

# Excavations at Pierowall Quarry, Westray, Orkney

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## ABSTRACT

*In response to the discovery of a large decorated stone during quarrying operations a single season of salvage excavation took place in the quarry at Pierowall, Westray, Orkney. These excavations revealed a multiperiod site of considerable complexity and also resulted in the recovery of the other half of the large decorated stone and two other smaller stones. The primary feature on the site was a large circular chambered tomb dated to the middle of the third millennium. This was demolished at the end of this millennium to create a small structure on a platform adjacent to the paved over cairn. The structure had large quantities of flint knapping debris on the floor and with this was pottery including some sherds of Grooved ware. After this the site was abandoned until the early Iron Age when a large round-house was built directly over the cairn. A considerable quantity of occupation debris came from outside the walls of this house and this provides a limited picture of the economy and cultural affiliations of the site.*

*After the description and analysis of the excavations there is a discussion which isolates the important features of the site and tries to interpret them. This involves a critical examination of many of the recent publications of similar monuments in Orkney and results in certain new approaches to problems hitherto unanswered.*

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## MICROFICHE SECTION

Stratigraphic units	<b>N Sharples</b>	fiche 1: D3
Pottery	<b>Clare Yarrington</b>	fiche 1: D8
Flaked stone	<b>Caroline Wickham-Jones</b>	fiche 1: E8
Stone tools	<b>Ann Clarke</b>	fiche 2: C5
Decorated stones	<b>N Sharples</b>	fiche 2: C11
Pumice and worked bone	<b>N Sharples</b>	fiche 2: D3
Human bone	<b>D A Birkett</b>	fiche 2: D4
Mammal bone	<b>F MacCormick</b>	fiche 2: D10
Small mammals	<b>A Barlow</b>	fiche 2: F3
Fish bone	<b>G N Swinney</b>	fiche 2: F4
Bird bone	<b>A S Clarke</b>	fiche 2: F5
Marine mollusca	<b>A Barlow</b>	fiche 2: F8

## INTRODUCTION

In January 1981, a large fragment of a decorated stone was discovered at a quarry near the village of Pierowall, on the Island of Westray, Orkney (illus 1; *Rescue News*, 25 (1981)). Examination of the find spot by North of Scotland Archaeological Services indicated that the stone came from a low mound at the NW corner of the quarry. The bulk of this mound lay outside the quarry and was thus preserved. The area inside was almost completely destroyed, with only a thin promontory surviving (illus 3). Nevertheless, it was clear that this, combined with a detailed examination of the sections exposed along the edge of the quarry, would provide important information on the nature of the site and the context of the stone. Consequently the author was asked by the Scottish Development Department (*Ancient Monuments Division*) to excavate the threatened areas and record the quarry sections.

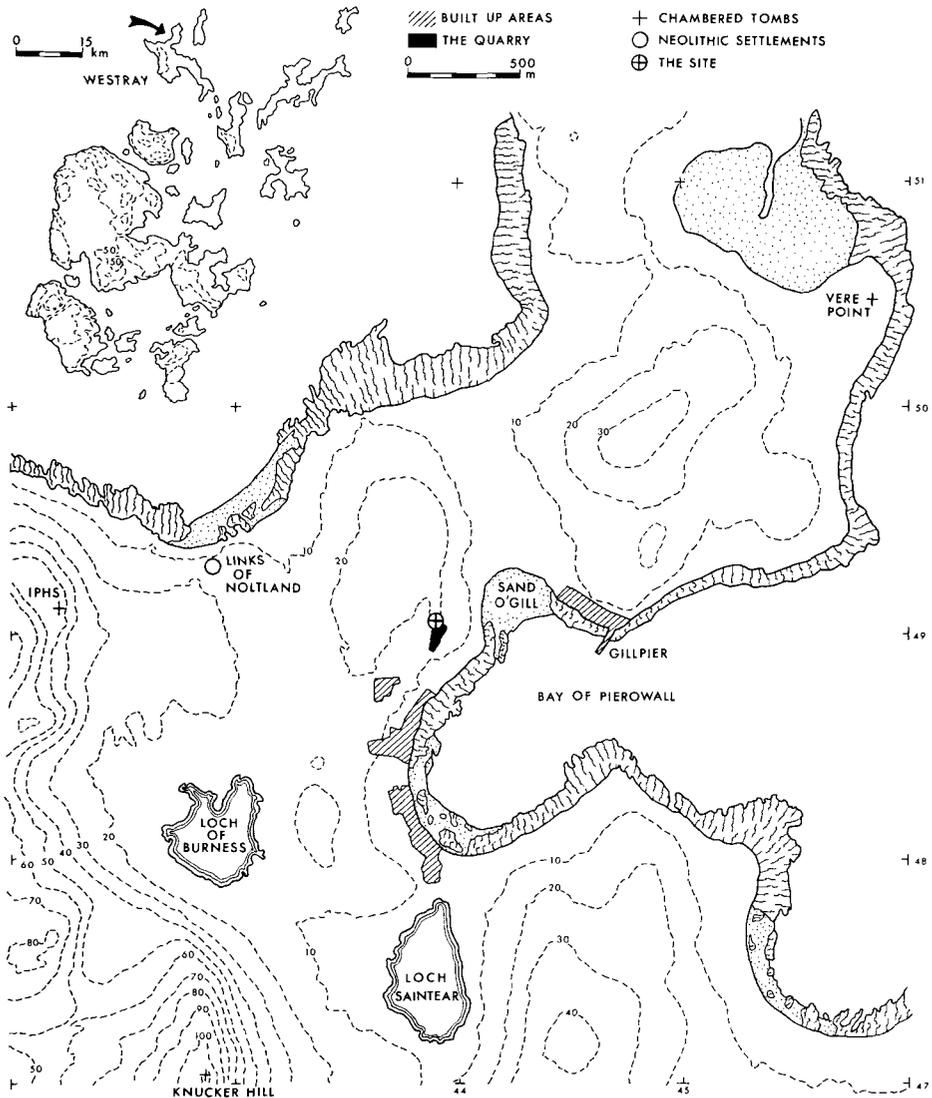
The site lies in the north of the island of Westray, the most north-westerly of the Orkney Islands. It is situated at NGR HY 438 490 at 20 m OD, on the edge of a low ridge between the Bay of Pierowall to the E and the Bay of Grobust to the NW. This low ridge connects the main body of Westray with the Peninsula of Aikerness and Rackness. The island is about 17 km long and 7 km wide. The eastern side is low lying with very few areas over 30 m OD. The west in contrast is noticeably hilly by Orcadian standards. A ridge of high ground stretches from Noup Head south to Skea Hill, reaching a height of 169 m OD at Fitty Hill. This, the western coastline, is bounded by precipitous cliffs, averaging 50 m high, but reaching 76 m OD at Noup Head.

Geologically the island is entirely formed from the Rousay Flags of Middle Old Red Sandstone, one of the most widespread divisions of the Old Red Sandstone group which comprises the geology of Orkney. Igneous intrusions are restricted to one small Camptonite dyke on the S coast.

The last glaciation has had a very noticeable effect on the landscape. The high ground, and in particular the S side of Fitty Hill, has been sculpted into a series of abrupt terraces forming a visually striking feature. Boulder clay is present as a semi-continuous superficial deposit over 19% of the land surface and is largely concentrated in the south eastern promontory. The only other superficial deposit of any significance on the island is blown sand which covers 12% of the surface area. This occurs around many of the small bays of the S, E, and N coast, but only in two places is the area covered to any great extent, Mae Sand in the SW, and the North Links between Pierowall and the Bay of Grobust. The remaining 69% has no significant overburden though there is a small quantity of peat in the south eastern promontory.

It is within the present area of the North Links that Pierowall Quarry is situated. It is, however, clear from the excavations that the sand now present in such abundance was not a feature of the landscape when the site was first occupied. The primary structures stood directly on a discontinuous

layer of boulder clay on bedrock, with the former never reaching a depth of more than 0.33 m. Clearly the absence of accumulated sand would have had a considerable effect on the site's original prominence. Even today the site is exposed and commands extensive views in all directions (illus 2). In the past not only would these views have been enhanced, but the site itself would have been a noticeable feature when viewed from its surroundings. Sand is only visible in the excavations after the abandonment of the Neolithic monument. It occurs as a thin layer between this and the early Iron Age remains in one of the quarry sections. The effects of this deposition are also visible in the analysis of the marine shell assemblage (fiche 2: F8). Only after the abandonment of the early Iron Age structure, however, is there any large scale deposition in the vicinity of the site. Sand does, in fact, completely cover the site mound, and to a large extent concealed it from archaeological knowledge until the work of the quarry.



ILLUS 1 Orkney and the area around Pierowall on the Island of Westray. All the known Neolithic monuments are marked



ILLUS 2 A view E across the excavated promontory which survived the quarry operations. At this point the early Iron Age levels are exposed. In the background is the Bay of Pierowall

The excavations revealed a stratigraphically complex site which was occupied during two distinct and chronologically separate periods, the Neolithic and early Iron Age activity. The Neolithic activity consisted of the construction of a large chambered cairn, probably of the Maes Howe type. This monument was the focus of activity for c 800 radiocarbon years from c 2600 bc. During this time its form changed dramatically. Around c 2100 bc, after the cairn revetment had collapsed, the monument was levelled and paved over. Associated with this was a small structure with rich occupation deposits. In the early Iron Age this cairn was succeeded by a large round-house with walls c 3m thick. The interior of the round-house was excavated into the mound of the cairn and it seems likely that the chamber area suffered particularly badly from this. Although very little of the house was excavated there were quite extensive occupation deposits surrounding it which were present in the excavations.

The value of the sequence is enhanced by the presence of considerable quantities of finds and a sequence of radiocarbon dates from many of the important contexts. These results are sufficiently important and unusual to force a re-evaluation of several of the present preconceptions about the Orcadian Neolithic and add important information to the only recently identified early Iron Age of the islands.

#### EXCAVATIONS (See also fiche 1: D 3-7)

##### THE NEOLITHIC CHAMBERED CAIRN

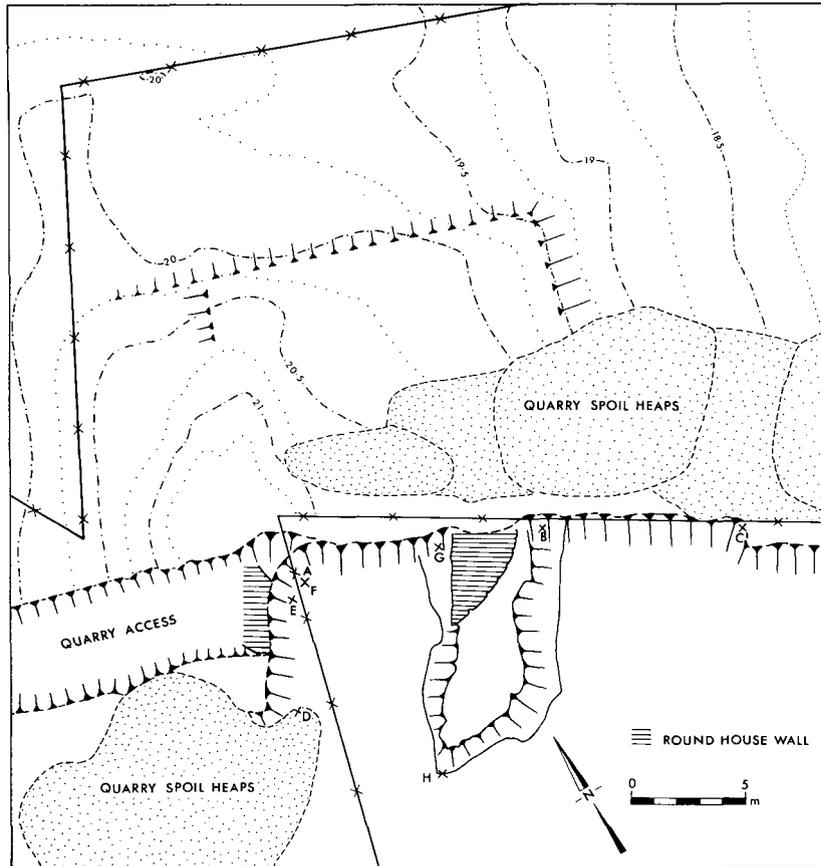
The cairn was represented by two circular concentric revetments in the excavated spit (illus 6) which were both visible in the E facing quarry section (illus 4, 12). The body of the cairn could



ILLUS 4 The E-facing quarry section, truncated in the top right by the quarry access trench



ILLUS 5 The cairn showing the inner and outer revetments after the late Neolithic alterations. Note the projecting basal course of the outer revetment



ILLUS 3 The site in the northern corner of the quarry

be traced across the quarry sections and roughly in the centre of the cairn there was a passage. The cairn had been very badly robbed in the Iron Age and the late Neolithic, and this was especially evident around the passage. Outside the other revetment there were considerable quantities of rubble from its collapse.

In the excavated area the cairn (24) stood to a maximum height of c 0.7 m from the old ground surface. It was defined by a well-built revetment, which was estimated as c 14 m in diameter by extrapolating to the E-facing quarry section, and assuming that it was uniformly concentric with the outer revetment. One of the most noticeable features of this inner revetment was the presence of two projecting stones. Their prominence was emphasized by the otherwise regular and vertical nature of the face. It seems extremely unlikely that their position was the result of instability within the cairn, as both were very large slabs bonded well back into the body of the cairn. They were set c 2 m apart, and their upper surfaces lay 0.52 and 0.50 m above the old ground surface. Apart from these stones there seems to be no other distinctive feature in the cairn construction. Flat slabs were preferred and these lay roughly horizontal throughout the cairn. The facing stones were marginally larger on average but this was not noticeable from the front, as their long axes were placed perpendicular to the cairn edge. The stones used were distinctly rounded and weak, breaking into pieces when lifted.

The outer revetment (23) lay c 1.8 m in front of the inner revetment and had a diameter of c 18 m. A large length, 8 m, of this was exposed and so it can be assumed with some confidence that it is

a representative portion of the cairn. Behind the face, the revetment merged into a layer of rubble which extended over the old ground surface up to the inner revetment. This consisted of quite large stones, 0.3×0.3×0.1 m, on average.

The face of the outer revetment was preserved to a height of c 1.1 m (illus 5) and there was marked variability within its construction. The basal course was of very large slabs, which projected 0.1 m. The first three or four courses above this were also quite large but from 0.55 to 0.8 m very small stones were used. The latter feature caused considerable instability which left only a small area where the courses survived above c 0.6 m, but where they had survived, it seemed that large stones were used as a final construction feature. This variability in the face suggests that it was not of a single construction and this will be discussed in the next section. The stones used in the construction of the lower courses of the outer revetment were different in several respects from those in the inner revetment. In particular, they were sharp edged and relatively unweathered. They were solid and did



ILLUS 6 The Neolithic constructions: (a) the inner cairn; (b) the outer revetment with the cairn covered by the partially robbed layer of paving. To the S is the platform wall which lay on a rubble layer derived from revetment collapse; (c) the late Neolithic structure built on the platform



ILLUS 7 The S-facing quarry section. Resting on the old ground surface behind the horizontal ranging rod are the stones of the destroyed passage at the centre of the cairn. Directly overlying this is a wall which faced the rubble infill of the round-house

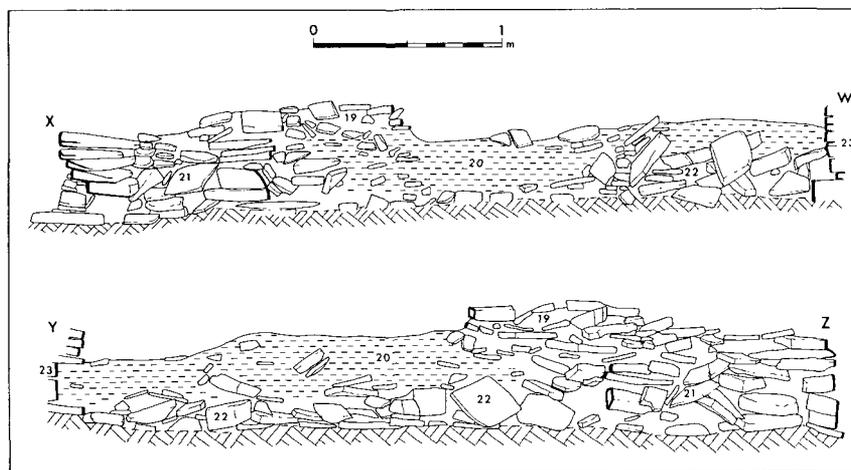
not break up when lifted, and they were thinner and laid parallel to the revetment face. These differences are clearly important and suggest that the function of the outer revetment was slightly different from that of the inner. The two revetments are not physically bonded in any way, although the projecting stones may have been for this, and it seems unlikely that they were chronologically separated by any great length of time. There were no traces of cairn collapse, occupation debris, soil change, or build-up under the outer revetment. There would probably have been a considerable deterioration and deposition of stone if the inner revetment had been exposed for any length of time. The differences in design and construction may well be characteristic of an inner cairn, which had to encompass the chamber and passage, making them a stable structural unit, combined with an outer revetment which was built to provide an imposing facade.

All that was visible of the passage (103) in the S-facing quarry section (illus 6 & 7) were two very large slabs resting on the old ground surface and set c 0.70 m apart. The remnants of the cairn clearly abutted these on either side. On the W side two smaller slabs formed a second course. The orientation of this was c SSW but such a small area was exposed that it cannot be claimed to represent the orientation of the passage with any certainty. The passage was filled with a layer (104) of small laminar fragments of stone which are presumed to result from frost-shattering of the Orkney flagstone; this type of deposit will henceforth be referred to as shillet.

It seems probable that the large decorated stone (667), at least, was associated with the passage. Although all three stones were found lying on the surface of the quarry spoilheaps, the original piece of this stone was noticed by a quarry worker when it was *in situ*. Its approximate position coincided with where the passage would appear to have met the cairn revetment. Thus one can interpret the stone as marking the entrance to the tomb. Its dimensions suggest that it was used as a lintel as the decorated face is long and narrow and behind this the stone is thick. The original position of the smaller stones is unknown, but it is possible to make the assumption that they come from the tomb, as all three stones have similar decorative motifs. Also, all the stones must have come from approximately the same position as they were found on the surface of the spoil heaps, within 2 m of each other.



ILLUS 8 The collapse from the cairn's outer revetment. In the foreground is the basal course of the southern face of the platform wall



ILLUS 9 Sections X-W and Y-Z through the platform beside the outer revetment of the cairn

The initial deposit outside the outer revetment was a layer of very loose rubble (22; illus 8 & 9). This covered the area excavated and extended approximately 3 m downslope from the revetment (illus 11). It was composed of thin rectangular slabs, some of which had broken-up into a shillet which partially filled the voids between the slabs. The lower slabs were embedded in the underlying old ground surface (25), and over much of the area they pitched noticeably downwards from N to S. This orientation, and the shape of the slabs clearly point to their having come from the collapse of the upper courses of the outer revetment. The only other possibility is that the slabs were introduced as rubble, but this seems unlikely given their orientation. The volume of stonework, in the excavated spit

especially, would suggest that the original cairn revetment was much greater in height than that which has survived. It is not known how long after the cairn's construction the revetment collapsed.

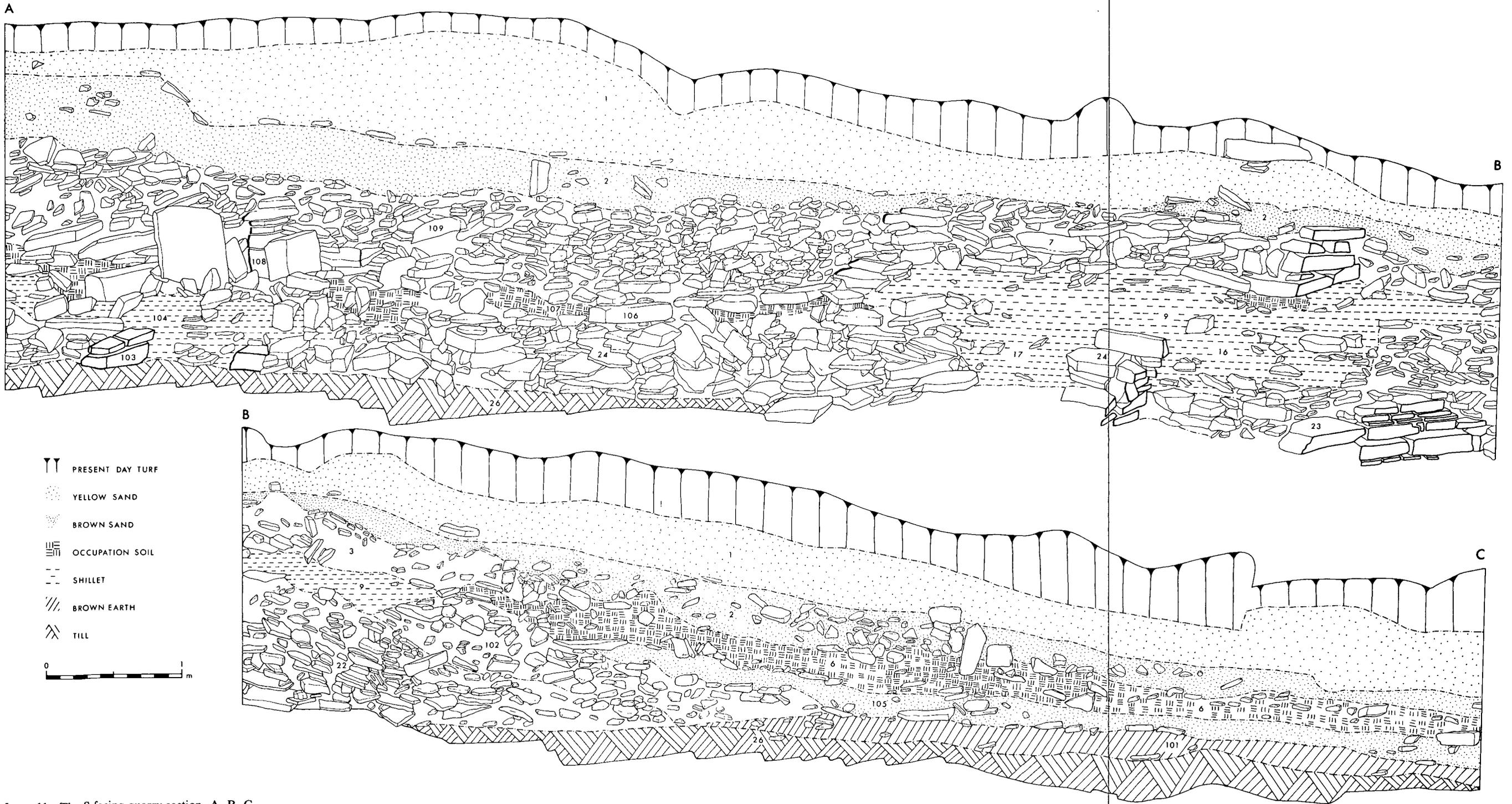
In conclusion, then, the primary construction on the site appears to be a large round cairn, c 18m in diameter. It had a near vertical revetment built primarily for display and an inner revetment, hidden and built for the stability of the cairn. A passage c 0.7 m wide led in from the SSW, and was almost certainly spanned by a very large decorated lintel. Nothing of the presumed chamber was visible but the size of the cairn would suggest that it was of the Maes Howe type. Round cairns with 'stalled' chambers do not have diameters larger than 12 m (at Bigland Round), and even the so called 'hybrids' of Isbister and Unstan are smaller.

#### THE LATE NEOLITHIC RECONSTRUCTION

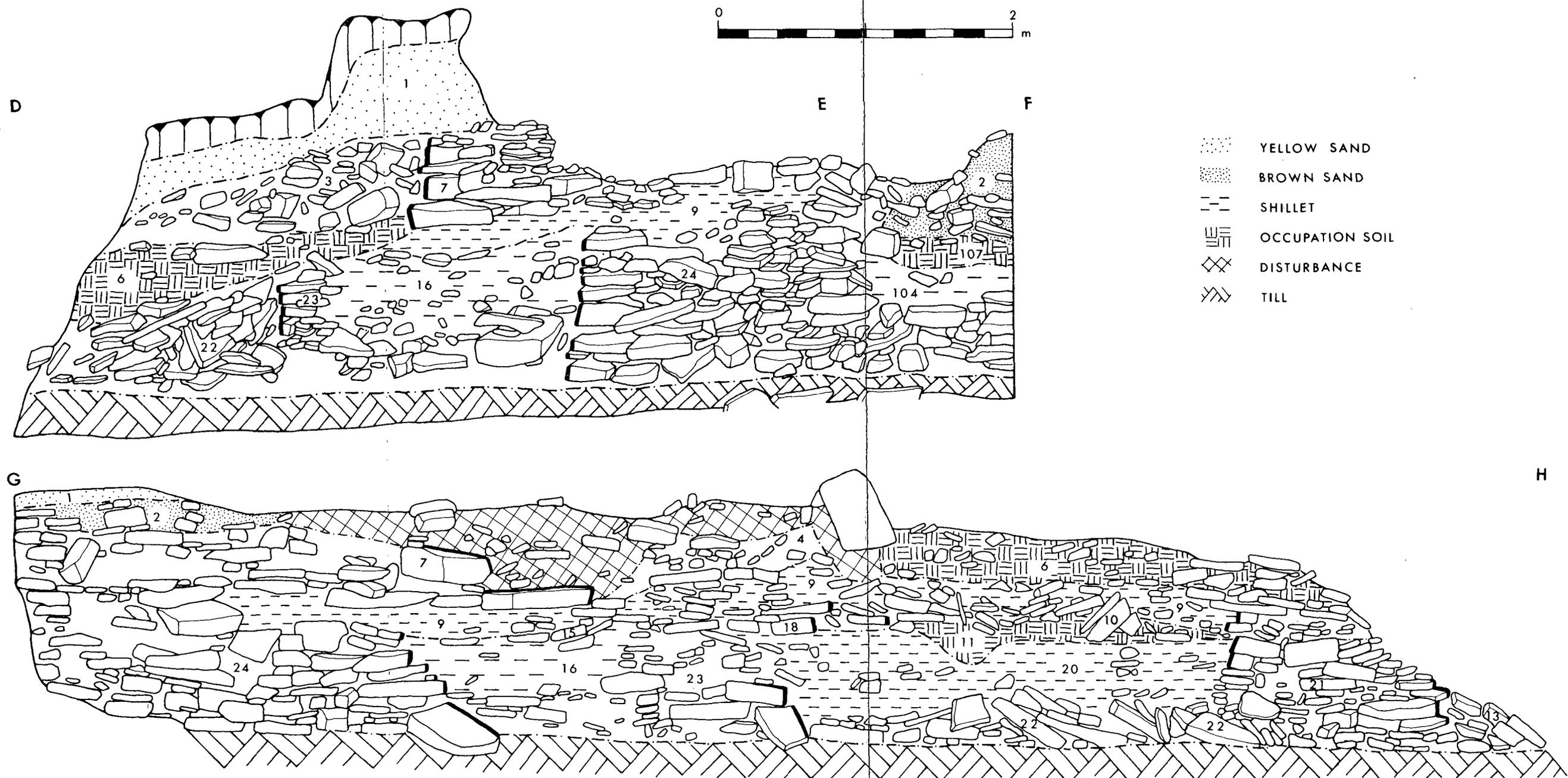
The appreciation of the exact profile of the primary structure of the cairn is impeded because subsequent alterations had a dramatic effect on the remains. Firstly, the cairn was effectively levelled and paved over (illus 6b), and secondly, adjacent to this, a small platform was constructed on which a structure was built (illus 6c), (only part of which lay within the area excavated). It is clear that the cairn should be interpreted as such, and not as the low paved area which survived for excavation, because of the collapsed revetment. This contains far too much stone to come from the revetment of the monument as preserved, and this revetment is reconstructable from collapse in layers stratigraphically separate from the original collapse. Clearly this would explain the different construction of the upper courses of the outer revetment, as this would have been effectively rebuilt when the cairn was altered. Likewise, it would be difficult to interpret the passage as having been part of a low paved area.



ILLUS 10 The outer revetment of the cairn with the paving which covered the monument after the late Neolithic



ILLUS 11 The S-facing quarry section, A, B, C



ILLUS 12 The E-facing quarry sections, D, E, F and the W-facing section of the excavated promontory, G, H

The sequence of layers above the cairn consisted firstly of a layer of shillet (16) which infilled the space between the outer revetment and the inner revetment, and overlay the rubble on the old ground surface joining these. Small patches of this layer also appeared actually overlying the cairn. On top of this shillet there was a layer of paving (15; illus 10) c 2 stones thick, which extended from the uppermost stones of the outer revetment, back across the top of the cairn. Where the paving passed over the shillet, the slabs sloped into it, and this would suggest that this material had not fully compressed before the slabs were laid. This sequence was clearly visible in the E-facing quarry section as well as in the excavated spit (illus 12).

It is unlikely that the shillet layer was part of the original cairn construction as it could not have provided a stable backing for a revetment of any height. Thus, after what must have been a large scale destruction of the monument, the outer revetment was rebuilt and the space between it and the inner revetment infilled. Then the monument was paved over. Presumably the cairn's destruction produced a substantial quantity of rubble, and though some of this was probably used to infill the chamber and passage, the bulk of it is absent and must be assumed to have been removed from the site.

The sequence of construction outside the cairn, in the excavated spit, was complex, but in the quarry sections this complexity was absent. Both sections simply show collapse from the cairn revetment being superseded by a soil and shillet layer, caused by the abandonment of the site. Thus, it is possible that construction around the cairn was limited solely to the area of the spit. The sequence began with the construction of a wall (21) but it is presumed that this was preceded by the removal of at least some of the underlying collapsed revetment. In particular, the S face of the wall was constructed directly on the old ground surface over most of its length. The line of this wall (see illus 6b) was roughly straight, c 1.2 m to 1.4 m thick, and ran at a tangent to the cairn, with its S face c 3.9 m away from the outer revetment. This face stood to a maximum of 0.53 m high. The wall was badly constructed and the use of small slabs in its construction generated an inherent instability in the S face which resulted in considerable slumping along its length. The orientation of the S face was also not parallel with the N face, the E end being much narrower. At this end the S face turned a neat curving corner and rose up over the collapsed revetment to meet the N face. Under the curved SE corner of the wall there was a projection of slabs surviving from the underlying rubble. These were probably left to give stability to a weak point in the new wall and in this they appear to have been successful. A single *bos humerus* from this wall was radiocarbon dated and gave a determination of 2190±60 bc (GU-1382). To the W, the wall was truncated by the quarry and as there was no sign of it in the E facing quarry section (illus 12) it would appear to have stopped in the intervening 7 m.

The construction of the wall defined a roughly rectangular hollow on the collapsed revetment. To the S was the rear face of this wall, to the N was the rebuilt outer revetment of the cairn and to the E the underlying rubble was mounded up. This hollow was filled and levelled by the deliberate deposition of a thick shillet layer (20; illus 9) and thus a platform, c 0.5 m above the old ground surface was created beside the levelled cairn.

The precise stratigraphy and interpretation of the features constructed on this platform are difficult to establish (illus 6c). A rectangular structure was created and this contained an occupation deposit (illus 13). The bulk of the structure must have lain in the area destroyed, and thus the W wall was absent. The N and S walls were clear; respectively the rear face of the platform wall, and an isolated stretch of a new wall (18). The latter was c 0.4 m high, and 1 m in length and ran parallel to the platform wall. In the E it was truncated but there is a slight indication that it had begun to curve round to form an E end to the structure. The only other structural evidence for this was an extension built on to the platform wall (19; illus 9) which overlay the shillet layer. This projected c 0.6 m from a point directly opposite where the N wall ended and it could reasonably be suggested that it was intended to meet the latter. However, it did seem to turn a corner and it may be that the E end was not simply a straight wall. The presence of some sort of wall as an edge to the structure on this side is supported by a line of vertical slabs which would represent its collapse. The interior of the structure so defined was filled with pitched slabs (10) which clearly derived from the collapse of the surrounding walls. These were in marked contrast to the rubble (12) further E which had no distinct orientation, or angle of pitch, and varied markedly in size. This could, therefore, be interpreted as part of the rubble backing of the robbed E wall of the structure.

The chronological relationship of this structure and platform and the reconstruction of the adjacent cairn are imprecise as there are few stratigraphic links between the two. The crucial relationship lies in the fact that the reconstructed outer revetment collapsed onto the shillet and was



ILLUS 13 The late Neolithic structure sitting on the platform beside the levelled cairn

sealed by the construction of the N wall of the structure. As the only apparent reason for the platform would be as a foundation for the structure, the latter must have followed the former with little time passing. Consequently, the cairn must have been reconstructed before the platform's construction. Subjectively, it is unlikely to date much earlier, as the reconstructed revetment with its shillet backing would not have provided a very stable structure.

Inside the structure, lying between the shillet and the wall collapse, was a dark brown-black occupation layer (11). This was c 0.3 m thick at its maximum in the NW, and gradually tailed out to the E and S. It abutted the N wall of the structure and surrounded a single layer of paving stones which was set directly in front of this. It contained an enormous number of flint flakes, which were the result of knapping (see flint report, fiche 1: E8). Amongst the collapsed stones from the walls of the structure (10) there was a slightly different occupation soil. It was a red-brown colour and noticeably clayey in texture. A rich collection of finds was present and these were slightly different from those in the underlying occupation soil. This can best be regarded as a secondary and final occupation into which the collapsed walls have been compressed. Animal bone from this layer was used to obtain two radiocarbon dates, 2190±60 bc (GU-1383) and 2080±63 bc (GU-1384).

Unfortunately, little attempt can be made to define or reconstruct the structure. It is possible that it represents a recess of a large house, but, given its position and the size of the platform on which it stood, this is unlikely. Thus, one is left with a small enigmatic hut perched on a well-built platform projecting from the edge of a raised paved area. This was once a chambered tomb of some size, and elsewhere it seems to have been surrounded by the rubble which resulted from the collapse of its revetment.

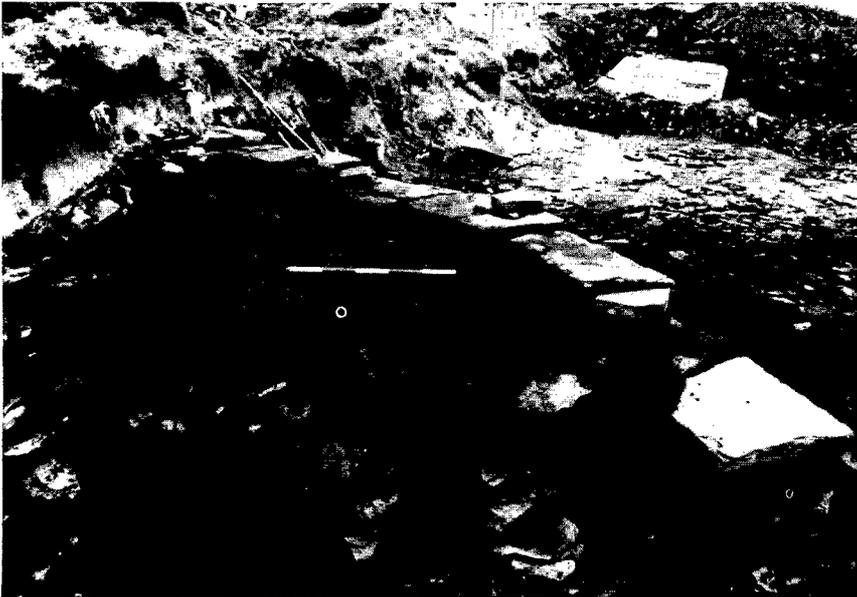
Before we move on to discuss the early Iron Age occupation of the site a number of features which post-date the reconstruction of the cairn need to be mentioned. Along the edge of the excavated spit there were two distinct holes cut into the monument. The most obvious consisted of the removal of a strip of the paving at least c 1 m wide, over the cairn and outer revetment (illus 6b). This was filled with a shillet layer (14) slightly different from that which lay between these elsewhere. Similarly, when

the cairn was excavated it became clear that in the area immediately outside the excavated spit it had been removed in antiquity and again the resultant hole had been filled with shillet (17). It is possible that these were produced by one period of stone robbing of a now-disused Neolithic monument. They do not seem to be related to the early Iron Age occupation as the round-house wall covered them.

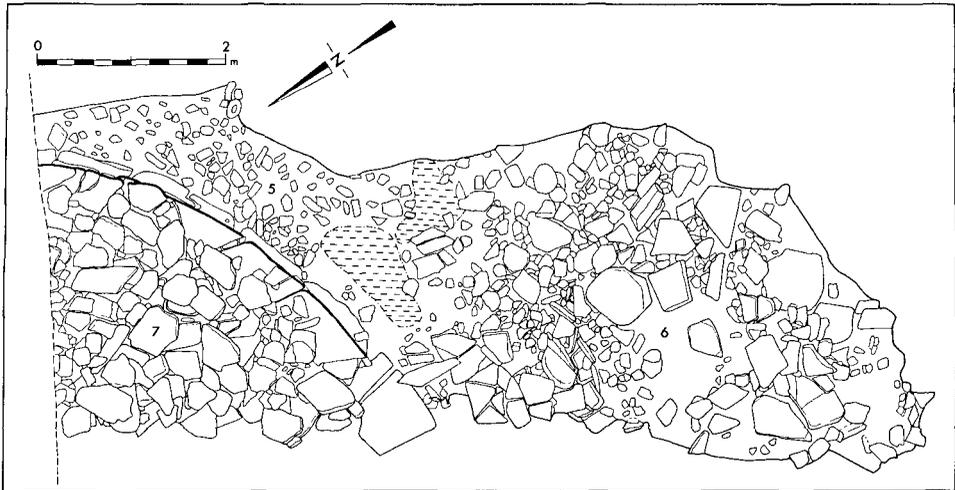
#### THE EARLY IRON AGE ROUND-HOUSE

Concealing the Neolithic remains was a shillet layer (9) which presumably represents the natural decay of the stones used, after the abandonment of the site. The consistency of this layer varied slightly from N to S but the differences seemed largely to correspond to variations in the underlying structures. They may also partly result from water movement, downslope, as it was in the S that the layer contained most soil. In the S-facing section (illus 11) it was clear that the shillet (9) was overlaid by a distinct wind-blown sand layer (103). This started c 2.6 m downslope from the cairn revetment and was consistently 0.2 m thick. It carried on to the end of the visible section, and overlay a thick well-developed soil (101) beyond the point where the cairn collapse petered out. Thus the Neolithic remains were completely hidden beneath a low formless mound. This was probably turfed over but would nevertheless have been noticeably stony. It may have been given some prominence by the deposition of sand around its edges, as vegetation cover on this sand is likely to have been different from that on the stone mound, and this would have helped to draw attention to the latter as a desirable area for the construction of a large round-house (illus 14).

Unlike the underlying cairn, the overall dimensions of the house cannot be estimated, as it is clear from the exposure that it was not a regular circle. It must, however, have been large, with one outer dimension of at least 16 m. The round-house wall (7) was c 3.1 m thick. Only one wall face was present in the excavated spit inside the quarry (illus 15); however, not only were both faces present in the access trench to the W of the quarry (illus 16) but the inside face was visible



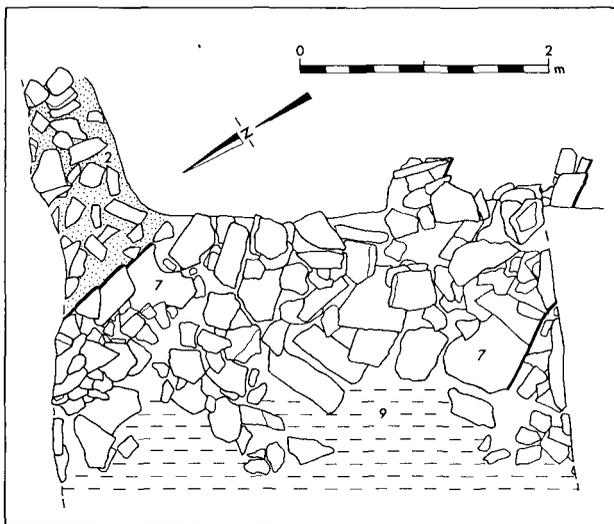
ILLUS 14 The round-house wall showing the outer face and the foundation slabs, after the removal of the core



ILLUS 15 The early Iron Age round-house wall and the stone spread in the occupation layer beside this

in the S-facing quarry section (illus 11). The wall was built on a foundation course of very large horizontal slabs, which extended across its width and protruded 0.1 m in front of its outer face. It stood to a maximum of four courses high (0.33 m) in the excavated spit. The primary course comprised large rectangular blocks, but above this, the stones were considerably reduced in size. All the courses were carefully chocked with small stones to give maximum stability.

As a prelude to the construction of the wall some small scale alterations to the surface topography of the mound took place (illus 34, fiche 1: D7). These were carried out to create a level surface on which the foundations of the wall could be laid, and consisted of the truncation of



ILLUS 16 The badly truncated remains of the round-house wall in the quarry access trench

a bump in the NW and the filling of a hollow adjacent to this with a dark, organically rich occupation soil (8). The latter contained enough animal bone to obtain one radiocarbon date, 560±80 bc (GU-1580). This is a *terminus ante quem* for the construction of the round-house.

Outside the round-house an occupation deposit was present. From the S-facing quarry section (illus 11) it was clear that this extended at least 9 m away from the round-house, downslope to the E. It reached a maximum thickness of c 0.4 m in this section. Unfortunately, the area of these deposits preserved in the spit was much less than that of the Neolithic levels because of the nature of the quarry stripping. The upper surface had also been slightly disturbed during this activity. Nevertheless it became clear after the disturbed surface (4) had been removed that the occupation deposits could be split into 2 layers: immediately adjacent to the round-house was a thin stony layer (5) and further to the S was a much thicker, organically rich, deposit (6). Intermixed with the latter were a large number of laid, horizontal slabs. No structural arrangement of these slabs could be discerned, but a plan was made when the greatest number were exposed (illus 15). From this, it could be suggested that they were arranged as a ring of paving with an outer diameter of c 4.8 m. At the centre of this was a bare area, c 1–2 m across, adjacent to the edge of the excavated spit. There was no sign of any stake- or postholes in any way connected with the ring. At the inner edge of the paving, one stone stood much higher than the others and could be interpreted as a seat.

The impression gained of this extra-mural activity is that the round-house was surrounded by a zone of land organized into activity areas which were at least partly paved. The occupation material had therefore built up *in situ* and was not the result of midden deposition. It is possible that structures might be present in this deposit elsewhere, and walling of an indeterminate nature could be observed in the S-facing quarry section (illus 11). Animal bone from this occupation layer gave a radiocarbon date of 475±60 bc (GU-1581).

Above the occupation layer there was a layer of pitched stone (3) which can be interpreted as collapse from the round-house wall. This extended as a curtain around the wall, up to c 3.4 m in front of it (illus 11).

Examination of both quarry sections (illus 11 & 12) gave some insight into the nature of the interior of the house. As noted above the floor was sunk into the original cairn. It was marked on the E side, c 0.4 m below the wall foundation, by a single layer of large paving slabs (106). Under and amongst these slabs was an occupation deposit (107) and when the slabs stopped after 1.74 m, this continued and could be traced intermittently across the whole of the interior. Against the inner face on the W this layer merged into a thick deposit of banded peat ash. At a point c 4.7 m from the wall there was a well built wall (108) which faced SW, and at right angles to this there was a large orthostat. To the W there appeared to be a similar orthostat which had fallen over.

Above these occupation deposits, the round-house was filled with rubble (119). This was of small slabs and, for a number of reasons, cannot be interpreted as the natural decay of an abandoned structure. In particular, the upper surface of the infill was level all the way across when one would have expected it to have formed a bowl, as the bulk of the infilling would have resulted from the collapse of the wall. Similarly most of the stones lay horizontally, when naturally they would have been pitched or at least disposed in a disorganized manner. Consequently, this can most readily be interpreted as a deliberate attempt to fill the interior. It is possible that the western part of the interior was not infilled. In front of the wall face (108) and above the orthostats, the rubble was looser and more jumbled (illus 11). Thus the wall could be interpreted as a face to the stone fill, which had been constructed to make the interior of the house much smaller. This is closely paralleled at Quanterness (Renfrew 1979, fig 51) where there seems to have been a very complex remodelling of the interior of the house. Large orthostats were also found projecting from the walls of the house at Quanterness.

Above the remains of the round-house and the traces of its destruction, there was a layer (2) which represented the final occupation of the area. It comprised a wind-blown sand deposit, which was light brown in colour at the top, changing to yellow in the few areas where it was more than c 0.35 m deep. Along the junction it was possible, in damp weather, to see furrows resulting from cultivation. Fertilizing the soil would account for the brown colouring of the deposit. In the section produced by the quarry access-track a mound of small stones was present lying on top of this layer. Unfortunately, it was not possible to clean and record this but it seemed to have represented either a clearance cairn or a ruined field dyke.

The brown sand of the cultivation layer was completely covered by another wind-blown sand deposit (1), which lay directly underneath the modern turf.

THE RADIOCARBON DATES

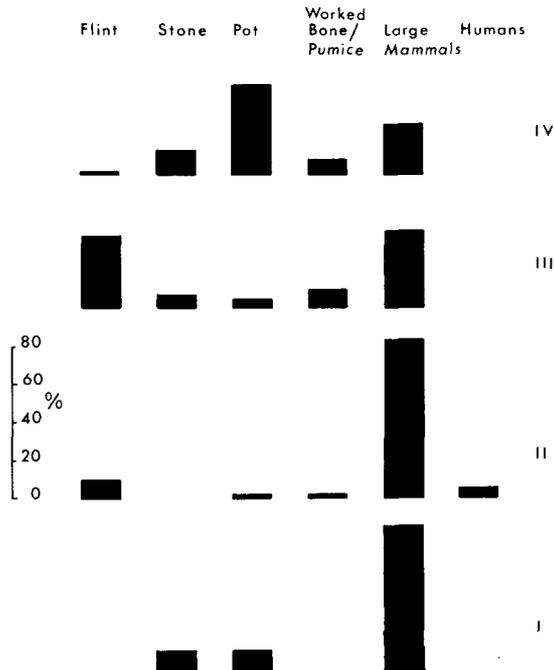
M J Stenhouse

GU-1580	Layer 8	Cattle bone	2510±80 δ <sup>13</sup> C=-20%
GU-1581	Layer 6	Cattle bone	2425±60 δ <sup>13</sup> C=-20%
GU-1582	Layer 21	Cattle bone	4140±60 δ <sup>13</sup> C=-20%
GU-1583	Layer 10	Cattle bone	4140±60 δ <sup>13</sup> C=-20%
GU-1584	Layer 10	Cattle bone	4030±65 δ <sup>13</sup> C=-20%

The above C-14 dates are quoted in conventional years before present (1950 AD) and are uncalibrated with respect to dendrochronological age. Errors are expressed at the ±one sigma level. For description and stratigraphical location of each layer, see fiche 1: D3. See page 125 for three additional dates.

THE FINDS (fiche 1: D8-fiche 2: G5)

A large quantity of artefacts and other finds came from the excavations and in several respects they illuminate a variety of aspects of the periods represented. However, it has not been possible to publish in full the specialist reports relating to these finds. The bulk of each report, outlining the



ILLUS 17 The composition of the finds expressed as a percentage of the total number of objects from each context. The figures from each category represent: retouched flints, stone tools, the minimum number of pots, worked bone and pumice pieces, the minimum number of animals and the minimum number of humans

method of analysis and containing detailed descriptions is, with, the catalogue of the artefacts, placed in a microfiche appendix enclosed with this volume (fiche 1: D8–fiche 2: G5). Only summaries and comparisons with related assemblages are presented in the text.

Before presenting these reports there needs to be a short discussion of the problem of residual deposition. Clearly, in any multi-period monument, this must be examined carefully as any analysis may lead to serious misinterpretation of the finds in use at any time. To do this it is necessary to examine the overall composition of contemporary assemblages and for this it is convenient to break the site down into four separate contexts. Unfortunately, all of these are not directly related to the phases of constructional activity outlined in the previous description; for example, finds from the cairn cannot be separated between the primary monument and its late Neolithic alteration. It will, however, be argued in a concluding section on the finds that they represent distinct, chronologically separate contexts which contain material representative of the periods in the site's use. These contexts are not used in the discussion of individual types of finds as it is preferable to refer to the individual layers which contain the material.

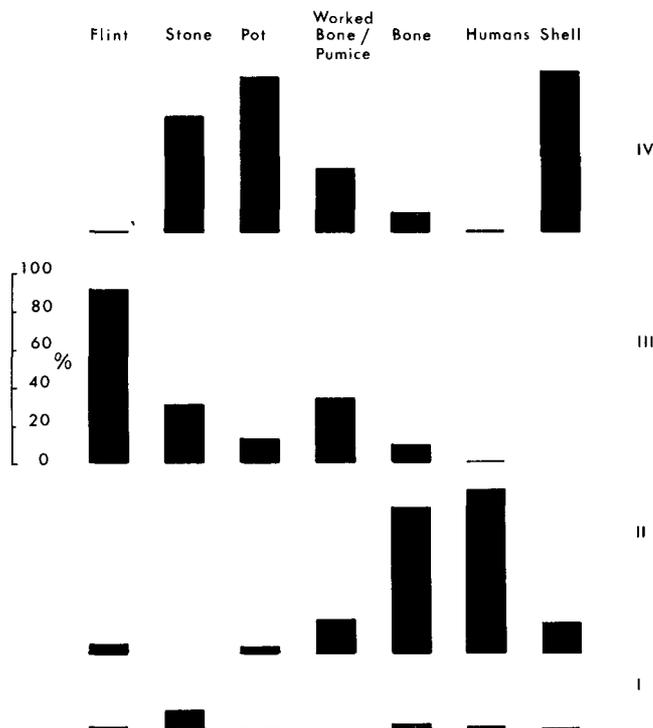
The basic components of the assemblage in each context are shown in ill. 17. The contexts are:

1. The cairn, which contained practically no finds at all.
2. The rubble of the collapsed outer revetment, and the platform built on top of this. This contained large quantities of small and large animal bones. Most artefact categories are represented but only flint occurs as more than isolated pieces. Human bones are present in a very localized deposit but in significant quantities.
3. The occupation within the structure built on the platform. This contained vast quantities of flint, particularly small *débitage* flakes. Other finds categories are represented by only small quantities, though the amount of bone does permit some analysis.
4. The early Iron Age occupation. This contained vast numbers of limpets and the only sizeable assemblage of pottery. Mammal bones are present in fair-sized quantities but human bones are few. All artefact categories are represented, but flint is negligible.

Each of these contexts, then, appears to have a distinctive assemblage of its own. However, this does not preclude the possibility of residual distortion. Another graph, ill. 18, has been drawn in order to isolate where this may be present. This is based on the same material as in ill. 17, but the columns represent the percentage of each type of find distributed over each context. As these contexts are chronologically arranged distortion can only be identified in the succeeding phase. One exception is, however, present – the first context, the cairn. This was not only reconstructed in the late Neolithic, but subjected to stone robbing after this.

Thus, contamination from later periods is likely. This would perhaps emphasize the dearth of finds from this context, as the later, comparatively richer, periods would provide a source for these finds.

Given the absence of finds in phase I, it follows that there can be little material from this redeposited in phase II. Thus, the phase III assemblage is the first which could suffer considerable residual distortion. In principle, one would expect the problem to occur only when there was a large quantity of a particular type of find in an earlier layer, in relation to a small quantity in the later. In this case one would clearly expect the human and mammal bone assemblages to contain material not dating to the use of the structure. This is quite important in the instance of the mammal bone assemblage and a case has been argued by the specialist that at least one layer in the phase III deposits is biased by the presence of large quantities of earlier bones, in this case sheep. The flint assemblage as a whole is unlikely to be biased but the presence of residual material could seriously distort the number and type of retouched pieces present. Fifteen pieces



ILLUS 18 The composition of finds expressed as a percentage of the total finds in each category. The figures for each category represent: flint pieces before wet sieving, stone tools, pot sherds, worked bone and pumice pieces, bone fragments, human bone fragments and shells

came from phase III as opposed to 11 from phase II. The other artefacts possibly suffer from residual contamination, but these assemblages are so insignificant that important conclusions are not affected. This is particularly so, as the only important potsherds in phase III are of a distinctive fabric restricted to its layers.

If the same principles are applied to the final early Iron Age assemblages, then it is clear that the shell and pottery assemblages will not be significantly affected, as the numbers present in these are much greater than any previous deposits. The rude stone, worked bone and pumice assemblages, in contrast, may well be biased. The small quantities of flint and human bone are almost certainly a result of redeposition. Indeed, it is argued that all the human bone on the site was originally deposited in one layer in phase II, thus its presence elsewhere is a clear sign of residual bias. Only two human bones were present in this phase so it suggests that the quantity of residual material is not very significant. If this is accepted, then one may show some confidence that the mammal bone assemblage represents the contemporary situation. It is, however, in a very weak position, as the minimum number of individuals present is very small compared to previous deposits.

In short, then, the overall problems of residual distortion of the assemblages in each period appear to be slight. Nevertheless, they are important in a number of specific cases, and they have to be taken into consideration in any attempt to interpret the nature of possible depositional processes and the chronological use of the finds.

## POTTERY (fiche 1: D8)

Clare H Yarrington

This is a small, rather poor, assemblage of 735 pieces, weighing just over 4 kg. The majority of the pieces are small, and of these, a third are classed as fragments, ie pieces less than 20 mm<sup>2</sup> and with one or no surfaces surviving. Generally, the pottery is roughly made, poorly fired, and now in poor condition. Microscopic examination of the fabric revealed that the grits used as a filler came from local sources throughout the phases of the site. The majority of the sherds are indistinguishable except for four groups which have special attributes of hardness, colour, surface treatment, and form. These make up 38% of the assemblage and are related to chronologically separate periods of the site's history.

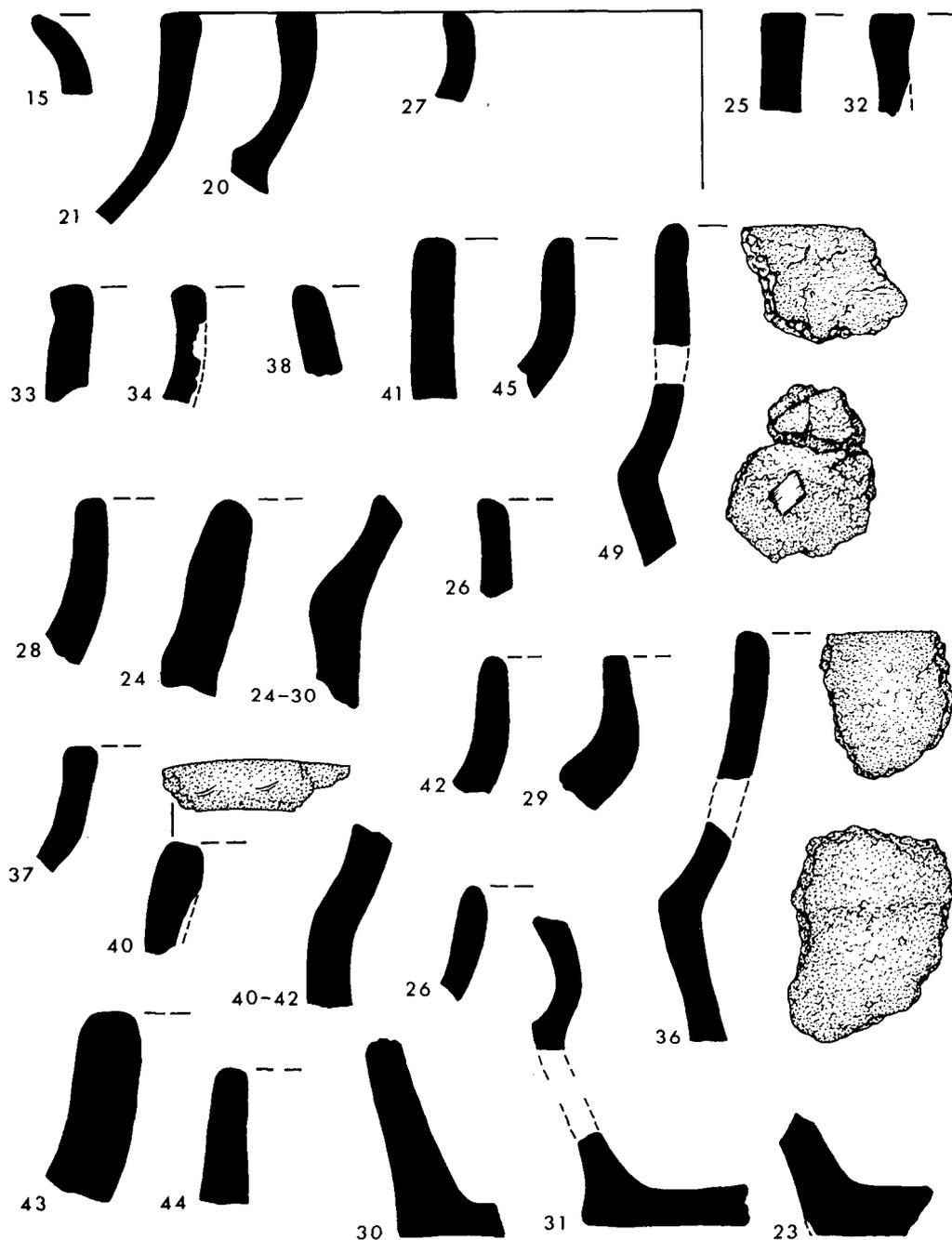
TABLE 1

Breakdown of the pottery assemblage by weight, number and type for each layer and phase

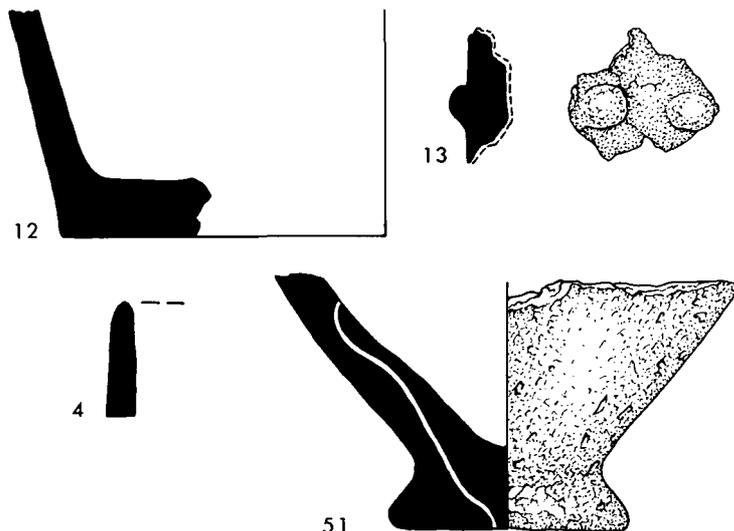
Context	Layer	Weight (g)	% By weight	Rim	Base	Body	Total sherds	Frag	Min no vessels
Cairn	24	5.4	0.12			1	1		
Platform	20	21.7				2	2	2	
	21/19	86.1		1?		10	11	7	2
	14	10.8				1	1	3	
	22	20.8				1	1	3	
	TOTAL	139.4	3.3	1?		14	15	15	2
Structure	11	128.5				18	18	21	
	10	233.0			2	30	32	14	2
	TOTAL	361.5	8.63		2	48	50	35	2
Early Iron Age occupation	9	85	2	1?		13	14	15	1
	7	5.2				1	1		
	6	1970		16	8	156	180	107	11
	4	358.6		3	2/3	37	43	33	4
	5	267.1		3		36	39	1	3
	8	161		4		15	19	20	3
	section	439.9		5		53	58	22	4
	TOTAL	3205.3	76.5	31	10/11	298	340	183	25
unstrat	2	98.8	2.4		1	3	4	4	1
	292.8	7	2?	2/3	21	26	33	—	
	4188.2		31/35	15/17	398	450	285	31	

Note: Percentages by weight only are shown, the calculations for sherds and fragments are similar

Table 1 gives a breakdown of the assemblage by weight, number and type of pieces for each layer, with totals for each period. Pottery was found in each main phase of this multi-period site, but the distribution is uneven. Only two small abraded sherds were found associated with the Neolithic cairn, and 15 sherds and 14 fragments were found in the other Neolithic layers of the platform. Three times this amount came from the interior of the late Neolithic structure, and twenty times from the early Iron Age layers. The fragments from the earlier Neolithic layers are too small to comment upon, but those from inside the late Neolithic structure seem to fit within the ceramic tradition of Orcadian Grooved ware. Two sherds (illus 20) in particular are decorated with applied pellets of clay, which is characteristic of the Orcadian substyle defined by Longworth



ILLUS 19 Ceramics from the early Iron Age contexts (scale 2:3)



ILLUS 20 Miscellaneous ceramics: 12 and 13 come from the interior of the late Neolithic structure, 4 is from the platform wall, and 51 from the ploughsoil which overlay the site (scale 2:3)

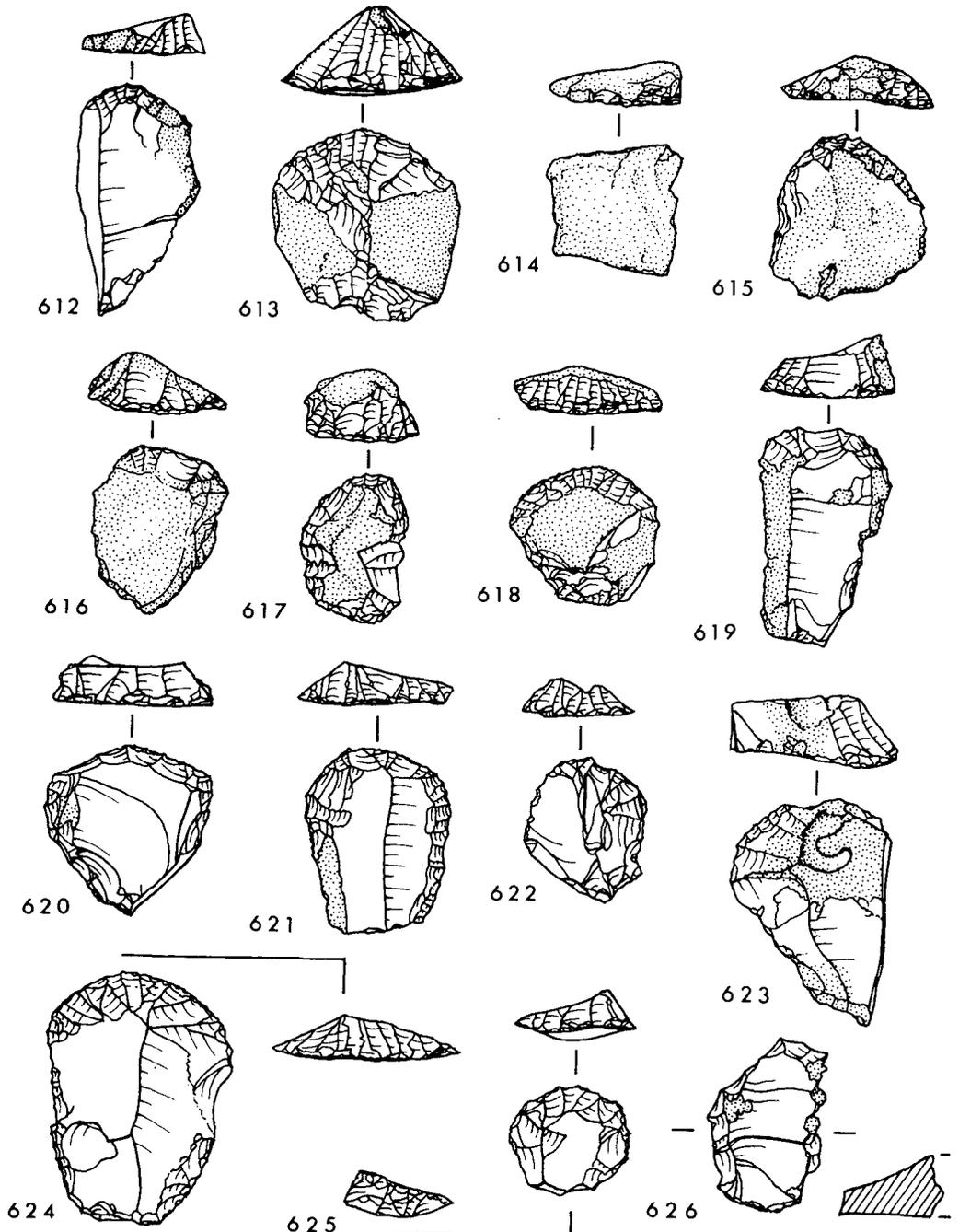
(Wainwright & Longworth 1971, 243). The larger, early Iron Age assemblage (illus 19) has good parallels with a number of sites of this period in both Orkney and Shetland. The diagnostic feature of a high and pronounced shoulder, with an upright rim, is directly comparable with the bulk of the assemblage from village II at Jarlshof (Hamilton 1956, 37–8, figs 18 & 19). The limitations of this assemblage make any comparisons tentative and it is likely that significant variations in ceramic form and fabric have gone unnoticed.

#### FLAKED STONE (fiche 1: E8)

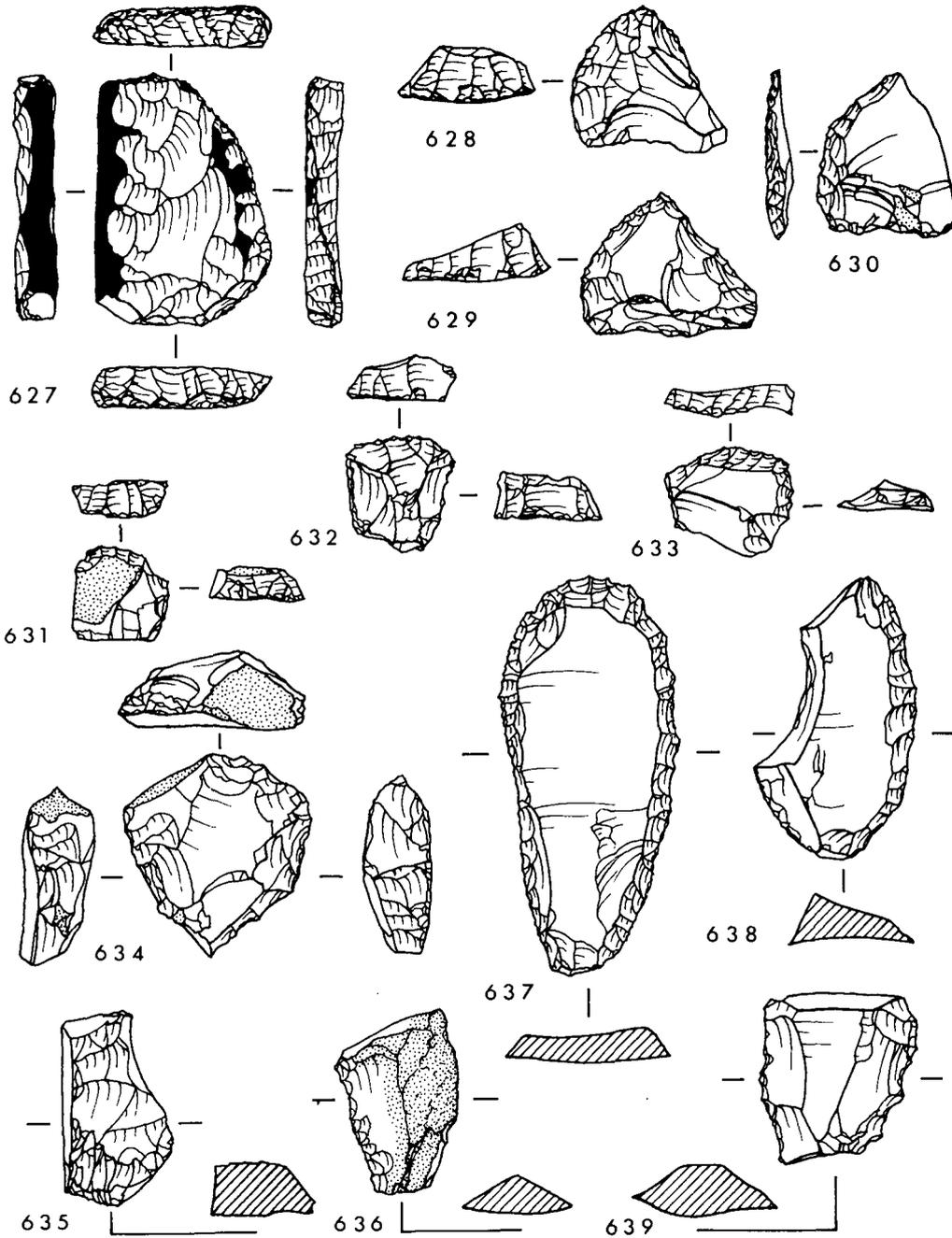
C R Wickham-Jones

The flaked stone assemblage from Pierowall comprises 588 pieces. Ninety per cent of these were recovered from within the structural remains of the late Neolithic period. The rubble below this structure contained 7% and the other stratigraphic units less than 1% each.

All pieces are flint, derived from a pebble source, either from the beach or within the glacial till. Fourteen are burnt, but these are small *débitage* pieces and it seems likely that this is due to chance contact rather than any deliberate action. One core is present, a scalar core (64; illus 23). This represents the use of a knapping technique particularly suited to the small pebbles available. However, the presence of carefully trimmed platforms on some flakes suggests that platform cores were also used. Knapping was carried out by direct percussion with soft hammers, such as antler or wood. Flake size was clearly restricted by the pebble source but many flakes appear to have been suitable for use with or without secondary alteration. At Pierowall such alteration was restricted to retouching work (illus 21–23). The presence of one polished fragment (627) is not conclusive proof of the use of polishing on site. Flakes were apparently selected for modification on the grounds of both size and shape so that retouching was restricted to the minimum. The aim seems to have been to produce two main types of retouched piece, scrapers and edge-retouched flakes. The latter are few in number and mostly broken. The scrapers, however, are more numerous,



ILLUS 21 Flaked stone: scrapers (scale 1:1)

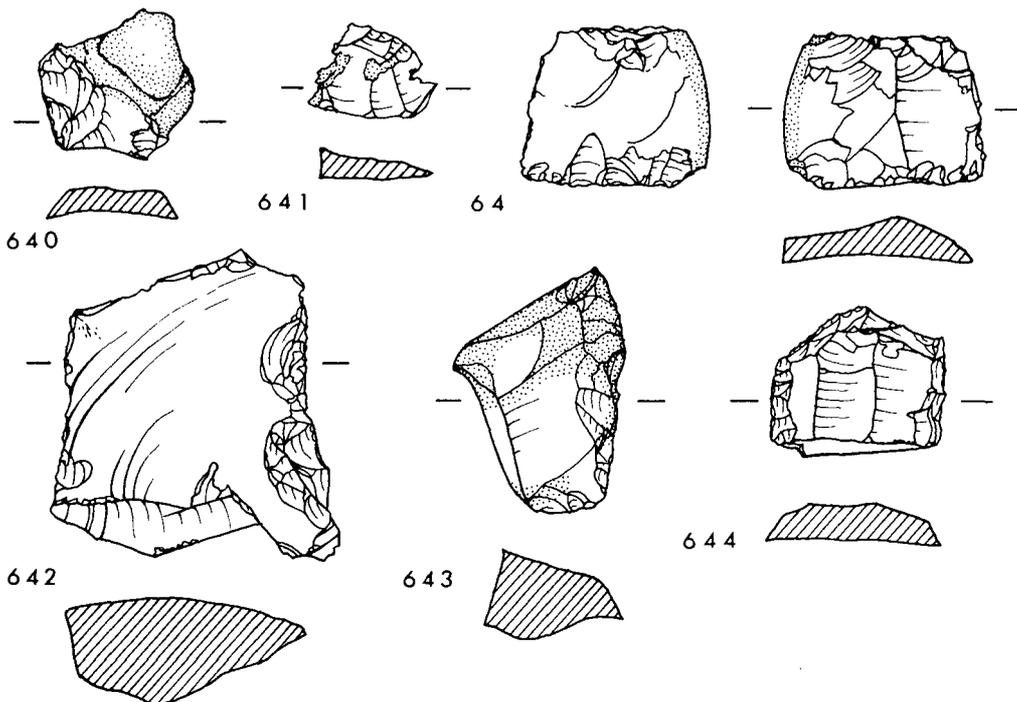


ILLUS 22 Flaked stone: 627-635 scrapers, 636-639 edge retouched flakes (scale 1:1)

and a variety of depths and shapes of face exist. One in particular is of note (627), a double ended tool made from a fragment of a previously polished flake. Resharpener of scrapers is suggested by the flake, 635, which has been struck-off across a scraper face.

The bulk of the assemblage consists of *débitage* produced by knapping and it seems likely that it results mainly from knapping activities, rather than the use of tools. Nonetheless, detailed stratigraphical examination reveals depositional differentiation within the main body of material. This was recovered from the two occupation layers within the late Neolithic structure and the rubble layers below. Within the structure, the lower layer (11) contained all the knapping debris with two retouched pieces, whilst that above (10), contained few pieces only; the core, larger, unretouched flakes and a higher proportion of retouched pieces. Unlike layer 11, layer 10 was not sieved but this cannot explain the complete absence of *débitage* flakes (see illus 24). The very small size of this *débitage* suggests that the deposit is *in situ* although the possibility remains that a dump is represented. Initial activity in the structure would therefore seem to have involved flint knapping, followed by a change in emphasis to the actual use of flint tools. The scalar core and unretouched flakes are not necessarily out of place as they would have formed effective tools along with the retouched pieces. Below this, the assemblage in the rubble platform produced only 40 pieces and wet sieving did not significantly increase this quantity. The majority of this assemblage comprises larger flakes and retouched pieces and there is little knapping debris. It would appear that this assemblage also resulted from tool use, rather than production, around the chambered cairn.

A variety of limitations makes it hard to assess any isolated assemblage in a particular cultural or chronological framework. However, there are two other assemblages in the locality

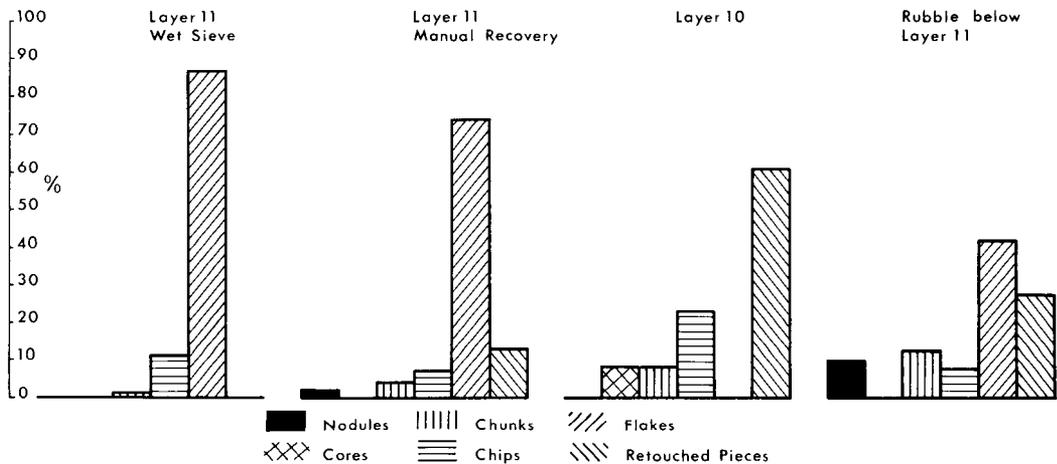


ILLUS 23 Flaked stone: 640-644 retouched, 64 scalar core (scale 1:1)

that have been studied in similar detail, and these provide illuminating comparisons. About 2 km away is the settlement of Links of Noltland which is of a comparable period with the later phase at Pierowall (Clarke *et al* 1978). Only preliminary analysis has been carried out, but similarities between the two can be seen. Both rely upon pebble flint and display a predominance of scalar cores. Both exhibit an emphasis towards the production of scrapers and edge-retouched pieces, although at Links of Noltland the assemblage is much larger and a greater variety of scrapers, including many coarser types, are present. The other site is Camster Long, Caithness, where the assemblage results from pre-cairn activity and is likely to be earlier than any of the Pierowall assemblages (Masters forthcoming). At this site a variety of sources was used: pebble flint, quartz, chalcedony and pitchstone. Only the latter, however, need necessarily represent a distant source. Here the assemblage differs more from that at Pierowall. Platform, as well as scalar, cores are present and there is slight evidence for the use of indirect percussion. Scrapers are once again the most common retouched type, but there are different types from both of the other sites and edge-retouched pieces are not present.

One other comparison remains to be drawn. This regards the polished piece, 571. Although this piece is small and the reworking has obscured much detail, it is likely that it represents a pre-form for a flaked knife. Similar pieces occur on other Orcadian sites, for example at Isbister (Hedges 1983, fig 20.95) where a complete limestone pre-form was recovered, at Unstan (Henshall 1963, 243, 253; NMAS E0177), Calf of Eday (*ibid*, 191, 250; NMAS E0661), and at Quanterness (Renfrew 1979, 79–81). All these pieces are of flint, all are burnt and all are broken, but possibly the most interesting feature is that the majority have been reworked by retouching. Beveling on the surviving polished edges of these pieces has been interpreted as resulting from use (*ibid*, 81). However, a use-wear examination of that from Isbister suggested that this was not so. It is also difficult to imagine an activity that would lead to such alteration. Such bevels would, in fact, be an integral part of the polishing if the pieces were ever to be finished by further flaking, *viz* that from Calf of Eday (Calder 1937, fig 9).

'Knives' with varying degrees of polishing and flaking do occur elsewhere in Britain (eg Manby 1974, 88–9, 113–15) and there are also two polished flints from Camster Round (Henshall 1963, 254, 264; E097), although these are not similar to the pieces mentioned above. In this case it is perhaps the local picture which is most important. A pattern is clearly emerging of the

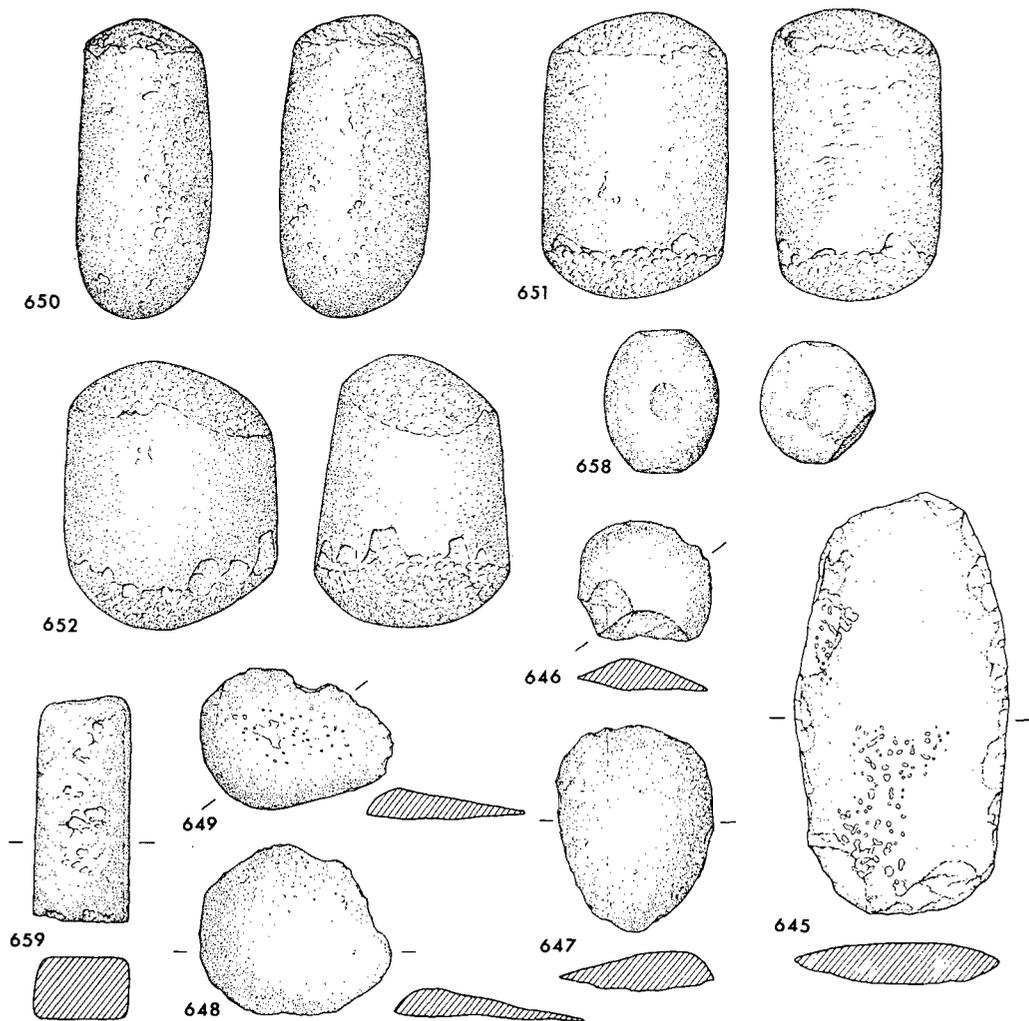


ILLUS 24 The typological composition of the flaked stone. (NB In layer 10 the bar shaded for chips should be hatched as for flakes)

incorporation of polished pre-forms into chambered tombs, together with, in specific cases, their later reworking into more functional tools. At Isbister the pre-form came from outside the entrance to the tomb (Hedges 1983, 58), and a similar location is also possible at Pierowall.

**Conclusion**

Debris from flint knapping, which took place in the late Neolithic structure represents 88% of the assemblage. The lack of clearance of this debris would suggest that this area of the structure was not used as a living place during this period. Few excavated prehistoric settlements have produced knapping debris within dwelling house walls (Wickham-Jones 1984). Evidence for the use of flaked tools was provided by the material from the occupation soil above this debris and from the rubble platform below it.



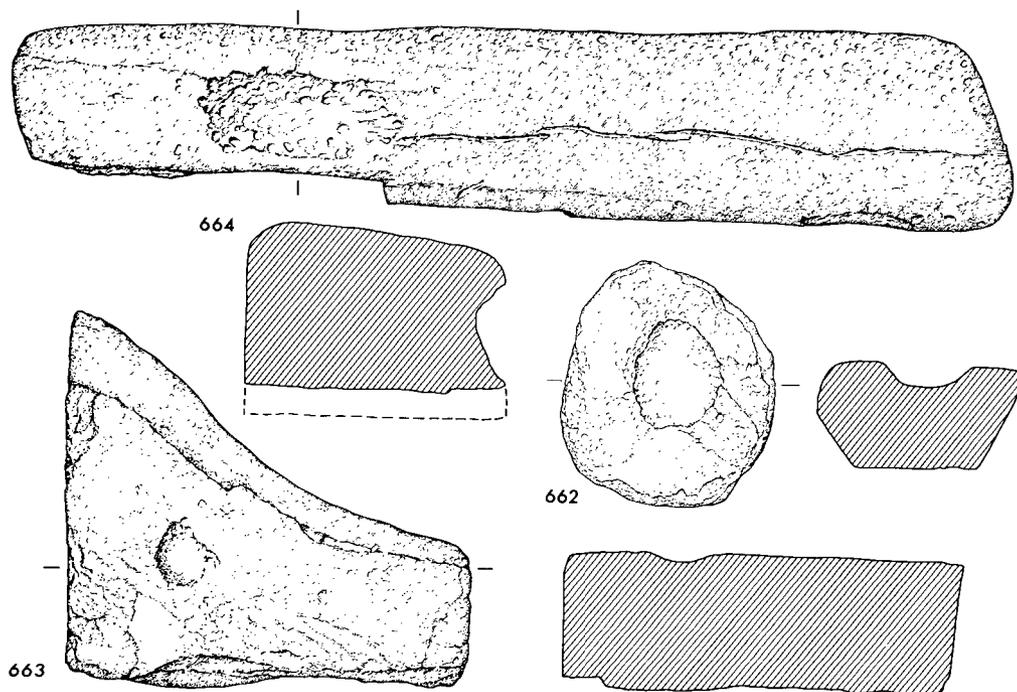
ILLUS 25 Stratified stone tools: 645-649 'Skaill' knives, 650-651 pounders, 658 faceted stone, 659 anvil stone (scale 1:3).

Although functional influences cannot definitely be ruled out, the patterning of types within the assemblages does show some chronological and possibly cultural differences. At Camster Long Cairn a greater variety of retouched pieces was produced and amongst the scrapers there are types not common on either of the later sites. Pierowall Quarry and Links of Noltland are of a more comparable period, but, even so, Pierowall Quarry demonstrates a surprisingly high percentage of finer scraper types. The presence of the polished piece also suggests Orcadian affiliations of a less domestic nature, as the incorporation of polished pre-forms of various materials into chambered tomb sites is observed.

#### STONE TOOLS (fiche 2: C5)

Ann Clarke

The assemblage comprises 20 pieces of which there are 5 'Skaill knives'; 8 cobble tools, including 6 pounders; 3 stones with pecked hollows, and a collection of miscellaneous items (illus 25, 26, 36). All of the pieces are made from the local, micaceous sandstone or red sandstone, in the form of beach pebbles or flagstone. Only a small proportion of these pieces come from stratified contexts. From the late Neolithic structure there are 2 Skaill knives and an unusual oval stone with smoothed facets at four cardinal points. From the early Iron Age occupation there are 3 pounders, 2 Skaill knives and 2 stones with pecked hollows. All the unstratified pounders are likely to belong to the latter period as they are unknown at other Neolithic sites on Orkney, ie Skara Brae, Links of Noltland and Knap of Howar. The chronology of the Skaill knives is, however, more ambiguous. These are found in abundance on settlements producing Grooved ware but seem to occur in the Iron Age only at Calf of Eday (Calder 1938). Clearly, then, there is



ILLUS 26 Stones with hollows. (scales: 662 & 663 1:6; 664 1:3)

a possibility that the early Iron Age examples at Pierowall are derived from disturbed earlier contexts. Both the 'Skail knives' and the pounders show considerable variation in their size and shape, but all were clearly subject to considerable use which has left distinctive wear marks on the pieces.

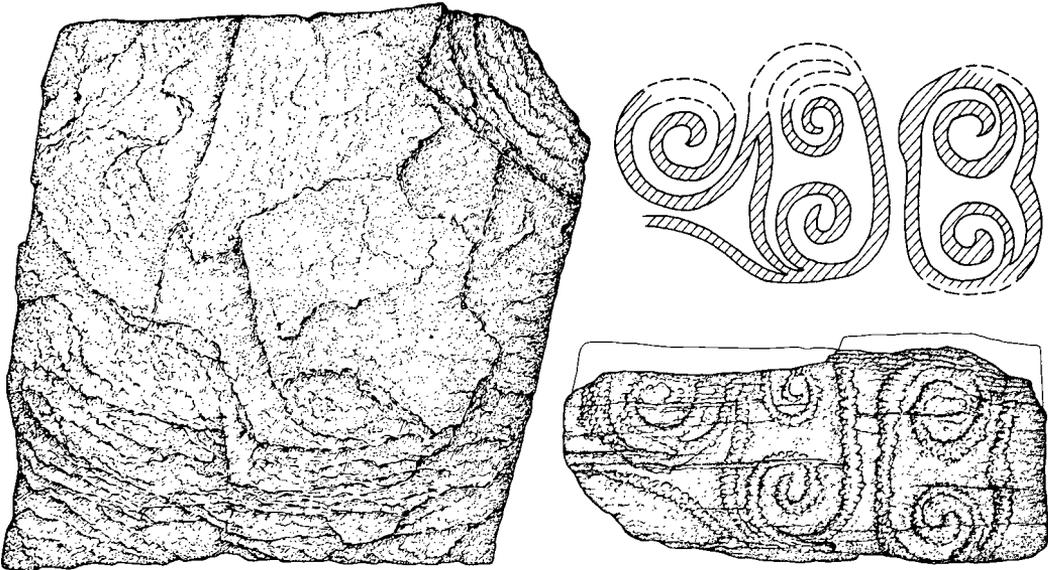
One of the unstratified pieces, a stone with a pecked hollow, deserves mention. Unlike the other stones with hollows this stone has it located on the edge of the slab (illus 26). The actual hollow is also different in that it is a deep oval with well defined edges and distinct peck marks, which clearly indicate the method of its production. The latter feature is very similar in execution to the decorated stones and it may be that this hollow has a similar function. Hollows do occur in the decoration at the nearby tomb of Holm of Papa Westray S, though there they are in groups and circular.

#### DECORATED STONE (fiche 2: C11)

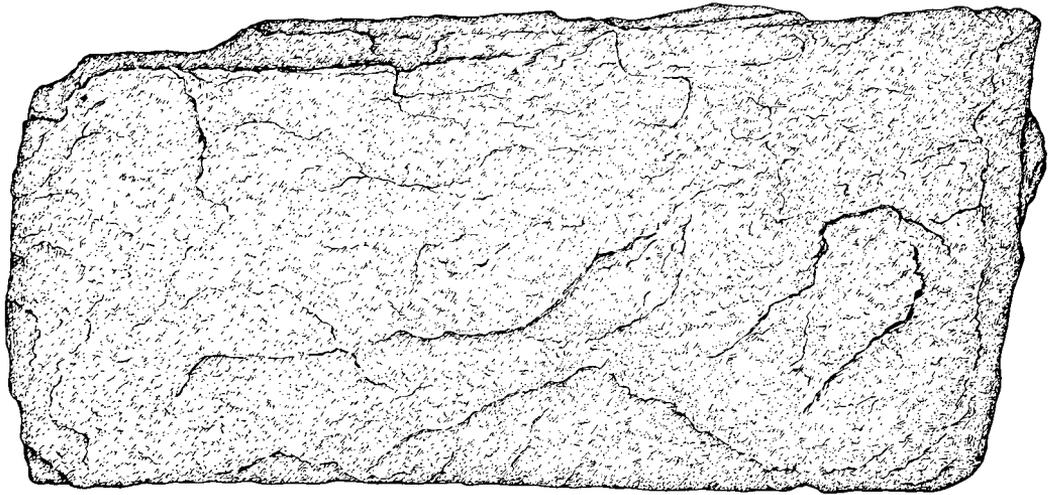
There are three decorated stones (illus 27-29) which are characterized by the same decorative motif, a pair of 'spectacle'-linked spirals (Twohig 1981, fig 11.4) arranged back to back. Stone 666 appears to have only half the motif but it is possible, either that it has split away, or that the decoration was carried out when the stone was *in situ* and extends over two stones. The former hypothesis is favoured as the present stone is splitting along a bedding plane parallel to the truncated edge. Of the three stones, the lintel stone (667; illus 29) is superior in the technique and scale of the decoration. The lines of the pattern on the smaller stones are a conjoined series of peck marks, whereas on the large lintel stone, the pecks have been smoothed out to form a uniform V-shaped groove. The decoration, in this case, covers the stone with an apparently planned, integrated pattern which emphasizes the individual motifs used in this design. The decoration on stone 666, on the other hand, does not cover the surface, and although this has been attempted on stone 665 it is achieved only in a superficial manner. Furthermore, the individual spirals on stone 666 are very badly executed, the designer appears to have made several errors in projecting the line of the right hand arc.

The explanation for the differences in the stones may be that they were decorated by different, perhaps chronologically separated, groups. Thus the two smaller stones may be seen as the crude forerunners to the workmanship on the larger stone, or rude copies of the latter by a succeeding generation. It may be possible, however, that the stones are contemporary despite the variations. The decorated stones at Newgrange in Ireland all date to the construction of the tomb, yet show considerable variation in design and the manner of execution. Although it has been suggested that the work here was shared between craftsmen and less skilled apprentices (O'Kelly, M J 1982, 119), it is perhaps more likely that the relative importance of the position of a stone, for instance at the entrance to the tomb, dictated a higher degree of skill and effort being put into its decoration. This could, quite clearly, be the case at Pierowall.

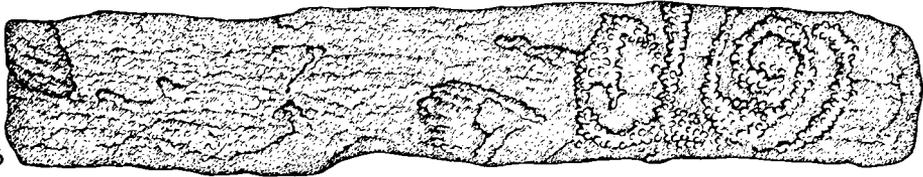
Whilst linked spirals are a feature of megalithic art throughout Britain, the motif of the 'spectacle'-linked spiral present at Pierowall occurs elsewhere only at Barclodiad Y Gawres, Anglesey, the Calderstones, Liverpool and Eday Manse, Orkney. It is unknown in tomb art in Ireland but it does feature on the recently discovered macehead from Knowth, Co Meath (Eogan & Richardson 1982). Of the occurrences in tombs mentioned, only Eday Manse has a very close similarity to Pierowall, as the motif includes a single straight cross-bar joining the two separate spirals. The motifs in the other cases tend to consist of spirals merged together. The arrangement of the motif in pairs, set back to back at Pierowall is unique, as is the variation of the pair of spirals on stone 667, which unlike the others turn in the same direction. Other unique features on this stone are the repeated semi-circles, when paired and centred on dots, and the lozenge created



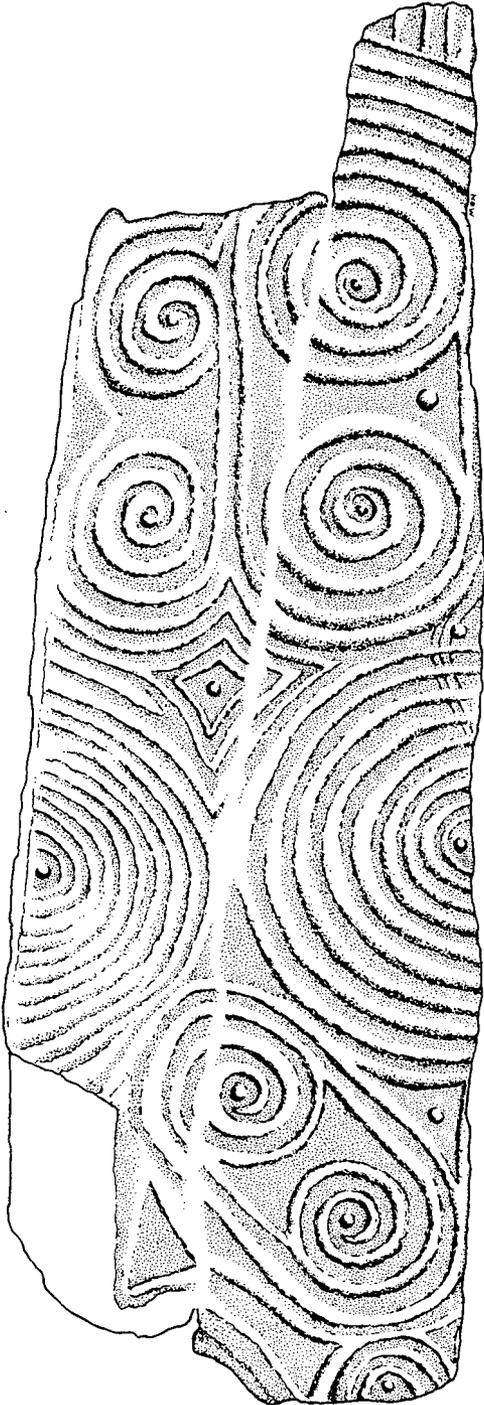
665



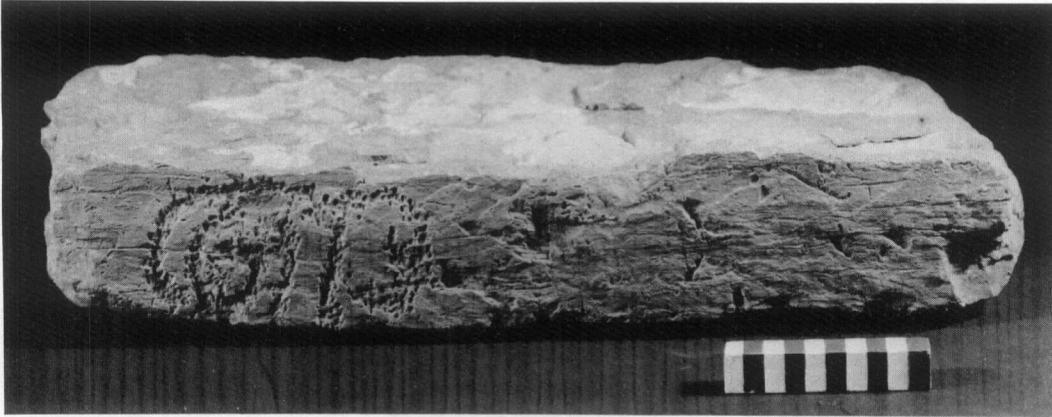
666



ILLUS 27 Decorated stones (scale 1:4)



ILLUS 28 Decorated stone, 667 (scale 1:7)



ILLUS 29 Decorated stone 666. Note the individual peckmarks which form the grooves of the decoration

by arcs around the other motifs, although the latter may well be a casual product of the overall design of the decorated face.

In conclusion it can be said that the decorated stones from Pierowall use motifs which are part of the general tradition of megalithic art in Britain and Ireland. These are all applied by the same technique and there is a differentiation in effort and design between the best stones and the majority of the stones. These parallels, in particular, link Pierowall to Newgrange in the Boyne Valley and this would support the interpretation of the large stone as being placed at the entrance. The individuality of the Pierowall decoration is, however, a factor which cannot be ignored. The motifs used have been developed to become distinct from the Irish examples and the hypothesized use of a lintel stone suggests an alteration in the position of stones to suit the difference in tomb design in Orkney.

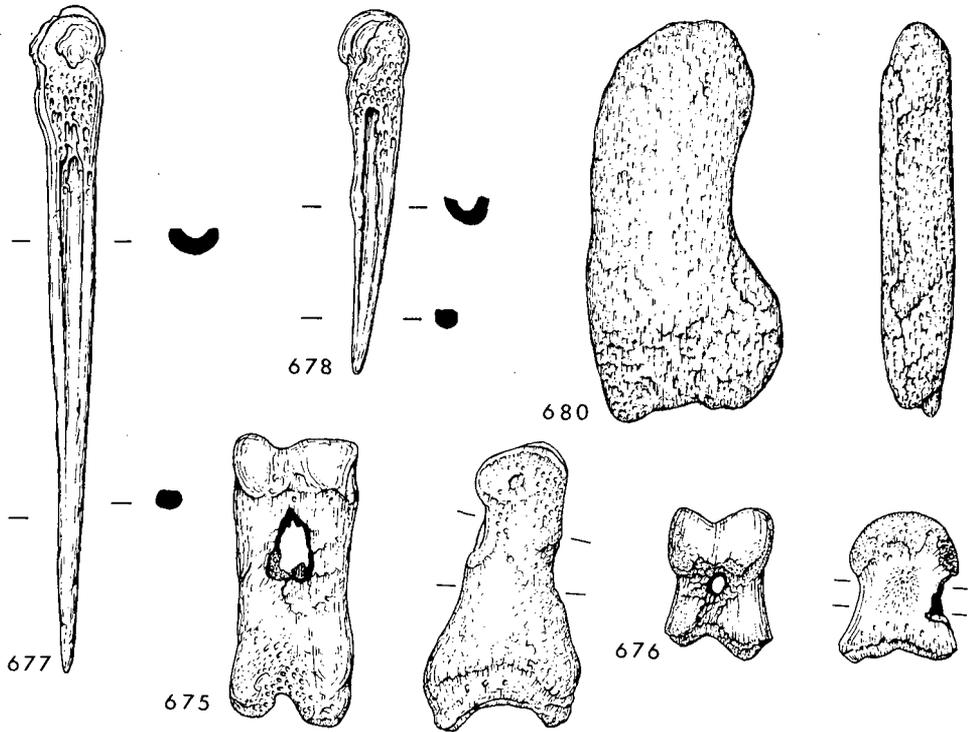
#### PUMICE AND WORKED BONE (fiche 2: D3)

Seven pieces of pumice and six pieces of worked bone were found on the site (illus 30). The only significant concentration was from the occupation of the late Neolithic structure which contained four pieces of pumice. Three of these show clear signs of use; the only pieces which do so in the assemblage. The worked bone consists of two bone points, some worked fragments of whalebone, and two perforated phalanges. The latter have been found on a large number of sites concentrated in the Northern Isles in contexts dating to both the late Neolithic and early Iron Age. Their function is, however, not known. It has recently been claimed by Binford (1981) that they could easily result from non-human agencies of modification. In particular, a phalange with a similar perforation was produced by a dog biting the bone (Binford 1981, 44, 45, fig 301). Of those examples present in the National Museum, however, none shows any of the characteristic signs of animal gnawing. On the other hand several show signs of human alteration including phalange 676 from Pierowall, which has a carefully bored circular hole. A phalange from Lower Dounreay has the edges of the perforation smoothed down, and one of the examples from Jarlshof (NMAH HSA 3107) has cut marks around the hole. Finally two examples are perforated on one side only. If this was due to animal gnawing other damage would be expected but none is visible. There seems to be no tangible explanation for these perforations as part of any butchering process, so it appears they are deliberately produced artefacts.

#### HUMAN BONES (fiche 2: D4)

A total of 106 individual fragments of human bone was found. They can be separated into three groups representing a variety of layers.

I. The main group consists of 77 fragments (72%) and was found as a well defined group



ILLUS 30 Worked bone (scale 2:3)



ILLUS 31 Human remains placed adjacent to the cairn's outer revetment in rubble derived from its collapse

stratified amongst the collapsed outer revetment of the immediately adjacent round cairn (illus 31). Amongst the human bones were a few animal bones and two well defined patches of limpet shells. Shell, unlike animal bones, is rare elsewhere in this collapse (see the molluscan report), so it seems likely that they were deliberately deposited with the human remains.

II. The second largest group contains 15 fragments (14%) and again comes from one layer (9). This represents the collapse and decay of the already destroyed cairn, and the late Neolithic structure adjacent to it. The few fragments that were recognized during excavation came from about the cairn revetment, slightly to the SW of the group I bones.

III. The last group contains 10 fragments (9%) and comes from five layers (20, 21, 4, 12 and 17). These are either in the construction of the subsidiary structure, or filling robbed areas of the round cairn. All are later than the collapse of the cairn revetment and earlier than the early Iron Age. Associated with one of these bones (778) was a group of shells.

The remaining four fragments of bone come from the interior of the subsidiary structure (2 teeth) and the early Iron Age occupation soil (8) which directly underlies the round-house wall.

This distribution can be best explained as the result of one burial, subsequently disturbed and scattered. The justification for this is threefold: the group I bones were discovered up to the very top of the collapsed revetment and this had clearly been truncated; all the group II and III bones are in layers which could contain material derived from the truncation of this layer, and the distribution of those bones suggests they had spread from the group I burial area. Furthermore, it seems clear that the group I bones result from a single act of deposition and that prior to this the bones were already disarticulated.

## Anatomy

### D A Birkett

The bulk of the remains are small fragments with only a few complete bones present. Preservation is, however, good and permits some vague estimation of age, sex and pathology to be made.

All the remains seem to be those of adults except 693, the femur of a small infant. A number of bones seem to be from muscular young males, others from old people. Most of the teeth are very worn, suggesting either great age or a very coarse, rough diet. There are some bones clearly from females and others clearly male. Thus, there seems to be a spread of age and sex in these burials.

The number of individuals represented here is impossible to estimate with any degree of accuracy because of the fragmentary nature of the remains. Nevertheless, on the basis of the number of femurs present, there is a minimum of six people. It was not possible to draw any inference as to whether the complete or nearly complete skeleton of one individual was present, owing to the fragmented nature of the bones.

Some signs of pathology were found – finds 702 and 733 in group I showed evidence of osteo-arthritis and might have been from the same person. Other joint surfaces were free from arthritis. Find 734 showed bony fusion of the left sacro-iliac joint – there was no evidence of a cause for the fusion, such as infection or severe arthritis, and this may have been a chance occurrence, as is known to happen on occasions. Find 732 showed periostitis of the lower tibia – this is a non-specific reaction in bone, and may be due to infection in the bone (there was no other evidence for this in this bone), to repeated trauma, varicose veins and ulcers, or to other more distant causes, eg lung disease.

Apart from these examples they seem to have been a healthy, normally built, but muscular, group of people.

## LARGE MAMMAL BONE (fiche 2: D10)

F MacCormick

The excavation produced only a small sample of animal bone and although this was well preserved the larger bones tended to be in a fragmented condition. Due to the possibility of considerable disturbance of the various layers during the long life of the site only large, closely associated, groups from relatively well stratified contexts were examined and discussed in detail. There are four separate groups; three from the Neolithic and one from the early Iron Age.

Groups 1 and 2 (tables 2 & 3) come from the rubble platform beside the cairn and correspond to the collapsed outer revetment (22) and the redeposited shillet layer (20) above this. Both groups consist mainly of sheep bones, 85% and 75% respectively, with small quantities of cattle and pig, and in group 2 a dog. Wild animals included red deer and otter and in group 2 there were the remains of at least 2 pine marten.

The high proportion of sheep to cattle is rather unusual. Sheep do, however, seem to form a significant proportion of the animals present on the later Neolithic settlements at Skara Brae and Knap of Howar (Noddle, unpublished and *in* Ritchie, Anna 1983); Clark (1952, 121) suggested this was to be expected as sheep thrive in an open, treeless environment. In group 1 over half the sheep present were neo-natal (table 4), ie under 10 months old. This observation and the mortality pattern of the remaining animals are very similar to that produced in Payne's model of a

TABLE 2

Mammal bone. Group 1. Table of skeletal parts and minimum numbers of individuals from collapsed cairn revetment

	Cattle	Sheep	Pig	Red Deer	Otter
Horn core/antler				2	
Skull fragments	1	5	1		
Mandible	3	6			
Teeth	16	28			
Atlas	1				
Cervical vertebrae		3	3		
Thoracic vertebrae	2	9	1		
Lumbar vertebrae	1	5	1		
Caudal vertebrae		3			
Rib	7	20			
Scapula	1	7			
Humerus	1	11	1		1
Radius		15			
Ulna		5			
Metacarpal		8			
Pelvis	2	8			
Femur	1	24			
Tibia		35	2	1	
Patella		23			
Calcaneum	1	44	1		
Astragalus	1	50			
Metatarsal		11		1	
Tarsals/carpals	14	71			
Metapodia		14			
Phalanx I	1	89	2		
Phalanx II	4	63	2	1	
Phalanx III		12			
Fragments total	57	569	13	5	1
Fragments %	8.8	88.3	20.1	0.7	0.1
MNI	2	28	1	1	1
MNI %	6.0	84.8	3.0	3.0	3.0

TABLE 3

Mammal bone. Group 2. Table of skeletal parts and minimum numbers of individuals from shillet in the platform

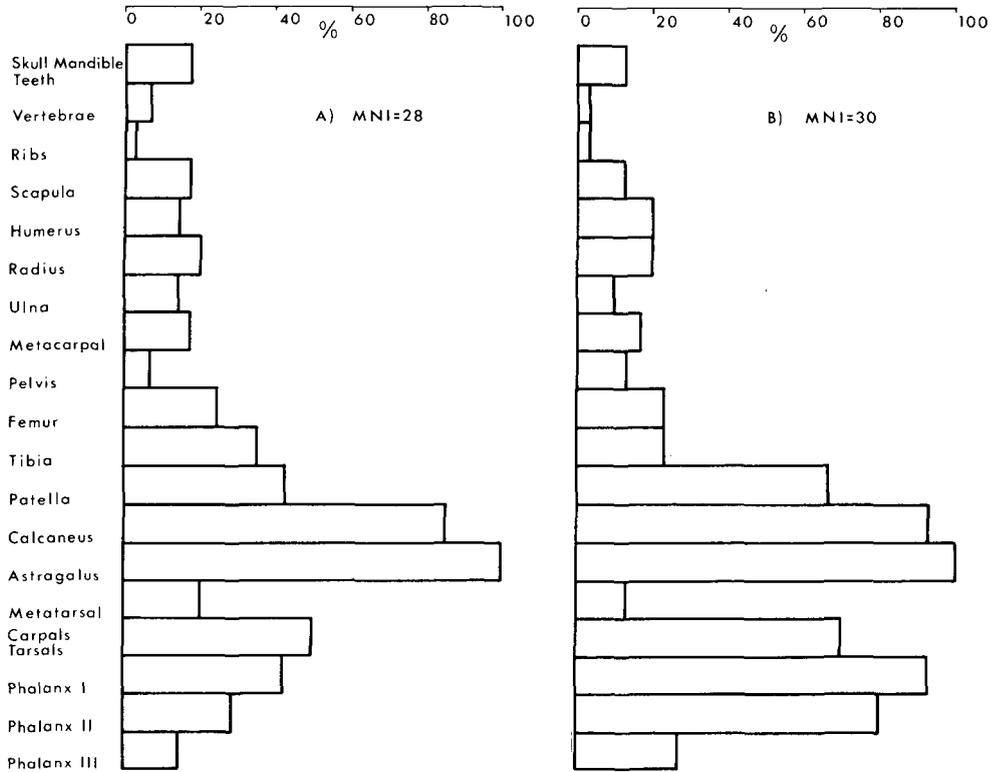
	Cattle	Sheep	Pig	Red Deer	Dog	Pine Marten	Otter
Horn core antler				1			
Skull fragment		11	1			4	1
Mandible	1	3					
Teeth	4	7	2				
Cervical vertebrae		5					
Thoracic vertebrae		9					
Lumbar vertebrae		4					
Caudal vertebrae		6					
Sacrum		1				2	
Ribs		63					
Scapula		7					
Humerus		16	1	1			1
Radius		15	2				
Ulna		3	2				
Metacarpal		11					
Pelvis	1	10				3	
Femur	1	20					
Tibia	1	23			1	1	
Patella		38					
Calcaneum		45					
Astragalus	1	52				1	
Metatarsal	1	11					
Phalanx I	1	111	4				
Phalanx II	1	94	2				
Phalanx III	1	34	1				
Carpalia/tarsalia	27	124	3				
Metapodia	1						
Fragments total	41	723	18	2	1	11	2
% total	5.2	90.8	2.3	0.3	0.1	1.4	0.3
MNI	2	30	3	1	1	2	1
MNI %	5.0	75.0	7.5	2.5	2.5	5.0	2.5

sheep-dairying economy (Payne 1973, 284). Thus the remains could be regarded as the surplus from such an economy. However, young animals of this age would find the large and loose rubble of the collapsed outer revetment an ideal shelter to rest and, if weak, die in. Just such a process has been noted on St Kilda where the deserted buildings of the islands were found to contain large numbers of dead animals (Boyd *et al* 1964). Thus this factor could seriously bias the results from Pierowall and other similar sites. The group 2 assemblage, in contrast, contained few neo-natal sheep (table 4) and half were over 3½ years at death. A natural explanation for this mortality pattern is impossible, although economic reasons are as difficult to identify. The only possibility is that the remains reflect a deliberate strategy of farming for milk with meat

TABLE 4

Mammal bone. Sheep age/death distribution based on data in table 17 (fiche 2: F2)

Approx age (in months)	Group 1%	Group 2%
0-10	57.7	18.8
18-28	1.7	14.5
28-36	16.0	15.5
36-42	—	1.2
42+	24.6	50.0



ILLUS 32 Mammal bone. The relative frequency of the minimum number of individuals based on different skeletal parts. A, the group 1 sheep; B, the group 2 sheep

production being an important but subsidiary activity. (The excavator of the site would, however, take issue with these conclusions and prefers a non-economic, ritual, explanation and this is discussed at the end of the finds' reports). There were no signs of butchering on any of the bones and the distribution of skeletal parts does not reflect any specific butchery practice (illus 32):

The pine marten, which appeared in other contexts in the site, is the first and only instance of this species so far identified on Orkney. Although generally regarded as an arboreal animal, it can also thrive in an open, unforested environment and this would not necessitate a great change in its diet. It may have formed part of the indigenous fauna of Orkney but as it is an excellent swimmer it may have arrived on the islands from the mainland after they were colonized by man.

The final two groups contained much smaller samples of material so the conclusions based on these are much more limited (fiche 2: E7-E9). Furthermore, group 3 is divided into two parts. Group 3a, which came from the floor of the late Neolithic structure (11) clearly has a large proportion of residual material from the earlier layers and so has to be discounted in any attempt to understand the late Neolithic assemblage. Group 3b, the secondary habitation layer, would indicate a change from the previous assemblages; cattle were represented by twice as many individuals as sheep, and the number of bone fragments was also much greater. The increased importance of cattle is also reflected in group 4, the early Iron Age assemblage. Here, however, cattle and sheep were present in equal numbers. Pig and red deer were present in both groups and in group 4 there were also some whale and dog fragments.



ILLUS 33 Pine marten

## SMALL ANIMAL BONES (fiche 2: F3)

The other faunal remains consist of bones of birds (identified by A S Clarke), fish (G N Swinney), rodents and amphibians (A Barlow). The bulk of the assemblage comes from the rubble and shillet layers making up the platform against the outer revetment of the chambered cairn and is therefore presumed to be Neolithic in date.

The precise composition of the assemblage is difficult to quantify, because a proportion of the fish and bird bones were unidentifiable. It was only possible to calculate the minimum number of rodents present because of the survival of large numbers of teeth. 343 Orkney vole (*Microtus arvalis orcadensis*) and 1 wood mouse (*Apodemus sylvaticus*) were counted and this is probably a gross underestimate. It was, however, clear that the assemblage was dominated by Orkney vole with birds, in particular passerines, taking second place, followed by amphibians, and finally fish. This composition of remains can partly be explained as the ejecta of birds. The presence of gannet, great black backed gull and buzzard, however, is difficult to explain by this process and it seems more likely that they are attributable to the feeding habits of pine marten and otter, which are present in the same deposits (see large mammal bone report). Otter especially are known to attack large birds and Harris (1968, 55) quotes a reference to an apparent killing of a gannet. Both species also eat carrion (Lockie 1961, 193) and sea birds are frequently washed ashore on Westray. It is not my intention to exclude completely the possibility that human activity was responsible for the deposition of any of this material as sites such as Isbister (Hedges 1983) clearly indicate the social as well as economic importance of birds and fish. In the context of the

present site, however, natural factors provide the most coherent explanation for the bulk of the small animal assemblage. There is only one possible exception to this – a group of fishbones, the remains of two cod, from the early Iron Age occupation surrounding the round-house. These are well stratified and were presumably caught for the inhabitants by line fishing from a boat.

#### MARINE MOLLUSCS (fiche 2: F8)

##### A Barlow

The assemblage consists of 5994 individuals, representing 14 marine species. The overwhelming majority of these are limpets (95% by MNI), and there was a consistent, though small, proportion of winkles (3% by MNI). The distribution of the number of shells throughout the stratigraphic sequence showed two main groupings. The larger of these was associated with the early Iron Age occupation deposits, the other with the human remains deposited in the collapsed revetment beside the Neolithic cairn. Otherwise, shells are rare amongst the occupation deposits of this period and in particular are almost completely absent from the interior of the late Neolithic structure.

The presence of two chronologically separate assemblages highlights a change in the local environment between these two periods. In the Neolithic assemblage there are indications that the collection area had a sheltered shore environment with a dense weed cover. In the early Iron Age, however, these indications disappear and sand or mud dwelling species assumed a significant presence. This change is probably linked with the onset of sand movement, and coincides with the appearance of blown sand in the site stratigraphy after the decay of the Neolithic monument.

Some idea of the relative unimportance of shellfish as a food source may be gained when it is borne in mind that the total meat weight of the winkles and limpets together is 8.7 kg (based on figures in Evans & Spencer 1977, 215). Nevertheless, there is an indication that the limpets were regularly cropped in the early Iron Age, as this has effectively curtailed the natural size-range of the limpets available for exploitation. In the Neolithic, their significance, presumably as a foodstuff, is indicated by their presence in a context which could only be described as a grave-good.

At Isbister (Colley *in* Hedges 1983) a group of 21 limpet shells was found in one of the cells (ST-5) of the chambered tomb with their apices missing and this would support the connection with the disposal of human skeletal material. At the nearby habitation site of Knap of Howar on Papa Westray the shellfish assemblage contained a similar proportion of limpets to winkles, but unlike Pierowall oysters occupied an important place in the collection (Evans & Vaughan 1983). In contrast, at Skara Brae there is an almost equal balance between limpets and winkles (Evans unpublished).

#### THE CONTEXT OF DEPOSITION

Before moving on to discuss the wider regional and national issues to which the excavation results contribute it is necessary to place the results of the analyses of the finds into the context of the site stratigraphy. Only when this is done is it possible to interpret these assemblages and how the site functioned during each period. This will be done by examining each of the phases outlined at the beginning of this section on the finds (illus 17). Firstly the cairn, one must accept, was deliberately kept clean, as none of the small quantities of animal bones present seems likely to have been placed there intentionally. That this was so should come as no surprise, as there has been very little sign elsewhere in Britain of the incorporation of material into the structure of chambered cairns during their construction. The absence of finds from the paving over the reconstructed cairn is, perhaps, more significant. It might be assumed that the purpose of this reconstruction was to allow activities of some sort to take place on top of the monument. If this was the case then these did not leave any recognizable discard.

The interpretation of the material incorporated in the platform is much more complex. This phase is represented by a variety of layers which have either built up *in situ* against the decaying cairn or been brought in as rubble for the construction of the platform. The human remains with their accompanying shells represent a clearly separate act of deposition occurring sometime between these two major activities. If one excludes these, this phase is characterized by a large quantity of animal bones, mainly ovicaprids, and a low but consistent quantity of artefacts. The latter, plus some small quantities of burnt bone, must indicate human activity around the cairn. Some of this material, including large bones and some pieces of flint, was pressed into the old ground surface so it seems that depositional activity began before the cairn collapsed. Nevertheless, the bulk of the material must have been deposited after, or possibly during, the collapse of the outer revetment.

There seems little difference between the composition and density of the material in the *in situ* revetment collapse and the shillet layer brought in to construct the platform, and the radiocarbon dates suggest that these are roughly contemporary assemblages. Thus it would appear that the rubble gathered up for the platform was collected in the immediate vicinity and included part of an earlier assemblage deposited around the cairn. This, however, does not explain the one major difference between the two groups of bones which suggests they result from totally contrasting depositional processes. This is in the age mortality data (table 4). The *in situ* material contains predominantly young animals and the introduced material predominantly old animals. The explanation put forward by the bone specialist for this difference is that the assemblages are from the ends of a spectrum ranging against the tomb. The young animals occurred close to the revetment and were the result of natural deaths of weak and sickly animals, immediately after birth, as they tried to shelter amongst the large loose stones present here. Away from the cairn were older animals, sheep, deliberately killed as part of the rituals involved with the tomb's use. The animals being killed were the natural surplus of an economy based on sheep-dairying. To the excavator, however, it remains questionable whether assemblages from around tombs should be explained in a simple economic framework. It is quite possible that a complex series of ritual activities occurred around the tomb in the mid second millennium bc which involved the slaughter of both old and young animals. A significance is then attached to this age division which results in the separation of the remains to create two contrasting assemblages later brought together again. Some support for a social explanation may be derived from the distribution of the skeletal parts of the sheep present in these layers. The absence of long bones is incompatible with the hypothesis of natural death put forward by MacCormick, as there can be no excavational bias which would result in a disproportionate survival of what are very small bones. Even if the long bones were broken up by post-depositional movement of the rubble the easily identifiable articular ends would survive. The only explanation the excavator can make to explain the observed distribution is again one of ritual activity. If the animals present were involved in a multi-staged ritual then the first part of this may have been the deposition of articulated carcasses on the cairn to decay. Subsequent activity involving the removal of all the substantial and readily visible bones of these animals after their decay would then explain the distribution. A reasonable interpretation would be that these bones were then taken into the chamber: this process of excarnation before entombment would apparently mirror the treatment of the bulk of the human remains in Quanterness and Isbister (see Chesterman's analyses in both reports: Renfrew 1979 and Hedges 1983).

This problem of interpreting the depositional processes involved is one which can be seen at a number of Orcadian sites and it is impossible to expect an answer from the limited salvage excavations at Pierowall. The site does, however, indicate the possible complexity of the activities carried out in and around these large chambered cairns. Very little extensive work has been done around the Orcadian chambered cairns. It is, however, possible to note the presence of animal bones and other material at only three sites: Quanterness (Renfrew 1979, 47), Quoyness (Childe 1952, 131) and Isbister (Hedges 1983). There is a noticeable absence around the small stalled cairns, particularly those on Rousay and Eday which were fairly extensively excavated in the thirties. Of the tombs with external deposits, only Isbister has been excavated and studied in any great detail. Here there is a distinction between deposits in the chamber and 'against the hornwork' (Hedges 1983). The latter context produced predominantly cattle, the former predominantly sheep. The species are all represented by young animals. Thus clearly the pattern present is not similar to Pierowall. However, it does suggest that animals brought to the tomb were placed in different and specific locations.

Before completing consideration of this phase it is necessary to comment on one small idiosyncratic group of bones found in the platform wall (21). These were distinctive primarily because

they were complete long bones, something otherwise absent from these layers, but also because they were from large cattle, something again very rare. Their presence in the wall means that they were part of the derived assemblage, and the question arises whether these could have been consciously brought at the time of construction of the platform, unlike the sheep remains, which seem to have come in accidentally. Bones were deliberately built into some of the walls adjacent to the settlement at Skara Brae (Clarke, pers comm), although there they were clearly meant to be seen.

The occupation within the structure built on the platform can be broken down for discussion to two layers (10 & 11). The earlier, 11, contained a vast quantity of flint *débitage* and also a small assemblage of bone largely contaminated by residual material from previous activities. The second contained a larger bone assemblage, probably suffering less from residual contamination, and a small assemblage of flint and pottery. Both these assemblages immediately strike one as being of a domestic nature. Thus, in purely functional terms, it could be claimed that the structure was used initially for flint knapping and then reverted to a more diverse use with the deposition of flint tools, broken ceramics and bone refuse. In neither case was the area kept clean, so one could presume this was not a house for sleeping in. Given the impossibility of the structure having been of any great size, this is not surprising. The relative absence of artefacts other than flints can not be regarded as significant given the very small area available for examination, and the same claim could be made for the absence of molluscs.

The problems of interpreting the occupation in this structure arise not through the coherence of the assemblage, but from the interpretation of the function of this structure in relation to the site as a whole. If the sequence has been interpreted correctly, and this interpretation can be extrapolated to cover the unexcavated area of the site, then this structure is sitting on a platform protruding from the edge of a circular paved area, the latter having been formed by the recent demolition of a large chambered tomb. The highly symbolic and clearly ritual nature of the reconstructed tomb does not seem to relate to the small scale, apparently domestic nature of its adjacent structure. This juxtaposition cannot be explained or understood without either a fuller excavation, or a better understanding of the nature of society and the role and specific nature of ritual within late Neolithic Orkney.

The occupation material associated with the early Iron Age round-house can again be labelled domestic, owing to its context. It has already been argued above that this material is coming from a processing area outside the walls of the round-house. The term 'processing' is used to describe the conversion of resources from one form to another, for example animal carcasses being dismembered into cookable joints. A processing area is in contrast to a cooking area, which can be regarded as secondary processing, or a midden, where the refuse from processing and eating is discarded. The reasons for identifying it as such depend on both negative and positive evidence. There is a relatively low density of finds amongst the occupation soil, and an absence of any clearly functional features such as a hearth. Yet the presence of paving, and a possible seat, clearly point to human activity. One can attempt to understand the activities underway in this area by examining the artefacts present. These seem to indicate activities mainly connected with shellfish. Perhaps these were being shelled and the meat transferred to the pots also present. The presence of low quantities of other remains, ie animal bones, is only what would be expected in a messy activity area where lateral displacement of material would be relatively easy.

This type of interpretation, however, should be treated with caution for a number of reasons. Processing areas may be concerned with more than one activity, and many procedures would not leave any trace, either because there was no survivable discard from the activity, for example, gutting fish, or the discard was immediately taken away to a midden. The distribution of the different categories of finds on site is also not known, with sufficient accuracy, to be certain of the relationships. Likewise, stratigraphy, or any sense of the time-span involved in this occupation is not known. Similarly, if one accepts the presence of processing areas around the round-house, each concentrating on an isolated part of the site's 'activities', then it is clear that little can be said of the general economic basis of this settlement or how it fits into an early Iron Age island economy. We know that cattle, sheep, pig, red deer and fish would provide appropriate resources. The first two were equal in terms of number of individuals present, thus cattle would presumably be more important for the amount of food provided but not necessarily so in terms of 'secondary' products. Other evidence for food present included remains of shellfish, predominantly limpets; study of their size suggests that they were regularly and intensively exploited. The absence of seeds or any other debris from cereal production is not regarded

as significant, particularly as the resources and time available did not allow for an intensive search for the isolated fragments which could be all that survived. Other than ceramics, hammerstones would appear to be the only tools used and deposited in the area of the site investigated.

The excavation has shown that this large round-house is a *single isolated structure*, but it is also the centre of quite an extensive and complex area of occupation. Thus any excavation of the structure alone would have given a picture very unrepresentative of the overall settlement activity. It is important to emphasize that there is no indication that activities outside the round-house were not carried out by people living within it, and this is in direct contrast to the later extra-mural settlements of brochs. These comprise houses with inhabitants, in essence a village subsidiary to the broch.

## DISCUSSION

It now remains to discuss and interpret the site in the wider social context of Orcadian prehistory. This discussion is effectively split into Neolithic and early Iron Age sections.

The potential for debate in the earlier period is great, as the amount of information available is considerable. However, this is not the appropriate occasion for a general review of chambered tombs in Orkney; the discussion will be restricted to certain specific features of the monument excavated and their contribution to debate in the area. These are the date of the tomb, the presence of the decorated stone, the external appearance of the monument and the significance of the late Neolithic alterations. From this discussion results are derived which are sufficiently interesting to undermine current attitudes to the use of the monuments and suggest that a new approach is necessary.

The discussion of the early Iron Age round-house is limited, in contrast to the above, not by choice but the constraints caused by the absence of evidence. Consequently it will only be possible to comment on the relationship involved between the early Iron Age sites known and to attempt to clear up some terminological problems which confuse present views of the chronology of the period.

### THE NEOLITHIC

The first aspect of the monument which must be considered is the original appearance of the chambered cairn. It has already been argued in the text that the cairn at Pierowall was intended to be constructed with two revetments and that the outer was slightly different in construction because it was primarily a façade for display. It is also clear that the cairn was a tower-like structure and that all of the rubble accumulated against this outer revetment derives from its collapse. This interpretation is somewhat in conflict with that put forward at the end of the Quanterness excavations (Renfrew 1979, fig 32). Renfrew argues that the Quanterness cairn was a formless mound with the two identified revetments acting solely as internal walls providing support for the chamber. The evidence for this reconstruction can, however, be questioned as the cairn revetments were not completely exposed. Excavation at Quanterness was stopped when the cairn edge, defined by a 'larger and more closely packed' rubble deposit, was reached. This edge lay c 5.7 m from the face of the outer revetment wall. It did not have any revetment and was not marked by the large stones illustrated (Renfrew 1979, 47, fig 3). It is difficult to see why this unexcavated rubble cannot be interpreted as collapse from the revetment, particularly as one of the reasons given against this was that the stones slope down away from the revetments exactly as one would expect if it was indeed collapse. The only other reason was that the rubble was too densely packed. This, however, is not very convincing given that the material has had over 4000 years to stabilize and that it lay just below the surface. It is difficult to be certain about this as

none of the appropriate sections was ever published and the only relevant plan shows the area at a higher level.

Support for the interpretation of these monuments as towers comes from Childe's excavation of Quoyness on Sanday (Childe 1952). The cairn revetments here were well preserved due to the addition of first an encircling platform and then a casing to the original cairn. Wall A and A' (*ibid*, fig 1) stood to a height of c 10 ft (c 3 m) and 6 to 9 ft (1.8 to 2.7 m) respectively and both rested on the old ground surface where their bases could be examined. Outside wall A' there was a rubble layer which sloped down from the wall and underlay the platform. This almost certainly represented the collapse from A'. Childe was explicit in his reconstruction of the cairn. Wall A' had been completed soon after the initial cairn wall A and stood to a height of 10 to 14 ft, completely obscuring A. This formed 'an imposing but very unstable tower' (*ibid*, 134). His interpretation of the sequence suggested that it was only some time later, and in 'conflict' with the builders' original intentions, that the platform and casing were built.

Thus it seems reasonable to envisage the majority of the Quanterness/Quoyness type of tomb standing as stone towers. As such they would be a very striking feature of the landscape and must have formed a focus of attention for the surrounding community. It is in this context that one can interpret and begin to understand the assemblages of material deposited beside the cairns at Pierowall and Quoyness. As monuments these were not only a visual focus of attention but may be conceived as a place where people met and carried out activities. Thus they appear to have acted as community foci and as such were distinctly different from the 'stalled' tombs. None of the excavations, by Callander and Grant or Calder on these monuments in the 1930s, revealed signs of similar activity even though extensive areas were often examined. Neither could it be claimed that these monuments can in any sense be reconstructed to become as imposing as Quoyness or Pierowall must have been, although Midhowe is a possible exception. The only 'monumental' aspect associated with 'stalled' tombs are the horns and façades of the long horned cairns but these are rare in Orkney, with only four examples known.

One of the visually most striking features of this tower-like cairn must have been the decorated stone positioned to form a lintel over the passage entrance. The presence of this stone immediately raises two points of debate: what is the purpose behind its 'use' and what is the significance of the parallels with Ireland which it clearly exhibits. The problem of Irish influence in the development of the Orcadian Neolithic is not a new issue. It has for a long time been assumed that an influx of people from the Boyne area was the reason for the appearance of the Maes Howe type of tomb (Henshall 1972, 268). Although this attitude was the subject of some detailed criticism by Renfrew (1979, 210), this did not totally convince everyone (Ritchie 1976, 21). Subsequent work has indeed shown that Renfrew's alternative explanation for the origin of the Maes Howe tombs is unacceptable (Renfrew, *in* Hedges 1983, XX). Nevertheless his criticism still stands and it is necessary, with the discovery of the Pierowall stone, to reassess the nature of the Irish contacts.

The decoration and the positioning of the stones at Pierowall can be paralleled in Ireland. In both areas the larger stones, which have better planned and executed designs, are restricted to important divisions in the chamber structure. In particular the entrance was marked at both Newgrange and Pierowall by the best stones. This, perhaps the most important feature in the use of decorated stones, can help to explain the function of the stones in Orkney and this in turn provides an explanation for the apparent connection between Ireland and Orkney. The entrance is naturally one of the most important points in the structure and use of any tomb. It is the point which effectively separates the living society from the dead and all the forces and power which surround them. Thus the emphasis placed on this boundary is in effect an increase in the

importance of one of the boundaries which divide up the rituals or 'rites of passage' (Van Gennep 1960) which surround any 'life crisis ceremony' such as death.

The emphasis on boundaries was not restricted to the tombs with decorated stones. The development of all the tombs of the Maes Howe type involved an increased emphasis on the structural boundaries of the tombs by the use of passages. Not only do these become very long between the outside and the chamber but they re-appear within the chamber to separate and isolate spatial units. This is one of the most important distinguishing features of this type, as the 'stalled' tombs have only a single, apparently utilitarian, passage into the chamber and, though the chamber is divided, it does not require passages to separate each unit. The presence of passages is important and represents a deliberate design feature of the tombs, as the occurrence of Gallery graves such as the Cotswold-Severn tombs proves they are not an essential element. Similarly, the development of long passages is not directly related to the size of the cairn as it is feasible for the chamber to be situated at the edge of the cairn.

The use of the decorated stones would seem therefore to provide an increased emphasis on a feature which was already developed as the most important defining feature of the Maes Howe type. What then is the nature of the Irish connection behind this appearance? Is it simply that we have a peripatetic artist who happened to find patronage in Orkney? It seems to the author that this question is largely irrelevant and unanswerable. There are many ways by which ideas, symbols and objects could and presumably were transferred in the milieu of Neolithic Britain. The importance lies in trying to understand why in certain areas at particular times these were picked up and put into use. Decoration was adopted by the users of the tomb at Pierowall only because it served to emphasize a crucial point in the burial ritual of the society in existence on the Island of Westray at that time. The very many differences between the two types of tomb involved suggests that the organization of each area did not develop along identical lines. The structural differences in the tombs are documented by Renfrew (1979, 210), but others include the use of cremation in Ireland as opposed to inhumation in Orkney and the organization of tombs into cemeteries in Ireland. Clearly, this would also negate the concept that Maes Howe tombs result from an influx of Irish immigrants. Thus, if an origin for these is required it has to be sought elsewhere. Any understanding has to take into consideration the developing ideas and activities of Orcadian society, and thus it seems the increasing emphasis on the definition of space by boundaries is the crucial factor. In Orkney the arrangement and distribution of space exhibited in the design of the Maes Howe type tombs can be paralleled in the Bookan tombs. What is lacking is the monumentality and the internal passages which are such an important and obvious feature of the Maes Howe type. An explanation for these changes can only be provided by a much wider examination of the evidence which will not be attempted in the limited space available here.

Before moving on to the final topic of discussion concerning the Neolithic remains at Pierowall, the destruction of the cairn, it is important to explain the possible chronology of the monument and the changes through which it went. Unfortunately, the contexts which produced datable material at Pierowall did not include any which enable a date for the construction of the cairn to be established. Very little material was incorporated in the cairn structure and this was not certainly primary. Consequently the earliest dates come from animal bones present in the stones of the cairn revetment collapse. Three determinations were obtained: 2370±110 bc (GU-1586), 2115±90 bc (GU-1587) and 2155±120 bc (GU-1588). This gives at least a general indication of the date of the activity which took place around the cairn, some time after the monument had begun to decay and the revetment had collapsed. As such it also gives a *terminus ante quem* for the construction of the cairn. But it seems likely that this is several hundred years

after its construction. The dates from the tomb at Quanterness, a monument of at least similar size and shape, suggest that these tombs were built at the end of the first half of the third millennium. The two important dates are  $2640 \pm 75$  bc (Q-1294) and  $2590 \pm 110$  bc (Q-1363). Taking the first date to the limits of two standard deviations it is probable that the tomb was in use before 2490 bc. Corroboration of this date comes from the close parallels between the decorated stones at Pierowall and Newgrange. The latter tomb is accurately dated by a series of determinations to around 2500 bc (O'Kelly, M J 1982, 230).

The dating of the deliberate destruction of the tomb is fortunately relatively accurate. Animal bone from the secondary occupation layer in the structure built after the cairn was levelled produced a date ( $2190 \pm 60$  bc; GU-1583) identical to animal bone deliberately incorporated into the construction of the structure ( $2190 \pm 60$  bc; GU-1582). Thus a date between 2070 and 2310 bc is probable for the building of this structure and on stratigraphic grounds it appears to follow immediately on from the levelling of the cairn.

The levelling of the chambered tomb at Pierowall can be related to other roughly contemporary events occurring at quite dissimilar monuments throughout Orkney. Although structurally quite different, these events could be regarded as intended to create the same effect; they define and delimit areas within or on which ceremonies could take place. At Stenness the boundary was created, classically, by a ditch and stone circle. A date of  $2356 \pm 65$  bc came from bone in the basal layer of the ditch. Similarly, at Maes Howe a ditch, though very much wider than that at Stenness, was dug around the chambered tomb which is also surrounded by a platform of clay. The ditch was dated, by peat growing in the waterlogged bottom, to before 2055 bc and it was argued (Renfrew 1979, 36) that peat growth would have started soon after it was dug. It is important to emphasize, however, that this does not date the construction of the tomb which could well date to c 2500 bc. A much more comparable series of structural alterations occurred at the tomb of Quoyness. Unfortunately, this series is not yet dated. The sequence of activities consisted of building a low platform around the cairn which partly overlay the collapsed revetment of the original cairn. On top of this platform and against the decayed cairn was built another casing wall (B) which Childe argued would have been concealed by extra revetment material (Childe 1952, 135). The entrance to the passage was sealed by the construction of the casing wall and this made the chamber inaccessible. Thus the sequence effectively functioned in the same way as the activity at Pierowall; the burial period of the monument was completed and the attendant activities which took place around the monument became defined by structural modifications. The destruction of Pierowall may have resulted from the wholesale and dramatic decay which the monument had suffered in the 500 or more years of its life up to this time.

Apparently associated with these changes was the end of the use of chambered tombs as collective burial monuments and the large-scale destruction of many of the monuments. This is best documented at sites such as Midhowe and Isbister where it appears that the roofs were removed and the chambers filled with stone (Hedges 1983, 209–10). It may, however, be present on other sites where the burial remains could be classified as disorganized or conforming to no coherent pattern. Caution must be exercised with early excavations where a lack of articulation could be taken by the excavator as an absence of any patterning. The absence of any recognizable patterning in the human remains at the tomb of Quanterness may be used as an illustration. It has already been mentioned that there were signs of considerable confusion in the contents of the tomb. Fragments of the same pot, bones of individual animals and humans occur apparently at random both horizontally and vertically (Henshall and Clutton-Brock *in* Renfrew 1979, 77, 116). This could easily represent a deliberate act of desecration of the contents of the tomb in the late Neolithic period. This was then followed by the intrusive pit grave which contained the lower half

of an articulated skeleton. In other tombs, such as Maes Howe, the apparent lack of Neolithic remains could be a result of their deliberate removal from the tomb at this time rather than later by Vikings or 18th-century antiquaries.

It seems reasonable to suggest that the modifications and descriptions mentioned above and documented so clearly at the tomb of Pierowall represent the end of the tradition of communal burial. As such they must reflect a fundamental reorganization of late Neolithic society. Whether this results from the organization of society as a chiefdom as Renfrew (1979, 217) has suggested remains to be proved. Certainly, as Renfrew himself points out (1979, 218), there are few signs in the archaeological record of an individual's status being recognized. There are very few valuable objects, no separate or special burials and no spatial separation within the settlements. What is clear is the growing centralization of power as represented by monuments such as Stenness, Brogar and Maes Howe. Their construction required a considerable degree of organization and a labour force of some size. It may be that the use of chambered tombs and their association with small independent communities was potentially in conflict with this organization. Their removal and destruction can therefore be seen as a necessary precaution in order to maintain the new unity of Orcadian society.

#### THE EARLY IRON AGE

The discussion of the early Iron Age background to the round-house at Pierowall has to be approached in a quite different manner to that of the Neolithic as our knowledge of this period is considerably hampered by the lack of known sites in Orkney. Indeed, until the beginning of the 'seventies it could hardly be claimed that there was an early Iron Age in Orkney, as there was only one site, Calf of Eday (Calder 1937; 1938), which could be associated with the period, though even this was doubted (MacKie 1965b). Given this situation, the period was largely assumed to be similar to that exposed at Jarlshof in Shetland (Curle 1934, expanded upon by Hamilton 1956 & 1968).

In the last decade, however, new information has changed our view of the Iron Age in Orkney quite dramatically. By complete chance, excavation of three sites: Quanterness (Renfrew 1979); Navershough, Bu (Hedges & Bell 1980); and Pierowall have revealed structural remains dating to this period, whilst on Shetland two completely new early Iron Age sites, Sumburgh (Lamb, pers comm), and Mavis Grind (*Discovery Excav Scot* 1979, 28), have also been excavated. Only two of these sites, Quanterness and Mavis Grind, have been published so far and Quanterness was only partially excavated. Thus, this discussion can in no sense be regarded as full. Nevertheless, some details are available from the sites and an attempt will be made to integrate them.

The picture which is emerging suggests that settlement was based upon round, or slightly oval houses. These are quite different from the 'courtyard' houses present in the late Bronze Age village I at Jarlshof, but there is some indication that the former evolved from the latter, though why is as yet impossible to answer. At Calf of Eday (Calder 1938, fig 1) and Navershough (Hedges & Bell 1980, fig 3) the interior of the house has clearly been partitioned by the inhabitants to form cells or rooms against the inner wall face. There are clear signs that this also occurred at Pierowall and Quanterness (Renfrew 1979, fig 51) but it is certainly not so well defined at Jarlshof, if it is present at all.

These round-houses seem to conform to two different types of settlement. Very large round-houses with thick walls, such as Pierowall and Navershough, are situated individually in prominent, visually dominant situations, in both cases on the edge of a low hill. Smaller structures with thinner, more obviously functional, walls tend to occur in agglomerations or villages. The

best example of this is Jarlshof but it is quite possible that the house at Quanterness is but one of several. The site at Calf of Eday is very interesting because it appears to be first a large isolated round-house and then a small village. The excavator was quite clear about this chronological succession, and it is supported by the evidence from the ceramic assemblage (Stevenson 1938, 184) which shows two completely different vessel forms. Unfortunately, however, it is not clear exactly when to date the later assemblage from the smaller round-houses, as there are no sufficiently diagnostic finds.

The precise dating, and hence contemporaneity, of these sites is, unfortunately not well defined at present. Only three sites have relevant radiocarbon dates – Pierowall, Navershough and Quanterness. The first two sites have roughly contemporary pairs of dates which would suggest construction before c 600 BC. The other site, Quanterness, has two dates for the primary occupation, one of which suggests that it is c 100 years earlier than the other two sites (620±85 bc Q-1465). The dating of the other sites depends primarily on the common occurrence of a diagnostic shouldered jar, but at Jarlshof the stratigraphic sequence is also important. There, shouldered vessels appear with the round-houses of village II, and this overlies a series of courtyard houses, village I, which contained large quantities of late Bronze Age moulds. There are several mould fragments in village II but this seems to be residual material, and the presence of 'iron slag' would indicate that a change in technology corresponds to a change in house type and ceramic assemblage. The bronze moulds are for objects which would fit into Coles's Tarves phase, an insular and late subdivision of the British Ewart Park phase which marks the end of the late Bronze Age. Until recently this would have been dated to the sixth century BC (Renfrew 1979, 194), but recent work on late Bronze Age metalworking has revised the dating by more than a century and it now seems likely that by 'the end of the 7th century the use of iron was general in Britain' (Burgess 1979, 278). This would allow the beginning of Jarlshof village II to coincide with the construction of Pierowall and Navershough and would suggest that the two different forms of settlement are broadly contemporary.

Before moving on to discuss the significance of this emerging pattern, it is necessary to examine a point which could, or indeed has, become one of some contention in Scottish archaeology. This revolves around whether the site at Navershough is, or is not, a broch. Hedges and Bell (1980, 90) clearly put it forward as one, and this is accepted with little serious criticism by Barrett (1981, 211). MacKie (1980, 72), however, refers to it as a 'broch-like structure' and I should have made my position in the debate clear by referring to it throughout the present report as a 'round-house'. The debate would appear to revolve around whether one regards classification as a useful intellectual technique in the understanding of how archaeological data relate to the operations of society. There seems little doubt that Navershough does not fall under the criterion used by MacKie to define a broch in his seminal work on the subject (1965b, 100). The crucial factor is that a broch was built as a free-standing stone tower up to 9m high. To make this possible a number of quite sophisticated constructional techniques were used. The most important of these 'is the hollow-built wall, consisting in effect of two concentric shells of masonry separated by a gap . . . which narrows as the wall ascends' (MacKie 1965, 100). A variety of other structural features are also listed as being necessary and these, along with the general indicator of the basal proportion of the wall thickness and outer diameter, can be used to identify the high wall and hence the broch when a structure is badly destroyed.

The site at Navershough shows no sign of a hollow wall or any of the other diagnostic features. It could be argued that this is a result of survival as the walls were no higher than 1.5m but the ground plan was well preserved and there is no sign of any access to the wall from this. Perhaps the most convincing piece of evidence is the construction of the wall. This occurs in three

stages: first the core c 2.95 m thick, then an inner face 0.66 m thick and finally an outer cladding c 1.61 m thick (these figures are all averages as the dimensions of each section varied considerably in each trench (Hedges, pers comm)). The latter stage was clearly constructed considerably later than the original wall as it consistently overlay occupation material built up against the 'core's' outer face. The inner face is presumed to be part of the original design but it was not excavated and does not appear to be bonded onto the 'core'. Even if these two walls can be regarded as one, the proportions of wall to outer diameter are still very low and construction in separate sections makes it extremely unlikely that the wall was built to stand to any great height. Thus it would not fit MacKie's definition and resembles much more closely the round-houses at Pierowall and Jarlshof. The wall at Pierowall is indeed roughly the same thickness as the inner core at Navershough. The claim that 'many of the Orkney "brochs" are similar' (Hedges & Bell 1980, 90) remains to be proven. There are certainly no excavated 'brochs' known to be constructed like Navershough and certainly none which could be claimed to date to the early Iron Age. The fact that some of the unexcavated sites shown on distribution maps as brochs could be like Navershough in date and structure is a different problem, relating more to the uses and abuses of locational analysis.

The question which remains is whether MacKie's rather rigid definition of the term broch is useful and serves some purpose in trying to understand the Orcadian Iron Age. The author feels that the answer to this really lies in the chronology of the period. Round-houses of the type seen at Pierowall, Quanterness, Navershough, etc seem to represent a clearly defined early Iron Age structure; brochs such as Gurness, Midhowe, Lingro, etc are later. There is no evidence at the moment to put any of these structures before the 2nd century BC. The cultural assemblage present in each of these structural types is not insignificant and in it, in particular, the pottery does not as yet suggest any overlap. This chronology is important and the use of the term broch for the structure at Navershough has already caused some considerable confusion, including erroneous attempts to redate sites such as Dun Mor Vault to the early Iron Age.

If we return then to the evidence we have for the early Iron Age in Orkney, how can it be interpreted? The following thoughts on this problem are disputable. As I clearly pointed out at the beginning of the discussion, the evidence for the period is still lamentably scarce. Nevertheless, any attempt to interpret the period as a functioning society is important as all too often it has been looked at solely in an attempt to understand the origins and development of the brochs. The apparent separation of very large isolated round-houses and village-like agglomerations of small thin-walled houses may well be the most significant factor. Both types of structure are clearly domestic dwellings as the interiors in those well preserved examples are separated into areas for eating, sleeping, cooking and perhaps stabling. The differences are solely related to the scale and the amount of effort put into the construction of the house. Differences would seem therefore to represent the relative importance of the people inhabiting these houses and signify one means by which a social hierarchy could be established and expressed. The use of structures which were clearly constructed over a lengthy period, perhaps several generations, would suggest that power was expected to be inherited, presumably in some form of lineage system. However, the infilling noted at Pierowall and Quanterness could be destruction caused by conflict between competing lineages and thus may indicate a degree of instability within the social structure.

The method and ideology used by this élite to create its control over the population are not at all clear. Control over the primary agricultural resources of the community would seem to be the only method of manipulation available. There is no sign in the material record that trade or contact with areas outside the Northern Isles were important between the end of the late Bronze Age and the appearance of Roman goods. Neither is there any sign of a commodity which could

be controlled by either access to the resource, or by a sophisticated industrial process, within the Islands. Similarly, purely religious symbols of power which are seen to develop in the late Neolithic are absent. An indication of the importance of agricultural products, however, may be represented by the appearance of souterrains. Although the function of these enigmatic structures is disputed, one of the most popular and believable explanations is that they are controlled cold stores for agricultural produce. The earliest date for one of these structures comes from the Jarlshof village where there was a small example built in house IV as it changed from a courtyard type of house to a round-house. There are two more examples built in the early Iron Age village and there is one constructed in front of the entrance to the round-house at Navershough.

The juxtaposition of individual round-house and village is clearly reflected in the relationship between brochs and their surrounding settlements. Particularly as it has recently been pointed out that these surrounding settlements are almost certainly contemporary with the brochs (Hedges & Bell 1980, 93). In claiming this the author would support Barrett's arguments (1981, 212), that brochs are, although exceptional, essentially domestic dwellings. The internal furnishings at such sites as Gurness and Midhowe in particular would not support the concept that they are used only as defensive refuges. The appearance of compact nucleated settlements with ramparts around them suggests that effective control of the population was becoming increasingly difficult. Thus the development or adoption of the broch structure could be looked at in a framework of competition between lineage groups striving, by a very conspicuous building programme, to impress and control the population in their locality.

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#### REFERENCES

- Barker, G 1983 'The Animal Bones from Isbister', *in* Hedges 1983.  
 Barrett, J C 1981 'Aspects of the Iron Age in Atlantic Scotland. A case study in the problems of archaeological interpretation', *Proc Soc Antiq Scot*, 111 (1981), 205-19.

- Beedham, G E 1972 *Identification of the British Mollusca*. Amersham.
- Binford L R 1981 *Bones; ancient men and modern myths*. New York.
- Boessneck, J 1969 'Osteological differences between sheep (*Ovis aries* L.) and goats (*Capra hircus* L.)', in Brothwell, D & Higgs, E (eds), London, 331-58.
- Boyd, J M, Doney, J M, Gunn, R G & Jewell, P A 1964 'The Soay sheep of the Island of Hirta, St Kilda. A study of a feral population', *Proc Zool Soc Lond*, 142 (1964), 129-64.
- Brothwell, D & Higgs, E (eds) 1969 *Science in Archaeology* (2nd edn). London.
- Burgess, C 1979 'A find from Boyton, Suffolk and end of the Bronze Age in Britain and Ireland', in Burgess, C & Coombs, D (eds), *Bronze Age Hoards*. Oxford, 269-83. (= *Brit Archaeol Rep*, 67).
- Burgess, C & Miket, R (eds) 1976 *Settlement and Economy in the third and second millennium bc*. Oxford. (= *Brit Archaeol Rep*, 33).
- Calder, C S T 1937 'A Neolithic double-chambered cairn of the stalled type and later structures on the Calf of Eday, Orkney', *Proc Soc Antiq Scot*, 71 (1936-7), 115-54.
- Calder, C S T 1938 'Excavations of Iron Age dwellings on the Calf of Eday in Orkney', *Proc Soc Antiq Scot*, 72 (1937-8), 167-85.
- Callander, J G & Grant, W G 1934 'A long stalled chambered cairn or mausoleum near Midhowe, Rousay, Orkney', *Proc Soc Antiq Scot*, 68 (1933-4), 320-35.
- Callander, J G & Grant, W G 1934 'The Broch of Midhowe, Rousay, Orkney', *Proc Soc Antiq Scot*, 68 (1933-4), 444-516.
- Chaplin, R E 1971 *The study of Animal Bones from Archaeological Sites*. London.
- Childe, V G 1931 *Skara Brae, a Pictish Village in Orkney*. London.
- Childe, V G 1952 'Re-excavation of the Chambered Cairn of Quoyness, Sanday, on behalf of the Ministry of Works in 1951-52', *Proc Soc Antiq Scot*, 86 (1951-2), 121-39.
- Childe, V G & Grant W G 1939 'A stone age settlement at the Braes of Rinyo', *Proc Soc Antiq Scot*, 73 (1938-79), 6-31.
- Clark, J G D 1952 *Prehistoric Europe: the economic basis*. London.
- Clarke, D V 1976 'Excavations at Skara Brae: A summary account', in Burgess & Miket 1976, 233-50.
- Clarke, D V 1983 'Rinyo and the Orcadian Neolithic', in O'Connor, A C and Clarke, D V (eds), *From the Stone Age to the Forty-Five: Essays presented to R B K Stevenson*, Edinburgh, 45-56.
- Clarke, D V, Hope, Rosemary & Wickham-Jones, Caroline R 1978 'The Links of Noltland', *Curr Archaeol*, 6 (1978), 44-6.
- Clutton-Brock, Juliet 1979 'Report of the mammalian remains other than rodents from Quanterness', in Renfrew 1979, 112-34.
- Corbet, C B 1979 'Report on rodent remains', in Renfrew 1979, 135-7.
- Curle, A O 1934 'An account of further excavation at Jarlshof, Sumburgh, Shetland, in 1932 and 1933 on behalf of H.M. Office of Works', *Proc Soc Antiq Scot*, 68 (1933-4), 224-319.
- Davey, J M, Ryder, M L, Gunn, R G and Grubb, P 1974 'Colour, Conformation, Affinities, Fleece and Patterns of Inheritance in the Soay Sheep', in Jewell *et al* 1974, 88-125.
- Eogan, G 1976 'Beaker material from Knowth Co. Meath: preliminary report', in Burgess & Miket 1976, 251-66.
- Eogan, G & Richardson, H 1982 'Two Maceheads from Knowth, County Meath', *J Roy Soc Antiq Ir*, 112 (1982), 123-38.
- Evans, J G 1979 'The Palaeo-Environment of coastal blown-sand deposits in western and northern Britain', *Scot Archaeol Forum*, 9 (1979), 16-26.
- Evans, J G & Spencer, Penelope 1977 'The mollusca and environment, Buckquoy, Orkney', in Ritchie, Anna 1977 'Excavation of Pictish and Viking-age farmsteads at Buckquoy, Orkney', *Proc Soc Antiq Scot*, 108 (1976-7), 215-19.
- Evans, J G & Vaughan, M 1983 'The Molluscs' in Ritchie, Anna 1983.
- Fenton, A 1978 *The northern isles: Orkney and Shetland*. Edinburgh.
- Fraser, D 1983 *Land and Society in Neolithic Orkney*. Oxford. (= *Brit Archaeol Rep*, 117).
- Grant, W G & Wilson, D 1943 'The Knowe of Laird, Rousay, Orkney', *Proc Soc Antiq Scot*, 77 (1942-3), 17-26.
- Grubb, P 1974 'Population Dynamics of the Soay Sheep', in Jewell, P A *et al* 1974, 242-72.
- Haig, D & Smith, Beverly 1982 *Excavations at Howe, Stromness: An Interim Report*. Typescript.
- Hamilton, J R C 1956 *Excavation at Jarlshof, Shetland*. Edinburgh.

- Hamilton, J R C 1968 *Excavations at Clickhimin, Shetland*, Edinburgh.
- Harris, C J 1968 *Otters: A study of the recent Lutrinae*. London.
- Hedges, J W 1983 *Isbister: A chambered tomb in Orkney*. Oxford. (= *Brit Archaeol Rep*, 115).
- Hedges, J W & Bell, B 1980 'That tower of Scottish Prehistory, the broch', *Antiquity*, 54 (1980), 87-94.
- Henshall, Audrey S 1963 *The Chambered Tombs of Scotland*, vol I. Edinburgh.
- Henshall, Audrey S 1972 *The Chambered Tombs of Scotland*, vol 2. Edinburgh.
- Hodder, I 1982 *Symbols in action: Ethnoarchaeological studies of material culture*. Cambridge.
- Jewell, P A, Milner, C A & Morton Boyd, J 1974 *Island Survivors: the Ecology of the Soay Sheep of St Kilda*. London.
- Keatinge, T H & Dickson, J H 1979 'Mid Flandrian changes in vegetation on mainland Orkney', *New Phytol*, 82 (1979), 585-612.
- Leach, E 1977 'A view from the bridge', in Spriggs, M (ed), *Archaeology and Anthropology*, Oxford, (= *Brit Archaeol Rep Int Ser*, 19).
- Legge, A J 1981 'The Agricultural Economy', in Mercer 1981, 79-103.
- Lewis, J R 1964 *The Ecology of Rocky Shores*. London.
- Lockie, J D 1961 'The food of the Pine Marten, *Martes Martes*, in West Ross-shire, Scotland', *Proc Zool Soc Lond*, 136 (1961), 187-95.
- MacKie, E W 1965a 'A Dwelling Site of the Earlier Iron Age at Balevullin, Tiree, excavated in 1912 by A. Henderson Bishop', *Proc Soc Antiq Scot*, 96 (1962-3), 155-83.
- MacKie, E W 1965b 'The Origin and Development of the Broch- and Wheelhouse-Building Cultures of the Scottish Iron Age', *Proc Prehist Soc*, 31 (1965), 93-146.
- MacKie, E W 1974 *Dun Mor Vault, An Iron Age Broch on Tiree*. Glasgow.
- Mackie, E W 1980 'Dun an Ruigh Ruaidh, Loch Broom, Ross and Cromarty: excavation in 1968 and 1978', *Glasgow Archaeol J*, 7 (1980), 32-79.
- McMillan, N F 1968 *British Shells*. London.
- Manby, T G 1974 *Grooved Ware sites in the North of England*. Oxford. (= *Brit Archaeol Rep*, 9).
- Masters, L forthcoming 'Excavations at Camster Long, Caithness'.
- Mercer, R 1981 *Grimes Graves, Norfolk Excavations 1971-72*, vol 1. London.
- Mercer, R (ed) 1981 *Farming Practice in British Prehistory*. Edinburgh.
- Mykura, W 1976 'Orkney and Shetland', *Brit Reg Geol*. Edinburgh.
- Noddle, Barbara unpublished 'The Animal bones from Skara Brae'.
- O'Kelly, Claire 1973 'Passage grave art in the Boyne Valley', *Proc Prehist Soc*, 39 (1973), 354-82.
- O'Kelly, Claire 1982 'Corpus of Newgrange art', in O'Kelly, M J, 1982, 146-85.
- O'Kelly, M J 1982 *Newgrange: Archaeology, art and legend*. London.
- Payne, S 1973 'Kill-off patterns in sheep and goats', *J Anatolian Stud*, 23 (1973), 281-303.
- Piggott, S 1962 *The West Kennet long barrow, excavations 1955-56*. London.
- Piggott, S & Powell, T G E 1949 'The excavation of Three Neolithic Chambered Tombs in Galloway', *Proc Soc Antiq Scot*, 83 (1948-9), 103-61.
- Renfrew, C 1976 *Before Civilisation: The Radiocarbon Revolution and Prehistoric Europe*. Harmondsworth.
- Renfrew, C 1979 *Investigations in Orkney*. London. (= *Rep Res Comm Soc Antiq London*, 38).
- Ritchie, Anna 1983 'Excavation of a Neolithic farmstead at Knap of Howar, Papa Westray, Orkney', *Proc Soc Antiq Scot*, 113 (1983), 40-121.
- Ritchie, J N G 1976 'The Stones of Stenness Orkney', *Proc Soc Antiq Scot*, 107 (1975-6), 1-60.
- Ryder, M L 1981 'Livestock Products: Skins and Fleeces', in Mercer 1981, 182-209.
- Ryder, M L 1983 *Sheep and man*. London.
- Shepherd, W 1972 *Flint: Its Origin, Properties and Uses*. London.
- Silver, I A 1969 'The ageing of domestic animals', in Brothwell & Higgs 1969, 282-302.
- Simmons, I & Tooley, M (eds) 1981 *The Environment in British Prehistory*. London.
- Southern, H N 1964 *The handbook of British Mammals*. Oxford.
- Stephenson, W A 1968 *Seaweed in Agriculture and Horticulture*. London.
- Stevenson, R B K 1938 'Report on the pottery', in Calder 1938, 182-5.
- Tait, R V 1981 *Elements of Marine Ecology*, 3 ed. London.
- Twohig, Elizabeth S 1981 *The megalithic art of Western Europe*. Oxford.
- Van Gennep, A 1960 (1909) *The Rites of Passage*. London.

- von den Driesch, A & Boessneck, J A 1974 'Kritische Ammerkungen zur Widderrist-hohenberechnung aus Langenmassen vor-und frühgeschichtlicher Tierknochen', *Saugetierkundliche Mitteilungen*, 22 (1974), 325-48.
- Wainwright, G J & Longworth, I H 1971 *Durrington Walls: Excavations 1966-68*. London, (= *Rep Res Comm Soc Antiq Lond*, 29).
- Watson, D M S 1931 'The animal bones', in Childe 1931, 198-204.
- Whittle, A 1979 'Scord of Brouster', *Curr Archaeol*, 65 (1979), 161-71.
- Wickham-Jones, Caroline R 1984 'The flaked stone', in Stevenson, J B, 'The excavation of a hut circle at Cul a'Bhaile, Jura', *Proc Soc Antiq Scot*, 114 (1984).
- Wickham-Jones, Caroline R & Collins, G H 1978 'The sources of flint and chert in northern Britain', *Proc Soc Antiq Scot*, 109 (1977-8), 7-21.
- Wijngaardehn-Bakker, L H van 1974 'The Animal bones from the Beaker settlement at New-grange, Co Meath: first report', *Proc Roy Ir Acad*, C,74 (1974), 313-83.
- Yonge, C M 1949 *The Sea Shore*. Glasgow.
- Yonge, C M & Thompson, T E 1976 *Living Marine Molluscs*. London.

## NOTE ADDED IN PROOF

The following radiocarbon, dates, obtained since the paper was submitted, should be added to the list on p 90:

GU-1586	Layer 22	Sheep bone (radius)	4330±110 $\delta^{13}\text{C} = -20\%$
GU-1587	Layer 22	Cattle bone (scapula)	4065±90 $\delta^{13}\text{C} = -21.8\%$
GU-1588	Layer 20	Sheep bone (tibia)	4105±120 $\delta^{13}\text{C} = -21.5\%$

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