OD, and was bounded on the north and west by a crest of outcropping bedrock. From this elevation there are commanding views to the north and west across the Almond floodplain to the Firth of Forth, and to the east back to Edinburgh, where the Castle Rock is clearly visible.

The site lay within the construction corridor of the M8 extension, directly on the line of a slip road linking the new section of the M8 to the M9. An archaeological evaluation of the whole corridor, funded by the Roads Directorate of the Scottish Office Industry Department and managed by Historic Scotland, was carried out by Glasgow University Archaeological Research Division. Trial trenching on the site at Ratho as part of this evaluation revealed two urned cremations and a number of other putative features; after evaluation the contract for full excavation of the site was won by AOC (Scotland) Ltd.

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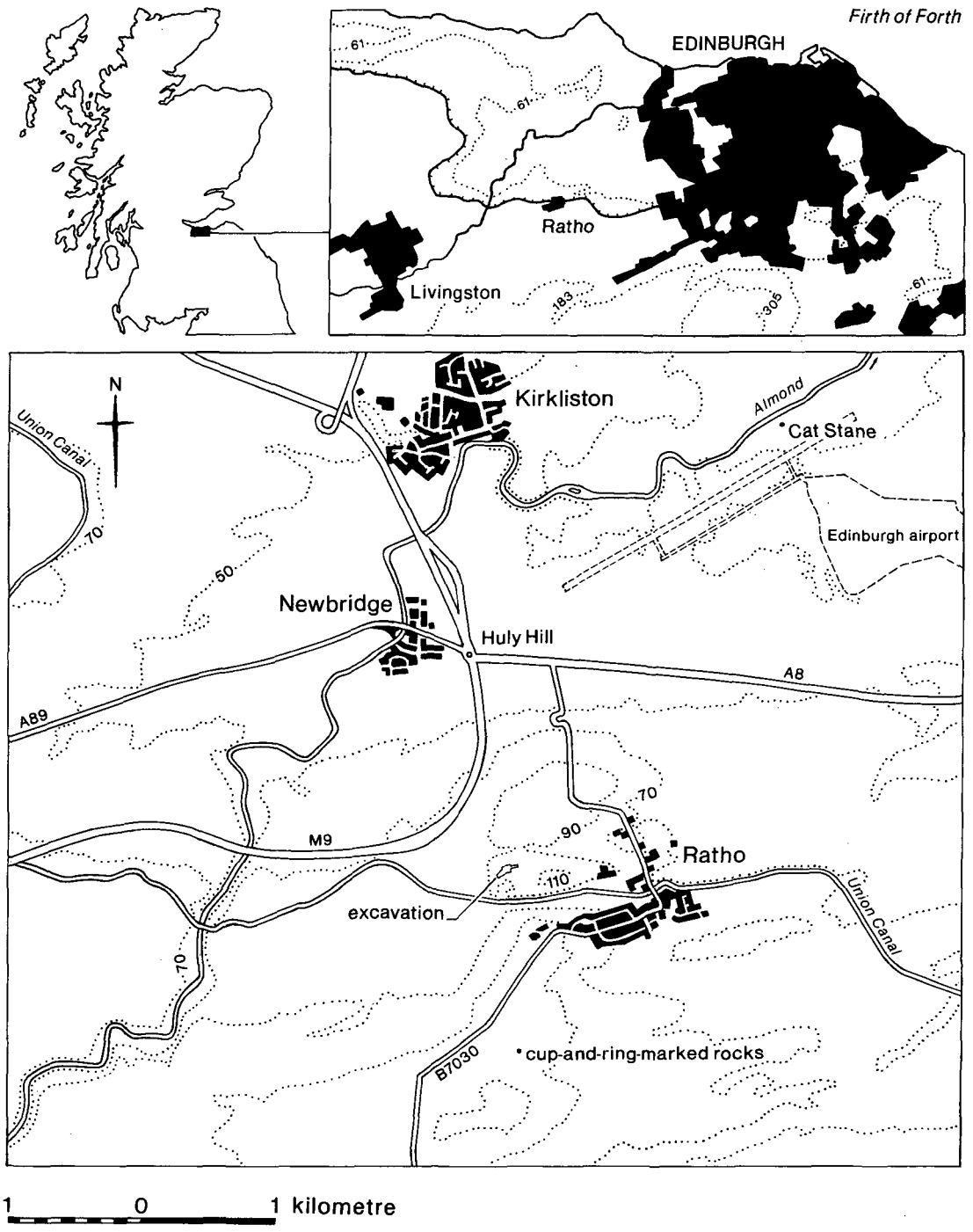
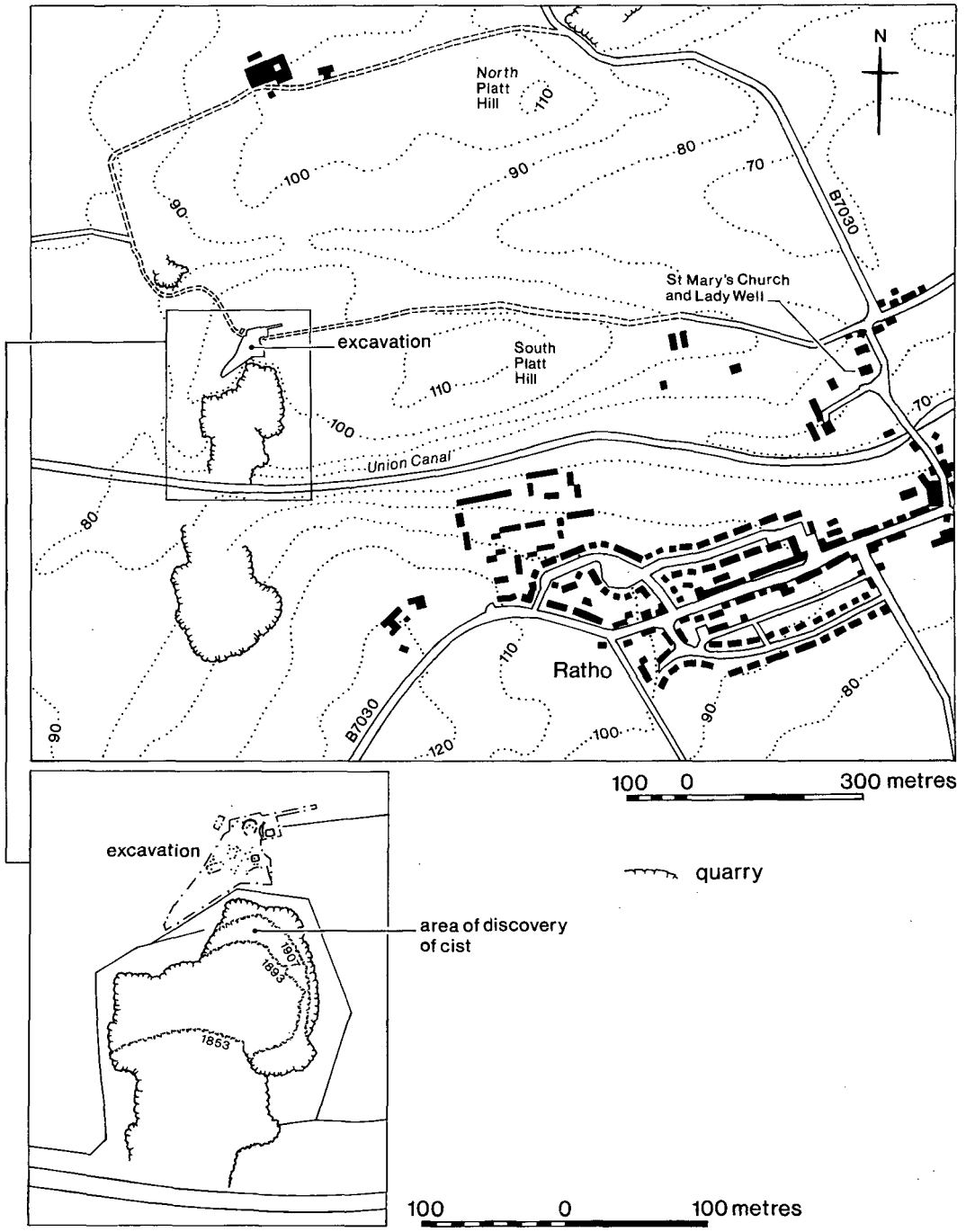


ILLUS 1 Site location (*Based upon the Ordnance Survey map © Crown Copyright*)



ILLUS 2 Site and environs, showing approximate position of cist found in 1897 (*Based upon the Ordnance Survey map © Crown Copyright*)

PREVIOUS ARCHAEOLOGICAL FINDS IN THE AREA OF THE SITE

Cist found in 1897

At Ratho Quarry, in late November 1897, workmen stripping soil 'from the top of the quarry' came across a flat stone with a cavity below it. The Society of Antiquaries of Scotland was informed, and the then Assistant Keeper of the Museum, F R Coles, visited the site and excavated the cist. The position of the cist is described (Coles 1898) as being at the highest point of the crown of the north quarry, and, although the area has since been quarried away, comparison of the advancing edge of the quarry on successive Ordnance Survey maps has narrowed down the area within which the cist must have lain (illus 2).

An unusual feature of this cist is that it seems to have been buried very deeply; the account describes a covering of soil and hard brown till to a depth of 6ft 2in (1.9 m) over the uppermost stone, and later it is noted that the bottom of the grave was 4ft 6in (1.3 m) below the surface of the till and 7ft 10in (2.4 m) below the surface of the ground.

The cist had been partly excavated into the 'rotten' bedrock and had contained the bones of at least two individuals. Although the bones were in very poor condition, the remains of one skull could be seen at the north end of the cist, with a leg bone under the central cross slab indicating possibly one flexed inhumation, and a second skull and bone fragments were packed in at the south-eastern corner. No pottery or other grave goods were recorded, although one of the smaller stones supporting the southern covering slab was found to have cup-markings. The cist was covered by two large slabs, with a third large central cross-piece on which the southern slab rested.

South Platt Hill

The National Monuments Record for Scotland records a destroyed site known as South Platt Hill in Ratho parish (NT 17 SW 32). South Platt Hill is no longer marked on maps as such, but the name is still in currency locally, and early maps of Midlothian (RHP 10329) show that it can be identified as the flat-topped hill on whose western shoulder the excavation was located (illus 2). The references to this site are principally contained in various editions of the *Statistical Account* (Sinclair 1793, 264), the *New Statistical Account*, and Chalmers' *Caledonia* (1889, 568), all of which refer to this site as an ancient encampment, generally comparing it with Kaimes Hill and Dalmahoy in the south of Ratho parish. The *New Statistical Account* (1845, 77, 90) describes the hill as being 'a few minutes' walk from the manse', and gives the text of a letter which is worth reproducing here in full:

> The South Platt hill is the site of an ancient encampment. The remains of it were to be seen about thirty years ago, when the ground was turned up, and the stones appropriated for building the present fences upon the Ratho Hall property. The camp, as described in a letter by George Reid, Esq. at that time proprietor of the grounds of which it formed a part, occupied about an acre of ground on the summit of the eminence, and was surrounded with a ditch and rampart, formed with large stones, mixed with black earth. There were also two circular enclosures, one on the east, and one on the west side of the main camp, of from 30 to 40 feet diameter, surrounded in like manner with a rampart of large blocks and black earth, and paved in the area with flags of freestone, which last must have been brought from a distance.
>
> On the removal of the rubbish, the bones of some persons of large dimensions were discovered, all of which were enclosed in coffins formed with flags of freestone. One of these stones now forms a seat on the top of the hill, at the corner of the wood. Some large beads of a blue and yellow colour also were discovered; none of which is known to have been preserved.

The implications of these accounts are discussed in more detail below.

Other known archaeological sites in the vicinity

On North Platt Hill, immediately to the north of the site, is a cropmark site consisting of two concentric ditches, apparently encircling the summit of the hill. This has been identified as a fort in the NMRS (NT 17 SW 92). An Early Bronze Age flat axe is recorded as having been found during quarrying on North Platt Hill in 1796 (NT 17 SW 17).

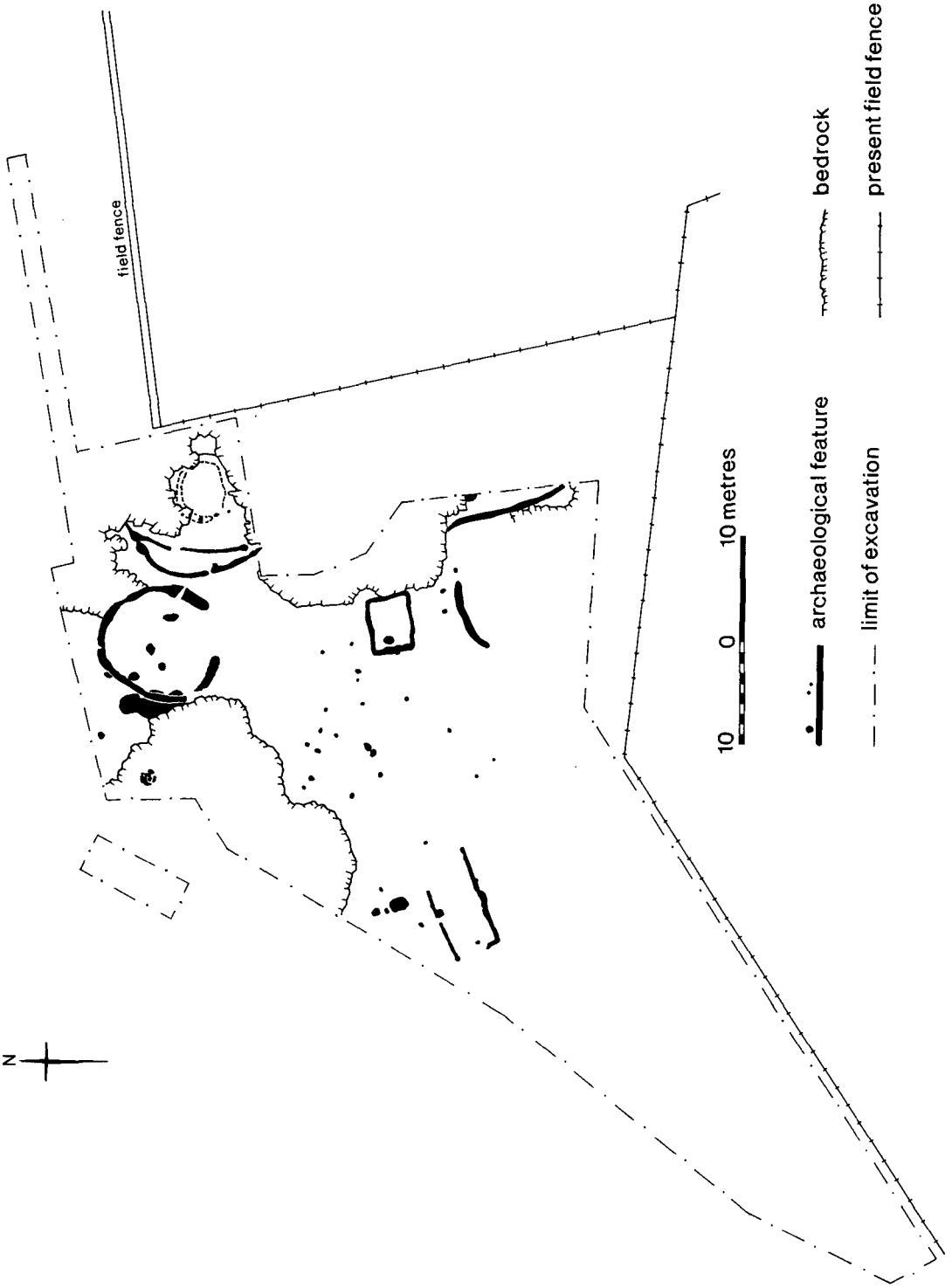
There are also a number of ceremonial and funerary sites of different periods in the surrounding area (illus 1), including cup-and-ring-marked rocks to the south of the site, the round cairn and standing stones at Huly Hill, and the Early Christian Catstane and associated long-cist cemetery to the north.

OBJECTIVES AND TECHNIQUES

The excavation of Bronze Age burials in Scotland has all too often had to be a spot salvage operation, after a good portion of the surrounding area has already been quarried or ploughed away. This site offered a rare opportunity to explore not only the burials and the enclosing ditch, but also a large area around them, within the natural boundary afforded by the level plateau surrounded by the rising bedrock crests. Given the current state of knowledge of the environs of Bronze Age burial monuments, their inter- and intra-site disposition, the small size of some of their components (cremation burials, cists, hearths, post-holes and pits), and the possibility that multiple foci might be present, it was decided that trial-trenching would be ineffective in recovering useful information unless carried out at impossibly close intervals. Geophysical prospection techniques would have been unhelpful; the most obvious option – use of a magnetic susceptibility coil – would have proved ineffective because of the highly magnetic dolerite bedrock. Magnetometry has been successful in revealing large-scale, deep features such as defensive ditches and ramparts against this level of magnetic background noise (A Aspinall, pers comm), but the type and pattern of features expected to occur on this site would have had little chance of detection. Complete topsoil removal of the area within the hollow was therefore recommended to be the most cost-effective and archaeologically sound method of examining this site.

Machine stripping of topsoil was carried out over the area defined by the bedrock crests, with an eastward extension and an additional trench cut at the point where there appeared to be a break in the line of the bedrock crest (illus 3). The extent of excavation was restricted to the north by the presence of the protected Scottish Wildlife Trust Great Crested Newt Sanctuary.

The soil was found to be highly variable in depth, ranging from a thin covering of turf over bedrock at the edges of the hollow, to 0.5–0.7 m deep along the southern perimeter of the site. The soil boundaries generally were very diffuse, and a high level of biological activity was noted throughout the soil, with worm holes extending into the subsoil, and numerous live worms observed throughout all levels of the soil. The C horizon is a glacial till, a heterogenous mottled sandy silt, with outcrops of dolerite bedrock which in some places was highly decayed and gravel-like on the surface. Ploughing over most parts of the site was evidenced by the presence of modern china, glass and oyster shell throughout the A and B horizons, and plough scratches were noted on some intact boulders. The site had been under pasture for several decades at the time of excavation, but parts of it at least had been cultivated during the Second World War (Mr Fleming Snr, pers comm). Routine soil analyses indicated a pH of sediments within the range 5.0–7.0, neutral to weakly acidic values to be expected in soils of the Darleith series (Dr S Carter, pers comm), in which, it should be noted, unburnt bone would not survive for long periods. Loss-on-ignition values were uniformly low. All sediments could be described as mineral rather than humic or organic, and all samples were found to be non-calcareous.



ILLUS 3 Plan showing all excavated features

EXCAVATION RESULTS

NEOLITHIC ACTIVITY (Illus 4 & 5)

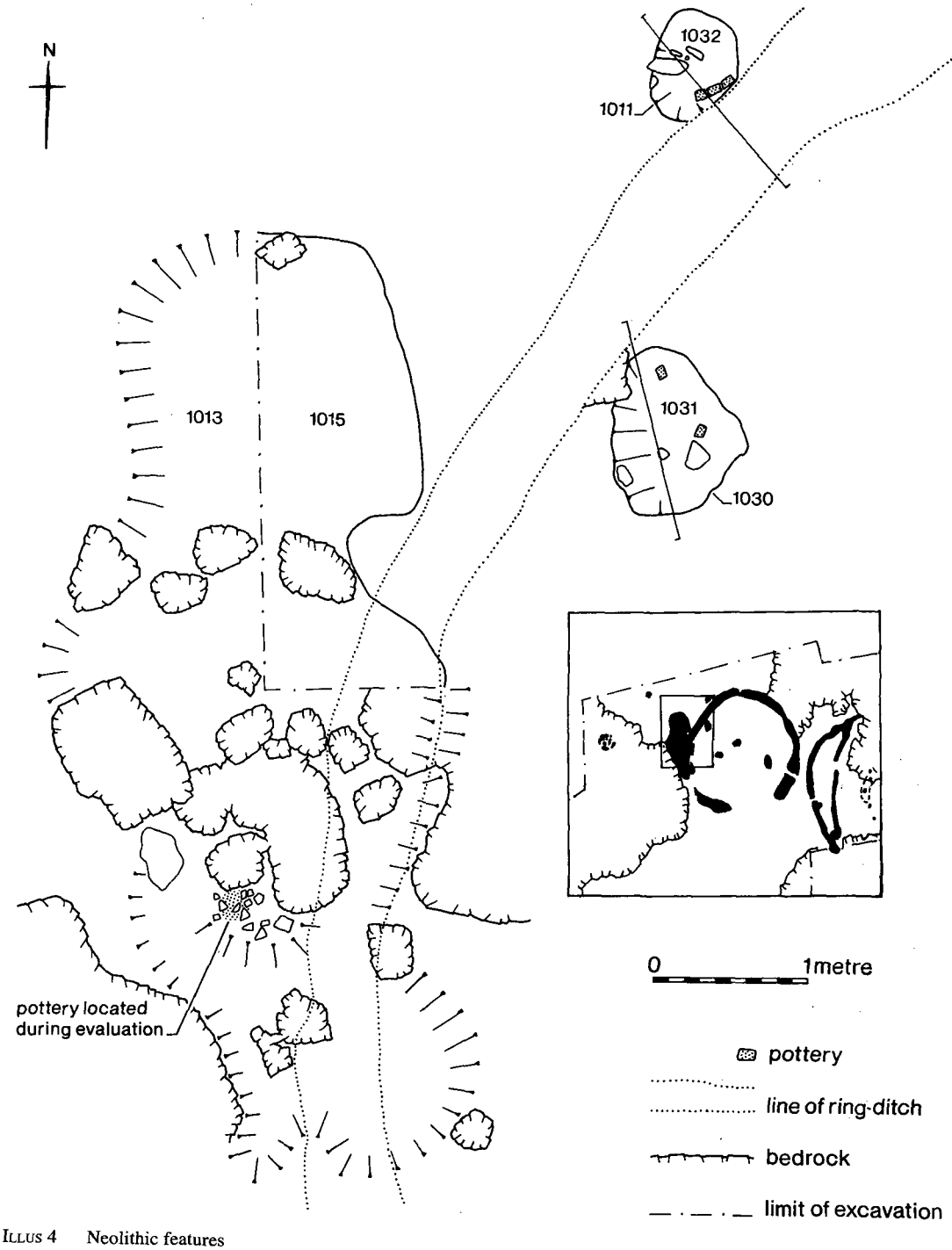
Pits with pottery

The evidence for a Neolithic presence at Ratho consists of two pits (1011 & 1030) and one putative feature, all sited close together. The later ring-ditch (1000) enclosing the burial area clipped the edge of pit 1011 and at this truncated level included pit 1030 within the enclosed area. However, if both features are reconstructed it is likely that the upper level of 1030 would also have been cut by the ring-ditch. Feature 1011 was a truncated subcircular pit, with a fill (1032) of dark brown friable silt loam, which contained three pottery body sherds similar to those from 1031 (see below). The second pit (1030) was an irregular ovoid pit, with a fill of brown friable silty loam (1031), similar to 1032, but in which there was a discrete charcoal-rich lens. The fill contained pottery, and a pitchstone medial blade fragment (illus 6: 1031). The pottery consisted of sherds from the rim and body of what was probably an open-necked, round-based bowl, 200 mm in diameter at the rim, possibly with a shoulder (illus 6: 1006 & 1086). The fabric is sandy clay tempered with approximately 20% rock fragments (alkali basalt or dolerite: D Dixon, pers comm) and has fired grey with red margins. A second body sherd from this context is very similar in fabric and colour, but may be from a different vessel. It is from the shoulder or carination of a vessel and has a circular stab mark. An unstratified sherd from the carination of a vessel has been decorated in a similar manner, using a grass stem (illus 6: 1001).

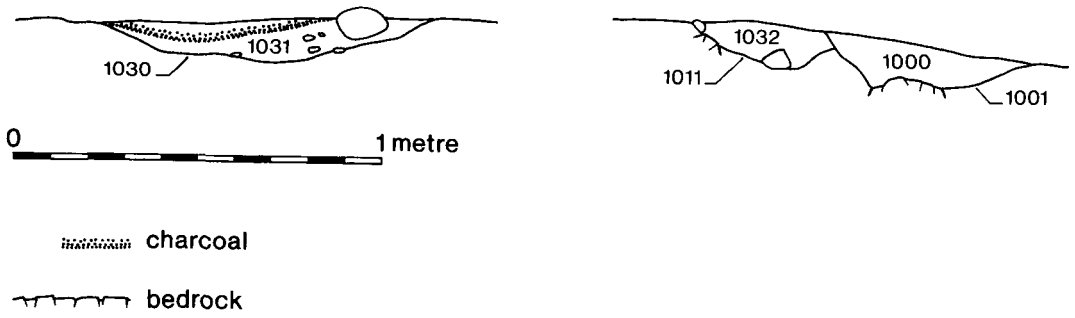
Over 13 g of charcoal was recovered from sieving of the fill (1031), some identified as hazel (*Corylus avellana*), but not submitted for dating on grounds of taphonomic insecurity. A small number of charred cereal grains were also found (discussed in Appendix 1), including one grain of wheat (*Triticum cf aestivo-compactum*).

There are indications that there may have been another feature of a similar nature in the area immediately to the west of the ring-ditch. A large irregular feature had been half-excavated during the trial-trenching by GUARD, from which pottery was recovered and charcoal-rich areas reported. The remainder of this feature and its fill was then excavated by AOC (Scotland) Ltd and 100% sampled, rendering in effect a 50% sample of the feature fill. The feature was 6 m long and between 1.7 and 2.4 m wide, but its edges were not convincing; the 'cut' was very irregular, with numerous small convoluted holes and channels piercing into the gravelly substrate and even into bedrock, indicative of root activity. The relationship of this feature to the ring-ditch was difficult to establish as the distinct pinky-red fill of the ditch was present patchily at the edges of the feature, but obliterated in the main part. The fill of the feature (1015), removed by AOC (Scotland) Ltd, consisted of a grey-brown loam similar to the topsoil, in which an iron nail was found. The feature was therefore interpreted as a hole left after the removal of a group of small trees or shrubs, whose position, immediately to the north of a 19th-century field-wall, may indicate that it was a relatively recent feature.

However, there were still some indications that another feature may have been disturbed by the tree-hole. The pottery recovered from it, although severely abraded, represented seven vessels, including three different rim types: a rolled rim (illus 6: 1086), a flat rim decorated along the lip (but too abraded to determine the method or nature of the decoration), and a rim with an internal bevel. The other vessels are represented by one, two or three body sherds. In all cases the fabric is similar to the sherds recovered from 1031 and 1032. Only a trace amount of charcoal was recovered from the fill removed by AOC (Scotland) Ltd and from the two bags of soil provided by GUARD, but there was a small amount of charred plant material, fuel ash slag (3 g) and burnt bone (4 g). The charred plant material is discussed in Appendix 1, as there are problems of possible contamination by later material. A high phosphate reading from this feature, although subject to possible later contamination, could be an indication of the former presence of bone or of other organic refuse rich in phosphate (Dr S Carter, pers comm). This variety of material, particularly with pottery present, was atypical of most of the site, and even of the ring-ditch fill. It is therefore suggested that there had been another pit similar to 1011 and 1030 in this area, which had been largely obliterated by the tree-hole.



ILLUS 4 Neolithic features



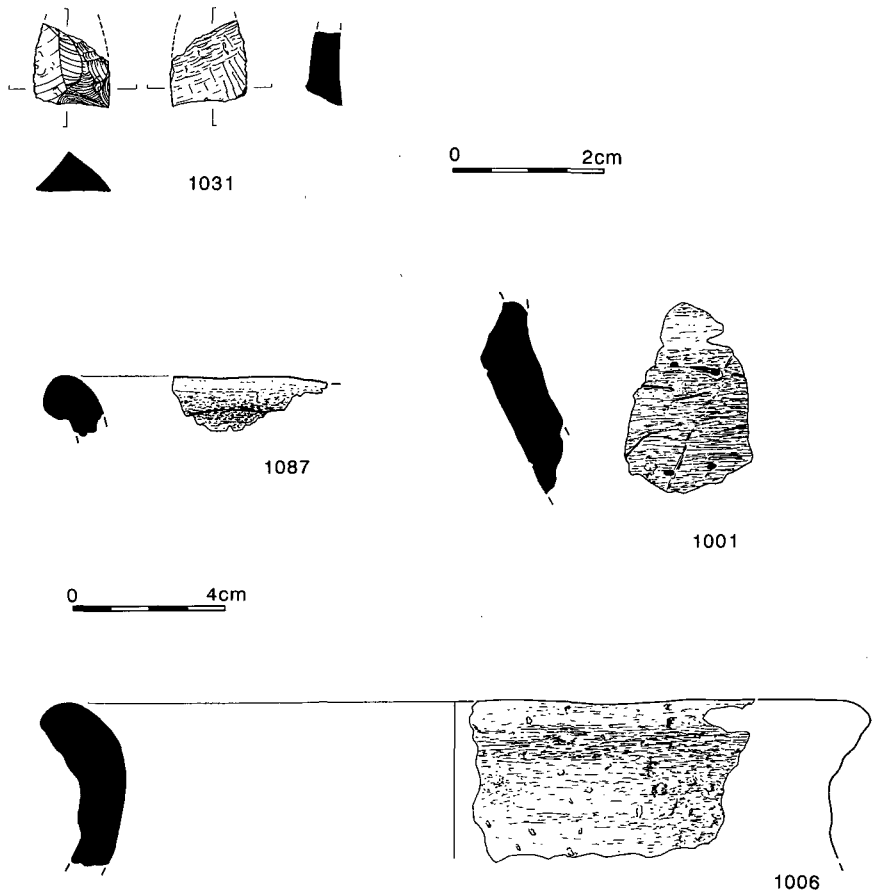
ILLUS 5 Sections of features 1030, 1011, 1000

Pottery (Ann MacSween) The Ratho Neolithic pottery (illus 6) belongs to the early Neolithic Grimston/Lyles Hill tradition as defined by Smith (1974; see also Henshall 1984, 61–2). Dated Grimston/Lyles Hill assemblages from Scotland include that from the earliest occupation at Machrie Moor, Arran (Haggarty 1991, 57), and from the Neolithic burial mound at Boghead, Moray (Henshall 1984). Parallels for the rim forms represented at Ratho can be found in both assemblages (Haggarty 1991, 59–60, illus 3 & 4; Henshall 1984, 63 & 65, illus 10 & 11). Charcoal from Phase 1 features at Machrie Moor containing Grimston/Lyles Hill ware produced dates of 3820±50 BP (GU-2321) and 4500±70 BP (GU-2320), while the Boghead pottery was radiocarbon dated to the early third millennium BC uncal (Burl 1984, 71). A smaller assemblage from a pit at Newton, Islay, was dated to 4965±60 BP (GU-1952) (McCullagh 1989).

Pitchstone (Nyree Finlay) The pitchstone from F1030 (illus 6:1031) has been macroscopically identified as Arran pitchstone, with phenocrysts visible within a green, glassy matrix. It is a medial blade fragment, with an area of steep retouch or edge damage across the truncated distal end. Surface finds of Arran pitchstone are known from other localities in Lothian at West Linton and Dirleton (Williams-Thorpe & Thorpe 1984, 7). The association of this stratified find with Neolithic pottery has parallels at Balfarg Riding School in Fife (Barclay & Russell-White 1993), and a number of other sites, predominantly chambered cairns, where pitchstone forms a small component of the assemblage (Williams-Thorpe & Thorpe 1984, 7).

INTERPRETATION

Interpretation of activity represented by only two severely truncated and one (or more?) almost destroyed features is necessarily limited. There is no indication of the original shape or depth of the features, and there is every likelihood that other archaeological remains have been lost which may have been associated with them. However, a comparison may be drawn between the Ratho pits and Feature 3 at Newton, Islay (McCullagh 1989, 27–8, Fig 5). Although the Ratho pits had been plough-truncated almost to destruction, they were first noted on site because of the presence of pottery sherds laid flat in the centre of the fills, and one of the pits (1030) had a discrete lens of charcoal towards one side. The Newton pit was bell-shaped, 1 m across and 0.8 m deep, and had sherds of pottery forming an irregular pavement on the dished surface within the pit. The fill also contained several dished charcoal layers. This feature was interpreted as having been used as a hearth, backfilled and reused a number of times within a relatively short period. It is proposed that the Ratho pits may represent the remains of a similar type of feature.

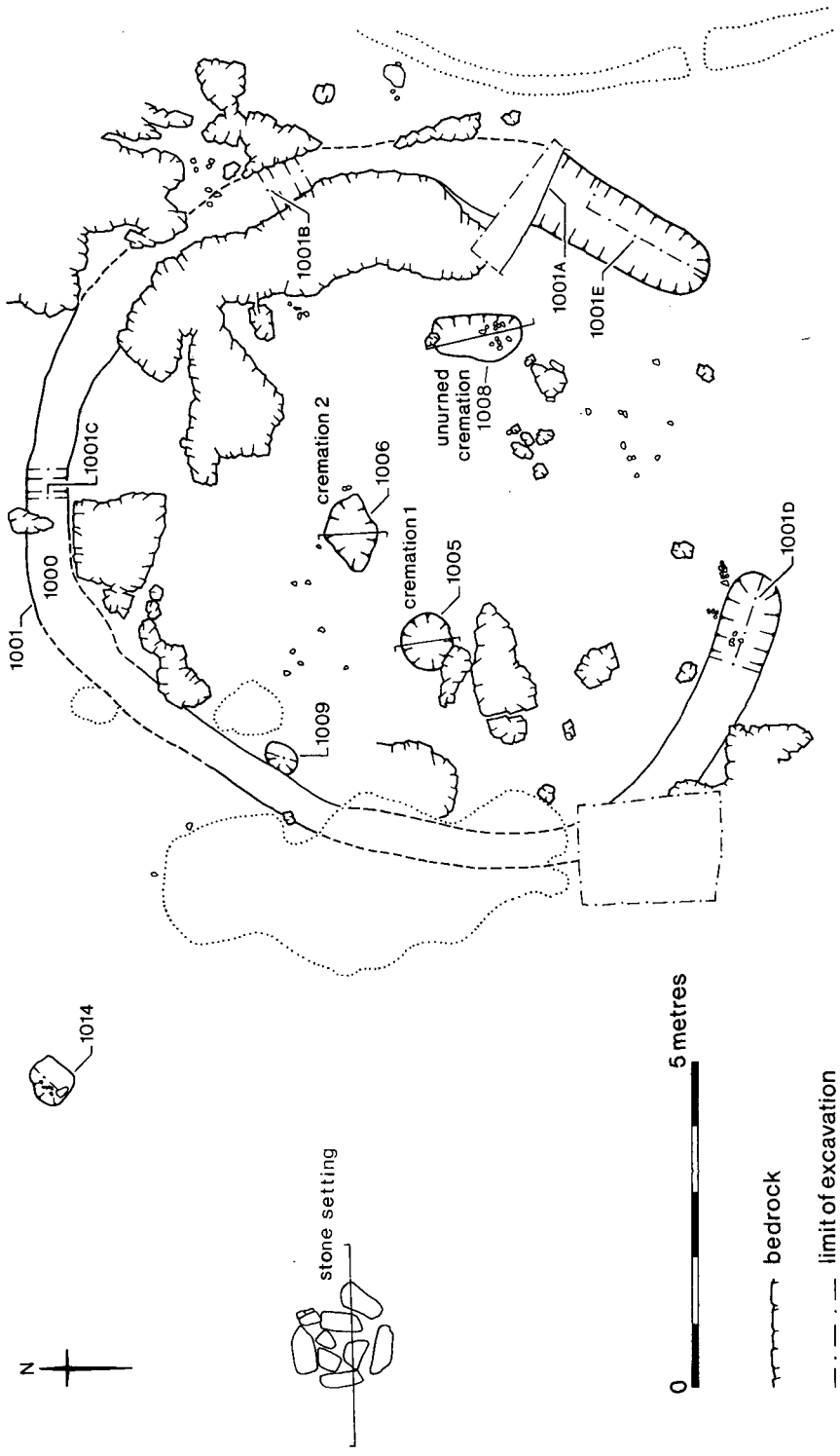


ILLUS 6 Neolithic artefacts: pottery and pitchstone

THE CORDONED URN CREMATION CEMETERY

The ring-ditch (illus 7)

The ring-ditch varied from 9.2 m to 10.6 m in diameter, with an entrance 4.4 m wide facing slightly east of south. The irregularities in the course of the ditch appear to have been caused by the difficulties of cutting into the outcropping bedrock, and where the ditch runs across rock it is narrower and shallower (W 0.5 m; D 0.2 m) than in areas of till, such as at the terminals (W 1.1 m; D 0.8 m). The ditch (1000) was sectioned at five points around the circuit, and the terminals were both sectioned longitudinally before being emptied completely (illus 7, A–E). The fill (1001) was sieved for artefacts; two flints were found close together in the western terminal (illus 9), but no other material was recovered from the other terminal or the section fills. Baulks had been left standing across the ditch in the hope that any form of internal or external earthen bank or mound might be detected, but it soon became apparent that the soil had been so well mixed and worked that there was no possibility of this, and the baulks were reduced in size. The fill (1001) of the ring-ditch was an homogenous reddish-brown silt loam, with no variation vertically or horizontally. Trace amounts of charcoal and carbonized plant material (two grains of bread/club wheat, see Appendix 1) were recovered from residue sorting, along with bone and slag, but in



ILLUS 7 Ring-ditch and associated features, with Neolithic features shown in dotted line

virtually microscopic quantities. This general absence of artefactual material in other parts of the ditch makes the presence of the two flints in the western terminal unusual, and possibly indicates deliberate deposition, in which case the traditional identification of one of the pieces as a strike-a-light (see below) is thought-provoking.

Within the area enclosed by the ring-ditch there was a total of five features, one of which (1030) has been attributed to an earlier phase (illus 4). A shallow scoop (1009) was sited close to 1030 on the inner edge of the ring-ditch. Feature 1009 and the ring-ditch are so close together at this truncated level that one must have cut the other; it is impossible now to tell whether 1009 pre- or post-dates the ring-ditch. The fill (1016) contained trace quantities (<1g) of charcoal, carbonized plant remains (including two oat grains, see Appendix 1), burnt bone and slag. The remaining three features consisted of one unurned and two urned cremations. The unurned cremation (Cremation 3) lay closest to the entrance on the right-hand side of someone entering the enclosure; Cremation 2 was sited furthest away but straight ahead; and Cremation 1 on the left-hand side, 2 m south-west of Cremation 2.

Flint artefacts (Nyree Finlay) Two flint blades were recovered from the western terminal of the ring-ditch, in close proximity to each other. One is an unretouched blade (illus 9, no 1003), the other is a retouched piece (illus 9, no 1004), conventionally classified as a rod (Saville 1981, 10).

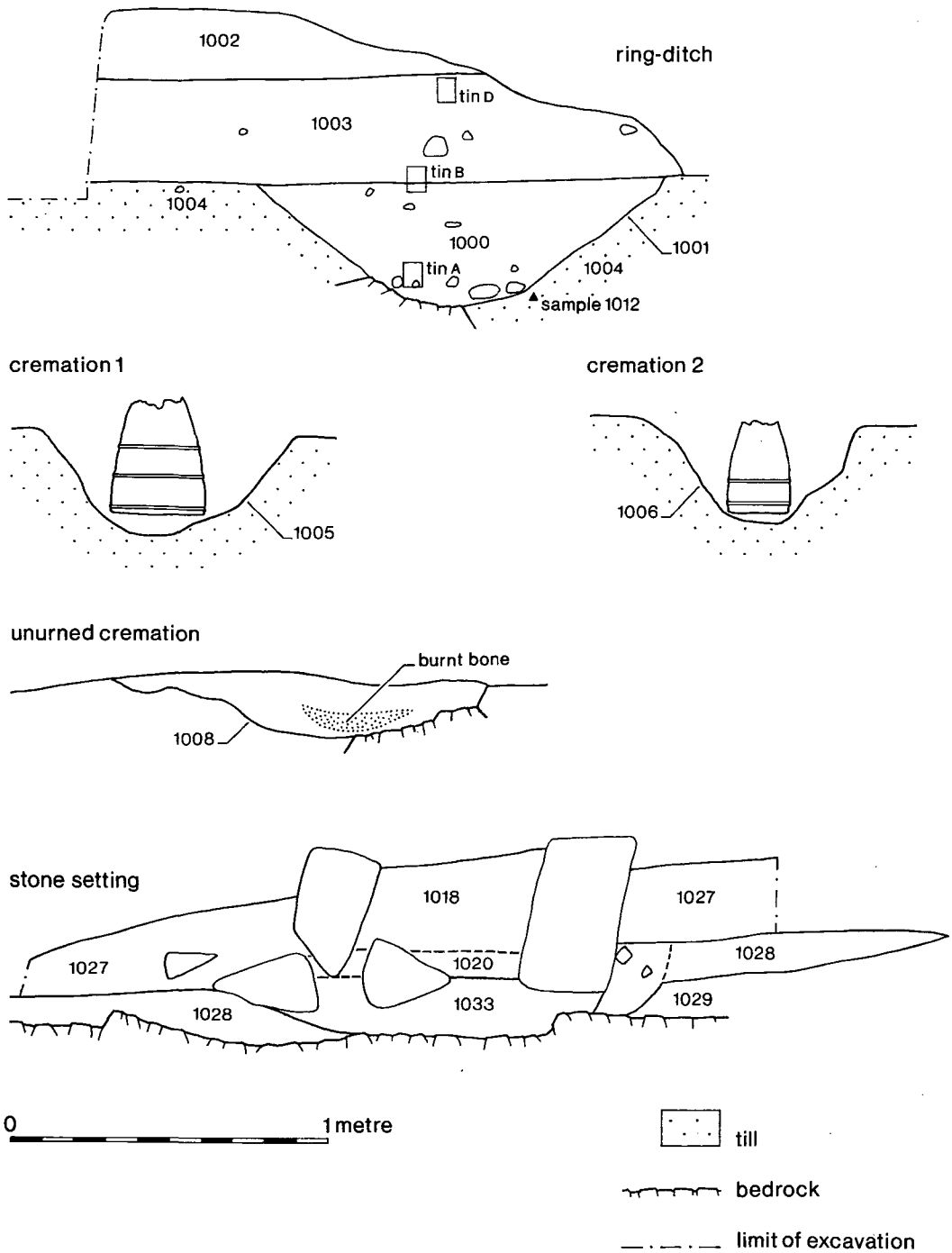
The unretouched blade is the larger find, with no macroscopic edge damage visible, but its function cannot be established in the absence of microwear analysis. Rods are an artefact class associated with Late Neolithic and Bronze Age assemblages. They are related to fabricators, implements with polar and lateral abrasion. It is possible that this piece was a fabricator, for it does have some lateral abrasion and may have been abraded at the, now missing, proximal end. Traditional interpretation of the function of this class of artefact, in the absence of detailed typological and microwear studies, has been as strike-a-lights or possibly implements for retouching.

The small size of the assemblage and the general paucity of chipped stone artefacts from similar sites, especially in Scotland, limits the inferences that can be made regarding their deposition, function and significance.

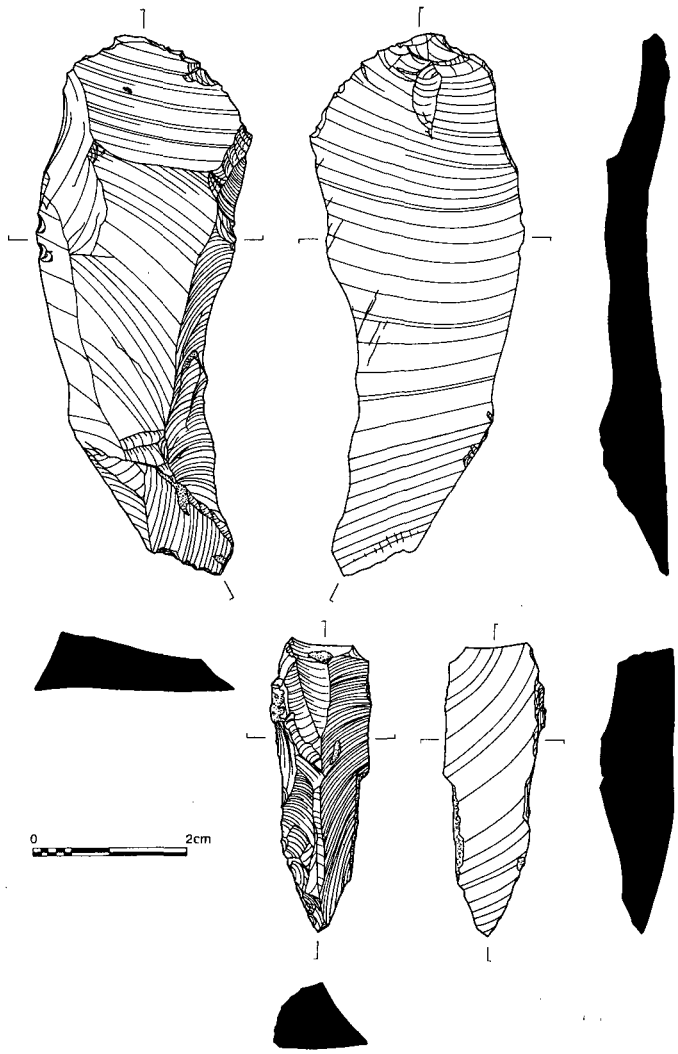
Cremation 1 (illus 7, 8)

The two urns had been lifted during the course of the evaluation excavation, and the features in which they had lain had been completely emptied. The urns had been emptied at Glasgow University, and all information relating to the method of excavation of the material within the urns is taken from records and subsequent correspondence. The urn fills were removed in a series of spits (illus 13, 15), which are discussed in the sections on sediment analysis below. No fill from either of the features was available for analysis by AOC (Scotland) Ltd. The urn was found inverted in a pit approximately 0.7 m in diameter, and which extended into the till for a depth of 0.4 m.

The human remains (Kathleen McSweeney) The bone weighed a total of 2063 g, and was light, crumbly and in generally poor condition. Apart from some small hand and foot bones there were no complete bones. There were numerous large fragments, but in many instances the outer cortex had crumbled away, making identification difficult. There was considerable variation in fragment size, with several longbone fragments in excess of 100 mm, but also numerous small fragments and much bone dust. The overall percentage of unidentified fragments was 31%, with a variation from around 14% from the upper part of the vessel (as inverted), to 70% in the lower part.



ILLUS 8 Sections of ring-ditch, cremation pits and stone setting



ILLUS 9 Flint artefacts from western ring-ditch terminal: *top* 1003, *bottom* 1004

There is no evidence to suggest that the remains of more than one individual had been deposited within the urn. Tooth remains were clearly under-represented, but otherwise the representation of most skeletal areas indicates that these remains comprised the fairly complete cremation of a single individual, and not simply a token deposit.

There had been a marked degree of curved lateral splintering and much twisting, particularly evident in the larger longbone fragments. These manifestations indicate that a high temperature was achieved during firing. Wells (1960, 35) suggests that the corpulence of the individual can have an effect on the degree of distortion, leaner bodies burning quickest and suffering the greatest distortion and Ubelaker (1978, 35) that curved lateral splintering and marked warping can be indicative of bone being burnt while still 'fresh', ie soon after death. It is possible that either or

both were factors in this case but such suggestions are difficult to support with archaeological material.

Although the predominant colour was yellow-brown, there were also some black, grey and bluish fragments among the cremated remains. There were several cranial fragments, which ranged in colour from yellow-brown on the external surface, to blue, grey and black on the internal surface. This indicates that combustion was not even throughout the skeleton, and was particularly poor at the back and sides of the skull. While the density of bone often results in poorer calcification of skull fragments, it is possible that other factors were involved in this case. The body may have been placed in a supine position with the head away from the greatest heat of the fire. The relative uniformity of colour amongst other fragments indicates that combustion of the rest of the skeleton was thorough.

There was no stratigraphic significance to the distribution of bone fragments within the urn; all skeletal elements were found in most spits although there was an increasingly higher proportion of unidentified fragments towards the bottom of the urn. This is likely to be due to the settling of smaller fragments.

There is little indication that remains were deliberately broken. Many of the fragments were very large and much of the fragmentation that had occurred appeared to be due more to the brittleness of the bone than to any deliberate action.

Age indicators show that this individual was adult. Epiphyseal fusion, particularly that of the vertebral body rings, suggests an age in excess of 25, while the presence of moderately severe degenerative changes in the spine and the partial obliteration of some cranial sutures point to a more advanced age. The degree of mineralization found at the sternal end of one rib is not normally found in individuals below 40 years of age. In common with most cremated remains, much of the evidence normally used to estimate age at death, such as dental attrition and the morphology of the pubic symphysis, has been lost and the most accurate estimation that can be given is that this was an adult who was probably over 40 years of age.

Unusually, for cremated remains, sexually diagnostic evidence was very convincing. A narrow angle of pelvic sciatic notch, large mastoid processes, well marked muscle attachments and large shoulder and hip joints indicated that this was a robust male.

This individual suffered from fairly gross pathologies which must have resulted in severe pain and limitation of movement. Degeneration of the spine was widespread, the sacro-iliac spine had a large bony spur extending from the lateral edge of the articulation and up and over the joint, the femoral heads which form part of the hip joints were slightly deformed and two bones of the left great toe had fused together (the right toe was not recovered). It is probable that most of the lesions noted above are linked. Although aetiology is not certain, these lesions appear to be manifestations of an arthritic disease. Fusion of the bones of the great toe excludes a diagnosis of degenerative arthritis (Ortner & Putschar 1981, 420). Although ankylosis of the small bones of the hands and feet is typical of rheumatoid arthritis, this is thought by some to be a relatively modern disease, with no clearly diagnosed cases in prehistory. A possible diagnosis of rheumatoid arthritis, however, has been proposed for an Eskimo skeleton (*ibid*, 409–11) which displayed very similar pathologies. The Eskimo skeleton had degenerative changes of the elbows, marked changes in the thoracic and lumbar spine, reactive bony growth at the sacroiliac joints, and areas of osteophytic growth at the knee, and although no fusion of the joints in the feet was noted, not all of the foot bones had been recovered. All of these changes are evident in the Ratho individual and, while it would be difficult to make a positive diagnosis of any disease from cremated remains, it is likely that this individual suffered from one of the arthritic diseases, possibly rheumatoid arthritis.

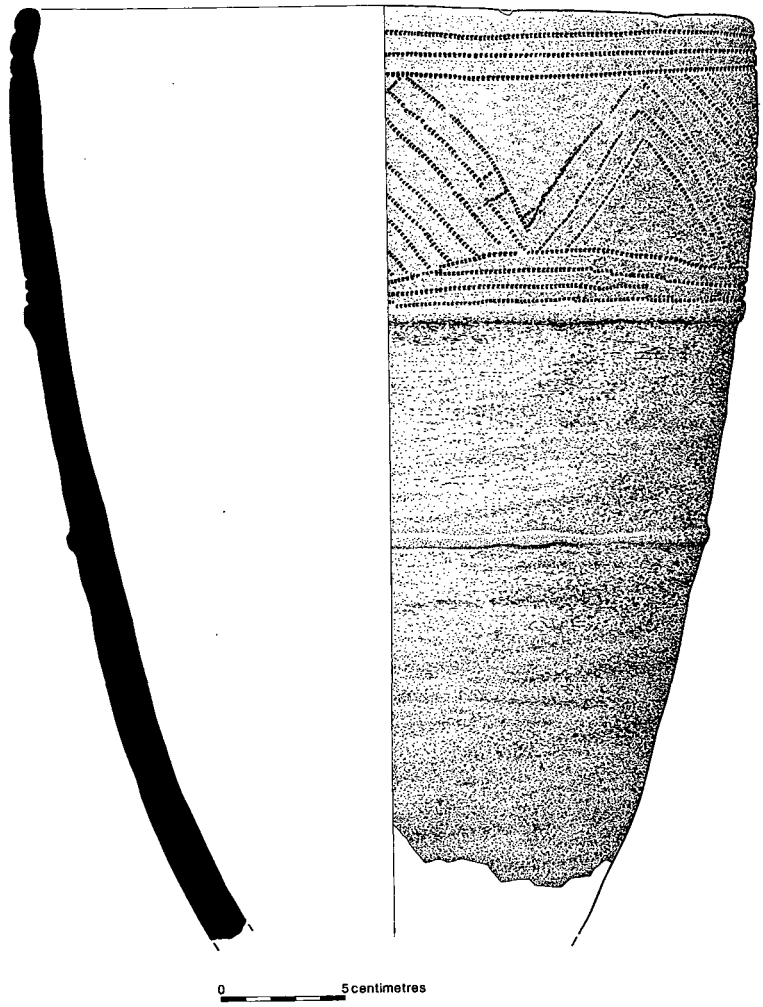
Other possible diagnoses include ankylosing spondylitis (Reiter's disease), well documented in antiquity, and psoriatic arthritis. Sacro-iliac and spinal involvement are the most common features of ankylosing spondylitis; fusion of the distal interphalangeal joints of the hands and feet is a frequent manifestation of psoriatic arthritis. However, any of the above lesions can occur in any of these rheumatic diseases, and it is not possible to arrive at a positive diagnosis, particularly as the full extent of the disease in this individual is not known.

Regardless of the true diagnosis, many of the clinical symptoms will have been similar. There would probably have been swelling, pain and stiffness of the affected joints. He would have suffered from severe back pain. Osteophytic formation at the sacro-iliac joint indicates that there may have been localized pain at the buttock and possibly also referred pain, radiating to the knees and groin. Bony spurs on the calcaneus suggest that there may have been localized pain at the heels, although these are often asymptomatic. Pain may have increased at night, resulting in periods of sleeplessness, and he probably experienced extreme stiffness in the morning. The degree of changes to the spine suggest that he may have been totally immobilised at times, and at other times his walking ability would have been severely limited. It is unlikely that he would have been able to travel great distances or carry out many manual tasks. While he may not have been totally dependent on others, he would probably have had to have considerable help, for instance in procuring food. Although extremely debilitating, rheumatic diseases are not normally life-threatening, and the lesions evident on the bones of this individual are unlikely to be directly related to the cause of his death.

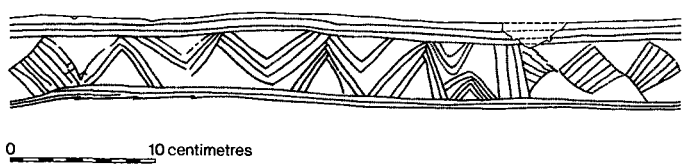
Urn 1 and accessory vessel (Ann MacSween) The vessel (illus 10 & 11) which contained Cremation 1 is a tripartite cordoned urn with a plain, slightly inverted rim 280 mm in internal diameter. At the point where the base had been broken off, the vessel is 150 mm in internal diameter, and the surviving height is 360 mm. The exterior surface has been slipped. Two cordons, 105 mm and 195 mm below the lip of the vessel, divide the urn. Decoration is confined to the part of the vessel above the upper cordon and comprises two sets of three horizontal lines of comb-impressed decoration with lozenge and triangular-based designs between. The decoration varies around the circumference of the vessel. The urn has been formed from fine clay tempered with approximately 50% of crushed rock fragments, and the fabric is hard-fired. There is light sooting on the exterior and interior. The urn has a red exterior surface and grey interior, indicating that it had been fired upside down.

Two further sherds recorded as having been 'in association' with Urn 1 are not part of that vessel. One is a rim sherd with an internal bevel from a vessel with an estimated diameter of 200 mm. The second is an undiagnostic body sherd. Both sherds are, however, similar in fabric to the urn.

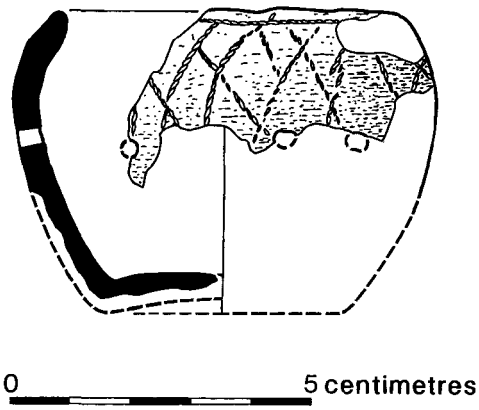
A fragment of an 'incense cup' (illus 12), 46 mm high, 60 mm in diameter at the rim and 50 mm in diameter at the base, was found inverted towards the bottom of the fill of Urn 1. The rim is inverted with a plain lip, and the walls are 5 mm thick. Much of the exterior surface of the vessel has flaked off, but on the remaining surface the vessel is decorated with fine twisted cord impressed decoration forming a lattice pattern, and a line of impressed twisted cord decoration surrounds the lip. There are two perforations, 8 mm apart, 18 mm below the rim, with traces of a third perforation in the break. The fabric appears to be vitrified, indicating that the cup had been placed in the pyre with the body. The single fragment represents approximately 40% of the vessel; careful sorting of the sieved urn samples could identify no further fragments belonging to the accessory cup, indicating that it had been put into the urn incomplete.



ILLUS 10 Urn 1



ILLUS 11 Schematic 'unrolling' of decoration on Urn 1



ILLUS 12 Accessory cup from within Urn 1

Petrological report on Urn 1 and accessory vessel (Dianne Dixon) Urn 1 is composed of pure clay, quartz-free with a few fine particles of feldspar. It is tempered with fragments of feldspar-phyric basalt, which are composed of plagioclase phenocrysts set in a fine-grained, granular groundmass of pyroxene, ore and plagioclase.

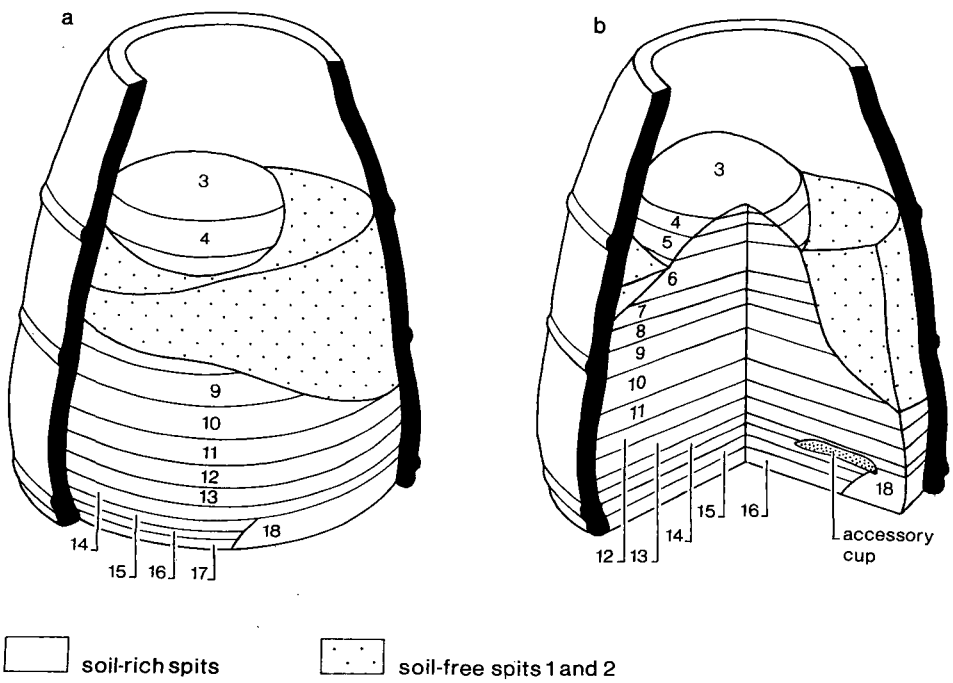
The source of the temper is almost certainly the basalts which form the Bathgate Hills, about 7 km to the west of the site. As deposits of quartz-free clay are perhaps more likely to develop in the basalt area than in the Carboniferous sedimentary succession which covers most of the Central Midland Valley, it is possible that the urn was made in the Bathgate area and transported to Ratho for the burial. Alternatively, as the local bedrock at Ratho is quartz-dolerite, and is notably tough, it may have been preferable or necessary to travel to collect more easily crushable basaltic temper to manufacture an urn locally. As ice movement was from the west, if any boulder-clay had formed, it might be expected to have been deposited on the eastern side of the Bathgate Hills.

The accessory vessel is made from a relatively pure clay with only a few minute quartz grains and a scattering of reddish, almost opaque particles, similar to the alteration product found in the basalts, plus one or two particles of pyroxene and feldspar. It is not possible to identify whether one of the numerous doleritic intrusions which dot the area, or the basalts of the Bathgate Hills, was the source rock.

Sediment analysis (Stephen Carter) The spit numbers given during excavation of the urn fills in Glasgow have been retained in order to avoid unnecessary complications. Urn 1 had contained 0.22 m of fill, which had been excavated in 18 spits (illus 13), with an additional sample of sediment from below the urn. Spits 1 and 2 consisted almost entirely of large bone fragments at the top of the fill; spits 3–17, with a greater soil content, formed a continuous sequence from top to bottom, and spit 18 was a lump of hard-packed soil at the base. In the early stages of post-excavation at AOC (Scotland) Ltd it was noted that the presence of quantities of sediment in the fill of Urn 1 was in contrast with the relatively soil-free fill of Urn 2, and, since a pollen assessment was to be carried out, it was important to attempt to determine the origin of these sediments. Had it all been introduced as part of the original deposition, or had it resulted from the infiltration of soil after burial of the urn? A procedure was therefore designed which would analyse the composition of the urn fills with a view to determining its origin (Appendix 2).

The proportions of components were variable, with soil contributing 50–70% in most spits, and bone contributing 30–50%. Spits 1 and 2 contained considerably more bone than average (69% & 87%), as did spit 8 (88%). Least bone was recovered from the top spit (3), and the bottom spits (15–18). Pottery did not exceed 8% of total weight, and there was no trend in the results; charcoal contributed less than 1% but was generally more abundant towards the base of the fill. The texture of the soil fine fraction (<2 mm) was uniform throughout the fill with 35–45% silt and clay (<63 μm) and 30–40% fine sand (63–250 μm).

One of the main clues to the origin of the sediments was the distribution of two different types of pottery. The main fragment of the accessory cup was found inverted at the base of the fill (spit 15). Fragments of the urn itself occurred throughout the fill, and included both oxidized and reduced fragments from the outer and inner surfaces, suggesting that the wall of the vessel had been breached. It should also be noted that the fragments of urn were distributed evenly throughout the fill (both in contrast to Urn 2). The obvious source of the soil is the proposed break in the vessel wall; the drawing of the urn fill during excavation showed that the top of the soil-rich fill rose higher in one area, and was capped by an extremely soil-rich layer (spit 3). This indicates a point source for the soil above this area; presumably a hole in the vessel wall. The failure of fragments of urn to accumulate at the base of the fill suggests that fragments became detached during the ingress of soil, which progressively filled the interstices between the bones, blocking the further descent of the pottery fragments. This may be contrasted with the distribution of charcoal which is relatively more abundant towards the base of the fill, indicating that charcoal was introduced with the bone as part of the original burial deposit.



ILLUS 13 Schematic section through Urn 1 with fill, showing spit numbers

Pollen assessment (Coralie Mills) A full description of methodology and detailed description of the pollen assessment (illus 23 a & b) is contained in Appendix 3. The microfossil evidence indicated that Urn 1 contained very low concentrations of pollen and spores, compared with the control samples from the upper soil profile, but broadly comparable to that of the lower subsoil and ring-ditch fill. This was in contrast with Urn 2, which had an even lower concentration of microfossils, indicating that Urn 1 had received some fresh input of sediment from above in recent years.

The pollen analytical data indicate that the pollen within the urns is generally not well preserved and that differential decay has taken place. The taphonomic complications at Ratho mean that the pollen data cannot be used to reconstruct reliably past landscapes or cremation rituals. On the simplest level of taxon presence/absence information, however, it is interesting to note that a range of habitats are represented, notably grassland and, to a lesser extent, arable, woodland and heathland. Given the active movement and decay processes, most of this pollen is likely to be of relatively recent date. One possible exception is *Sphagnum* moss, the spores of which were present in reasonably large numbers in several of the urn samples, and including both Urn 1 and Urn 2. While preferential decay of other weaker microfossils could account for much of their relative abundance, it is difficult to identify a likely local source for *Sphagnum* as the site is very well drained and there are no wet or boggy areas close by. On balance, it seems more likely that most of these spores do originate from moss gathered elsewhere and placed in the urns before burial. *Sphagnum* spores were generally most frequent in spits at the top and the base of the bone-rich spits in Urn 1. In contrast to the urn samples, relatively little *Sphagnum* was observed in the control samples. While the counts are too low to make any certain interpretation, it is possible that *Sphagnum* was used as a lining or as part of a container for the bones.

Summary

The person whose remains constituted Cremation 1 had been a man over 40, whose once robust and powerful frame had become crippled with arthritis, which towards the end of his life had undoubtedly caused him great pain and loss of mobility. It is likely that he would have needed help from his family and neighbours to get about and to obtain food.

The high degree of twisting and lateral splintering of the bones indicated that the cremation pyre had reached a high temperature. Kathleen McSweeney (above) notes that a leaner body may burn more quickly and suffer greater distortion of the bones, and also that splintering and warping of the bones may be indicative of cremation soon after death. The combustion within the pyre appears to have been uneven, and it is suggested that the body may have been placed in a supine position, with the head away from the greatest heat of the pyre. After firing, care was exercised in collection of the bones, including not only all the major skeletal elements but also many small bones and teeth. There appears to have been no deliberate breakage of the bones.

The urn was filled with clean burnt bone, with a few fragments of oak and hazel charcoal, and may have been packed around with mossy vegetation. On top of the bones was placed a fragment of an accessory cup which had probably been through the pyre with the corpse, and had been picked out from among the pyre debris. Over this may have been placed more mossy vegetation. No evidence of any other cover to the top of the urn was found. The urn was inverted in a pit at least half a metre deep, and compression after burial forced the vessel rim down into the soil at the base of the pit by a few centimetres.

Subsequently, the urn was broken close to the top, allowing soil to enter. This opening was either very small, or was created relatively recently, because the urn had not filled totally by the time it was excavated.

Cremation 2 (illus 7 & 8)

The human remains (Kathleen McSweeney) The condition of the cremated bone from Urn 2 was fairly good. Although there were fewer large fragments, the bones were less fragile and in better condition than those of Cremation 1, and there were more complete small bones. There were several almost complete vertebrae, many large cranial fragments, a few longbone fragments of 80–100 mm long and good survival of dental remains. Average fragment size was in the region of 30–40 mm and there was a high proportion of identified fragments (74% of total weight of 1710 g).

There was no evidence for the presence of more than one individual within the cremated remains, and the remains of all the major skeletal elements were in evidence. These remains represent a complete cremation of a single individual and not simply a token deposit.

There was no evidence of the inconsistency in combustion found in Cremation 1. The colour of the bone from Cremation 2 was an almost uniform light yellow-brown. Like the bone of Cremation 1, there was a significant degree of curved lateral splintering, distortion and separation of the tables of the cranium. During the cremation of this individual, a high temperature, even throughout the body, must have been achieved.

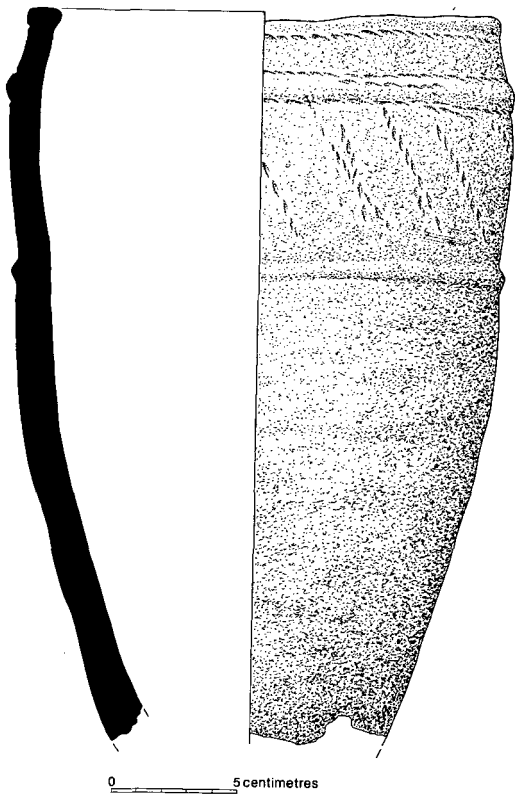
As with Cremation 1, it seems evident that these remains were carefully collected; all skeletal elements and many small bones and teeth were present. Although fragment size in general was smaller than the Cremation 1 remains, there is no strong evidence to suggest deliberate breakage. There were several fairly large bones and a much smaller proportion of unidentified fragments than would be expected if crushing had formed part of the burial practice.

From the various age indicators it is clear that this individual had reached adulthood. Fully developed third molars suggest an age in excess of 21, while fusion of the vertebral body rings indicates 25 had been reached. However, a slight to moderate degree of degenerative changes of the spine and other joints, point to a more advanced age, perhaps in the thirties or forties, although as the hyoid bone, which normally fuses in middle age, was still unfused, age was unlikely to have been much greater than this.

As with Cremation 1, many sexually diagnostic features had survived. Large mastoid processes and pelvic and skull morphology provided strong evidence for male sex.

Slight osteophytic formation was noted at various parts of the spine. Damage to and loss of many of the vertebral bodies prevents any accurate assessment of the true extent of these lesions. Such bony changes can occur as the result of trauma, may be associated with occupationally related stress or may simply be the result of the normal degeneration associated with ageing. As the latter is the most common aetiology and as the changes occur throughout the spine, this is the most likely cause in this case. Degenerative changes are probably also responsible for the lesions noted at the shoulder and costovertebral joints and at the kneecap and heel. As these changes were only slight, they were probably asymptomatic. The intravertebral disc herniation (slipped disc), evidence for which was noted on one thoracic vertebra, may be traumatic in origin. It is likely that this individual would have experienced back pain as a result of this condition. At least one, and possibly two molars had been lost during life. A possible carious lesion was noted, indicating that the tooth loss may have been associated with tooth decay.

Urn 2 (Ann MacSween) A tripartite cordoned urn (illus 14) with a flat, slightly inverted, rim contained Cremation 2. The base had been broken off, but the remaining sherds indicated that it had been flat with angled walls. The vessel is 190 mm in internal diameter at the rim and it is probable that the diameter at the base was about 120 mm. The surviving height is 270 mm. The exterior of the urn was probably slipped. Two cordons divide the vessel at 25 mm and 80 mm below the lip. Decoration,



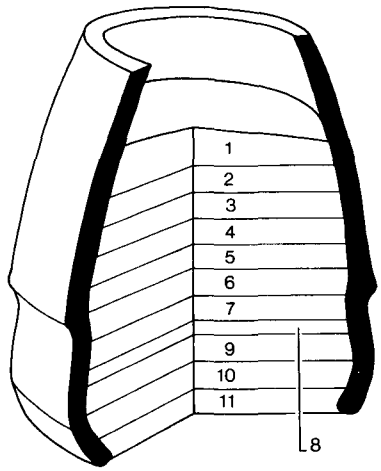
ILLUS 14 Urn 2

by impressing twisted cord, comprises three horizontal lines (one around the lip, one above the upper cordon, and one below the upper cordon), with a band of impressed oblique lines between the cordons. The lines are irregularly spaced (approximately 30 mm) and their angle with the horizontal varies.

The fabric is a fine clay tempered with approximately 60% of crushed rock fragments and it is hard-fired. The upper part of the vessel is sooted on the exterior, and the interior is sooted and has a residue. It is possible that this vessel had been used for cooking before being placed in the grave. Like Urn 1, the vessel had a red exterior surface and grey interior, and was probably fired upside down.

Petrological report on Urn 2 (Dianne Dixon) This urn was formed of moderately sandy clay, with quartz grains in the 0.15 mm range, plus some feldspars and pyroxene. The temper is much altered dolerite, with ophitic pyroxene, often replaced by a deep red alteration product, growing within a network of zoned, clouded plagioclase laths. This could have originated from one of the numerous doleritic intrusions, outcropping in the area.

Sediment analysis (Stephen Carter) Urn 2 had contained 225 mm of fill, which was excavated in 11 spits (illus 15), with an additional sample ('C') from an uncertain position at the bottom of the



ILLUS 15 Schematic section through Urn 2 with fill, showing spit numbers

pit. Spits 1–8 contained almost no soil, and consisted of bone with some pottery; the pottery is concentrated at the top (spits 1 & 2), and the bottom (spits 6, 7 & 8). Spits 9, 10 and 11 contained increasing amounts of soil with very little bone at the base of the fill (spit 11). There was almost no charcoal recorded from any spit in Urn 2.

For spits 1–9 particle size analysis of the <2 mm fraction was not attempted as the total weight of this fraction was too low. The texture of the bottom two spits is similar with 34–35% silt and clay, and 37–38% fine sand. Sample C from outside the urn contained less silt and clay (28%) but more coarse sand.

Spits 1–8 may be interpreted as urn fill, spits 10 and 11 as pit fill pushed into the open urn, and spit 9 as the boundary between the two. There is very little bone below spit 9 and very little soil above. The pottery from the fill consisted of two types of fragment. The concentration at the top is made up from relatively large sherds (up to 20 mm) that contain parts of the oxidized outer surface of the vessel. These are thought to have entered the fill only when the urn was damaged by the machine bucket; breakage of the vessel cannot have occurred in antiquity as no soil subsequently filled the urn. Pottery fragments at the base of the fill consist of numerous small fragments (up to 5 mm) of reduced fabric that must have derived from the inner parts of the vessel wall; a few oxidized fragments are also present. The inner surface of the urn is intact up to its surviving height, but detached fragments of the base have lost their inner surface. It is therefore suggested that the inner surface of the inverted base of this urn disintegrated, and the small flakes fell through the vacuous bone layer and accumulated at the bottom of the fill. No soil entered the urn from above.

Pollen assessment (Coralie Mills) A full description of methodology is contained in Appendix 3. The general absence of sediment from the urn fill meant that only the bottom two spits and the sub-pot sample could be sampled for pollen (10, 11 & C). These had even lower concentrations of microfossils than Urn 1, and similar poor preservation. The same reservations over depletion of

less robust grains also apply. One grain of cereal type pollen was found, possibly introduced by invertebrate activity. However, the most noticeable feature of the assemblage from Urn 2 was the relatively large number of grains of *Sphagnum* moss, particularly from spit 10. As discussed above, it is difficult to identify a local source for this pollen, and it seems likely that most of these spores originate from moss gathered elsewhere and placed in the urns before burial.

Summary

Cremation 2 represented the remains of another man, probably in his thirties or early forties, who had suffered from back pain due to a slipped disc.

The cremation pyre had achieved a high temperature, and, unlike that of Cremation 1, this high temperature had been achieved throughout the body. Care had again been exercised in collection of the bones, including not only the major skeletal elements but also many small bones and teeth. Although fragment size was smaller than in Cremation 1, there was no strong evidence for deliberate breakage.

The clean bone had been placed in the urn (probably while upright) and a covering of mossy vegetation placed over the top. The urn was inverted in a pit at least 0.5 m deep, and in this case also, compression after burial forced the rim down into the soil at the base of the pit by a few centimetres.

Subsequently, the fabric of the inverted base of the vessel partially disintegrated, and small fragments of the inner surface became detached, filtering down through the bone to accumulate at the base of the fill. The pot remained intact, however, and no soil entered.

The unurned cremation (illus 7 & 8)

Human remains (Kathleen McSweeney) Bone condition from this unurned cremation was extremely poor. The largest fragments, of which there were only a few, were about 50–60 mm long; most were only 10 mm or less. In addition, many of the fragments were badly eroded, making identification difficult. Consequently, a large proportion of this deposit remained unidentified (67% of total weight of 550 g).

Although only a small proportion of the remains could be identified, in the absence of any evidence to the contrary, it must be assumed that only one individual was represented in this cremation deposit. As most skeletal areas were present, at least in part, it would appear that the remains represent a fairly complete cremation and not simply a token deposit. Neither the sternum nor pelvis were recognized but it is possible that fragments of these were among the unidentified bones. While overall weight was low (550 g), this may, at least in part, be due to erosion that is likely to follow deposition directly into the ground, without the protection of a container.

The few indicators of age confirm that this individual was an adult, and the fusion of vertebral body rings suggest that an age of 25 had been reached. There was very tenuous evidence for degeneration of the spine. This, and the partly obliterated cranial sutures, suggest that age at death may have been more advanced. However, in the absence of any stronger evidence, the most precise estimation of age that can be given is that this individual was an adult of at least 25 years. No sexually diagnostic areas had survived and the sex of this individual is unknown.

There was some slight evidence to suggest the presence of early degeneration of the spine. However, this conclusion is based on only a few very small and eroded vertebral fragments and

cannot be regarded as other than very tenuous. No other pathological lesions were noted. The poor condition of the remains allows little to be deduced about cremation technology. Colour was a uniform yellow-brown with little evidence of poorly calcined bone. It is probable, therefore, that burning was at a high temperature and efficient.

A total weight of 550 g clearly does not represent a full cremation but whether this is due to a lack of care in the collection of the burned remains or to the post-depositional erosion that must have occurred without the protection of a container is not clear.

The cremation pit The pit (1008) (illus 7 & 8) was sited in the south-eastern part of the enclosed area, 2 m from the edge of the ditch and 3 m to the south-east of Cremation 2. The pit would have lain on the right-hand side of a person entering the enclosure. It was visible on the surface as an oval spread, 1.2 m by 0.5 m, of reddish-brown gritty silt, with small fragments of burnt bone concentrated towards the northern end. The feature was half-sectioned along its long axis (north/south), showing up a lenticular spread of bone approximately 0.3 m long and 0.05 m deep (max) (illus 8). Some fragments had been displaced a few centimetres upwards, probably as a result of invertebrate activity, but otherwise the deposit appeared as a coherent shape, and it is considered unlikely that a significant quantity of bone has been physically removed by truncation or large-scale disturbance of the top of the feature. A Kubiena tin was inserted through the bone and pit fill (1019) in an attempt to recover any evidence for an organic container; the feature was also 100% sampled. The soil thin section did not pick up any evidence of an organic container; the area around the edges of the bone deposit had been totally disturbed by biological mixing.

There are two points of interest about the nature of the cremation deposit itself; that the fragments are much smaller than those of the urned cremations, and that the amount of bone is less than would normally be expected for an adult cremation. There has been no gross physical disturbance of the bone deposit itself; the only agents of soil mixing at this level have been invertebrates, which are unlikely to have moved particles greater than 1 mm in size (Carter 1990), so that it is argued that after deposition bone fragments have not been further broken up, nor physically removed from the deposit. It is therefore suggested that the fragments were either deliberately broken up into smaller pieces, or that subsequent rougher handling, such as transport in a soft bag rather than in a solid urn, may have caused the brittle bone to have broken up further into smaller fragments. The amount of bone in the original deposit is rather more difficult to assess; the processes by which burnt bone becomes sufficiently chemically inert to survive in acid soils are not fully understood, and it is possible that incompletely combusted bone fragments would be chemically destroyed, leaving behind an apparently partial deposit. The observation that the surviving bone from this unurned cremation was all of a yellow-brown colour indicative of high temperature firing (McSweeney, above), with little evidence of poorly calcined bone, may support this hypothesis.

The stone setting (illus 7 & 8)

Description The stone setting (1012) was sited 7 m to the west of the ring-ditch, and consisted of four large tabular stones in a roughly square setting, with a smaller stone filling in the north-eastern corner. A sixth large tabular stone lay at an angle against the outside of the south-eastern corner, as if it had been pulled off the top. The stones enclosed an area approximately 0.85 m by 0.6 m, within which were three further stones. The stone setting had already been exposed by the evaluation excavation; it sat very high up in the shallow

soil profile in this area, and the top of the stones must have been very close to the modern ground surface, so that the survival of this feature is rather surprising.

There were three soil layers within the setting: 1018, a brown loam similar to the A horizon; 1020, a silty loam below 1018; and 1033, a brown loam with red sandstone flecks below 1020 and over bedrock. These layers had been well mixed by invertebrate activity, so that the boundaries were very diffuse, and there was no apparent base to the setting, nor a buried ground surface below it. Outside the stone setting, topsoil (1027) overlay a rich brown loam (1028), which was very similar to the lowest layer within the stone setting (1033) except for the inclusion of the red sandstone fragments. Although no clear cuts were visible, the interpretation is that a cut was made through the existing soil profile down to bedrock, which was then levelled back up using redeposited 1028, possibly with the addition of other material. The origin of the red sandstone is uncertain; but the till contains a large proportion of sedimentary rock including red sandstone. The stones used in the setting were of the local dolerite; this is a poor building stone, very hard and brittle, with numerous cracks and fissures, so that it cannot be well shaped, but care had been taken using chocking stones under the misshapen corners to ensure that the upper edges of the stones were reasonably level. The three infilling stones lay at a relatively low level within the stone setting. The only trace of external cut and fill was a slight increase in stoniness in 1028 along the western side of the setting.

The only finds from the stone setting included a few carbonized plant remains from 1033, and a lump of fused fuel ash slag and bone from the topsoil beside it. Occasional finds of small pieces of fuel ash slag within the topsoil were made all over this northern area of the site so that this cannot necessarily be associated with the stone setting itself. The presence of carbonized plant material within 1033 is interesting, possibly an indication of occupation material having become incorporated with the redeposited subsoil. The assemblage included mainly hulled barley, with a single oat grain (see Holden & Rankin, Appendix 1), although the customary caveat applies because of the problem of later contamination. Phosphate levels throughout the setting were low. Tiny scraps of burnt bone were recovered from sieved samples of 1018, 1020, 1027 (not 1028 significantly), and 1033.

Interpretation

In the field there were three main hypotheses: that the stone setting was a cist, that it was a hearth, or that it was a ritual monument significantly placed close to a gap in the bedrock crest which may have formed an entrance to the burial area. There is no evidence to support the second hypothesis; there were no signs of burning on the stones themselves, and the red sandstone was probably derived from the heterogenous till which contains much sedimentary rock. The first and third are not mutually exclusive, and are favoured here. The tiny scraps of burnt bone recovered from the fill of the cist suggest that there had at one time been a cremation deposit within it, which has been subsequently disturbed. Samples for pollen analysis were taken, but not proceeded with because the soils were so well mixed. The stone leaning by one corner of the setting was not big enough to have covered all the four outer stones, but would have covered most of the internal area, possibly supported on the three inner stones. On an estate map of 1841 (NLS MS Acc.8572) and on subsequent Ordnance Survey maps a road is shown crossing the site, still visible as a track at the time of excavation. The stone setting lay in the 'verge' between this track and a field wall, a protected position which probably saved this exposed feature from destruction by ploughing over the last 150 years.

TRUNCATED FEATURES IN THE SOUTHERN AREA

The southern part of the site, away from the areas of outcropping bedrock on the northern and eastern margins, was an area of very deep soil (up to 0.7 m), with unequivocal evidence of ploughing. The archaeological remains here consisted of a scatter of highly truncated pits and linear features, some as little as 0.05 m deep. An attempt has been made to interpret the nature and

origin of these features, based on the results of routine soil analyses, products of residue sorting and on the basis of such morphological characteristics as survive, but some have nevertheless defied analysis. Some comments have been made on the distribution of these features, but, as it is likely that many other associated remains have been lost, it was considered that 'joining the dots' would have been an exercise of dubious value. Likewise, sections of highly truncated features have not been illustrated as they are largely meaningless.

Destroyed cist and associated features (illus 16)

A group of features 30 m to the south-west of the ring-ditch, represent a second funerary focus, the surviving remains consisting of the remains of a cist, and five nearby pits. This area had the deepest A and B horizons encountered on the site, with a total depth of approximately 0.7 m.

Destroyed cist This consisted of a large shallow pit (2003), 1.80 m north/south by 1 m east/west, and 0.10 m deep. The fill of the pit was a medium brown sandy silt, with a flat stone slab (0.69 m by 0.46 m, 0.08 m thick) towards the southern end. The fill (2002) produced a medium phosphate reading, and contained over 7 g of burnt bone, 4 g of charcoal, carbonized grain and seeds, and a sherd of pottery. This undecorated body sherd was very similar in thickness, surface finish and firing to the urns containing the cremations. In her analysis of the petrological thin section of the sherd, Dianne Dixon noted that the temper is similar to that of Urn 1, although the clay, which is silty, could have come from the immediate vicinity of the site.

This feature is therefore interpreted as the remains of a cist destroyed in the past, either by ploughing or by deliberate excavation, which had originally contained cremated human remains, probably placed in an urn.

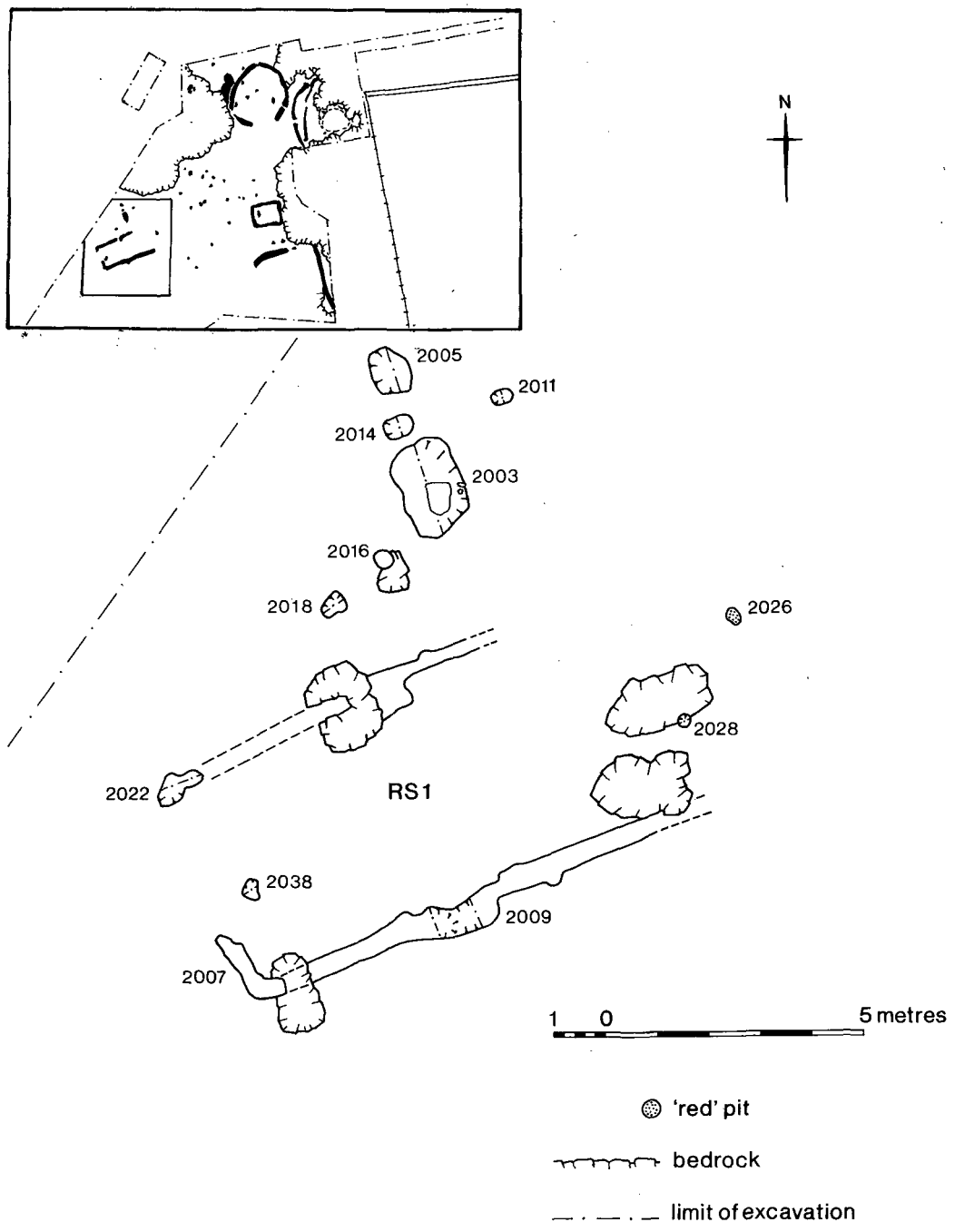
Adjacent pits Five pits close to the destroyed cist also had indications of possible funerary or ritual use, although these again had been almost totally destroyed. All these features produced medium phosphate readings (with the exception of 2011), an unusual feature on this site where the bulk of the readings were low. Immediately to the north of 2003 were two pits, 2005 and 2014. The larger of these (2005) was an oval pit 1 m by 0.65 m, and 0.25 m deep. The fill (2004) produced 2.5 g of burnt bone, charcoal, carbonized grain and seeds, and some microscopically small crumbs of pottery. There was also a tiny fragment of black vesicular slag-like material. The quantities of material are unimpressive, but unusual for features at Ratho.

The fill (2013) of the smaller pit (2014) produced trace amounts (c 1 g) of burnt bone and charcoal. This pit was small and heavily truncated, 0.3 m by 0.35 m by 0.06 m deep. The fill (2017) of a third pit (2018), 2 m west of 2003, also contained trace amounts (c 1 g) of burnt bone and charcoal, as well as carbonized plant remains. Two additional truncated pits (2011 & 2015) in the immediate vicinity produced trace quantities of charcoal but nothing else, and may not necessarily be associated with the other features.

The macroplant material is discussed in Appendix 1; there were also problems here with contamination of these samples, indicated by the presence of invertebrate egg cases and uncharred plant remains.

Pits containing burnt bone (illus 17)

Eight pits scattered over the central area of the site appeared to have some features in common; a summary of these features can be seen in Table 1. Four of the eight pits were found to have enhanced phosphate levels, probably associated with the presence of bone. The four pits with low phosphate levels also had what appeared to be packing stones in the fill, and these may represent a different group of structural features.



ILLUS 16 Destroyed cist 2003 and associated pits; rectilinear structure 1

Nevertheless, burnt bone was not found in the fills of many of the other pits in this central area, and is deemed to be worthy of note.

TABLE 1

Cut	Fill	Diameter (cm)	Depth (cm)	Phosphate	Burnt bone (g)	Charcoal (g)	Macroplant	Stone
2000	2001	50	12	Medium	4.3	8	Present	Absent
2056	2055	43	8	Medium	0.3	1.4	Present	Absent
2068	2061	50	14	Low	1	1	Present	Present
2065	2064	42	11	Low	1	1	Present	Present
2067	2066	67	14	Low	1	5.6	Present	Present
2070	2069	63	17	Low	1	1	Absent	Present
2084	2083	40	7	High	2.5	2.3	Absent	Absent
2086	2085	50	30	Medium	1	1	Present	Present

Fragment of second ring-ditch (illus 18)

A curvilinear feature (3002) running in a shallow arc for 6 m in the south-eastern part of the site was similar in fill and profile to the terminals of the ring-ditch to the north. The curvilinear feature was relatively broad and flat-bottomed, and had a distinctive reddish-brown silty loam fill (3003), similar to that of the northern ring-ditch, and to that of a group of pits (see below). The feature was sectioned in one place only, and the fill (3003) contained trace amounts (<1 g) of burnt bone and charcoal. It also produced a medium phosphate level.

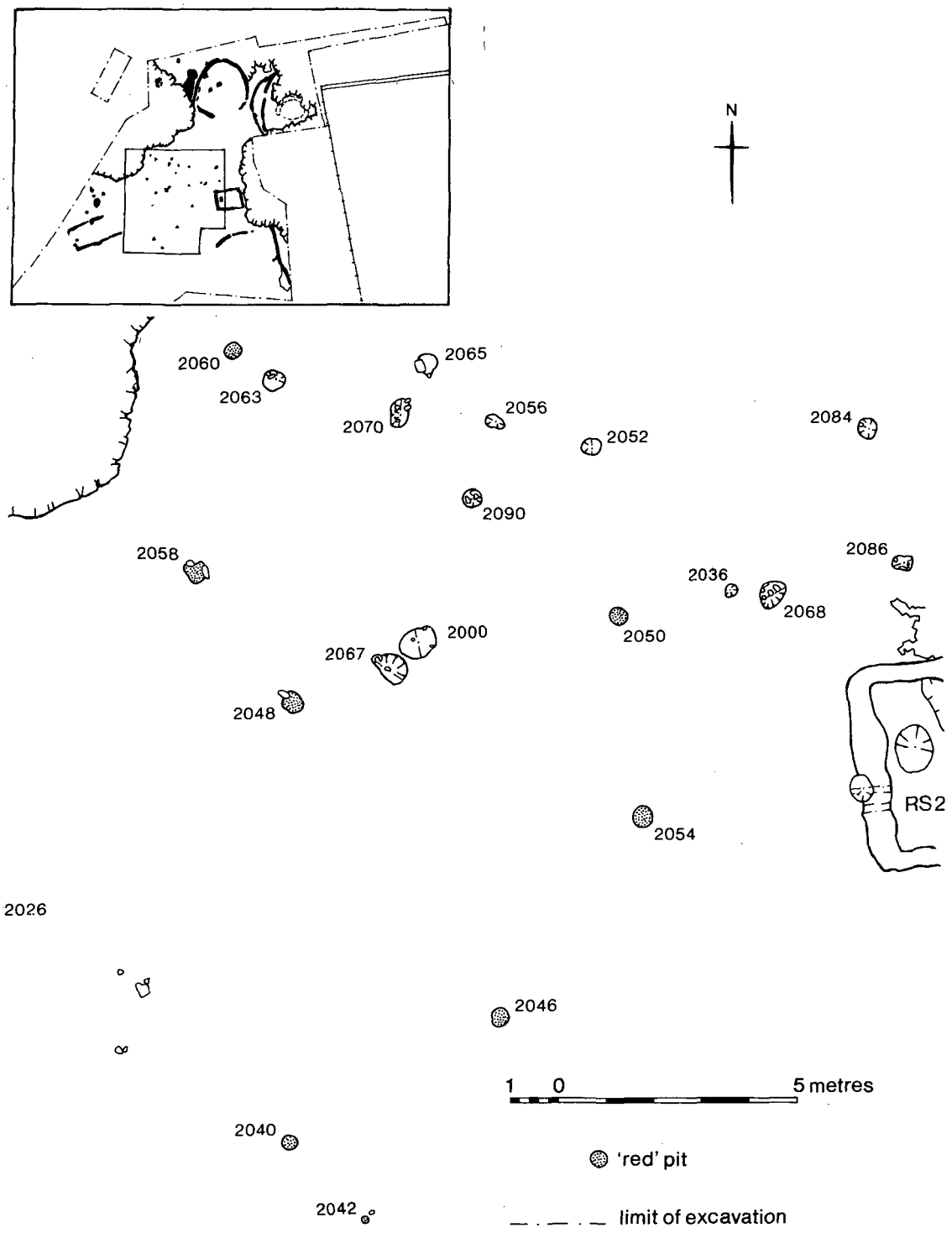
The feature faded away at both ends, and had been disturbed by a modern intrusion at the western end. At the eastern end a sub-oval feature (3009) with five angular packing stones lay on the projected course.

The similarity in appearance, fill and profile with the ring-ditch to the north suggests that this curvilinear feature (3002) may be all that remains of a second ring-ditch. The relationship with the stone-packed pit or post-hole (3009) to the east is not clear.

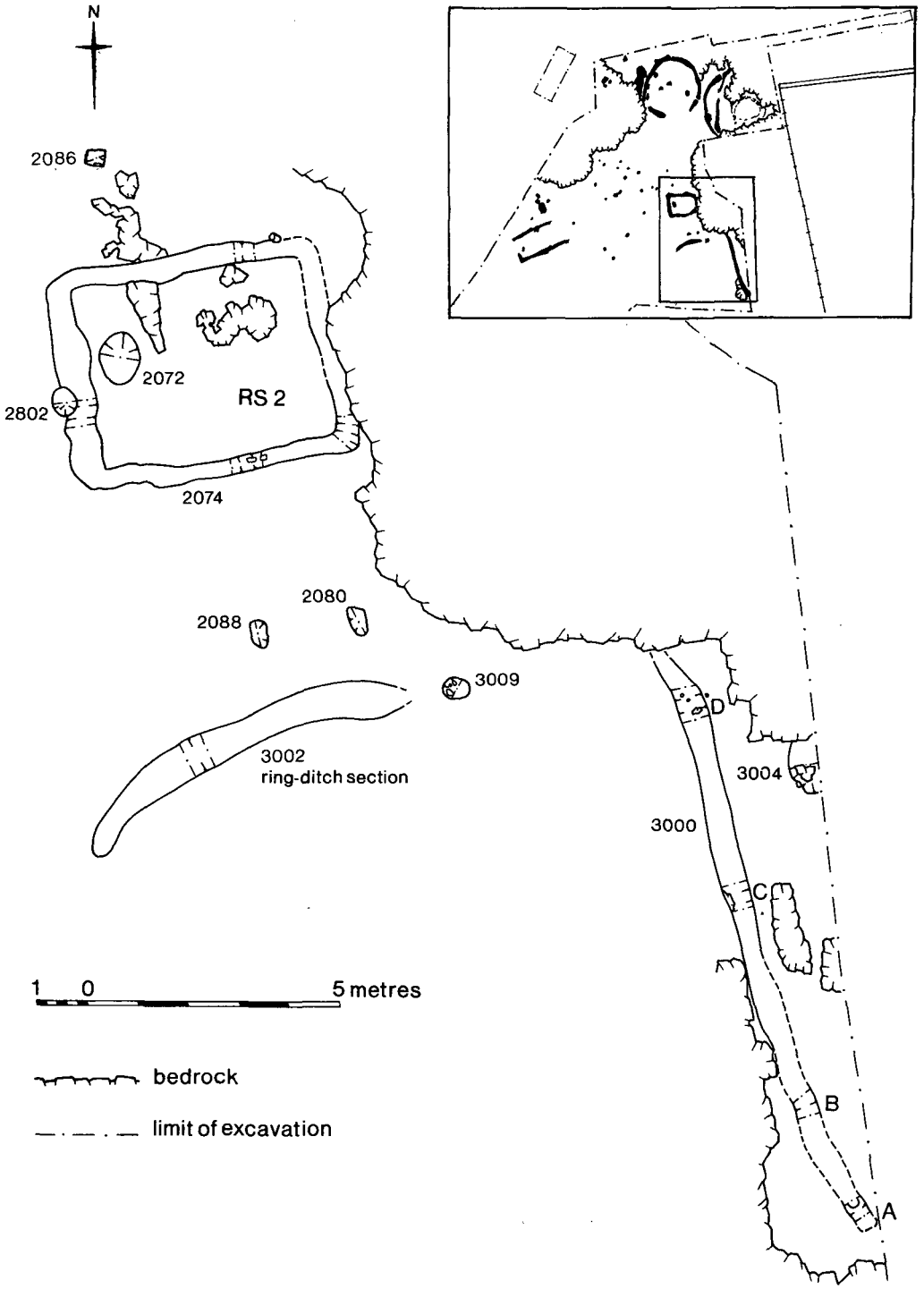
The 'red' pits (illus 17)

Ten pits in the central area of the site (summarized in Table 2) have been grouped together because they shared a very distinctive reddish-brown silty sand fill, similar to the fill of the ring-ditches. The fill was also relatively sterile, containing no stone and no burnt bone, and with only minute traces of charcoal and occasional carbonized grains present. The pits are spread over a large area in the centre of the site, and could form two sides of a rectilinear enclosure or structure. The pits in the east fence- or wall-line appear to be regularly spaced at approximately 5 m intervals.

Sediment analyses (Stephen Carter) In the attempt to explain the nature of the reddish-brown fill, routine soil analysis and examination of thin section samples failed to reveal any differences in basic composition between the red-brown fills and other soils from the site. It is therefore suggested that the colour difference between the red-brown fills and the other darker brown fills may be due to a difference in the relative amounts of other soil components, that is in the amount of organic material present, particularly charcoal, possibly in highly comminuted form. The red-brown fills would represent backfill of features with B horizon material containing principally the mineral component of the soil, which is naturally of a red-brown colour. The darker fills would represent features backfilled with soil which has become mixed with organic material, including comminuted charcoal and charred plant remains.



ILLUS 17 Central pit scatter, showing 'red' pits shaded



ILLUS 18 South-eastern area of site, showing second ring-ditch fragment 3002 (centre); rectilinear structure 2 (top); and possible continuation of primary palisade alignment 3000 (bottom right)

TABLE 2

Cut	Fill	Dia (cm)	Depth (cm)	Phosphate	Burnt bone (g)	Charcoal (g)	Macroplant	Stone
2026	2025	30	5	Low	0	0.2	Absent	Absent
2036	2035	28 x 22	6	Low	0	0	Absent	Absent
2040	2039	29 x 26	8	Low	0	0	Absent	Absent
2042	2041	35	9	Low	0	0	Absent	Absent
2046	2045	39	19	Low	0	0	Present	Absent
2048	2047	40	23	Low	0	0	Present	Absent
2050	2049	32	17	Low	0	0.5	Present	Absent
2054	2053	48 (30)	18	Low	0	0	Absent	Absent
2058	2057	30	13	Low	0	3 (shale?)	Present	Absent
2060	2059	34	7	Low	0	1	Present	Absent

Rectilinear features

Rectilinear structure 1 (RS1) This structure (illus 16) is composed of the truncated and intermittent remains of linear trenches (2007, 2009, 2022), forming three sides of a rectangle, measuring 4 m by 9.5 m (minimum) internally. The trenches were on average 0.3 m wide and 0.1 m deep, with an homogenous mid- to red-brown sandy silt fill (2006, 2008, 2021), and had been disturbed by animal burrowing. The southern line was slightly better preserved, and showed signs of becoming wider and deeper occasionally, possibly indicating a post-in-trench construction. The fill (2008) produced a low phosphate reading, trace amounts of burnt bone (< 1 g from 115 l of soil) and carbonized plant remains.

There were no surviving internal surfaces, but there were two features at either end of the structure. An irregular flat-bottomed pit, 0.3 m across (2038), was sited close to the south-western end, but off-centre, with a distinctive red-brown fill (2037) which has been noted elsewhere. A second small pit (2028) was sited just beyond the point where the trenches petered out at the north-eastern end. Neither of these pits produced any finds from the processing of the fill samples. It should be noted that two irregularities in the northern and southern trenches coincide at a point 4.5 m from the south-western end; it is possible that these represent traces of a subdivision within the structure.

Rectilinear structure 2 (RS2) This structure (illus 18) comprised a continuous rectilinear trench (2074), enclosing an area 3.7 m north/south by 4.5 m east/west, backing onto an area of rising bedrock on the eastern side. The trench was similar in appearance to those forming RS1, being variable in width, but on average 0.3 m, and up to 0.2 m deep. The trench was sectioned in four places, and possible packing stones were found in the southern side. The variations in width could also be indicative of the former presence of post-holes within the trench; another possible example of post-in-trench construction.

The fill of the trench (2073, 2078) was a silty sand with a reddish-brown coloration; a small amount of carbonized plant material was recovered, and trace quantities of burnt bone and charcoal. One feature lay within the area enclosed by the trench, a broad, shallow pit (2072), 0.7 m wide and 0.125 m deep, with a grey-brown fill (2071) including some carbonized plant material. However this feature may not necessarily be associated with the structure. The trench on the western side was cut by a pit (2082), 0.5 m in diameter and 0.15 m deep, with a fill of dark brown silty sand, producing no finds or plant material.

Interpretation These two post-in-trench structures are assumed at least to be contemporary with one another; they have a similar morphology and similar fills in the trenches. The fill of the trenches was noted to have a reddish coloration; the probable cause of this coloration has

been discussed above (the 'red' pits), indicating that the trenches had been backfilled with clean B horizon material, into which little carbonized organic material had become incorporated.

A large quantity of soil was processed from the southern trench of RS1 (2008), in the hope that some dating material could be recovered, but study of the macroplant remains (see Holden & Rankin, Appendix 1) has indicated that here also there are contamination problems. From 115 l of soil, 59 charred grains were recovered, but also 64 uncharred grains and 36 invertebrate egg cases. The charred plant assemblage included bread/club wheat, barley and oats, a composition which does not fit clearly into any given time period, and may indicate post-depositional mixing of material.

Likewise, morphologically these structures could fit into any one of the three identified phases of activity on the site; rectangular post-in-trench structures are known from the Neolithic period as well as the Early Historic period (see Discussion below), and, as the environs of Bronze Age burial sites in Scotland have been so poorly explored, the possibility that these structures represent timber mortuary and ceremonial structures and enclosures cannot be ruled out.

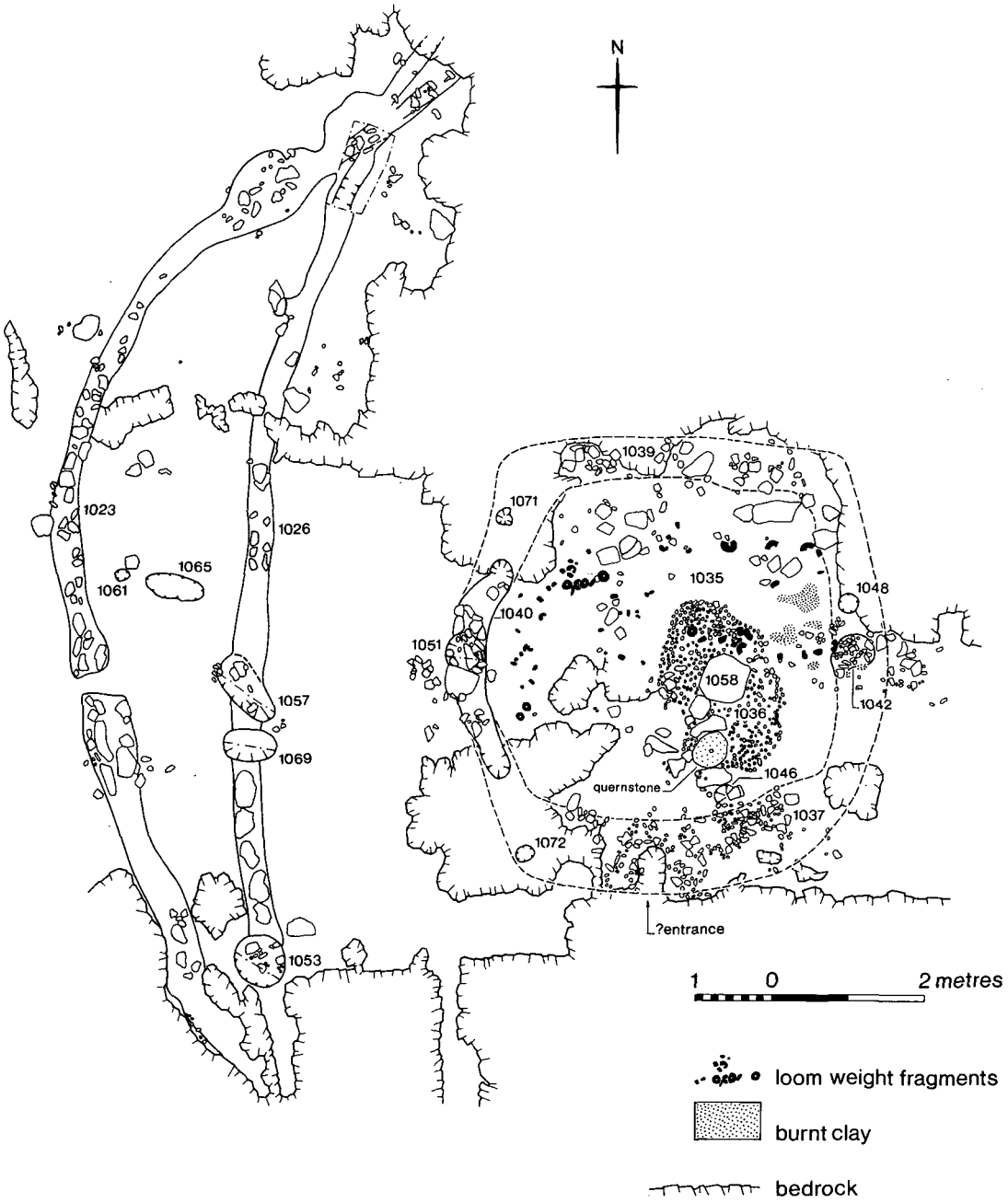
PALISADE ALIGNMENTS AND SUNKEN-FEATURED BUILDING (ILLUS 19)

In an area of shallow soil and outcropping bedrock immediately to the east of the ring-ditch were the well-preserved remains of two curving palisade alignments (1023 & 1026). The sunken-featured building lay in a hollow within the bedrock 2 m to the east of the primary palisade (1026). Although there is no direct stratigraphic link between either of the palisade alignments and the sunken-featured building, the relative positions are taken to indicate that the palisade alignments were enclosing the area within which it, and presumably other settlement remains, now lost, were sited.

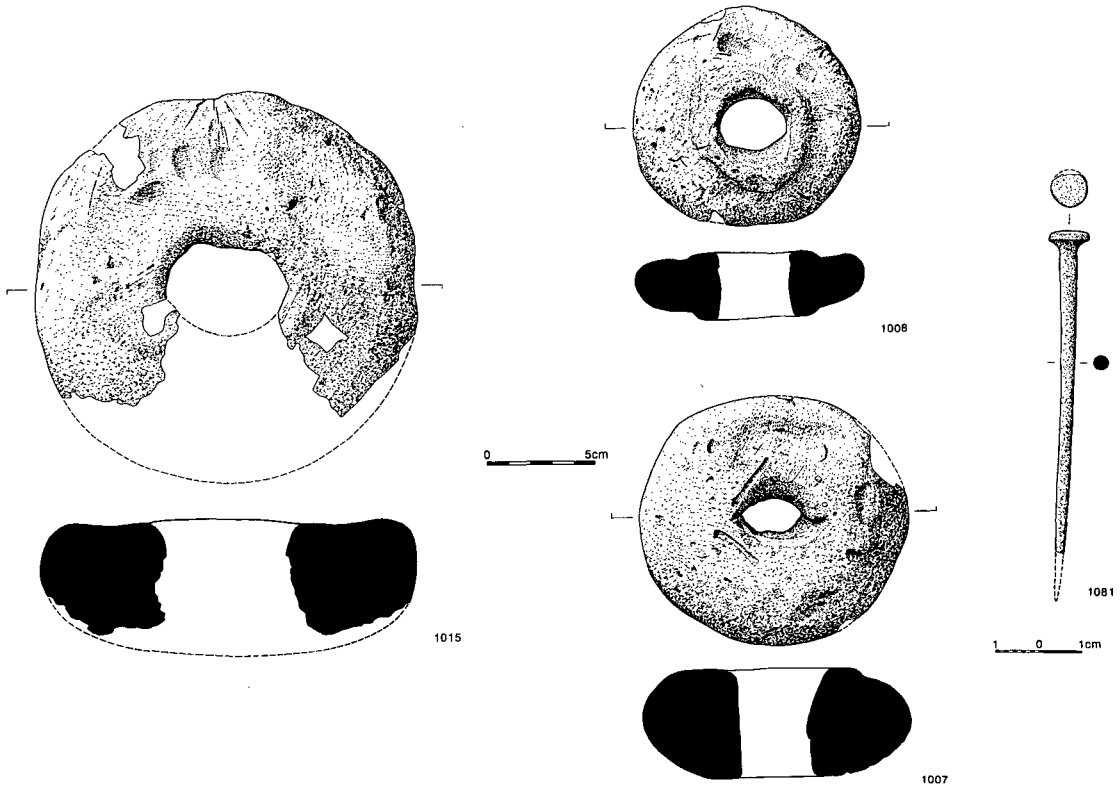
Primary palisade

The primary palisade setting (1026) ran north/south for over 14 m in a shallow flattened arc. At its southern end an uneven, pitted trench had been quarried into the bedrock to a depth of 0.25–0.3 m for 1.5 m before fading out. The soil matrix of the fill (1025) consisted of a medium-brown soft silty sand, homogenous throughout the length of the feature, and contained trace quantities of burnt bone. The upright stone packing (1024) survived in the southern half as single larger, rounded stones (up to 0.5 m long), one of which had plough-scratches, and in the northern half as paired smaller, angular stones. At the northern end also, the line could be seen to continue for a short distance onto the bedrock, where it had been cut away, before fading out. It was at the northern end that this inner palisade was seen to have been cut by the outer, secondary, alignment (1023). A copper alloy nail-headed pin (illus 20) was recovered from the fill of the primary alignment (1025) to the south of the intersection (see below).

Three other features were associated with the primary palisade, only one of which (1053) clearly cut the alignment towards the southern end. This was a deep, well-defined pit, 0.5 m in diameter and 0.3 m in depth, cutting down into bedrock. The fill (1052) was a dark brown silty sand loam with small quantities of charcoal, and also trace quantities of burnt bone. The two remaining features were similar, both appearing on the surface as shallow ovals 0.7 m by 0.5 m (1069) and 0.9 m by 0.5 m (1057). The fills (1070 & 1058) were indistinguishable from that of the palisade cut, and the relationship between the oval pits and the palisade was therefore unclear. It is considered that these features were either integral with the palisade alignment, or related to a modification or repair.



ILLUS 19 Palisade alignments and sunken-featured building



ILLUS 20 Copper alloy pin from primary palisade alignment and clay loomweights from within sunken-featured building

Copper alloy pin

Nicola Battley

A complete copper alloy pin (illus 20) was found in the fill of the primary palisade alignment, a short distance to the south of the intersection with the secondary alignment. The pin has the appearance of a modern nail; the head is round and flat (Diam 8–9 mm), the shaft is straight and circular in section (L 73 mm; Diam 4–2 mm), and tapers regularly towards the point. It is, however, in a relatively poor and fragile condition, with little or no metal remaining.

The simple style of this object makes it difficult to date; the majority of late Iron Age flat-headed pins are decorated, and also tend to have hipped shafts. Examples with straight shafts include ones from Kirbister, Orkney (NMS FC241), from North Ronaldsay, Orkney (NMS FC181), and Buiston, Ayrshire (Foster 1990, 155), but these all have decoration, in the form of rings around the shaft, and are all smaller than the Ratho pin. The closest parallels found for the Ratho pin, in both appearance and size, are two pins from Traprain Law (Cree 1923, 194; fig 7). The dating of the Traprain Law examples is uncertain, as they occurred within a mixed assemblage including Neolithic and Bronze Age flaked stone, Roman pottery, and undiagnostic items such as shale bracelets. Clay moulds from Dunadd, showing the outline of pins similar to the Ratho example, may be dated to the seventh century AD (Ewan Campbell, pers comm).

Secondary palisade

The secondary palisade (1023) was very similar in construction and appearance to the primary alignment, terminating to the north and south very close to 1026, and being cut into bedrock in a similar fashion. However, the course of the secondary alignment had a much more pronounced curve, diverging by 1 m at its furthest point from 1026, and crossing over and cutting 1026 at the northern end. The stone packing (1021) of the secondary alignment was better preserved, and consisted of parallel edge-set stones, some up to 0.4 m in height. The fill (1022) produced trace amounts of burnt bone but no charcoal.

Two features were found in the area between the two palisade settings: a shallow rounded post-hole (1061), and a shallow oval pit (1065). The post-hole (1061) was 0.2 m in diameter, up to 120 mm deep, and the fill (1062), of brown sandy loam, produced no finds. The oval feature (1065) was similar to the two cutting the primary palisade, measuring 0.8 m by 0.4 m, and up to 0.1 m in depth, with a fill (1066) of brown sandy silty loam. The fill of the oval feature (1066) produced small quantities of carbonized plant remains and burnt bone.

Linear feature and pit (illus 18)

In the far south-eastern corner of the site a very well-defined linear feature (3000) 12 m in length ran roughly north/south, fading out at a patch of outcropping bedrock to the north, and turning at right-angles into the baulk to the south. This was sectioned in four places (A–D illus 18), and found to have a variable depth (0.1–0.2 m) and cross-section, from a broad V-shape to a shallow bowl-shape. The fill (3001) was an homogenous brown sandy silt, with no packing stones visible in the areas opened. All the sections produced a small amount of carbonized plant remains (see Holden & Rankin, Appendix 1) and trace quantities of burnt bone; the phosphate levels for three sections were low, but for section B were medium.

A pit (3004) lying partly in the east baulk may or may not be associated with this feature; it was 1.1 m in length and a minimum of 0.5 m in width, filled with a brown silty loam (3005), which produced a medium phosphate reading. The fill also produced a small quantity of carbonized plant remains (see Holden & Rankin, Appendix 1).

The slightly meandering line of the linear feature suggests that it did not form part of a roofed structure, but may represent the remains of a boundary ditch or palisade trench. Although the surviving remains of this feature are dissimilar, it does lie on the same line as the primary palisade (1026), on the other side of the bedrock outcrop, and it is suggested that it may represent a continuation of this line.

The sunken-featured building (illus 19)

This structure occupied a hollow between two rising knolls of bedrock, and had lain directly below the 19th-century field wall, a position which had probably saved it from destruction by the plough. Unfortunately, however, the soil profile was very shallow, and there had been a high level of biological mixing of the soil, leading to a loss of definition of archaeological layers. The carbonized plant remains are discussed in detail in Appendix 1; biological mixing was also evident from the very large number of invertebrate egg cases found in the samples, as well as the large number of uncharred modern seeds.

Structural features and layout The exact shape of the building is difficult to assess, as sections of the wall line are missing where it crosses over bedrock, but it would appear to be roughly square, with an internal area of 4.4 m north/south by 4.5 m east/west. Although the dolerite bedrock here has natural fissures forming misleadingly straight lines and right-angles, there appeared to have been some modification of the bedrock, particularly in the area of the north wall, where the bedrock appears to have been cut back 'against the grain' and an artificial slope created.

The north wall (1039) was represented by an area of dispersed stones, partly lying over sloping bedrock. The stones were larger and less uniform in size than those of the other walls, and more spread out, possibly indicating greater disturbance to the wall at this side. The soil matrix from around the stones produced small quantities of burnt bone and carbonized plant material.

The east wall was also ill defined, although there was a very sharp boundary between the dark, organic-rich material within the structure and a yellow-brown sandy material outside, with a few stones. Two features also lay on the supposed line of the east wall, both of which could be partnered with features of a similar size and position on the line of the opposing west wall. A bowl-shaped post-hole (1048), 0.26 m in diameter and 0.23 m deep, had been cut into the bedrock a short distance to the north of an area of closely packed angular stones 0.5 m in diameter (1042), probably a post-pad.

The west wall consisted of a number of components, principally a band of dispersed stones (1040), similar to those of the north wall. At the mid point of the wall was a substantial post-hole (1051) with packing stones (1049), which could be paired with post-pad 1042 in the opposite wall. Where the wall encountered bedrock at north and south, as with the palisade alignments, the line was continued for a short length by rock-cut trenches which could also have acted as post-slots. At the far northern and southern ends, possibly marking the corner points of the walls, were the remains of two further post-holes (1071 & 1072), showing as slight depressions cut into the bedrock.

The south wall (1037) consisted of a band of close-packed small to medium-sized stones, at the western end lying over bedrock, and at the eastern end curving away from the bedrock. There is reason to believe that the entrance was sited in this wall, as the paving of large stones inside the structure appeared to lead towards the centre of the south wall.

Interior of the structure The high level of biological mixing of soils in this area meant that within the structure it was impossible to distinguish layers as such; the occupation material was divided into an upper (1034) and a lower level (1035), taking the level at which the stone and pebble paving and the loomweights were found to indicate the surface of the lower part of the occupation material (1035). The upper part of the occupation layer (1034) consisted of a dark brown mottled sandy loam, with patches of red burnt clay and black charcoal-rich soil, which appeared to be a mix of topsoil and occupation deposits. The lower part was essentially similar to 1034, a very mottled brown sandy soil with areas of red burnt clay and grey unburnt clay. There were also a number of small angular, possibly fire-cracked, stones. The total depth of sediment varied, apparently dependent on the undulating bedrock, and was shallower (0.1 m) in the south-western quadrant, and deepest (0.35 m) in the northernmost part of the interior.

Over much of the south-eastern part of the interior was a floor surface of densely packed small rounded pebbles (1036), and a line of larger stones (1058) forming a path towards the southern wall, noted above as the probable site of an entrance. These larger stones included an inverted lower quern-stone (see illus 19).

The main feature of the interior of this structure, however, was the large number of whole and fragmentary clay loomweights, discussed in detail below. The weights and weight fragments were not scattered all over the interior, but were found in lines in three main areas. A broken and scattered line lay parallel to the west wall and approximately 0.3 m away from it, and across the pebble surface on the eastern side was a second line of fragments running east/west. A third line, running parallel to the north wall, is represented by a closely set group of smaller weights (find nos 1007–1013), one of which was lying on its side at the western end (find no 1008), and a more widely spaced series of larger weights at the eastern end (find nos 1014–1017). Other artefacts from within the building were few, consisting of only two sherds of pottery and a stone ball (discussed below).

Carbonized plant remains (Tim Holden & Dorothy Rankin) The high level of contamination of modern plant material has been discussed above, but worthy of particular mention among the charred non-domesticated species recovered from within the building, are two carbonized fruits of *Iris pseudacorus* L. (yellow iris). This species of iris is unlikely to have been brought to the site as cereal waste, as they grow at loch or pond edges. It is possible that they were brought in along with flooring material such as rushes or sedges, or for their attractive flowers, although there is little other botanical evidence to support this. Other uses of the plant include the production of a black dye from the rhizome (Grigson 1987, 419; Grieve 1992, 438). Given that loomweights were present in the same context, it is tempting to suggest that the iris had been brought into the building to make dye, to be used to colour yarn or cloth woven within.

Analysis of soil thin section micromorphology (Stephen Carter) During excavation of the structure a baulk was left across the building, and a vertical sequence of Kubiena tins taken from the baulk through the occupation material. Information gained from the analysis of these thin sections was used to investigate the composition of the sediments forming the material within the building. The high degree of biological mixing had removed any evidence of the original sedimentary fabric, so that it was not possible to reach direct conclusions about the mode of deposition of the sediments. However, study of the rock mineralogy, and the abundance of various anthropic components (for detailed discussion see Appendix 2) helped to indicate sediment sources and demonstrate former stratification in the sediments.

The examination of the soil thin sections supported the field interpretation that the level represented by the loomweights and the pebble surface was a floor surface. Sediments below this level (1035) were relatively clear of anthropic components, and may have been local sediments introduced to level up the floor area. Sediments over the loomweights (1034) were introduced after the abandonment of the structure, possibly resulting from the natural silting of the hollow.

The loomweights (Andrew Norton & Ann MacSween) The clay loomweight assemblage from the interior of the sunken-featured building comprises whole weights and fragments representing a total of 68 weights (see Appendix 4 for a complete catalogue).

ILLUS 21 Line of loomweights in northern area of sunken-featured building viewed from east. Foreground, weights 1007–1011, background, larger weights 1015–1017

The overall diameter of the loomweights (illus 21) varies from 100 mm to 180 mm, with most of the perforations measuring between 30 mm and 40 mm. The weights are made of rough clay and are not well fired. Several of the weights, including finds 1035 and 1036 from the east side of the house, have vitrified patches, indicating contact with intense heat. Most of the weights are grey/brown, with a lesser number orange in colour. The weights are, in general, featureless, although one (1017) has three thumb-prints around the perforation (illus 21) and several others have deep holes which could have resulted from inclusions falling out. While these features may not be deliberate, the possibility must remain that they represent the marking of certain weights. There are no wear-marks on the weights, but this is perhaps not surprising, given that the surfaces are, in most cases, badly abraded.

Wheeler (1935, 154) identified two types of loomweights: 'annular' weights which have a relatively large central opening, and 'bun-shaped' weights which were more massive with a smaller perforation in comparison to their overall diameter. He suggested that this represents a chronological difference, with the annular loomweights belonging to the earlier Saxon period and the bun-shaped loomweights dating to the later Saxon period. Hurst (1959, 23) identified a third 'intermediate' form, in use in the middle Saxon period. He noted an additional, technological, difference, with the earlier loomweights apparently being made as rings and the later loomweights made as discs and then pierced. Following Hurst (1959), the weights from Ratho can be broadly classified as 'intermediate' (see illus 21, for example), although there is some variation in both the overall shape and section; 1008, for example, has a lip surrounding the perforation. Hedges (1980, 91) has pointed out that the typological divisions proposed by Wheeler and Hurst are not as clear-cut as has been suggested and has stressed that loomweights should never be used to date sites or features.

The weights imply the use of a warp-weighted loom. When in use, the weights would have been tied to bundles of warp ends by a loop of cord (Hedges 1980, 81). The mass of a weight is the only functionally crucial aspect (*ibid*, 89), and it was possible to estimate weight for the majority of items in the Ratho assemblage. Several groups of similar weight were noted; the most notable is the line of six weights plus several fragments (1007–11 & 1013) (illus 21), which all weigh between 508 g and 630 g apart from 1008 at 255 g. To the east of these were three larger loomweights (1015–17) some distance apart in a line. The remains of three loomweights (1021–3) found on the pebble surface in the centre of the building were all estimated to be 500 g in weight. Both 1015 and 1017 were considerably heavier than the majority of weights found, weighing 1330 g and 1160 g respectively. Hoffman (1974, 42), in her study of the use of the warp-weighted loom in modern Scandinavia, observed that, while having a set of loomweights of uniform weight made life easier, loomweights of different mass were sometimes used on the same loom, with proportionately more warp threads being tied to the heavier weights. Alternative explanations are that the heavier weights were used to strengthen the side selvedges (*ibid,* 65), or that they were part of a set of weights used in the weaving of a heavier cloth.

Although there is no direct evidence for a loom within the sunken-featured building at Ratho, in the form of post-holes for the uprights or remains of charred large timbers, it is probable that weaving was carried out at least in part of the building. The lines of weights could indicate the former position of looms, or could represent groups of weights which had been threaded on sticks ready for use.

Similar sunken-featured buildings in other parts of southern Scotland and England have been interpreted as weaving sheds, on the grounds of the presence of loomweights. Excavations at New Bewick, Northumberland, recovered between 20 and 30 clay loomweights from a sunken-featured building (Gates & O'Brien 1988, 7). At Castle Park, Dunbar, loomweights were recovered from

within a building similar to the Ratho sunken-featured building (Holdsworth 1993), and on the ground surface outside the west end wall was a heap of over 20 loomweights.

Petrological analysis of the loomweights (Dianne Dixon) Two loomweights (1046 & 1015) were analysed. The vast majority of the plentiful grains in the sandy/gritty clay are quartz, with a scattering of other minerals, some larger plagioclases and pyroxenes of basaltic origin. The clay is almost certainly local, derived from the Carboniferous sandstones with contributions from the doleritic intrusions which dot the landscape.

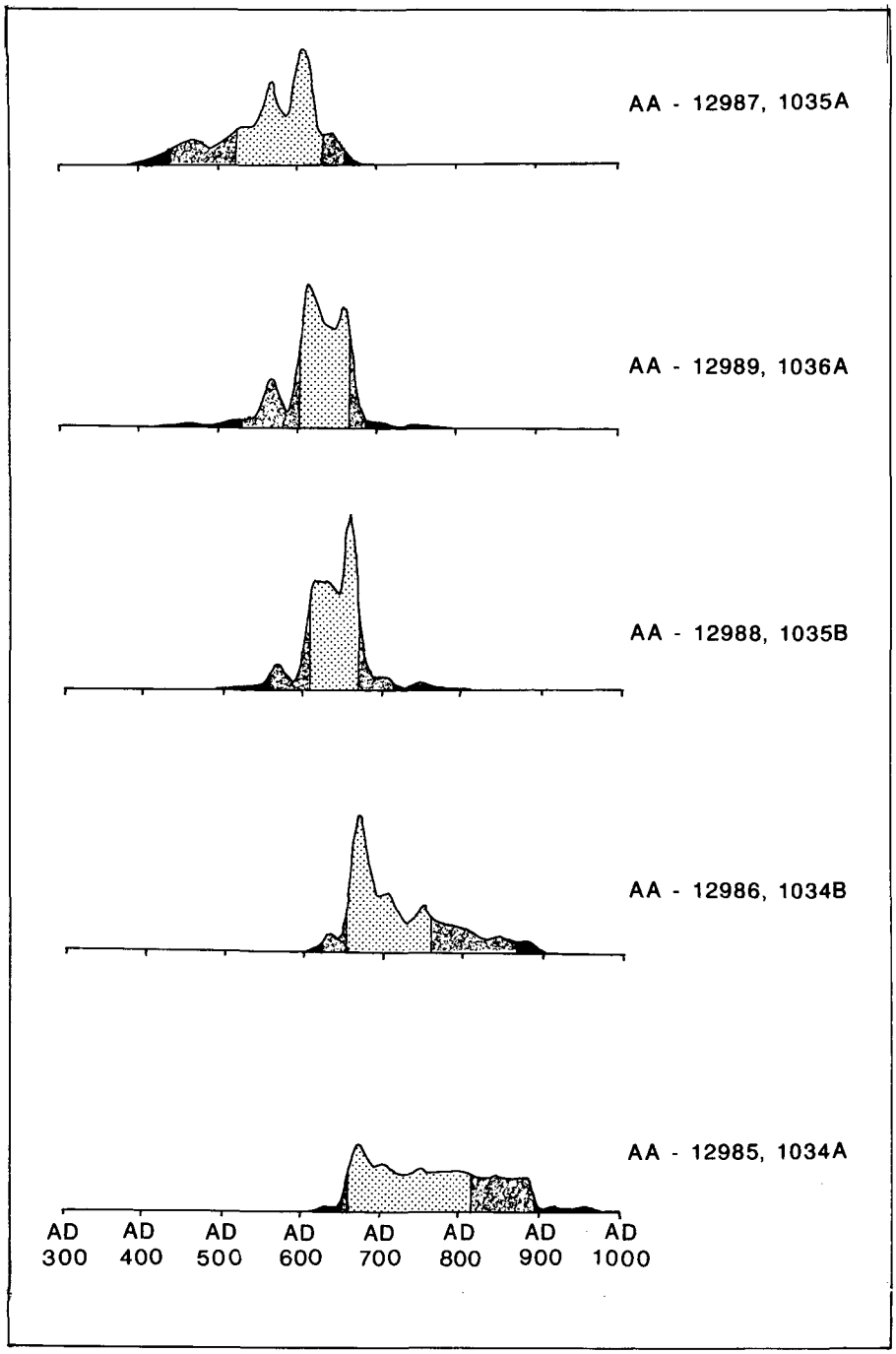
Pottery (Ann MacSween) Two sherds of pottery were recovered from the interior of the sunken-featured building, one from the upper and one from the lower horizon. The one from the upper horizon is a body sherd of a sandy fabric with some rock temper. That from the lower horizon has a sandy hard-fired fabric, with a thick residue adhering to the interior. It is completely different in character from the Neolithic and Bronze Age pottery.

Coarse stone (Nicola Battley) There were two coarse stone finds from the interior of the structure: a stone ball from the lower occupation horizon, and a lower rotary quernstone, which was found inverted in a paved surface.

The stone ball is almost spherical (diam 38 mm), and slight pecking is visible on the surface. Stone balls have been found at various hillfort locations in south-east Scotland, but are not believed to be chronologically or culturally sensitive (Rideout 1992, 115). These objects are traditionally interpreted as slingstones, but it has also been suggested that they may have been used as gaming pieces (Cool 1982, 95).

The quernstone is subcircular with a circular central perforation, but with no handle holes, indicating that it would have been the lower grinding surface stone. The grinding surface is flat, except for a slight lip around the central perforation. There are light tool marks showing an irregular wear pattern over about three-quarters of the grinding surface. The lower surface, which would presumably have been set in the ground during use, but was facing upwards during its reuse as paving, shows heavy tool marks, with no signs of wear.

Radiocarbon dating The dating programme concentrated on the sunken-featured building because of the lack of suitable dating material and taphonomic problems elsewhere on the site. However, even within the sunken-featured building, the amount of charcoal recovered from flotation of bulk soil samples was very small, and in total barely sufficient for a single conventional radiocarbon date. Some degree of soil turbation had also taken place within the structure, caused principally by soil fauna, which resulted in considerable blurring of soil boundaries. It was therefore decided that multiple AMS (Accelerator Mass Spectrometry) dates should be obtained from within the building, using the largest available (non-*Quercus*) single charcoal fragments. The assumption was that the charcoal was derived from the fixtures and fittings of a short-lived building, which had been destroyed by fire, and that therefore all the dates should prove to be coeval. Sufficient charcoal was available for a pair of dates from each of the three levels (1034, upper level; 1035, lower level on which loomweights lay; 1036, soil matrix of pebble and stone surface). The charcoal was all identified as hazel (*Corylus avellana*) roundwood, which seemed promising, as the use of small twiggy branches from a fast-growing species, should avoid the 'old wood' pitfall of oak charcoal.



ILLUS 22 Calibrated radiocarbon dates

Problems of possible contamination by earlier and later material were considered. There was the possibility of drift of earlier charcoal from the nearby Bronze Age funerary complex, but in the absence of charcoal from the fills of the ring-ditch and other features, this was thought to be unlikely. Equally, background levels of charcoal over the whole site, and from the topsoil, were very low, indicating that charcoal had not made up a significant proportion of material put into the soil in recent centuries, and that therefore the potential for recent contamination was low. The fact that all the identifiable charcoal from the sunken-featured building consisted of hazel roundwood supported this hypothesis; if contamination had occurred, a greater range of species and of timber size would be expected.

The radiocarbon determinations from the building are shown in Table 3. The dates were calibrated using the Belfast calibration curve (Pearson *et al* 1986), and the results are shown in Table 4.

TABLE 3

Lab no	Sample	Years BP	$\delta^{13}C$ (‰)
AA-12985	1034A	1495±55	–25.6
AA-12986	1034B	1420±55	–25.8
AA-12987	1035A	1250±55	–25.1
AA-12988	1035B	1395±55	–25.7
AA-12989	1036A	1290±55	–25.7
AA-12990	1036B	2260±55	–25.0

TABLE 4

Lab no	Sample	SCR	LCR
AA-12985	1034A	AD 525–630	AD 440–660
AA-12986	1034B	AD 605–665	AD 530–685
AA-12987	1035A	AD 660–815	AD 655–895
AA-12988	1035B	AD 610–670	AD 560–715
AA-12989	1036A	AD 655–760	AD 625–865
AA-12990	1036B	400–270 BC	460–190 BC

One date (AA-12990, 1036B) stands out as being considerably earlier than the rest, falling in the late first millennium BC. This date was from one of the smallest identifiable fragments of hazel roundwood, from the soil matrix around and below the pebble surface. It is not impossible for earlier material to have become incorporated into this soil matrix, and the soil thin section report suggests that some material may have been brought in to level up the undulating bedrock floor. This material may have originated from earlier structures on the site, now destroyed (see argument below for South Platt Hill being a lost hillfort site). This is a salutary lesson in the use of combined charcoal samples; if this piece had been included with the others for a single conventional radiocarbon date, a misleadingly early date would have been produced.

Illus 22 shows that although in the longer calibrated range the dates fall within a wide bracket from the late fifth to the ninth centuries AD, there is a high probability that the real dates fall within the seventh century. Two dates in particular (AA-12988, 1035B; AA-12986, 1034B) have a probability of over 80% of falling between AD 600–700. The earliest of the five dates (AA-12985, 1034A) has an LCR (Longest Continuous Range) which extends back as far as AD 440, but there is an 85% probability of the date falling later than AD 500. There is therefore a high likelihood that this in fact represents a sixth- or early seventh-century date. Of

the two later dates (AA-12987, 1035A; AA-12989, 1036A), the former has an LCR ranging from the mid-seventh century to the late ninth. The flat profile of the probability distribution for this date shows that it is not possible to suggest a more precise bracket into which it may fall. The latter date has an LCR ranging from the early seventh century to the mid-ninth, but the probability distribution shows that it is most likely to fall in the late seventh or early eighth centuries.

DISCUSSION

The excavated remains found at Ratho can be grouped into three main phases of activity: early Neolithic, middle-later Bronze Age, and Early Historic. It has not been possible, however, to attribute some of the truncated features in the southern area of the site to any particular phase with certainty. Evidence from earlier discoveries in the vicinity of the site may be added to these excavations to broaden our knowledge of its history: the cist found in 1897 (Coles 1898; and above), and the intriguing description of remains on South Platt Hill (see above).

South Platt Hill can be identified as the flat-topped hill on whose western shoulder the excavation was located. The account appears to describe a hillfort, with a central area surrounded by a ditch and stone rampart, and with two further enclosures approximately 10 m in diameter. It is not clear whether these lay within the central area or outside it. The description of finding cists with inhumations 'on removing the rubbish' inspires speculation as to the nature of the rubbish; was it midden material? The dating of these remains is also a matter for speculation, but the mention of blue and yellow (glass?) beads could, in combination with the ditch and stone block rampart, place the hillfort in the pre-Roman or Roman Iron Age. Forts such as The Dunion, Roxburgh (Rideout 1992), have features in common with those described at South Platt Hill, and the anomalous radiocarbon date from the sunken-featured building (AA-12990, 460–190 BC LCR) is contemporary with dates from primary occupation at The Dunion (*ibid,* 108–9). Antiquarian accounts repeatedly compared South Platt Hill with Kaimes Hill, in the south of Ratho parish, and it is interesting that Rideout notes the similarity between The Dunion's ramparts and those at Kaimes Hill (*ibid*, 116; Simpson 1969, 12, pl 2).

The stone cists with inhumations could belong either to the Iron Age or to the Bronze Age. However, comparison of some of the features found in the 1993 excavations with the features described raises some interesting points; first, the fortified area is described as approximately one acre, which is too large to describe the summit of the hill itself, but does fit the area enclosed by the bedrock crests. Second, the excavation found evidence of two ring-ditches, one of which was approximately 10 m in diameter; and, third, the excavations found evidence of one robbed cist and one destroyed cist. It is within the bounds of possibility that the antiquarian account may be describing the destruction of upstanding features within the area excavated in 1993, and that the 10 m diameter enclosures, surrounded by ramparts of stone blocks and black earth, may have been Bronze Age enclosed cemeteries rather than Iron Age houses.

NEOLITHIC FEATURES

The evidence of Neolithic activity at Ratho consists of one almost destroyed and two heavily truncated features, from which carinated bowl type pottery of early Neolithic date and a pitchstone blade fragment have been recovered. The cereal remains from these features, subject to

reservations because of possible contamination, and consisting of hulled barley, bread/club wheat and oats, are not, however, characteristic of the emerging picture of the Neolithic in Scotland (see Holden & Rankin, Appendix 1). There remains the possibility that at least the larger of the two rectilinear structures (RS1) could be of Neolithic date; after Balbridie (Fairweather & Ralston 1993), and the controversy over Doon Hill Hall A (Hope-Taylor 1980), it is evident that rectangular timber post-in-trench structures cannot safely be assumed to be of Early Historic date. Although Ratho RS1 falls within the size range of the later structures (James *et al* 1984, 191), RS1, like Balbridie, lacks evidence for a line of substantial posts along its long axis (Fairweather & Ralston 1993, 316). No diagnostic artefacts were recovered from the structure. The assemblage of carbonized plant remains is also problematic (predominantly hulled barley with bread/club wheat and oats, cf Appendix 1), but is similar to the Neolithic and Bronze Age assemblages elsewhere on the site.

It seems that it is impossible to excavate a site anywhere in eastern Scotland without finding fragments of the Neolithic pattern of settlement, in the form of truncated pits and pottery sherds. In the immediate vicinity of Ratho, sherds from carinated bowls were found during the excavations at the Catstane (Cowie 1978, 191), a plain bowl was recovered from a sandpit near Roslin, Midlothian (Stevenson 1948), and at the Bronze Age burial site at Dalgety, on the opposite bank of the Forth, a single pit containing fragments of a carinated bowl was excavated (Watkins 1982). This evidence is very fragmentary, often having been heavily eroded by subsequent intensive Bronze Age agriculture, and sometimes hidden deep in podzolic soil profiles, but it seems to indicate that many of the sites chosen for settlement and/or ceremonial activity in later periods had also been used in the early Neolithic period.

BRONZE AGE FUNERARY REMAINS

The Bronze Age funerary remains at Ratho can be summarized *in toto* as: a ring-ditch enclosing two urned and one unurned cremations, and a disturbed cist 7 m to the west of the ring-ditch, probably containing originally a cremation; a partially destroyed cist 30 m to the south-west of the first ring-ditch, probably containing originally an urned cremation, with an adjacent group of pits containing burnt bone; and traces of a second ring-ditch, 12 m south of the first. These form three principal foci on the site, and with these could also be included the central scatter of pits containing burnt bone. The rock-cut cist containing two inhumations discovered in 1897 (Coles 1898; and above) had probably been sited a maximum of 90 m to the south of the northernmost ring-ditch. The funerary remains were thus spread over a minimum area of approximately 4000 sq m.

It should be noted that the slight natural acidity of the soil means that unburnt inhumations placed directly into the soil would not survive for long periods. Evidence of any features which did not penetrate into the C horizon has been lost because of ploughing in the upper soil profile, and biological mixing in the lower part of the profile. This means that any features in, on or above the old ground surface, such as scorching of the surface by pyres, or earthen mounds and banks, have been lost, and, therefore, that the original appearance of the burial area must remain unknown. Equally, the lack of stratigraphy and diagnostic artefacts in some of the excavated features, such as the rectilinear structures and scattered pits, means that they cannot be attributed to any one phase with certainty.

Some details of ritual have been deduced from study of the cremation deposits; these are described above, with a few points emphasized here. The study of the cremated bones from Urn 1 by Kathleen McSweeney has recreated a picture of a severely arthritic man of advancing years,

who would have required a high degree of care from those around him to get through everyday life. He had been accorded a larger and more elaborately decorated urn than the younger man in Urn 2, as well as an accessory cup, which had probably been through the pyre with the body. In both cases the bones had been carefully collected, cleaned, and placed in the urns with some padding in the form of mossy vegetation. The adult individual represented by the unurned cremation remains more anonymous, but some details of the ritual may be explored. It appears that in this case, unlike the two urned cremations, that the bone had been broken up into smaller pieces, either deliberately or by less careful handling. If the bones had been brought some distance to the site from a pyre elsewhere, transportation of bones in a solid urn would not cause too much damage, but carriage in a soft bag would probably cause the brittle bone to break up even further. Unfortunately biological mixing had removed any evidence for an organic container around the unurned cremation.

The Ratho site may be compared with others in south-east Scotland with a similar dispersed variety of burial rites, such as at Magdalen Bridge near Joppa and Kirkpark, Musselburgh. At Magdalen Bridge sand and gravel quarrying uncovered urned cremations (including cordoned urns, one with a bronze razor accompanying the burial), urns in cists, and inhumations with and without cists (Lowson 1882). The site at Kirkpark, Musselburgh, was also discovered as a result of sand extraction, and yielded 16 or 17 urned cremations in both collared and cordoned urns, eight unurned cremations, and an unknown number of cists with inhumations (Lowe 1894). The excavations at Ferniegair, Lanarkshire (Welfare 1975), recovered evidence of cists with inhumations, four urned cremations and one inhumation in a dug grave. A site remarkably similar to that at Ratho was excavated at Kinneil Mill, just outside Linlithgow, Stirlingshire (Marriott 1968), which had been partly quarried away, but it produced evidence for at least two ring-ditches, one with four urned cremations, two unurned cremations and two bone and charcoal deposits. There were also dispersed cists and urned cremations outside the ring-ditches. This site may, like Ratho, also have been chosen as the site of a later fortification, which emphasizes the ridge-top location of the sites, with good all-round visibility over a wide area.

Cordoned urns (Ann MacSween) Cordoned urns are generally tall vessels with an upright upper body tapering to the base, although more straight-sided examples are also found (Burgess 1980, 93). Urns with one, two or more applied cordons have been noted, but the most common are similar to Urn 1 from Ratho, having two cordons dividing the body of the vessel into three zones. Usually the zones are wide but some vessels have a short upper zone as with Urn 2 from Ratho, for example a vessel from Seamill, Ayrshire, which also has a short neck and decoration between the cordons (NMAS 1983).

Decoration is usually incised or cord-impressed and is frequently restricted to the uppermost zone of the vessel and arranged within the spaces defined by the cordons. The most common motifs are triangles (sometimes infilled), chevrons, lozenges or lattice patterns (Megaw & Simpson 1979, 238).

There is nothing in either the motifs, method of executing the decoration, or morphology of the urns to indicate chronological development. At Law Park, near St Andrews, urns with two and three cordons were recovered (Hay Fleming 1907). Different methods of decoration have also been noted on vessels from the same site. On the urns from Magdalen Bridge, Joppa, for example, both incised and impressed decoration is found (Lowson 1882), while on the urns from Kirkpark, Musselburgh, decoration includes both chevron style and oblique line decoration (Anderson 1894). The comb-impressed chevron-style decoration on Urn 1 from Ratho is a fairly common motif in south-east Scotland. Examples include urns from Magdalen Bridge (Lowson 1882, 422, fig 1),

Brackmont Mill (Longworth 1967, 63, fig 2.5) and Kirkpark, Musselburgh (Lowe 1894, 69, fig 3), incised in the first case and impressed with twisted cord in the other two cases. Infilled lozenge decoration is less common.

The decoration on cordoned urns is not always repeated consistently around the circumference of a vessel. Even when the decoration appears regular, there are examples of urns where inconsistencies appear to have been deliberately introduced, for example, on an urn found near Oban (NMAS 1898) where one of the triangles was infilled with oblique parallel lines unlike the other triangles which were infilled with a lattice pattern. On some vessels the motifs change around the circumference, the different motif sets being divided by vertical parallel lines, as on one of the urns from Magdalen Bridge (Lowson 1882, 423, fig 2). Urn 1 from Ratho has roughly executed decoration with only one set of vertical lines dividing the chevron decoration from the infilled lozenges.

The largest concentrations of cordoned urns are in the south-west and east of Scotland and the north-east of Ireland (Kavanagh 1976, 329) with lesser numbers in other parts of Scotland and Ireland, Wales and the north of England. Cordoned urns are most often found in funerary contexts but have occasionally been noted on habitation sites, for example at Downpatrick, County Down (Pollock & Waterman 1964). In funerary contexts, cordoned urns are associated with cremation burial. They have been found with secondary burials at megalithic tombs, for example at Harristown, County Waterford (Hawkes 1941); in mounds as at Llanddyfnan, Anglesey (Lynch 1970, 173); and broken and scattered on the surface of a cairn at Balbirnie, Fife (Ritchie 1974, 15). Most commonly, however, they are found in cemeteries, sometimes with other types of urns. At Kirkpark, Musselburgh, collared urns and plain urns were recovered in addition to cordoned urns (Lowe 1894), while at Brackmont Mill at Leuchars in Fife, collared urns and cordoned urns were recovered along with unurned cremations (Mears 1937, 255; Spence 1949). When accompanying a cremation, cordoned urns were usually inverted (Morrison 1968, 82).

Much of the excavation of cordoned urn cemeteries was carried out last century and little dating material was recovered, but their associations with collared urns indicated a date in the range 1800–1250 BC uncal (Burgess 1986, 350). Other artefacts are seldom found with the urns, the only recurring association being the bronze razor (Megaw & Simpson 1979, 238). Occasionally, assemblages of artefacts have been found accompanying a cordoned urn. At Balneil, Wigtownshire, for example, a bronze chisel, bone pin and a bead of vitreous paste were recovered with the urn (Curle 1916) but such associations are uncommon.

In some areas, accessory vessels (also called incense cups and pygmy vessels) accompany the urns, although they are rarely found in Ireland (Kavanagh 1976, 322). Often they are biconical with a diameter greater than their height and have perforations at or near their widest point, but a wide variety of small vessels has been recovered (see Scott 1951, 81, fig 2 for Scottish examples). Occasionally, different kinds of accessory vessels are found with one urn. At Kirkpark, Musselburgh, three accessory vessels were found with a cordoned urn (Anderson 1894, 71–2, figs 6 & 7). Accessory vessels are also found with other types of urns, for example, with collared urns as at Gilchorn, Arbroath (Hutcheson 1891, 447), but sometimes, as at Whitestanes Moor (Scott-Elliott 1965, 52) they are the only vessel accompanying a burial.

Decoration similar to that on the Ratho vessel has been noted on other accessory vessels, for example at Brackmont Mill (Childe 1942, 87) and on cordoned urns, as on a vessel from Bankfield, Glenluce (Wilson 1887, 186). Some accessory vessels may have been placed with the body in the pyre as indicated by the condition of the Ratho accessory vessel. A similar suggestion was made for the incense cup accompanying urn 8 at Brackmont Mill which was cracked at several points (Childe 1942, 87).

The Ratho urns fit into the most common context, buried upside down and accompanying cremations. The presence of an accessory vessel inside the urn is, similarly, not uncommon. There is little that can be deduced at present from the morphology or decoration of cordoned urns and accessory vessels in terms of regional patterning or chronology. It is possible that some patterns, for example chevrons, are more common in some regions than others, but insufficient synthesis has as yet been carried out to allow further comment.

EARLY HISTORIC PERIOD

Archaeological remains

The structural remains attributed to this period are a two-phase palisade alignment, apparently enclosing a sunken-featured building, with the possible addition of the two rectilinear post-in-trench buildings RS1 and RS2 some distance to the south and west. These remains all stood on a high shoulder of land with wide-ranging views to the north, east and west. Palisade alignments are a basic form of construction and recur in many different periods, so that in isolation they are difficult to date. However, the combination of palisade settings with a sunken-featured building can be seen at other so-called Anglian settlements in south-eastern Scotland and the Borders, such as Dunbar, East Lothian (Holdsworth 1993, 34–6). The *grubenhaus* at Dunbar, although considerably larger than the Ratho example, had some clay loomweights within and a large number apparently dumped outside one end wall; a radiocarbon date of 240–555 cal AD (GU-2992) was obtained from charcoal from a 'large timber' [oak?] overlying the loomweights. This could represent an 'old wood' date and therefore be too old. Two further dates from animal bone (GU-2994 AD 400–630; GU-2995 AD 430–650), associated with the same phase, are contemporary with the earliest of the Ratho dates (illus 22, AA-12985, AD 440–660), probably suggesting a sixth- or early seventh-century date for this material. The single *grubenhaus* excavated at New Bewick in Northumberland was closer to the Ratho example in size (4.7 m by 3.9 m) and contained 20–30 clay loomweights (Gates & O'Brien 1988, 5–7). The New Bewick example was of ridge-post construction, as was the Dunbar structure, but at neither site was it clear whether the floor had been on the bottom of the pit, or of raised planks at ground level. The Ratho sunken-featured building also appeared to have had two substantial posts at either end, indicating ridge-post construction. The carefully laid pebble and stone surface, and the evidence from the soil thin sections, clearly show that the floor had been at the bottom of the hollow. The lines of loomweights within may indicate the former presence of at least three or four large upright looms within the building. In this context it is tempting to see the presence of yellow flag iris seeds, the plant whose rhizome produces a black dye (see Holden & Rankin, Appendix 1), as evidence for the dyeing of yarn or of woven fabric. The patches of vitrification on some of the loomweights, and the higher than average amount of charcoal from deposits within the structure, are the only evidence for the destruction of the building by fire.

The two rectilinear post-in-trench buildings, RS1 and RS2, may also belong to this period, and it is from Anglian settlements that the most suitable parallels come. At Dunbar, the *grubenhaus* was accompanied by timber post-in-trench buildings, the most complete measuring 7 m by 4.5 m (Holdsworth 1993, 43). Some of the other cropmark sites, such as Sprouston, Roxburghshire (Smith 1991, 276–80), and excavations such as Thirlings, Northumberland (O'Brien & Miket 1991), have revealed a wide range of rectangular timber structures of post-in-trench and post construction. However, the closest parallels for the Ratho structures are among the

Period 1 structures at the Anglo-Saxon monastery site at Church Close, Hartlepool, Cleveland (Daniels 1988). This site uncovered a large number of small post-in-trench structures, some as little as 3 m by 5 m (cf Ratho RS2), with palisade alignments and numerous unphased pits. Unlike Ratho, but as at a number of other sites, these timber structures were later replaced by stone-footed buildings in Period 2. The radiocarbon dates from Periods 1 and 2 at Church Close are identical (Daniels 1990, 407), and are broadly contemporary with the Ratho dates. The dates from animal bone from Period 1, calibrated to one sigma, gave ranges of AD 570–710 (HAR-8602), AD 610–780 (HAR-8608), and AD 666–852 (HAR-8600).

At Ratho there are too few buildings to provide any evidence of layout; it was unfortunate that the area immediately to the east of the sunken-featured building had been used as a test blast area, and had been completely destroyed, removing any possibility of extension of the excavations. The two rectangular structures did appear, however, to have been placed at some remove from the sunken-featured building, and, if contemporary, set apart by the palisade fence.

Historical background of Anglian settlement in Lothian

The archaeological remains of Anglian settlement in Lothian are generally set against the turbulent documented events of the seventh century. The epic poem, *y Gododdin*, with its tales of pre-battle feasting at *Din Eidyn* (Edinburgh), is generally taken to imply that by the late sixth century Edinburgh was a centre of the British sub-Roman kingdom of Gododdin (Aliaga-Kelly 1986, 50). Not only was it a political centre, but the use of *Din* also implies that it was a fortified and populous place. Almost 40 years later, in AD 638, the event referred to as '*obsessio Etin*' or the siege of Edinburgh, in the Annals of Ulster, is interpreted as an assault on Edinburgh by the Northumbrian Angles under Oswald. It is not known whether this was the culmination of a process of annexation or a daring raid, and it only seems to be in the later part of the century that formal Anglian authority was established in the western part of the region, with the creation of a bishop's seat at Abercorn by AD 681. It is generally accepted that place-name evidence supports the conclusion that East Lothian had been settled by Anglians by the mid-seventh century. In AD 670s and 680s it could be said that the English possessed the whole of the southern coastline of the Firth of Forth, and Dunbar was the headquarters of a Northumbrian ealdorman (Stenton 1971, 85). Evidently, this possession was not without some struggle, as in AD 672 Ecgfrith found it necessary to quash a Pictish revolt (Smyth 1984, 66). Smyth argues that Abercorn was very much a frontier post, to spread Northumbrian influence and to monitor Pictish activity, but an alternative view would be that the bishopric was set up to serve and regulate an existing settled Anglian population in the west of the region, possibly in danger of being influenced by British clerics. The AD 680s saw the widest extent of Anglian control in the region; after the defeat of Ecgfrith and the Northumbrians by the Picts at *Nechtansmere* (identified as Dunnichen Moss, near Forfar) in AD 685, the Anglians are said to have withdrawn certainly from West Lothian, and possibly part of East Lothian (*ibid*, 31).

It is difficult to assess what these changes in political control meant to the majority of people living in this region during that time. It has been suggested that warfare amongst the North British and the Bernician Angles was almost completely an aristocratic concern, but at the same time, it is unlikely that those settlements unfortunate enough to lie in the path of the warring factions would escape unscathed (Alcock 1987). Did Anglians move into the region only after AD 638, and was there a wholesale departure after *Nechtansmere* in AD 685 ? It seems unlikely that events could have been as clear cut; Anglian settlement and influence may have been creeping round the coastal

fringes into Midlothian and West Lothian in the late sixth and early seventh centuries. Church and State withdrew in the later seventh century, and there may not have been a continuing influx of new Anglian settlement, but existing Angles may well have remained and been absorbed into the local population. Mingling of populations in this area may be indicated by hybrid place-names, such as Liston (now Kirkliston), on a strategic crossing of the River Almond, and which consists of both British (*llys*, lord's residence) and Anglian (*tun*) elements (Aliaga-Kelly 1986, 126). Aliaga-Kelly has also pointed out (*ibid*, 150) that the parish of Ratho has a noticeable concentration of place-names of Gaelic origin, which he interprets as an indication of British settlement continuity and cultural survival through the Anglian takeover. The Anglian takeover in this region might therefore have been in too few numbers at grass-root level to influence place-names to any great extent. Likewise, the period of English-speaking influence may have been too short to influence place-names, either by actual withdrawal of English-speakers after AD 685, or by absorption into the local population.

The dating of five hazel twigs from one building is a poor foundation on which to build a new history of Lothian, but nevertheless it can be ventured from the evidence at Ratho, that Anglian settlement appears to have been under way in the area west of Edinburgh in the late sixth and early seventh centuries, rather than in the mid to later seventh century as previously thought.

APPENDIX 1

CHARRED PLANT REMAINS

Timothy Holden & Dorothy Rankin

METHOD

(a) Flotation samples: samples were dry sieved using 4 mm, 1 mm and 0.3 mm meshes. Charcoal was removed from the greater than 4 mm fraction only and all other fractions above 0.3 mm were sorted under a binocular microscope for plant and insect remains. All finished flots were retained in case required for further analysis. The larger part of the flots were made up of charred plant debris, primarily charcoal. The results of the flot sorting are recorded in Table 5.

(b) Wet-sieving residues: residues were sieved through a stack of sieves of mesh sizes 10 mm, 4 mm, 2 mm and 1 mm. Charred plant remains were retrieved from all fractions and any identifications have been incorporated into Table 5.

Following flotation, wet-sieving and preliminary assessment, samples from well-stratified contexts were selected for detailed archaeobotanical analysis. Identifications were made with the use of a low-powered binocular microscope and were checked using the modern comparative collection at AOC (Scotland) Ltd.

THE SAMPLES

Ninety-eight soil samples were recovered from a total of 74 soil contexts. Of these, 41 samples from 31 sediment contexts were considered to have produced charred plant remains suitable for post-excavation analysis. Three main periods of settlement are represented, which are Neolithic, middle-later Bronze Age and Early Historic.

SAMPLE CONTEXT

(a) Neolithic features; predating the Bronze Age ring-ditch. Samples were studied from contexts 1015 and 1031.

(b) Bronze Age; ring-ditch with associated features, including cremation pits (1001B, 1016, 1017, 1019), a

stone setting (1033), miscellaneous features (2003, 2004, 2017, 2061, 2062), and a curvilinear feature (3009).

(c) Rectilinear structures (2006, 2008) with no surviving internal surfaces or features other than a small sub-square feature (2073) and a broad, shallow pit (2073C).

(d) Early Historic; palisade settings (1022) and a sunken-featured building (1053). The latter produced 173 clay loomweights and loomweight fragments thought to have been found *in situ*. The samples derive from features: 1034, 1035; 1036; 1037; 1039; 1040; 1043; 1045; and 1049.

(e) Miscellaneous features; a pit group, a linear feature and miscellaneous features. The samples derive from features: 2045, 2047; 3001A, 3001C; and 3005.

RESULTS

The charred plant remains

The results of the analysis of the macroplant material is summarized in Table 5 and briefly outlined below. All samples included both charred and uncharred remains with both cultivated and wild species being represented. The cereal element consisted only of the grains with none of the more diagnostic chaff fragments being recovered from any samples. Preservation of charred remains was generally very poor resulting in the use of rather broad taxonomic groups following identification (see Table 5). Probably because of the poor preservation, the diversity of the archaeological plant assemblages was not great. It has not been possible to highlight any context-related variation in the composition of the plant remains and it is therefore unlikely that they will contribute further to an understanding of function of individual features. In this examination of the macroplant remains, therefore, interpretation of the material is restricted to broad context groups and is discussed in relation to the four major phases of activity identified on the site.

Modern contaminants

The soil conditions at Ratho are such that preservation of organic material is generally poor. All uncharred seeds found in the flotation samples are therefore believed to be modern. Many of these seeds are common weeds of disturbed ground being particularly frequent in agricultural fields. It is probable that many of these date from at least the Second World War when the land was apparently last ploughed. Others could have become incorporated in ensuing years as the area developed through fallow into the present pasture.

The presence of these modern seeds indicates that there has been a degree of vertical movement of particles through the soil profile. The presence of uncharred weed seeds in archaeological features means that some contamination of these layers has therefore occurred. The most likely method by which this could have happened is via earthworm burrows which can penetrate down to 2 m in depth (Keepax 1977). In support of this, invertebrate eggs were recovered from many of the samples sorted. Mammal burrows and drying cracks are, however, also potential means by which vertical movement of seeds can occur. With the exception of the sunken-featured building most archaeobotanical material stems from heavily truncated features remaining in the C horizon. There is, therefore, a possibility that charred plant remains from later plough-obliterated archaeological features could have contaminated earlier ones in the same way that we can demonstrate modern seeds have done. We lack, however, any means to test whether this could have been the case.

Neolithic

The plant remains A total of 54 cereal caryopses were recovered. Of these, 33 were poorly preserved and could be identified only as indeterminate cereal. The majority of the remainder were barley (*Hordeum vulgare* L.). Three grains were definitely hulled barley, one had a twisted profile indicating the likely presence of a six-rowed variety. One other was tentatively identified as being naked barley.

A single wheat grain was tentatively identified as bread/club wheat (*Triticum aestivo-compactum* Schiem.) and two more as oat (*Avena* sp.), it being impossible to make a more accurate identification because of the absence of diagnostic lemma and palea base.

Other plant parts recovered include a monocotyledon rhizome fragment and a culm node. These are likely to have belonged to a species of wild grass. Two fruits of a species of sedge (*Carex* sp.) were also identified. Without identification to species it is not possible to gain further information about habitat conditions, although many species in this genus are damp-loving.

DISCUSSION

There have been relatively few finds of cereals from Scottish Neolithic contexts. Most consist of small assemblages and a clear picture of preferred cereals is only just beginning to emerge (see for example Boyd 1988; Grieg 1991). Barley is represented by both hulled and naked varieties although it is the latter which seems to predominate on sites such as Balbridie, Grampian Region (Fairweather & Ralston 1993) and Boghead mound, Moray District (MacLean & Rowly-Conwy 1984), especially on the mainland. No finds of hulled barley from the Scotish mainland have yet been published. Excavations at the Scord of Brouster, Shetland (Milles 1986, 119–22), recovered one of the few examples of hulled barley found in a Neolithic context to date.

Emmer wheat (*Triticum dicoccum* L.) is also a notable cereal component at Neolithic sites such as Balbridie and Boghead mound though bread wheat (*Triticum aestivum* s l) is also present in small numbers. It has been proposed that bread wheat may have been grown as a crop in its own right during the Neolithic in other parts of Britain (Hillman 1981, 188) but Milles (1986, 119) suggests that the small amount of bread wheat present at the excavations at Scord of Brouster on Shetland represented a 'weed' of the main crop, hulled barley.

Oats are a very rare find during this period and, where recovered, are usually considered to have been the wild species *Avena fatua* L. which was probably a weed of the wheat or barley crops rather than a crop in its own right.

The cereal remains from Ratho Quarry are atypical of the emerging picture of the Neolithic in Scotland. To date, the species recovered from Ratho (hulled barley, bread/club wheat and oats) have been seen as being of only minor importance during this period. Hulled barley has, for example, so far been restricted to the Northern Isles. The discovery of the hulled barley from Ratho Quarry, should the context prove to be secure, would be one of the first for a site on the mainland of Scotland. Finds of oat have hitherto been restricted to two grains from a very large assemblage at Balbridie and bread wheat appears to have been only a minor crop at certain sites. In view of this the remains from Ratho are of some importance. Either they add significantly to our understanding of the Neolithic period in Scotland or they represent contaminations from a later period. Accelerator dating of some of the debated components would prove most illuminating.

Bronze Age

The plant remains A total of 71 cereal grains were recovered, 34 of which were in a poor state of preservation. These are included in Table 5 as indeterminate cereal. Of the identifiable grains, the majority were barley (*Hordeum vulgare*). Grains which were evidently hulled with twisted profiles were found in two instances indicating the presence of a six-rowed form. One grain only indicated the possible presence of naked barley.

One grain was identified as bread or club wheat (*Triticum aestivo-compactum*) and a second was also thought likely to have been be bread/club wheat but its poor state of preservation made identification uncertain. Oat (*Avena* sp.) was represented in two samples.

DISCUSSION

It has been noted that in the Scottish Bronze Age naked barley is more often dominant over hulled varieties. During the same period in England hulled barley increases in occurrence at the expense of naked barley in the later Bronze Age (van der Veen 1985, 190). This pattern seems to be borne out by the results from sites in Scotland such as Lairg, Sutherland (Carter & Holden, forthcoming).

The typical wheat varieties of this period in Britain as a whole are those of emmer (*Triticum dicoccum* Schuebl.) and spelt (*T. spelta* L.). On the other hand, as already discussed, the exploitation of bread wheat (*T. aestivo-compactum*) seems probable from the earliest periods (Hillman 1981, 188). Towards the end of the Bronze Age, however, climatic deterioration could be linked to the '... apparent cessation of the cultivation of *Triticum aestivum* and naked *Hordeum vulgare*' (Greig 1991, 305).

Cultivated oat was initially thought to have been an introduction of the Iron Age in Scotland (Boyd 1988, 104). Earlier finds have also been recovered, however, such as the single charred floret from a Late Bronze Age context at Oakbank crannog in Loch Tay (Clapham & Scaife 1988). This and other macroplant analyses, including the Bronze Age site of Upper Suisgill, Sutherland, leads van der Veen (1985, 190) to conclude that there is a high probability that the cultivated variety of oat (*Avena sativa* L.) may well have been present if not even a species cultivated in its own right by the ninth century BC.

The plant assemblages from Ratho Quarry do not totally conform to the general picture of Bronze Age agriculture and are very similar in composition to those from the Neolithic contexts above. However, the extent of regional differences in growing preferences in the Bronze Age is not fully understood and the Ratho samples might therefore be a perfectly reasonable assemblage for this part of the Lothians. Nevertheless, a date in the latter part of the Bronze Age might be slightly more favoured if this assemblage is to be compared with others from more or less contemporary sites.

Rectilinear structures 1 & 2

The plant remains Of the 56 cereal grains recovered, 23 were classed as indeterminate, further identification not being possible owing to their poor condition. The majority of the better-preserved grains were of barley, one of which showed the characteristic form of a hulled variety.

Wheat was represented in the samples by three grains, two of which could be identified as bread/club wheat. Six oat grains were also recovered but, as with the other oat grains found at Ratho, identification to species was not possible because of the lack of the diagnostic chaff.

Non-cereal remains consist of seeds or fruits of rose (*Rosa* sp.), a small seeded legume (*Vicia/Lathyrus/Pisum* sp.) and sun spurge (*Euphorbia helioscopia* L.). The latter is common to gardens and arable land where a good water supply is present (Hanf 1983).

DISCUSSION

There is a scarcity of archaeobotanical data for the Early Historic period in Scotland (c AD 400–600) with Boyd's precis of published data (1988) being little changed to date. Certainly, the predominance of barley in the assemblage is in keeping with other contemporary sites. The presence of the wheat is also perhaps not surprising for this period, in spite of its apparent disappearance from the archaeobotanical record during the Late Bronze Age/Iron Age transition (Greig 1991, 305). The cultivation of bread wheat is, for example, well attested in the medieval and post-medieval period in Scotland. Emmer wheat (*Triticum dicoccum*) has been found at the Early Historic sites of Barhapple Loch and Dunadd (Boyd 1988). The presence of cultivated oat is also documented in the macrofossil record for the period.

The presence of sun spurge is indicative of disturbed ground which also includes arable land. Its shallow root system needs a good water supply to survive (Hanf 1983). Members of the rose family grow in a variety of habitats which include grassland and hedgerows.

The present uncertainty regarding the date of these features is of some concern because, as with the periods already discussed above, the composition is not such that it fits clearly into any particular time period. The composition of the samples is in fact very similar to those recovered from Neolithic and Bronze Age features at Ratho. The interpretation of the plant remains therefore has to be tempered by the uncertainty in the dating of many of the contexts.

TABLE 5

SITE: Plant Remains from Ratho

			I Early–Middle Neolithic I										I Middle–Late Bronze Age I									
		Area	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
		Block	0	0	0	0	1	2	2	2	2	3	3	3	3	8	8	8	8	8	8	
		Context no	1015	1015	1015	1015	1031	1001	1016	1017	1019	1033	1033	1033	1033	2003	2004	2017	2047	2061	2062	
		Sample no		1004	1005	1006	1014	2					3	4	5							
Charred remains		Orig.volume	22	2	26	23	7	12	12	12	44.5	15	14	15	14	20	14	4.5	2	7	4	
Species	Plant part	Common name																				
Triticum aestivo-compactum	caryopsis	bread/club wheat						1														
Triticum cf. *aestivo-compactum*	caryopsis	bread/club wheat					1	1														
Triticum sp.	caryopsis	wheat indet.																				
Hordeum vulgare indet.	caryopsis	barley indet.	3		2	5						8	2	5	5	1						
Hordeum cf. *vulgare* indet.	caryopsis	barley indet.																				
cf. *Hordeum vulgare* indet.	caryopsis	barley indet.					1						3			1						
Hordeum vulgare (hulled)	caryopsis	hulled barley		1																		
Hordeum vulgare (cf. hulled)	caryopsis	hulled barley			1	1						1		2				1				
Hordeum vulgare L. (hulled – straight)	caryopsis	hulled barley (straight)	1																			
Hordeum vulgare L. (hulled – twisted)	caryopsis	hulled barley (twisted)			1								1					1				
Hordeum vulgare (cf. naked)	caryopsis	naked barley				1									1							
Hordeum murinum L.	caryopsis	wall barley											1									
cf. *Hordeum* sp.	caryopsis	barley sp.			1																	
Avena sp.	caryopsis	oat			1	1			2						1							1
cf. *Avena* sp.	caryopsis	oat												1								
Avena/Hordeum sp.	caryopsis	oat/barley																				
cf. *Danthonia decumbens* (L.) DC.	caryopsis	heath grass																				
Gramineae (large grained)	caryopsis	large-seeded grass											1									
Gramineae (medium grained)	caryopsis	medium-seeded grass															1					
Cereal indet.	caryopsis	cereal indet.	8	6	12	2	5	1			1	4	12	4	3	1		5		1		2
Carex rostrata type	fruit	bottle sedge	1									1										
Carex binervis type	fruit	ribbed sedge	1																			
Carex sp. (trigonous type)	fruit	sedge																				
Indeterminate	calyx													1								
Indeterminate	cf. nutshell																	1				
Indeterminate	culm node			1																		
Indeterminate	fruit																					
Indeterminate	rhizome			1														1				
Indeterminate	seed													1	1			3				
Cenococcum geophilum Fr.	fungal sclerotia														1							
Modern Contaminants																						
Urtica dioica L.	fruit	stinging nettle																				
Bilderdykia convolvulus (L.) Dumort.	fruit	black bindweed				1																

SITE: Plant Remains from Ratho (cont)

			I Early–Middle Neolithic I									I Middle–Late Bronze Age I									
		Area	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
		Block	0	0	0	0	1	2	2	2	2	3	3	3	3	8	8	8	8	8	8
		Context no	1015	1015	1015	1015	1031	1001	1016	1017	1019	1033	1033	1033	1033	2003	2004	2017	2047	2061	2062
		Sample no		1004	1005	1006	1014	2					3	4	5						
		Orig.volume	22	2	26	23	7	12	12	12	44.5	15	14	15	14	20	14	4.5	2	7	4
Species	Plant part	Common name																			
cf. *Bilderdykia convolvulus*	fruit	black bindweed																			1
cf. *Bilderdykia convolvulus*	kernel	black bindweed																			
Chenopodium album L.	fruit	fat hen					3				1			2		13					3
Atriplex hastata/patula	fruit	orache						1								4					
Chenopodium/Atriplex sp.	fruit	goosefoots/oraches	1							2							10		3		
cf. *Chenopodium/Atriplex* sp.	fruit	goosefoots/oraches									1								2		
Montia fontana ssp. *chondrosperma* L.	seed	blinks	1								1										
Stellaria media (L.) Vill.	seed	chickweed		2	4			1	1		3			1							
Stellaria cf. media	seed	chickweed																			
cf. *Stellaria* sp.	seed	chickweed/stitchwort																			
Cerastium fontanum Baumg.	seed	common mouse-ear chickweed																			
Fumaria officinalis L.	fruit	fumitory																			
Fumaria cf. officinalis	fruit	fumitory																			
Brassica/Sinapis sp.	seed	brassicas/mustards																			
Rubus fruticosus agg.	fruit	blackberry																			
cf. *Calluna vulgaris*	stem	ling, heather										1									
Galeopsis tetrahit agg.	fruit	common hemp nettle																			
Sambucus nigra L.	seed	elder																			
Cirsium vulgare (Savi) Ten.	fruit	spear thistle																			
Cirsium sp.	fruit	thistle									1					1					
Carduus/Cirsium sp.	fruit	thistles			1				1												
Gramineae indet.	stem	grass indet.																			
Carex rostrata type	fruit	bottle sedge			1																
Carex cf. *flava/pendula* type	fruit sedge																				
Indeterminate	calyx																				
Indeterminate	seed		1	1						1				1							
Cenococcum geophilum Fr.	fungal sclerotia						1					1	2						1		
Invertebrate	egg case		10	4	8	2	4	5		7	45	4		10	5	2	2	2	3		3

SITE: Plant Remains from Ratho (cont)

		Early Medieval																	Misc			
		I or Neolithic I								I 7th Century Anglian I									I Undated Features I			
	Area	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	3
	Block	6	6	9	9	4	4	5	5	5	5	5	5	5	5	5	5	5	7	10	10	12
	Context no	2006	2008	2073	2073	1022	1053	1034	1035	1035	1036	1036	1037	1039	1040	1043	1045	1049	2045	3001	3001	3005
	Sample no				6					1028		1027								7	8	
Charred remains	Orig. volume	8	115	12	10	14	8	14	14	64	28	30	13	13	14	15	4	11	4	12	14	13
Species	Plant part	Common name																				
Rumex cf. *crispus*	fruit	culred dock								1												
Rumex cf. *obtusifolius/ conglimeratus/sanguineus*	fruit	dock								1			2									
cf. *Polygonaceae*	fruit	knotweed family								1												
Rosa sp.	fruit	rose			1																	
cf. *Vicia/Lathyrus* sp.	fruit	vetch/tare/vetchling																	2			
Vicia/Lathyrus/Pisum sp.	fruit	vetch/tare/vetchling/pea		1																		
Euphorbia pelioscopia L.	seed	sun spurge		2																		
cf. *Viola* sp.	fruit	violet									1											
Galium aparine L.	fruit	goosegrass											2									
Iris psudacorus L.	seed	yellow flag							1	1							1					
cf. *Poa* sp.	caryopsis	poa grass								1												
Triticum aestivo-compactum	caryopsis	bread/club wheat	1	1																		
Triticum cf. *aestivo-compactum*	caryopsis	bread/club wheat																				
Triticum sp.	caryopsis	wheat indet.		1																		
Hordeum vulgare indet.	caryopsis	barley indet.		10				2	1	3	1	4				1	5	1				
Hordeum cf. *vulgare* indet.	caryopsis	barley indet.										1										
cf. *Hordeum vulgare* indet.	caryopsis	barley indet.		11		1				3											1	
Hordeum vulgare (hulled)	caryopsis	hulled barley		1																		
Hordeum vulgare (cf. hulled)	caryopsis	hulled barley		1						1							1	1				
Hordeum vulgare L. (hulled – straight)	caryopsis	hulled barley (straight)																				
Hordeum vulgare L. (hulled – twisted)	caryopsis	hulled barley (twisted)					1					1								1		
Hordeum vulgare (cf. naked)	caryopsis	naked barley																				
Hordeum murinum L.	caryopsis	wall barley																				
cf. *Hordeum* sp.	caryopsis	barley sp.																				
Avena sp.	caryopsis	oat		5	1																	
cf. *Avena* sp.	caryopsis	oat								1												
Avena/Hordeum sp.	caryopsis	oat/barley																				1
cf. *Danthonia decumbens* (L.) DC.	caryopsis	heath grass		1																		
Gramineae (large seeded)	caryopsis	large-seeded grass		1		1				4												
Gramineae (medium seeded)	caryopsis	medium-seeded grass																				
Cereal indet.	caryopsis	cereal indet.		23			1			5		3	2					3				
Carex rostrata type	fruit	bottle sedge																				
Carex binervis type	fruit	ribbed sedge								1												
Carex sp. (trigonous type)	fruit	sedge															1					
Indeterminate	calyx			1																		
Indeterminate	cf. nutshell																					
Indeterminate	culm node																					
Indeterminate	fruit																1					

SITE: Plant Remains from Ratho (cont)

			Early Medieval																				Misc	
			I or Neolithic I								I	7th Century Anglian		I								I Undated Features	I
		Area	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	3	3
		Block	6	6	9	9	4	4	5	5	5	5	5	5	5	5	5	5	5	5	7	10	10	12
		Context no	2006	2008	2073	2073	1022	1053	1034	1035	1035	1036	1036	1037	1039	1040	1043	1045	1049	2045	3001	3001	3005	
		Sample no				6					1028		1027									7	8	
		Orig. volume	8	115	12	10	14	8	14	14	64	28	30	13	13	14	15	4	11	4	12	14	13	
Species	Plant part	Common name																						
Indeterminate	rhizome																		1	1				
Indeterminate	seed								1						2		1			1				
Cenococcum geophilum Fr.	fungal sclerotia																							
Modern Contaminants																								
Urtica dioica L.	fruit	stinging nettle								2														
Bilderdykia convolvulus (L.) Dumort.	fruit	black bindweed						3			3					2			2		2	2		
cf. *Bilderdykia convolvulus*	fruit	black bindweed							1				5											
cf. *Bilderdykia convolvulus*	kernel	black bindweed											1											
Chenopodium album L.	fruit	fat hen							10	3	11		5	2			3							
Atriplex hastata/patula	fruit	orache			1		1	2	1	2	6		6				4							
Chenopodium/Atriplex sp.	fruit	goosefoots/oraches	5	37	13	4	3		5	1	8	3	2	6	5	9		2	3	2	4	12		
cf. *Chenopodium/ Atriplex* sp.	fruit	goosefoots/oraches		22				1																2
Montia fontana ssp. chondrosperma L.	seed	blinks																						
Stellaria media (L.) Vill.	seed	chickweed		3				2	7	3	19	1		27	1			3	24					5
Stellaria cf. media	seed	chickweed																	3					
cf. *Stellaria* sp.	seed	chickweed/stitchwort												1										
Cerastium fontanum Baumg.	seed	common mouse-ear chickweed													1									
Fumaria officinalis L.	fruit	fumitory									13	1	18	2		1	2			1		2		
Fumaria cf. officinalis	fruit	fumitory																	3					
Brassica/Sinapis sp.	seed	brassica/mustard																	1					
Rubus fruticosus agg.	fruit	blackberry		1											1									
cf. *Calluna vulgaris*	stem	ling, heather																						
Galeopsis tetrahit agg.	fruit	common hemp nettle											1											
Sambucus nigra L.	seed	elder																		1		1		
Cirsium vulgare (Savi) Ten.	fruit	spear thistle			1			1		4	1		1			1								
Cirsium sp.	fruit	thistle		1												1								
Carduus/Cirsium sp.	fruit	thistles																						
Gramineae indet.	stem	grass indet.													2									
Carex rostrata type	fruit	bottle sedge																						
Carex cf. flava/pendula type	fruit	sedge											1											
Indeterminate	Calyx									2														
Indeterminate	seed				1				2	5			1											
Cenococcum geophilum Fr.	fungal sclerotia		1				1				1			1										2
Invertebrate	egg case		4	36	5			3	16	26	151	13	70	67	3	46	13	8	27	1	2	4	2	

Early Historic period

The plant remains Of the 43 cereal grains, 14 were very poorly preserved and so could not be identified to genus. They have been recorded as indeterminate cereal.

The majority of identifiable grains were barley. Two were identified as being hulled with a twisted profile indicative of a six-rowed variety. Two of the grains closely resemble oats but were too badly preserved for a positive identification.

Non-cereal remains include occasional fruits of goose grass (*Galium aparine* L.), dock (*Rumex* spp.) and two seeds of yellow flag (*Iris pseudacorus* L.).

DISCUSSION

As outlined in the samples above, the cereal assemblage is dominated by barley, a proportion at least being of a hulled variety. The other cereal found is probably oat, although the poor preservation of the caryopses does not allow for certain identification.

Unlike the earlier assemblages, there is no evidence for the presence of wheat which, on the evidence from other sites, becomes more prevalent in the medieval and post-medieval periods (Boyd 1988, 105).

Greig (1991) suggests that a study of early medieval sites and their cereal assemblages may reveal regional variations in crops produced. This variation is likely to reflect differences in soil and weather conditions. He suggests that in climatically less favourable areas of Britain barley and oat would have been cultivated over other cereal types (Greig 1991, 317). This may adequately explain the lack of wheat species, in the assemblage at Ratho Quarry.

The assemblage of charred non-domesticated species comprises mainly weed species of cultivated crops. These include four dock fruits (*Rumex* spp.), a tentative identification for knotweed (*Polygonaceae*), two fruits of cleavers (*Galium aparine* L.), a possible seed of violet (*Viola* sp.) and a possible caryopsis of poa grass (*Poa* sp.). The small number of identified remains preclude any detailed ecological discussion, although the presence of cleavers could indicate damp soil conditions.

The two carbonized fruits of *Iris pseudacorus* L. (Yellow Iris) are perhaps the most intriguing discoveries made. They were found in features 1035 and 1045 and relate to the lower occupation material of the sunken-featured building. Context F1035 also produced a number of loomweights. This species of iris is unlikely to have been brought to the site as cereal waste since they typically grow at loch or pond edges. It is possible that they were brought in along with flooring or roofing material such as rushes or sedges or for their attractive flowers, later to be burned on the fire as a means of disposal. There is, however, little other botanical evidence to support this theory. Other uses of the plant given by Grigson (1987, 419) and (Grieve 1992, 438) include use of the rhizomes of this plant to produce a black dye; it is, therefore, tempting to link this with the presence of loomweights and suggest that it may have been used in the production of textiles on the site. Apart from this there are records of the rhizomes having been used medicinally as a purgative and of the roasted seeds being used to make a '... coffee-like drink ...' though these derive from the last century and may have little antiquity.

Miscellaneous features: blocks 7, 10 & 12

The plant remains Three caryopses only were found from Blocks 10 and 12. They comprised one tentative identification for barley, one a six-rowed hulled variety and a badly preserved grain which could have been either oat or barley (*Avena/Hordeum* sp.).

Non-cereal remains include two fruits tentatively identified as vetch or vetchling (cf *Vicia/Lathyrus* sp.), a fragment of monocotyledon rhizome and an indeterminate seed.

DISCUSSION

The very small quantity of recovered macroplant material from these contexts makes it impossible to discuss with any meaning the nature of the remains, or indeed, provide any clarification as to the function and dating of the features themselves.

APPENDIX 2

ANALYSIS OF URN FILLS AND SOIL THIN SECTION MICROMORPHOLOGY

Stephen Carter

METHOD OF ANALYSIS OF URN FILLS

Each spit was weighed in an air-dry condition. All bone larger than 2 mm was then sorted dry in order to avoid unnecessary wetting. The remaining sediment was wet-sieved through 2 mm, 500 μm and 63 μm meshes. Material greater than 2 mm was dried and sorted for bone, pottery, charcoal and other components. These components were weighed and the weights expressed as percentages of the total spit weight. Size fractions less than 2 mm were dried and weighed, and the weights then expressed as percentages of the total weight of the less than 2 mm fraction.

In Urn 2, spits 1–9, particle size analysis of the less than 2 mm fraction was not attempted as the total weight of this fraction was too low.

The results are shown in Table 6.

SOIL THIN SECTION MICROMORPHOLOGY

During excavation of the sunken-featured building a baulk was left across the building, and a vertical sequence of Kubiena tins taken from the baulk through the occupation material. Information gained from the analysis of these thin sections was used to investigate the composition of the sediments forming the material within the building. The high degree of biological mixing had removed any evidence of the original sedimentary fabric, and it was not possible to reach direct conclusions about the mode of deposition of the sediments. However, study of the rock mineralogy, and the abundance of various anthropic components, helped to indicate sediment sources and demonstrate former stratification in the sediments.

Three categories of rock were distinguished (Table 7): basic igneous, derived from the local dolerite bedrock and most abundant in all samples; sedimentary rock, predominantly sandstones and siltstones with some mudstones and coals, all derived from Carboniferous rocks to the west and carried over the dolerite in glacial till; and metamorphic rock fragments, which were rare, reflecting long-distance ice transport of Highland rock types. Differences in the relative abundance throughout the profile of the first two types of rock were found; the very base of the sequence contained a relatively large proportion of sedimentary to igneous rock (38% against 53%), in contrast with the remainder, which contained a preponderance of igneous rock (up to 95%), indicating a different source for the material at the base compared with the remainder. Examination of the thin section showing the base of the sequence revealed that almost all of the sedimentary rock fragments occurred in fragments of disrupted glacial till, and study of control samples of the till confirmed a similar proportion of local and non-local rocks (64% igneous, 31% sedimentary and 5% metamorphic). The rarity of non-local rock in the remainder of the profile, above the very base, indicates a different source for these sediments; it is suggested that they were primarily derived directly from the bedrock with only some contribution from the till.

It is concluded from these results that, in the area of the structure, a period of erosion or progressive wear removed most of a till-derived soil. This left pockets of till in an uneven bedrock surface upon which the floor sediment subsequently accumulated. It is not known whether the erosion occurred before or after the erection of the structure.

The distributions of anthropic components in the floor sediments are summarized in Table 8.

Charcoal is relatively abundant higher in the profile, whilst the clay is most concentrated at the level of the cobble surface. Fragments of clay or charcoal larger than 500 μm are unlikely to be ingested by invertebrates, or to survive as such large fragments if they were; therefore the observed distribution probably reflects an original distribution. The distribution of clay fragments matched that of the clay loomweights, at the level of the pebble surface, and the clay presumably derived from material brought in to make the weights, or from the weights themselves. Charcoal was not particularly concentrated at this level, but was abundant higher up in the profile. It seems unlikely that this difference is the result of differential destruction and it is concluded that charcoal was introduced with sediments over the layer with the loomweights.

The examination of the soil thin sections supported the field interpretation that the level represented by the loomweights and the pebble surface was a floor surface. Sediments below this level (1035) were relatively clear of anthropic components, and may have been local sediments introduced to level up the floor area. Sediments over the loomweights (1034) were introduced after the abandonment of the structure, possibly resulting from the natural silting of the hollow.

TABLE 6

			COMPONENTS OF URN FILL (% WEIGHT)				TEXTURE OF <2 mm SOIL (% WEIGHT)			
SAMPLE	SPIT	WEIGHT(g)	BONE	POTTERY	CHARCOAL	SOIL	>500μm	>250μm	>63μm	<63μm
					URN 1					
1061	1	406.87	87.0	1.3	0.0	11.7	11.44	13.78	34.87	39.91
1053	2	404.67	69.2	1.0	0.1	29.7	10.05	12.88	38.65	38.42
1036	3	92.25	2.9	0.9	0.2	96.0	9.41	13.16	41.55	35.88
1037	4	105.04	44.6	0.2	0.2	55.0	10.46	13.81	38.84	36.89
1038	5	108.48	16.3	8.0	0.2	75.5	13.34	34.93	12.32	39.40
1039	6	141.04	43.9	2.1	0.1	53.9	11.36	13.90	37.65	37.09
1040	7	117.35	34.9	0.8	0.2	64.1	9.86	13.41	36.99	39.74
1041	8	90.97	88.0	1.3	0.6	10.1	10.02	11.62	38.28	40.08
1042	9	233.52	56.9	1.1	0.1	41.9	11.95	14.46	34.26	39.33
1043	10	410.20	35.8	0.7	0.2	63.3	12.25	14.19	30.04	43.51
1044	11	519.23	33.7	1.5	0.2	64.6	11.70	13.38	33.59	41.33
1045	12	493.43	39.5	1.1	0.3	59.1	10.74	13.01	31.35	44.91
1046	13	446.31	28.9	0.9	0.6	69.6	12.66	14.39	34.62	38.33
1047	14	744.87	34.6	0.6	0.5	64.3	9.93	16.46	34.33	39.29
1048	15	368.98	7.7	4.0	0.4	87.9	11.65	13.87	37.74	36.75
1049	16	364.91	21.0	0.2	0.3	78.5	10.44	14.03	31.72	43.82
1050	17	304.49	11.0	0.1	0.7	88.2	10.43	13.64	38.07	37.86
1051	18	635.48	3.7	5.1	1.0	90.2	7.15	13.72	34.13	45.00
1033	Below	763.59	7.1	0.0	0.7	92.2	10.69	12.61	27.98	48.71
					URN 2					
1055	1	33.49	87.9	8.6	0.0	3.4				
1054	2	141.31	82.5	11.8	0.0	5.7				
1060	3	112.58	96.2	1.0	0.0	2.8				
1058	4	229.69	90.3	6.2	0.0	3.5				
1062	5	244.86	100.0	0.0	0.0	0.0				
1057	6	196.41	98.8	0.2	0.0	1.0				
1056	7	192.48	92.5	4.2	0.0	3.3				
1059	8	204.84	86.2	6.8	0.0	7.0				
1063	9	420.25	31.5	12.7	0.0	55.8				
1030	10	356.65	17.2	0.4	0.3	82.1	13.54	13.85	38.26	34.35
1031	11	407.10	9.4	0.0	0.3	90.3	14.69	13.22	36.84	35.26
1032	C	839.16	0.1	0.1	0.0	99.8	25.09	11.23	35.35	28.33

TABLE 7

SAMPLE	TOTAL	BASIC IGNEOUS(%)	SEDIMENTARY(%)	METAMORPHIC(%)
1000	89	88	12	0
1001	118	82	14	4
1002	67	78	18	4
1003	72	81	18	1
1007	92	88	12	0
1015	59	64	31	5
1017	65	83	14	3
1018	59	85	15	0
1019	59	95	5	0
1029	58	53	38	9
210	84	72	24	4

TABLE 8
Distribution of selected components in thin sections of sediments from the floor of the Anglian structure. Frequency in whole slide of fragments of charcoal, clay and slag (larger than 500 μm).

SAMPLE	CHARCOAL	CLAY	SLAG	DESCRIPTION
1017	10	15	2	Upper sediments
1018	11	48	2	Cobble surface
1019	3	11	0	Lower sediments
1029	1	0	0	Interface of B and C horizons

APPENDIX 3

POLLEN METHODOLOGY AND ASSESSMENT RESULTS

Coralie Mills

(A full version of this report may be consulted in the site archive)

It was evident during the excavation that many of the deposits at Ratho had been subjected to intensive invertebrate activity and that the degree of mixing of sediments was high (Carter, pers comm). For this reason, it was recommended that only pollen analysis of the cremation urn contents and some control samples should proceed. The sediments associated with the possible cist (stone setting F1012), the unurned cremation (F1008/F1019) and the ring-ditch fill (F1001) were considered for pollen analysis but were rejected mainly because of the degree of sediment mixing. Field observation suggested that invertebrate activity had penetrated to the base of even the deepest features, for example the ring-ditch. A few sediments, mostly from various depths in the ring-ditch section (illus 8), were included as control samples to enable an examination of patterns of pollen movement and survival.

METHODS

The contents of the cremation urns were excavated by GUARD under laboratory conditions, and the contents were largely removed as thin spits of arbitrary thickness (illus 13 & 15). These spit samples were stored at room temperature in the GUARD laboratory for several weeks. Once received at AOC (Scotland) Ltd, the spit samples were placed in cool storage at 4°C to prevent any further decay of the

samples. Control samples were also placed in cool storage. It was noted, both by GUARD during the laboratory excavation and on their arrival at AOC (Scotland) Ltd, that the samples had a dry appearance.

A total of 19 samples was selected for pollen analysis. Five of these were control samples (illus 23a), the remainder being from within or below the two cremation urns (illus 23b). Three samples were associated with Urn 2 and 11 with Urn 1, which had a much larger quantity of sediment within it. Three of the control samples (1003D, 1003B, 1001A) came from the upper 10 mm portion of Kubiena cans placed at different heights in the subsoil and ditch-fill in a section through the ring-ditch (illus 8). Together with bag samples from the overlying ploughsoil (Context 1002) and the underlying till (Context 1004/Sample 1012), these allow an investigation of the pattern of pollen representation and survival on the site generally. A known volume of sediment from each sample was taken, the volumes ranging from 8 mm^3 to 10 mm^3.

Standard techniques were used to extract pollen (Moore *et al* 1991). Marker spores of *Lycopodium clavatum* (Stockmarr 1971) were added to allow microfossil concentration to be determined, two tablets being used in each case. All samples were from mineral-rich sediments. Mineral particles were extracted by sieving through meshes of 150 µm and 10 µm, to exclude very coarse and very fine material respectively, and by the use of hydrofluoric acid digestion. The samples each required three hydrofluoric acid treatments. The residues were stained and mounted on slides in silicon oil for counting and identification. An Olympus microscope was used, usually at magnification x 400, but with magnifications of up to x 1000 for more difficult identifications. Identification was made with reference to standard keys, particularly Moore *et al* (1991), and by comparison with type slides.

As this piece of work was an assessment, full counts were not made. Instead, each slide was counted until at least 50 marker spores had been encountered. This generally involved between one and two hours' counting per sample. The dominant preservation state for each pollen grain or spore was recorded, following the scheme developed by Cushing (1964; 1967) as modified by Tipping (1987), and using five preservation classes. These were well preserved, crumpled, broken, corroded and amorphous, with the crumpled and corroded classes being subdivided into light and heavy effects. As in Tipping's scheme, unidentifiable and obscured grains were also recorded. Unidentified grains were also classified according to their preservation state.

The samples generally contained many charcoal fragments. These were recorded in size classes according to the length of the longest axis, a relatively quick method which was also developed by Tipping (eg Tipping *et al* 1993). Due to the abundance of charcoal, fragments were counted on only a small part of the slide covered for pollen counting, and the class totals were multiplied up by a factor derived from the number of marker spores encountered during charcoal counting to give approximate totals for the area covered by the full pollen count.

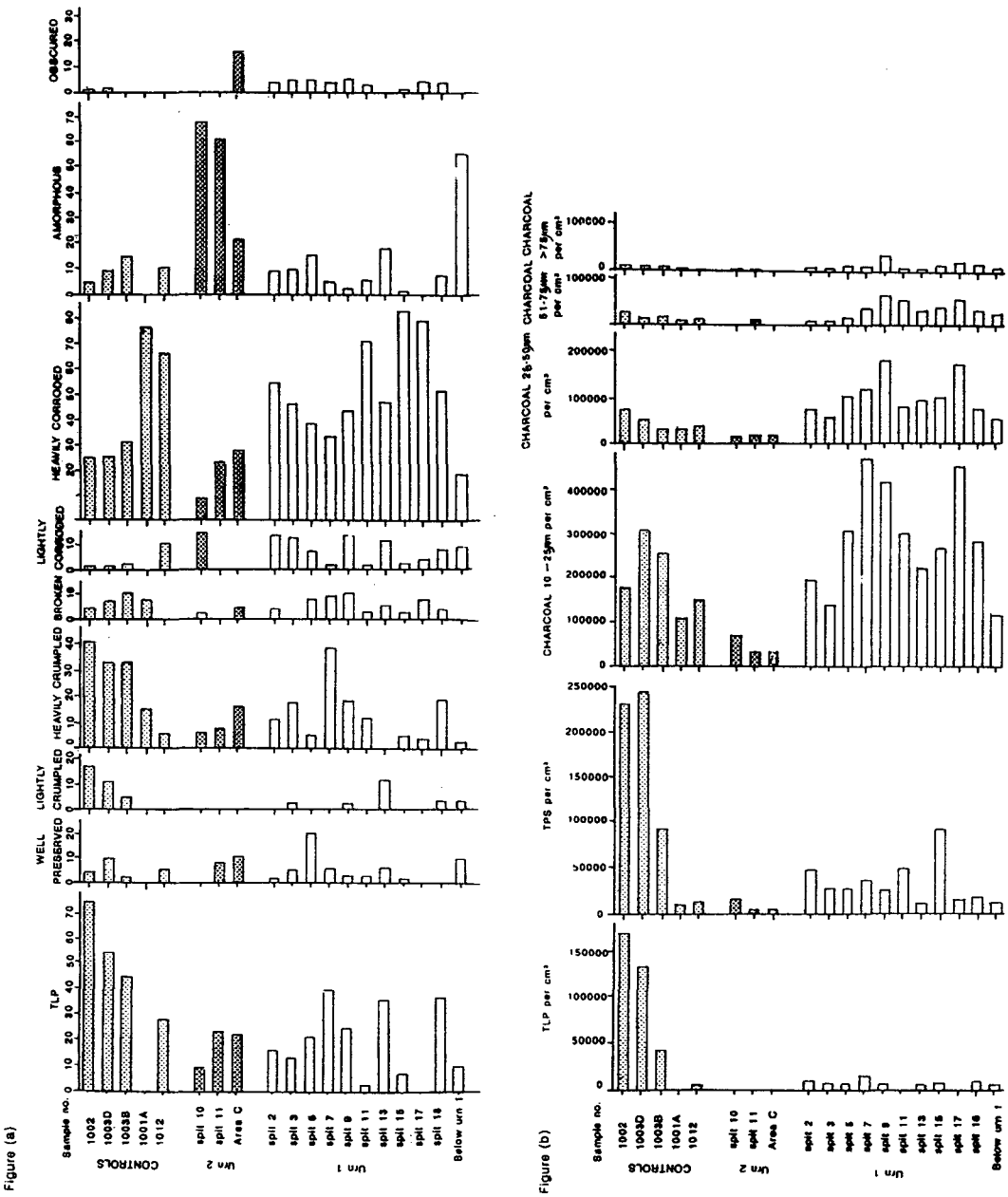
RESULTS

Table 9 lists the taxa encountered and their frequencies. Illustration 23a summarizes the preservation state records as a percentage of TPS. The detail of the preservation state for each taxon in each sample is recorded on the count sheets deposited in the archive. Pollen and spores, both identifiable and unidentifiable, were classified according to their preservation state. Particular taxa are prone to particular types of effect, for example Gramineae (grass family) are more prone to crumpling than, for example, Compositae Liguliflorae (daisy family, sub-family Liguliflorae). Therefore, variation in the relative abundances of different taxa in this group of samples does affect preservation state pattern, and may account for much of the variation between samples. The Total Land Pollen (TLP) sum is illustrated as a percentage of TPS for each sample in illus 23a; illus 23b shows concentration data for TLP, TPS and for the four microscopic charcoal classes.

When referring to tables and figures, and to the results generally, it must be remembered that the counts were generally low, that the work was intended as an assessment, and that the data are therefore not statistically robust.

TABLE 9
Ratho microfossils: Raw count frequencies

	CONTROLS					URN 2			URN 1										
SAMPLE LOCATION	F1002	F1003 Tin D	F1003 Tin B	F1001 Tin A	F1004	Spit10	Spit11	Area C	Spit2 Area B	Spit3	Spit5	Spit7	Spit9	Spit11	Spit13	Spit15	Spit17	Spit18	Below Urn 1
AOC SAMPLE NUMBER	1002	1003D	1003B	1001A	1012	1030	1031	1032	1053	1036	1038	1040	1042	1044	1046	1048	1050	1051	1033
POLLEN TAXA																			
Alnus	1	1							1									1	
Abies	1																		
Corylus/Myrica	1					1										1			
Pinus	1	1							1	1	1		1			1			
Salix		1																	
cf *Sambucus nigra* type	9	3	3					1	3	1		4	3						
Ericaceae undiff	1	1								1									
Gramineae	184	67	22		3	3	1	3	4	1		15	2		2	2		3	2
Cereal type	2	7	1				1												
Anagallis tenella type	5	39	4						1										1
Caryophyllaceae	2	9	4				1			1				1					
Compositae Liguliflorae	13	41	20		1	1					1	2	1	1		3		3	
Filipendula											1								
Hypericum perforatum type	2																		
Oxyria type	2	8	1		1						4				2	2		2	
Plantago lanceolata	19	13	3						1				1		1				
Rosaceae											1								
Solanum nigrum type			1												1				
Stachys sylvatica type	1												1						
Umbelliferae cf Dentaurea cyanus		1																	
SPORES																			
Botrychium lunaria type		2	2	1	2	4	1	2	13	3	2	3	1	5	5	5			5
Filicales			5								4		1	1	1	4	2		
Polypodium	2	2	1	2		1						1	1						
Pteridium aquilinum	2		2							4	4	1	2	4	1	2			
Sphagnum	1	3	1		1	24	5	5	24	15	2	4		9		37	3	4	15
UNIDENTIFIED pollen & spores	79	151	61	10	10	26	4	7	22	12	19	23	23	49	4	75	20	12	9
TLP	244	192	59	0	5	5	3	4	11	5	8	21	9	2	6	9	0	9	3
TPS	328	350	131	13	18	60	13	18	70	39	39	53	37	70	17	132	25	25	32
Marker spores (L. *clavatum*)	50	50	50	52	50	100	100	100	52	50	50	50	50	50	54	50	50	50	100
OTHER MICROFOSSILS																			
Fungal spores	11	1	1			2	3	2	5		1	2	1	1	1	1	1	2	1
Selaginella selaginoides	3	12	15		3				1	1		2	3	2	2			1	



ILLUS 23 (a) Percentage diagram for TLP and preservation classes; all represented as % TPS
(b) Concentration diagram for pollen, spores and charcoal

DISCUSSION

It is clear, from illus 23a, that the modern-day ploughsoil (F1002) and subsoil (F1003) contain much higher concentrations of pollen than the samples either from lower down in the profile or from within and beneath the urns. However, even in the upper horizons, the conditions of the microfossils is not good, with heavy crumpling and corrosion being particularly evident. This pattern is consistent with our understanding of the nature of the local soils as highly biologically active, well-mixed and ploughed in the recent past. Generally the low pollen counts and poor preservation led to a decision not to pursue more detailed analyses.

The microfossil evidence indicated that Urn 1 contained very low concentrations of pollen and spores, compared with the control samples from the upper soil profile, but broadly comparable to that of the lower subsoil and ring-ditch fill. This was in contrast with Urn 2, which had an even lower concentration of microfossils, probably indicating that Urn 1 had received some fresh input of sediment from above in recent years.

Microscopic charcoal concentration (illus 23b) was highest in the Urn 1 samples. Urn 2 had much less charcoal than either Urn 1 or the control samples. It is likely that more charcoal was originally deposited with the cremation in Urn 1 while the Urn 2 contents were almost entirely cremated bone.

The pollen analytical data indicate that the pollen within the urns is generally not well preserved and that differential decay has taken place. Many of the taxa are relatively robust, for example Compositae Liguliflorae and *Selaginella selaginoides* (lesser clubmoss), and this pattern, together with the predominance of spores, might be expected if microfossils had been received from the lower parts of a biologically active soil profile, depleted of many less robust grains. The generally depleted and poorly preserved urn pollen spectra, together with the likelihood of introduction of pollen from outside the urns, means that these results are relatively unhelpful in providing information about offerings or materials associated with the original emplacement of the cremations urns. One well-preserved *Filipendula* (Meadowsweet/Dropwort) grain was observed in Urn 1 (Table 9), and this taxon has been interpreted as an indicator of offerings such as mead or flowers (Dickson 1978; Tipping 1992). The taphonomic complications at Ratho, however, mean that this grain does not necessarily derive from offerings emplaced with the cremation and it could have been introduced from elsewhere. *Filipendula* is a relatively robust grain (Tipping, pers comm) and thus is likely to be resistant to damage when subjected to soil processes. A single grain is insufficient evidence to postulate ritual offerings. A greater number of *Filipendula* grains would be expected if they had originated, for example, from a floral tribute.

While more robust microfossils predominate in the urn samples, some less resistant types were observed, for example, Gramineae grains in several samples and particularly in Urn 1, spit 7. This, together with the occasional presence of *Alnus* (alder) and *Corylus/Myrica* (hazel/bog myrtle) grains, types particularly prone to corrosion (Havinga 1984; Tipping 1992), indicates the likelihood of recent incorporation of pollen from higher up in the profile. The single grains of *Solanum nigrum* (black nightshade) type in the control sample from the lower subsoil (1003, Tin B) and in Urn 1 spit 13 may also hint at recent movement of pollen, since this pollen group includes the pollen of the potato, *S. tuberosum* (Punt & Monna-Brands 1977). Part of the site is reputed to have been cultivated as part of the 'Dig for Victory' campaign during the Second World War, and pollen of cultivars could derive from that period. The site has also been ploughed, presumably for cereal cultivation, and the cereal-type pollen noted in control samples from the ploughsoil and the subsoil could derive from recent agricultural activity. The single cereal-type grain observed in Urn 2 spit 11 was possibly introduced recently by invertebrate activity. In all cases, the cereal-type pollen was not sufficiently well preserved to allow more precise identification.

The taphonomic complications at Ratho mean that the pollen data cannot be used to reconstruct reliably past landscapes or cremation rituals. On the simplest level of taxon presence/absence information, however, it is interesting to note that a range of habitats are represented, notably grassland and to a lesser extent, arable, woodland and heathland. Given the active movement and decay processes, most of this pollen is likely to be of relatively recent date. One possible exception is *Sphagnum* moss, the spores of which were present in reasonably large numbers in several of the urn samples, and including both Urn 1 and Urn 2. While preferential decay of other weaker microfossils could account for much of their relative abundance, it is difficult to identify a likely local source for *Sphagnum* as the site is very well drained and there are no wet or boggy areas close by.

On balance, it seems more likely that most of these spores originate from moss gathered elsewhere and placed in the urns before burial. *Sphagnum* spores were generally most frequent in spits at the top and the base of the bone-rich spits in Urn 1. In contrast to the urn samples, relatively little *Sphagnum* was observed in the control samples. While the counts are too low to make any certain interpretation, it is possible that *Sphagnum* was used as a lining or as part of a container for the bones. *Sphagnum* has been noted with other Bronze Age human remains, for example at Loan Leven, Perthshire (Tipping 1992, 310), and Ashgrove, Fife (Lambert 1964).

APPENDIX 4

CATALOGUE OF LOOMWEIGHTS

AREA	F NO	F NO	LAB NO	EXT DIAM cm	PER DIAM cm	TH cm	WT g	EST WT g	SIZE %	COMMENTS
1	1034	1045								lumps of burnt clay
1	1035	1007	930425	12	3	5	560	560	100	Orange
1	1035	1008	930426	10	3	2.8–3.1	255	255	100	Orange; lip on interior
1	1035	1009	930427	13	4	3.9–4.2	446	530	80	Orange
1	1035	1010	930426	11	3	5–5.5	512	520	97	Orange
1	1035	1011	930429	14	3	4.2	288	630	40	
1	1035	1013	930430	12	4	3.8–4.2	508	508	100	Orange
1	1035	1014	930431	14	3	3.7	380	760	50	
1	1035	1015	930432	17	5.5	4.1–5.3	1064	1330	75	Orange; includes small fragments
1	1035	1016	930433	12	4	3.5	311	622	50	Includes small fragments
1	1035	1017	930434	17	5	5	553	1160	45	?Thumb-prints
1	1035	1018	930435	12	4	4.3	341	450	75	Includes small fragments
1	1035	1019	930436B	18	6					Orange
1	1035	1019	930436A	14		4.2				
1	1035	1020	930437	11	2	4.1	79	400	20	3 frags, partly vitrified
1	1035	1021	930438	13	4	3.5	260	500	50	2 frags
1	1035	1022	930439	13	3	4.1	311	500	60	Large hole, due to stone?
1	1035	1023	930440	12	3	3.6	128	500	25	
1	1035	1024	930441	16	4	4.3	350	900	40	One side orange; includes small fragments
1	1035	1025	930442							Fragments pressed into pebble floor
1	1035	1026	930443	12	3	4.1	107	550	20	Orange; includes fragments
1	1035	1027	930444	12		2.6				
1	1035	1028	930445	15	4	3.4–4.3	724	724	100	2 frags
1	1035	1029	930446	15	3		227	900	25	Upper half only; includes small fragments
1	1035	1030	930447	11	3	4.3	168	850	20	
1	1035	1031	930448	12	4	3.6	115	345	33	
1	1035	1032	930449	13	4	3.9	239	700	33	Orange
1	1035	1035	930451	13	3					Includes fragments, partly vitrified
1	1035	1036	930452	11	4	4.6–5.4	367	500	75	3 frags, partly vitrified
1	1035	1037	930453							Fragments only
1	1035	1037	930453							Sample comprises many small fragments
1	1035	1038	930454	18		5.1				Includes many fragments, partly vitrified
1	1035	1039	930455B	15		4.7				
1	1035	1039	930455A	12		3.2				
1	1035	1040	930456B							3 frags
1	1035	1040	930456A	14	4	4.2	74	525	14	Orange; 3 fragments

AREA	F NO	F NO	LAB NO	EXT DIAM cm	PER DIAM cm	TH cm	WT g	EST WT g	SIZE %	COMMENTS
1	1035	1046	930457	10.5	4	4.1	231	400	60	Hole in upper side; includes many fragments
1	1035	1047	930458	11.5	4	4.4	325	430	75	Includes fragments
1	1035	1048	930454			2.9				
1	1035	1049	930460	14	3	3.7	171	700	25	Includes fragments
1	1035	1050	930461	11	3	3.4	88	350	25	
1	1035	1051	930462							2 frags
1	1035	1052	930463	11	3	4	148	300	50	Includes fragments
1	1035	1053	930464							1 small frag
1	1035	1054	930965	17	4	4.7	189	950	20	Orange
1	1035	1055	930466	15	4	4.3	454	750	60	
1	1035	1056	930467	12	2	5.3	206	400	50	Other half of 1057; includes fragments, partly vitrified
1	1035	1057	930468	12	3	5.4	146	350	40	Partly vitrified
1	1035	1058	930469			4.5				
1	1035	1059	930470	11	3	4.8	89	750	12.5	Many fragments
1	1035	1060	930471	13	3	5.4	257	550	45	Includes fragments
1	1035	1061	930472	17	4	3.5	99	800	12.5	
1	1035	1062	930473	11	8	3.8	127	400	33	2 frags
1	1035	1063	930479							Orange
1	1035	1069	930480	15	5	4.3	227	900	25	
1	1035	1070	930481B							Orange
1	1035	1070	930481B							2 frags
1	1035	1071	930484	15	4	4	179	900	20	2 frags
1	1035	1072								lump of burnt clay
1	1034	1045								lumps of burnt clay
1	1035	1074	930483							3 frags
1	1035	1075	930484							Orange
1	1035	1077				3.4				
1	1035	1079								lump of burnt clay
1	1035	1082		15	2	3.5	132.8	450	20	includes pieces of burnt clay, may not be a loom weight
1	1036	1064	930475	17	6	4.4	146	750	20	
1	1036	1065	930476	10		4.4				
1	1036	1066	930477	14	4	4.1	185	750	25	
1	1036	1067	930478	10.5	3.5	3.6	100	400	25	

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