

THE EXCAVATION OF A CHAMBERED CAIRN AT EMBO, SUTHERLAND

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INTRODUCTION

IN 1956 I [A.S.H.] had occasion to observe, and report on, a cist-burial with a food-vessel found in the remains of a cairn at Embo, Sutherland.¹ In 1960 it was necessary for the landowner to remove the cairn in order to make a car-park and we undertook an excavation for three weeks in July before the site would be destroyed.² In

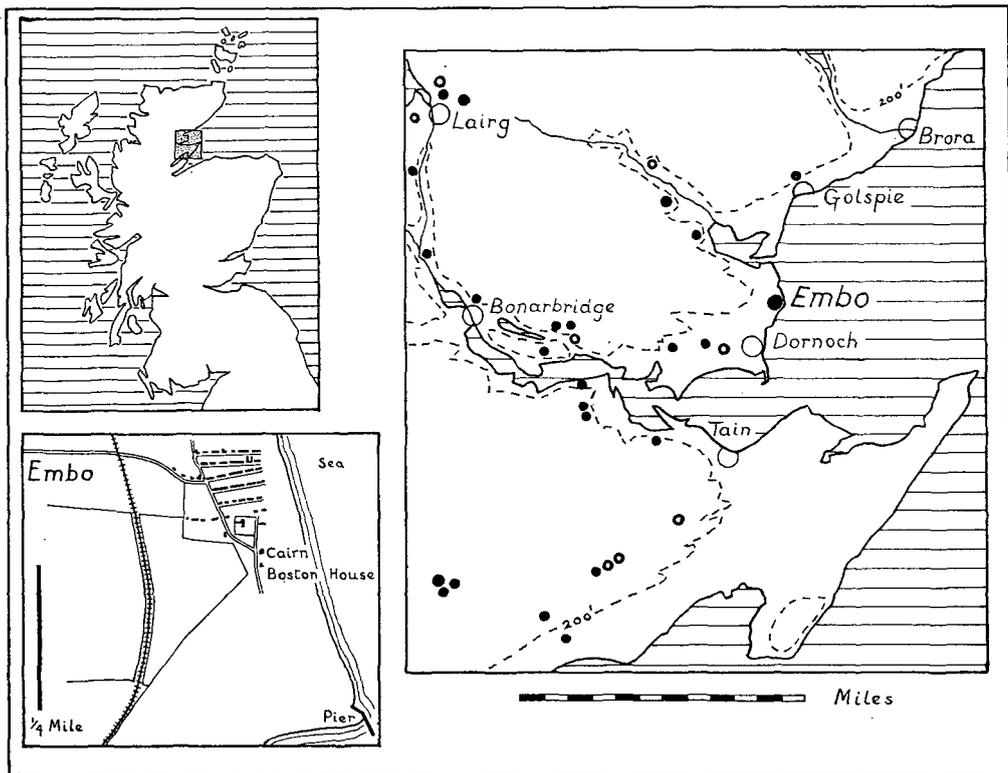


FIG. 1. Maps showing location of site and local distribution of chambered tombs of Orkney-Cromarty type

¹ *P.S.A.S.*, xc (1956-7), 225-7.

² We are most grateful to the landowner, Mr John Macintosh of Embo House, for requesting that this unscheduled site should be excavated before it was destroyed, and for his help while the work was in progress, and for presenting the finds to the National Museum of Antiquities. Labour and equipment were provided by the Ministry of Public Building and Works. We are also grateful to the Society of Antiquaries of Scotland for a grant to cover Mr Wallace's expenses. Miss Henshall undertook the excavation as part of her duties in the National Museum.

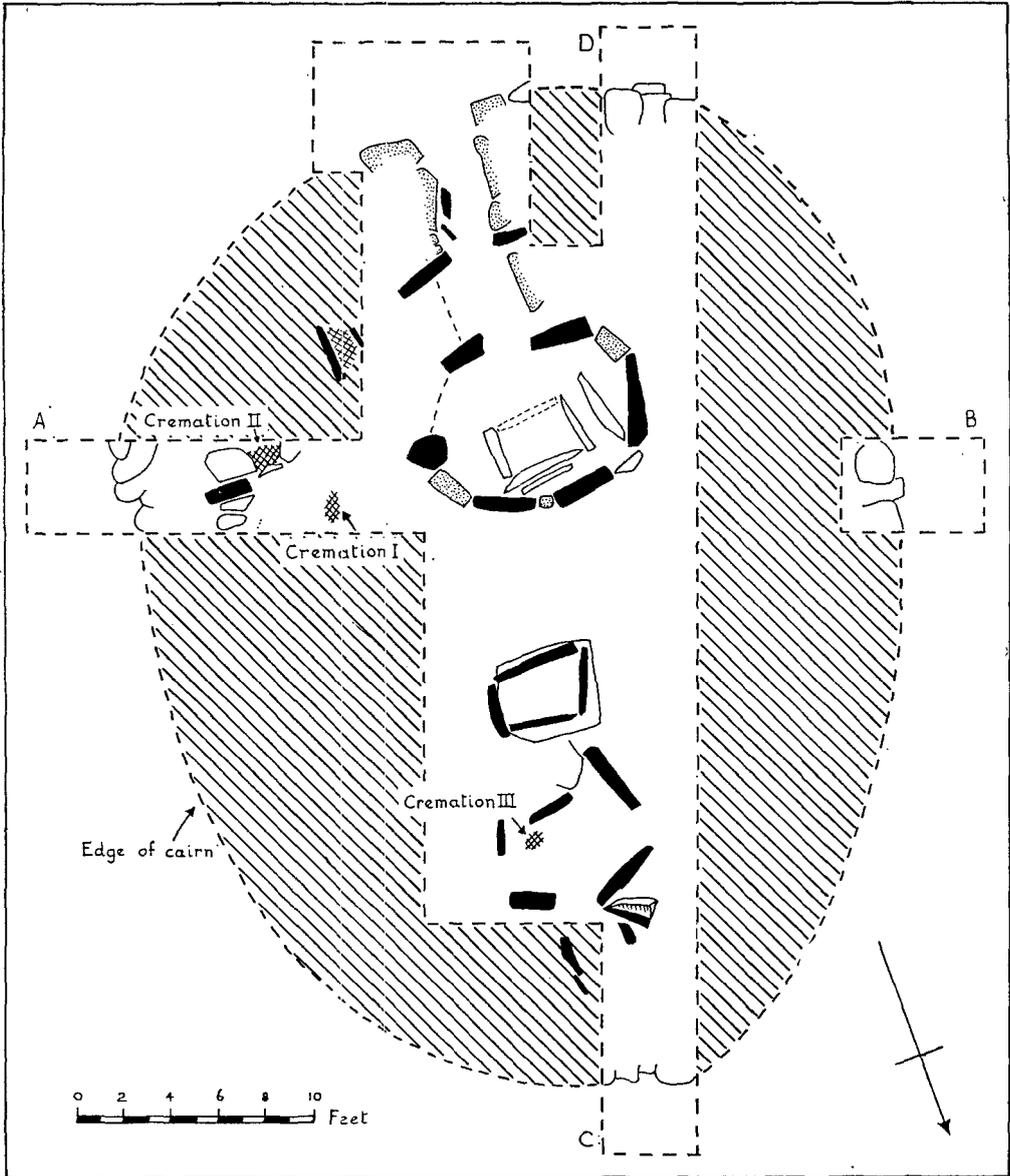


FIG. 2. Plan of cairn

the event the structure revealed by the excavation was of such interest that it has been preserved in the middle of the car-park, although unfortunately the soft sandstone of the orthostats is weathering rapidly.

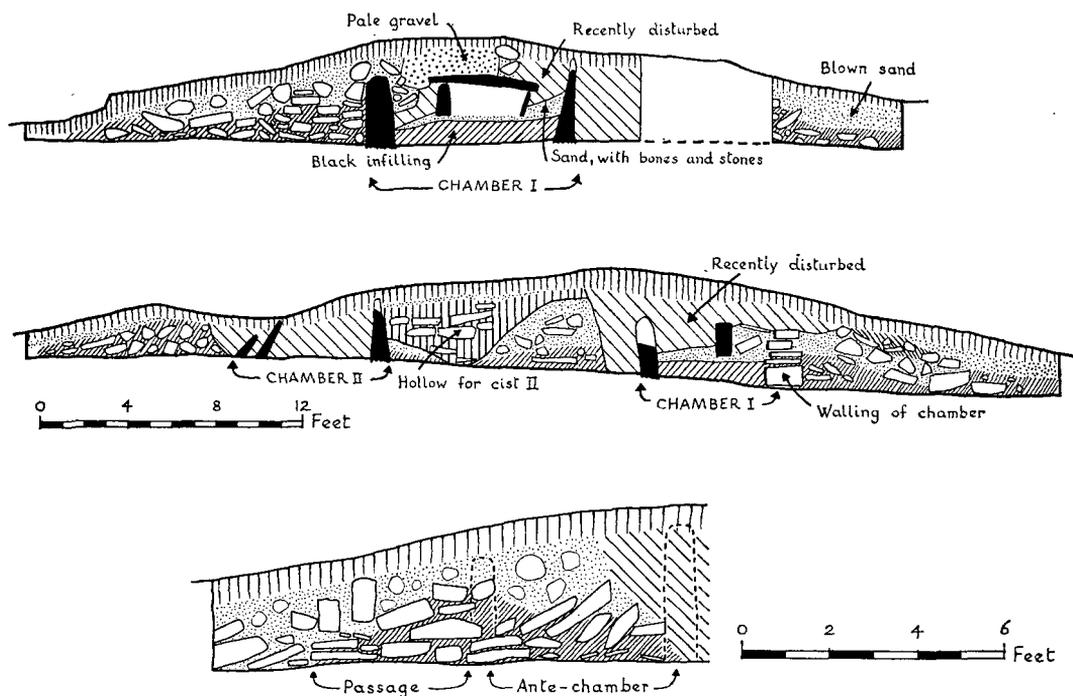


FIG. 3. Sections through cairn: above, on line A-B on plan; centre, on line C-D; below, along passage and antechamber of Chamber I.

LOCATION

The village of Embo lies on the E. coast, in the SE. corner of Sutherland, 2 miles NNE. of Dornoch. The site was to the S. of the village, on the links, between the present limit of cultivation and the sand-dunes, on the edge of a gravel terrace at about 30 ft. above o.d. (map ref. NH 817926). Boston House stands isolated on the links and the cairn lay 111 ft. NNE. of the house. From the site there are magnificent views over the rather flat hinterland and particularly along the coast, to Tarbet Ness to the SE. and to Golspie, Helmsdale and the Ord of Caithness to the NE.

EXCAVATION

The cairn was a small, irregular, inconspicuous turf and sand-covered mound. It had obviously been much disturbed and robbed even before 1956 and excavation showed that disturbance was even more extensive than was anticipated. In 1956 it had been obvious that the cist burial was not a primary feature. As there was little indication as to the nature of the site, and, by 1960, the position of the cist had been lost, it was decided to lay out two trenches to bisect at the apparent crest of the mound. As the structures emerged the cuttings were extended to strip most

of the interior of the cairn, but unfortunately our main sections cut the site rather awkwardly.

The cairn covered the remains of a chamber entered from the S., in which had been built the secondary cist; the remains of a second chamber, entered from the N.; a second cist inserted between the two chambers; a number of cremations on the E. side, and one in the second chamber.

Chamber I

The main chamber was orientated almost due N.-S., the passage opening from the S. side of the cairn. The short passage, about 5 ft. 2 in. long, and slightly over 2 ft. wide at the narrowest point, had its walls built of flattish, rounded, water-worn stones. Three courses remained on either side, with a maximum height of 1 ft. 10 in. On the E. side two small stones had been set upright in the ground in front of the wall. The outer was 1 ft. high and the inner 2 ft. 2 in. high. They reduced the width of the passage to 1 ft. 6 in.¹

The entrance into the antechamber was between two upright stones, 2 ft. 6 in. high, set roughly at right-angles to the axis of the passage. The W. wall of the antechamber was of masonry similar to that of the passage, still 2 ft. 6 in. high, consisting of five courses, the two upper displaced. The E. side had been completely removed during howking in 1956. The antechamber measured 3 ft. 8 in. long. The width is unknown but the W. wall was set back only 4 to 6 in. from the inner edges of the upright transverse stones.

The chamber was oval, about 7 ft. 8 in. by 5 ft. 6 in., the longer diameter at right angles to the axis of the passage. The walls were constructed with six upright sandstone slabs, 3 ft. 3 in. to 3 ft. 11 in. high, those on the S. side forming a pair of portal stones at the entry from the antechamber. Stone A, the eastern of the portal stones, was quite loose due to previous howking round it, and stood at a rather awkward angle, but the fact that it is parallel to the eastern of the outer portal stones suggests that it had not shifted from its original position.

Between stones B and C, D and E, and E and F, were courses of walling, consisting of a stack of horizontally laid stones, each stone large enough to span the gap between the uprights. Five courses, the original number, remained, 2 ft. 5 in. high. Presumably walling had also existed between stones F and A but had been removed in 1956. On the other hand between C and D there was only a small roundish stone 1 ft. 9 in. high, resting on its edge outside the uprights, and leaning slightly towards the chamber so that it rested against the upright stones on either side of it. This stone could not have supported walling, and it was probably the blocking at the entry to a side cell which lay to the NW. of the main chamber. The area to the NW. of this stone had been recently disturbed to ground level by a hole filled in with loose stones, and though the ground surface was carefully examined, no sign of a cell was found.

A number of corbel-stones belonging to the lowest courses of the spring of the

¹ This might be compared with a similar feature in the passage at Corrimony, Inverness-shire, *ibid.*, LXXXVIII (1954-6), 180.

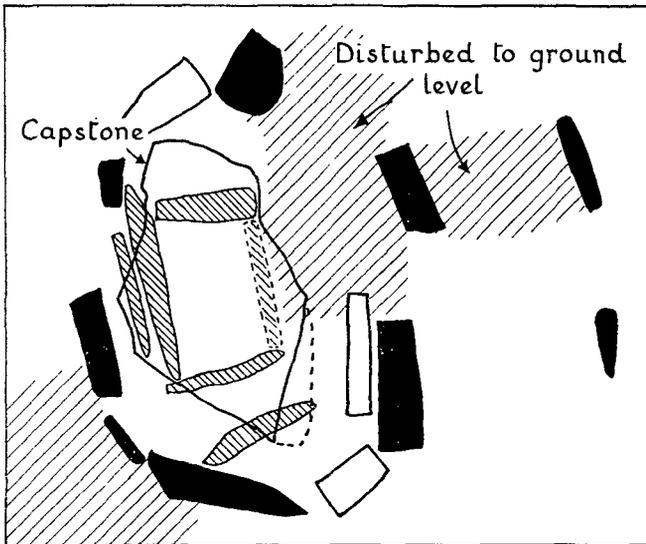
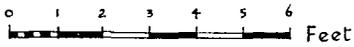
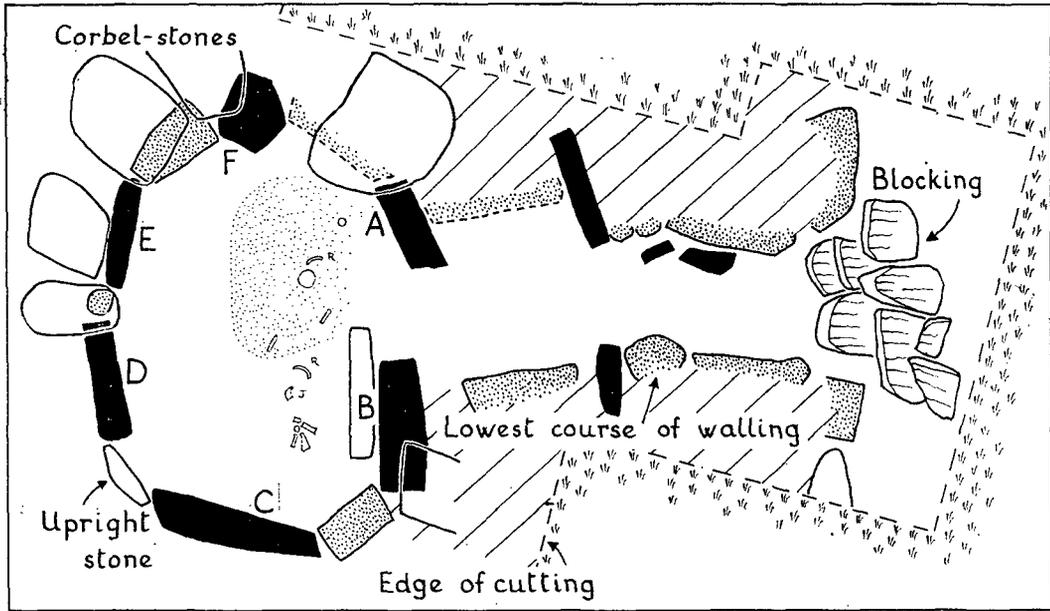


Fig. 4. Above, plan of Chamber I showing bones and charcoal on floor (R = rib, J = jaw); below, plan of Chamber I at high level, showing Cist I.

domed roof of the chamber were found in position. They were large flat slabs, roughly 2 to 3 ft. square, resting either on the walling between E and F or on the shoulders of stones D, E, A and B. Their inner edges hardly overhung the walling below, and sometimes did not project at all. Their longer axes stretched back into the cairn material sloping down away from the chamber. Two or three seemed to have slipped back out of position. These corbel-stones contrasted with the relatively small horizontally laid stones of the walling below.

A rather curious feature in the chamber was the large upright stone placed to lean against the inner face of stone B, and projecting slightly in front of the entrance. Its foot rested on the gravel floor of the chamber, but had not sunk into it in the way the chamber uprights had, probably because it did not bear any weight from the structure. It had no obvious function.

The SE. part of the chamber had been disturbed to ground level (as indicated in fig. 4), the W. part of this disturbance being the square pit sunk in the cairn in 1956, and stone A being the isolated stone on the S. side of the pit mentioned in the 1956 report. Over the rest of the chamber the lowest layer was a black filling, about 1 ft. deep (soil sample B, Appendix III). This filling was surface soil; it was hard and gravelly mixed with small stones and included also some larger stones lying at various angles. Some of these stones lay on the gravel suggesting a rough paving, but this was probably fortuitous. There were also small pieces of charcoal, and an area about 4 by 3 ft. at ground level N. of stone A and the entrance contained much charcoal, some being quite large pieces 1 in. or so long (Appendix VII). Where some of the black infilling had been protected by the way the larger stones lay it was quite loose, as if the black layer in general had been consolidated by trampling; the upper surface was uneven. The layer seemed to have been dumped in the chamber at one time. It contained neither bones nor artifacts.

On the gravel floor of the chamber, and partly pressed into it, and in the lowest part of the filling, were scattered a few decayed and broken human and animal bones. Presumably they were lying on the floor when the filling was brought to the chamber. Although about three-quarters of this lowest layer in the chamber was intact the number of bones found was surprisingly small. But it seems certain that a quantity of bones was found in the other quarter; in 1956 two skulls and other bones were found against the N. face of stone A, at ground level; also when the cist was reopened, it contained many bones, presumably placed there during the later howking in 1956, many of them coloured by black earth, and which could have come only from this part of the chamber, or possibly from the E. side of the antechamber (Appendix IV). The only other object from the floor of the chamber was a small piece of pumice.

The black material also filled the lower part of the antechamber and passage. The lowest 6 in. in the antechamber consisted of black earth, with a few small slabs laid on the gravel floor. On one of these, against the W. wall, 1 ft. 2 in. from stone B and protected by a small upright stone on the E. side, was a complete skull. On the gravel to the E. were a few more bones.

From just inside the outer end of the passage to between the portal stones into

the antechamber, the floor was covered by a neatly fitting 'pavement' of fairly heavy slabs. Above them, and over the earthy filling of the antechamber, were more flat slabs or slabs set slanting inwards towards the chamber. All these slabs were carefully placed and filled most of the space, with the black material in the interstices to a height of 1 ft. 4 in. above natural when it gave way to sand. Outside the entrance, layers of slabs had been set sloping up to the flat slabs in the passage, this time with sand filling the interstices. There can be no doubt that all these stones were deliberately placed in position as a blocking of the entrance to the chamber.

The main chamber, above the black layer, was filled with reddish sand and rounded stones up to 1 ft. in diameter. The top of the black layer was rather uneven, and between the two was a layer of dirty sand. The sandy layer had been even more disturbed in 1956 than that below, partly by later burrowing into the sides of the original hole. Throughout the sandy layers up to the level of the cist capstone were many human and animal bones in disorder, and to these should be added the 'mass of human bones' noted in 1956, and some beaker sherds. These bones belong to a second communal burial phase, placed on top of the black infilling of the chamber, the sand having percolated into the chamber from the cairn.

In the sand, occupying the northern part of the chamber, was the cist (Cist I) found in 1956. The S. side-stone had been removed then, but otherwise it was intact. It measured 2 by 3 ft. internally. The N. stone was supplemented by another slighter stone outside. To the W. was an extra stone set on edge, less than 1 ft. from the cist, making an extra compartment. This, however, was too small to take a burial, and actually contained some adult bones including the pelvis and vertebrae mentioned in the earlier report, presumably belonging to the earlier burials. The capstone of the cist was large, and the SW. corner had been broken off. Perhaps this extra stone was meant to support this side of the capstone.

The cist had been placed amongst the sand and stones, its base slightly above the black layer. Many of the larger stones in the sand had been placed against the outside of the side stones to keep them in position. At the same time three curious deposits of minute bones were made in the sand outside the cist. The deposits were roughly the size of a cricket ball, and consisted of only fish bones so small that the deposit looked like sand of a somewhat coarser texture (see Appendix VI). In dismantling the cist part of a skull, most of which lay at the N. end of the 'side compartment', was found under the W. side-slab. A few bones were found to have penetrated the top of the black layer, but one piece of skull had sand adhering to the cavities in it, so that it was clearly derived from the sandy layer.

The makers of the cist must have entered the chamber from above, dismantling the roofing. It is probable that the cist stones are reused corbel stones, and the fact that the capstone was unnecessarily large suggests that it was the original capstone of the chamber. The cist-builders pushed the sand and bones to the sides of the chamber, trampled some into the top of the black infilling, and probably formed the dirty sand layer by trampling.

The cist contained an intact food-vessel, placed in the SE. corner, and jet beads scattered about the centre. Only a few bones were found in position by A.S.H. in

1956, the rest having been already removed. Those which were thought to come from the cist have been described previously, and represented an adult female, at least one bone of another adult, and part of a foetus, but unfortunately we cannot be confident that some bones from the surrounding burials were not included. The cist was full of sand, in which were bones of fish, rodents, dog, sheep, sea-birds and shellfish. The sand had presumably percolated in from the sides and from above; the animal debris presumably derived from the upper part of the cairn, as will be described, but may only have reached the cist during the 1956 operations.

Above the level of the bottom of the cist capstone, and the surviving walling and corbelling of the chamber and antechamber, the whole area was covered with stones and sand indistinguishable from the layer below and the upper layer of the cairn itself. There were many dirty hollows, and it had probably been disturbed many times from the Bronze Age onwards; it contained human and animal bones and also shells. Above the capstone, except the SW. quarter of it, and extending 3 ft. southwards from it, was a deposit of pale gravel with small stones and some bones. This seemed a relatively modern disturbance though the nature of its filling is difficult to explain.

The Cairn

Excavation showed that the cairn was oval, measuring about 42 by 30 ft. There was no definite edging to it. On the S. side the precise edge was indicated by the end of the passage. In the SE. cutting an upright stone 2 ft. 6 in. high was found, set at right angles to the perimeter, its end on the gravel subsoil, and supported on either side by flat slabs laid radially in a rough sort of kerb. Outside this, cairn stones stretched for about 4 ft., the interstices firmly filled with dark gravel, beyond which was just a scatter of smallish stones. On the W. side over 1 ft. of sand had accumulated on top of the cairn stones, blown over the cairn and settled against its lee side, and there was a slighter accumulation of sand against the N. edge of the cairn.

The lowest level of the cairn was built of large flat slabs, closely and carefully set horizontally, so that they gave almost the appearance of a platform stretching from the flat stones of the 'kerb' on the SE. This 'platform' was seen only in the cutting running SE. from the chamber, NE. of the chamber and in part of the SW. cutting, as the centre of the cairn had been disturbed in antiquity, and the area to the NW. of Chamber I had been so completely disturbed in modern times. The interstices between the stones were filled with hard dark gravelly soil similar to the chamber filling (soil sample E). The dark layer increased in depth from the cairn edge to about 1 ft. 9 in. or 2 ft. against the chamber, and a maximum of 2 ft. 4 in., about 3 ft. NE. of the chamber. The dark gravel also ran between the stones of the chamber walling up to this height. Around Chamber II this dark layer contained more irregular stones laid without any special care.

The upper part of the cairn consisted of a roughly half-and-half mixture of reddish sand (soil sample C) and rounded irregular boulders, carelessly placed.

The contrast between the two layers around Chamber I, both in colour, and in the type and position of the stones, was striking. The sand lay between the upper one or two stones of the chamber walling. Round the chamber there had been slanting corbel-stones set with their outer ends jutting into the cairn, resting entirely in the sandy layer.

Under some of the corbel-stones, in the sand outside the chamber, were found several deposits of bones, both animal and human. Two small deposits, about 8 in. across, were found immediately NE. of stone F and against the uppermost slab of the walling between F and E, at 3 ft. 3 in. and 3 ft. 10 in. below the turf, the first in the sand layer, the second in a sand-filled hollow in the dark layer. Another deposit was found under the lowest corbel-stone on the N. side of the chamber, 16 in. behind stone D, in one place going down to the black layer, also stretching to 2 ft. 6 in. behind E. 1 ft. 9 in. above ground, and a quantity of bones at the same level spread from here westwards up to the deep disturbance outside stones D and C though the covering corbel-stones had gone. Another small deposit was found 1 ft. 5 in. behind stone B. These bones must have been placed there before the corbel-stones were in position. All the bones were small. In three cases there were human and animal remains, in the other two cases only animal remains. The adult human bones were from hands and feet with one exception; there were a few children's and infant bones, and a number of teeth.

The bones were not resting on stones but were in sand, implying that the sand was tipped onto the site at the same time as the stones, and during building a scoop was made in a pocket of sand, and the bones placed therein. Although this sounds unlikely, as one would have expected the sand to be windblown from the dunes, the alternative, such extensive and consistent worm action as to move the bones into the sand, seems more unlikely.

Many bones, both human and animal, were found immediately below the turf over the chamber, and in the area around it. Some of these were probably derived from the disturbed chamber deposits. But it is curious that among these bones there is a high proportion of animal bones, and during excavation we had the impression that there had been some sort of deposit of bones and shells over Chamber I in the top levels of the cairn. These bones might have arrived at any time and might be unconnected with the funerary use of the cairn, but it is noteworthy that they are restricted to one area and that the highest point of the cairn. They were also found in some quantity in Cist I, but we cannot be sure that they did not arrive there during the 1956 disturbance. The probabilities seem to be either that the bones were placed against the roof of the chamber, and became mixed with the upper cairn material when the roofing was dismantled, or that they were deposited by the Food-Vessel people in the infilling of the hollow made by them in the crest of the mound. The former suggestion is more likely, and a possible parallel was noted at the tomb of Quoyness, Orkney, where bones, ash and sherds found on the sides of the mound were thought to have derived from a deposit on the top.¹

¹ *ibid.*, LXXXVI (1951-2), 132-3.

Chamber II

At the N. end of the cairn was a group of eight upright stones, their bases slightly set into the gravel, the last remains of a ruined second chamber. The four stones, J, K, L and M, were taller and more shapely, 3 ft. to 2 ft. 3 in. high. The fifth stone N was only 1 ft. 7 in. high, for its jagged upper edge had been reduced in height. The stones were set with their long axes forming the sides of a polygonal chamber measuring 6 ft. 6 in. by 3 ft. 7 in., though curiously stone L was set well over 1 ft. inside what looks like its proper position.

The entrance, without antechamber, had been from the N. along a short passage, 1 ft. 9 in. wide, of which one stone on the W. side and two on the E. side remained.

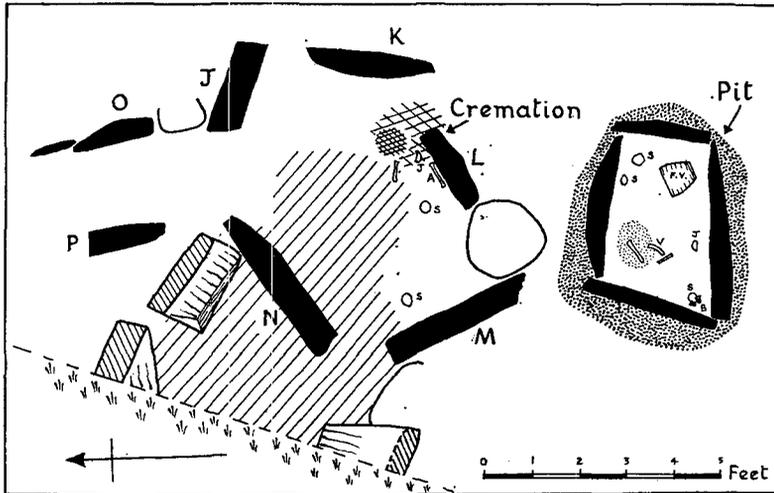


FIG. 5. Plan of Chamber II and Cist II (J = jaw, S = skull fragment, V = vertebrae, A = arm bones, B = beaker sherds, F.V. = Food-vessel; hatched area disturbed to ground level).

The S. pair of stones were 2 ft. 2 in. high, the other stone was much slighter, 1 ft. 1 in. high. The only signs of the dry walling which must have existed between the uprights were flat slabs between L and M in the S. corner of the chamber, and another on the E. side of the passage. Three large displaced stones were found outside the chamber on the W.

Almost the entire area of the chamber had been disturbed to ground level, except on the E. side. This disturbance was relatively modern; a hollow had been made and was filled with rubbish including pieces of iron plate, glass and bait debris. Where the lowest layers were undisturbed on the E. side there was a dark layer resting on the gravel, only 2 or 3 in. thick, which was sterile, and above were boulders in sand, indistinguishable from the upper part of the cairn. In front of stones L and M a few human bones were found in disorder lying on the dark layer. There were no bones in the sand and boulder filling of the chamber. The cairn at Embo was known locally to be a burial place before the 1956 operations which

implies that human bones had been found there previously and it seems most likely that they had been unearthened during the disturbance of this chamber.

In the sand and stones a little above the bones was a cremation (No. III). The main deposit, which was not nearly as large or concentrated as the other two cremations we found, was NE. of the E. end of stone L, but scattered cremated bone extended over the inhumations below, and round the E. end of the stone. The presence of this cremation shows that the chamber was already ruinous at some time in the Bronze Age.

To the N. of the chamber the cairn stood only 1 ft. 6 in. high, and from there to the N. edge it consisted of rounded stones in dark gravel. To the E., however, the black gravel layer was overlaid by boulders in sand similar to that over the rest of the cairn. The section along the east side of the central area appeared to be uninterrupted, the only difference being that the carefully laid slabs of the lower layer around Chamber I gave way to boulders like those of the layer above. No definite evidence could be seen for one chamber with a smaller cairn being earlier than the other, though such evidence would be difficult to detect in a section largely made up of boulders. However, the fact that the lower layer of well laid slabs seemed to surround only Chamber I might indicate that Chamber II was an addition to the original plan.

Cist II

As has been mentioned already, the centre of the cairn had been disturbed in antiquity. The NE.-SW. trench cut the edge of a great hollow made into the cairn, which had subsequently been filled up. This hollow was made down to ground level in order to build a cist. The cist was almost entirely below ground, in a rectangular pit made in the gravel just large enough to take it. Above the cist the hollow was filled in firstly with black earth and small stones, above which were set large flat slabs very closely and carefully laid side-by-side in two rows, two courses deep. Between the slabs and the edge of the hollow were more black earth and small stones.

The cist was trapeze-shaped, the side stones fitting fairly neatly, but the NE. stone was shorter and had to be made up with extra flat slabs above. A thin sandstone flag covered the cist. The space between the side-stones and the edge of the pit was filled in with gravel. The cist measured 1 ft. 8 in. to 2 ft. 6 in. wide by 3 ft. to 3 ft. 8 in. long, by 2 ft. 2 in. deep. The bottom was the natural gravel. On this was a layer of silted brown soil 2 or 3 in. deep, above which the cist was empty. A food-vessel was found lying on its side in the SE. corner. The ware was so friable that it had gradually collapsed and only small pieces of the rim could be saved, though the size and position of the pot were clear. Several sherds of a corded beaker were found at the W. end of the cist, lying on the silt, in it, and on the gravel. A speck of corroded bronze was found near the centre. The bones of two babies were fragmentary, decayed and in some cases displaced. This scattering is probably not significant but due to worm action moving these small light-weight objects in this very light soil. The newborn infant was probably associated with the food-vessel

lying to the S. of it, and the older baby with the beaker sherds, the body occupying the W. half of the cist. There was a patch of charcoal on the gravel in the N. corner.

The Cremations (Appendix V)

Besides the cremation already mentioned, two cremations were found in the cutting to the SE. of Chamber I, 8 ft. and 6 ft. within the cairn edge. The first was in a small hollow 7 in. deep, among the cairn stones and sand but without any special protection. The bones were mixed with dark sandy earth and there were a few fragments of charcoal. The top of the deposit was 1 ft. 9 in. below the turf. The second cremation was in a restricted space between boulders just inside the 'kerb', at the junction of the sand and black earth. The bones were hard packed but in large pieces which broke up on being lifted. Among the bones were fragments of a very corroded and cracked bronze object, which turned out to be about half a razor. Presumably this object had been burnt; only half of it was present, and all the fragments recovered fitted together. It was already in pieces when it was buried, for some of the breaks were discoloured though some of them occurred as it was extracted. These burials must have been inserted but the necessary disturbance of the cairn could not be detected.

When the remaining cairn material on the E. side was being removed after the excavation the workmen found more cremations, probably about six. One of these was in a carefully made recess about 2 ft. E. of the antechamber. It consisted of two upright stones to E. and W. set at about ground level, the taller stone 19 in. high, with a rough walling of cairn stones between them, the interior space measuring about 12½ to 16½ in. by 15 to 30 in. One of these cremations had a bronze blade with it, but only the centre portion was recovered.

CONCLUSIONS

The cairn is situated in a region where many chambered tombs of the Orkney-Cromarty group are known, though the actual siting only a little above sea-level on the coast is unusual in this group. However, within a few miles are three sites only a little further inland, two probably and one certainly chambered, at Embo Street, Camore Wood and Evelix.¹

The Orkney-Cromarty group of chambered tombs has been described recently² and it will be seen that the plans of the chambers at Embo are similar to many in the southern part of the group in Ross-shire and Sutherland. All the architectural features at Embo can be paralleled among mainland Orkney-Cromarty tombs, as can the filling of the chambers, the depositing of animal bones with and above the burials, the appearance of beaker sherds with the collective burials, and the secondary use of the site for Food-Vessel burials and Middle Bronze Age cremations. It remains to comment on one or two unusual pieces of evidence which emerged in the Embo excavation.

Firstly there are fairly clear data on the successive stages in the building and

¹ *R.C.A.M.* (Sutherland), 48, 49-50, Nos. 137, 141, 143.

² Henshall, A. S., *The Chambered Tombs of Scotland*, 1 (1963).

use of the tomb. It can be seen that Chamber I and the cairn were built in two stages. The uprights of the chamber and antechamber, the walling between them, and the carefully laid lower stone layer of the cairn with dark soil between are strictly contemporary. The dark soil which had been brought from a marshy place may have been a capping over the structure at this stage, but it is more likely the stones were deliberately set in it, perhaps to give greater stability to the structure. The change to the upper layer in the cairn coincides with the placing of the lower corbel-stones. The upper part of the cairn was probably built of stones set in sand (see pp. 17, 28) rather than as a cairn of stones only. The reason for this change is not clear, but the first act of the second stage was the deposition of animal and human bones round the outside of the chamber.

A change from black gravelly soil to sand and stones was also found in the chamber, the materials being indistinguishable from those of the cairn except that the gravelly soil contained no laid stones. At first it was tempting to regard the black layer in the chamber and cairn as contemporary, and earlier than the stone and sand-layer above in both places. From this it would follow that the lowest burials in the chamber were deposited when the chamber was half-built, the black infilling being a protective covering for them. But the passage was completely blocked with stones set in the same dark gravel, and this blocking could not have been in place until after the upper layer of bones had been put in the (presumably complete) chamber. So it seems probable that the black infilling in the chamber was not placed there until after the chamber and cairn were complete. The black soil of the cairn and chamber, and also presumably of the passage blocking, came from the same or similar marshy source (see Appendix III).

The evidence suggests the following order of events. (1) Chamber I and its cairn were completely built, perhaps with a pause during construction (probably Chamber II being added to the plan at the end of the first phase of construction). (2) The first burials were deposited on the gravel floor of Chamber I. They comprised at least three adults, a child and an infant. The bones found in 1960 were pressed into the floor, but probably a quantity in good condition were found on the floor in 1956 as well as the skull in the antechamber in 1960. (3) The infilling was dumped on the chamber floor to a depth of about 1 ft., thinning away in the antechamber towards the passage. (4) The second group of burials was brought into the chamber and placed on top of the infilling. They comprised at least three adults, one adolescent, four children and two infants. The very incomplete evidence from Chamber II shows only one burial above a shallow filling. (5) The passage and antechamber of I were carefully blocked with large slabs, set in dark gravel, which in the antechamber overlay a thin layer of stoneless gravel representing the chamber filling of stage 3. Outside the entrance the blocking stones had blown sand in their interstices. (6) Sand percolated into the chamber from the upper part of the cairn and enveloped the bones. (7) The top of the chamber was dismantled. Perhaps when opened the upper part was still empty, but the sand-layer with burials was disturbed by the erection of a short cist for a Food-Vessel burial. A considerable time-gap before this happened is implied by the amount of sand percolated through

the cairn and into the chamber. (8) The hollow above the cist was filled in with stones and sand indistinguishable from that of the cairn itself. About the same time as (7) and (8) another cist was inserted in the centre of the cairn to receive two infants, a food-vessel and sherds of a beaker and it was probably at this time that the upper part of Chamber II was dismantled. (9) The cairn was used for about nine cremations, two certainly of the Middle Bronze Age, Chamber II then being ruinous.

There is no direct evidence whether the burial layers in Chamber I were made as one deposit or successively, or whether the bodies arrived articulated or as skeletons, for both layers had been disturbed before they were sealed. However the condition of the burials is reminiscent of the conditions found in the tomb at West Kennet in Wiltshire, where the evidence was much fuller.¹ The fact that the small bones of hands and feet were present in quantity indicates that the bodies were whole when laid in the tombs. But the incompleteness of the skeletons suggests that certain bones (at Embo especially long bones) were deliberately removed from the chamber some time between the first burial and the sealing of the burial layer. At Embo the fragmentary state of many bones, especially long bones, suggests much disturbance and trampling, probably on many visits to the tomb before each layer was sealed.

The second burial phase on the chamber filling seems unusual for one would expect the infilling to be the last act in sealing the tomb and to be continuous with the passage blocking. At many Caithness tombs inhumations were found lying on a layer of dark earth and charcoal which might be up to 1 ft. 6 in. deep. However this layer, unlike the filling at Embo, contained artifacts and many bones, generally burnt. There was some suggestion that there may have been an initial deposit of unburnt bones on the chamber floor in a few Caithness chambers.²

The small deposits of human and animal bones beneath the corbel-stones round the outside of Chamber I are without parallel as far as we are aware. They are presumably some sort of dedicatory deposit, perhaps brought from another tomb in the district.

Sherds of beakers were found with the upper burial layer in Chamber I and probably belong to the period of these burials, but they could have arrived during the disturbance for the cist. The lower burial layer had no artifacts.

The animal bones found in the upper part of the cairn and the upper part of Chamber I have already been discussed. A few animal bones were found with the lower burial layer, and these must be associated with the burials. It is probable that some of the animal bones in the upper burial layer were also deposited with the burials. The deposition of animal bones with the interments has been recognised since excavation started on the Caithness cairns in the middle of last century, and since then at other chambered tombs. The strange thing about the bones at Embo is the big number of different species represented, with a relatively small number of bones of each.

¹ Piggott, S., *The West Kennet Long Barrow* (1962), 67-68.

² Henshall, A. S., *The Chambered Tombs of Scotland*, 1 (1963), 88-89.

The two infant burials in Cist II are interesting. It is certain that they did not accompany an adult burial. It is also very difficult to argue that they are not contemporary for it is extremely unlikely that the cist was reopened, yet they were accompanied by a whole food-vessel and a few sherds of a corded beaker.

APPENDIX I

The Finds (fig. 6)

(now in the National Museum of Antiquities, Edinburgh)

1. Five sherds of a beaker, of hard, well fired, black to grey ware, with fairly small granite grits. It tends to break along the joints of the ring building. It is neatly decorated with fine comb impressions. The internal rim diameter is about 4 in. The rim edge is flat with a series of faint transverse impressions. The profile is very gently curved. On the neck are two bands of lattice with three horizontal lines above, between and below. There were similar bands on the body of the vessel. One sherd was found in 1956, the others were found in both disturbed and undisturbed sand in Chamber I on the E. side of Cist I. (EQ 612)

2. Sherd of a beaker, of a gritty fabric, bright pink-buff outside, dull buff inside, with a dark grey core. For a beaker this is rather thick ware and from an unusually large vessel. There remains only a relatively heavy cordon, presumably from just below the lip, with horizontal rows of comb impressions below. The teeth of the implement are rather wide-set and the indentations almost circular. From disturbed sand beside Cist I. (EQ 632)

3. Rim, wall and base sherds of a beaker, hard buff ware with darker core, including some relatively large grits. The rim is narrowed to a thin edge. From 0.7 in. below the lip there are horizontal lines of cord impressions. The base diameter is 2.5 in. The base portion was found in three pieces. From Cist II. (EQ 633)

4. Food-vessel, of coarse friable ware with a brown slip outside and dark grey core. It is badly cracked and warped. It is decorated all over with string impressions. On the internal bevel of the rim are four concentric lines of impressions. Outside, the vessel is divided into three zones by mouldings. The two main bands of decoration are loose chevrons or waves, and horizontal lines fill the top, centre and bottom. The vessel is 4.6 in. high, 4.1 in. across the rim, and 2.1 in. across the base. From Cist I, found in 1956. (EQ 611)

5. Sherds of a food-vessel, intact when buried, but of such friable fabric that it was reduced to crumbs except for small portions of the rim. It measured about 8 in. across the rim, and about 8 in. high. Decorated lines of coarse comb impressions, three round the rim bevel, slanting lines on the inner edge, nicks on the outer edge, horizontal lines below the rim outside with a band of large triangular jabs below. From Cist II. (EQ 634)

6. Knife of pale grey flint, 2 by 1 in., made from a flake with one edge fairly steeply worked on one face, and the upper part of the other edge slightly retouched to form a point. Found in 1956, either from Cist I or Chamber I. (EQ 613)

7. Two barrel-shaped and fourteen disc jet beads. The former are highly polished and worn. The disc beads vary from 7 to 8 mm. in diameter, and the holes vary somewhat in size, one having a bevel on one face; the thickness of the beads varies from 1 mm. to 3.5 mm., and not all the faces are cut parallel. Found in 1956 in Cist I, and in 1960 in disturbed material outside the chamber. (EQ 614, 631, 615)

8. About half a bronze razor, found in fragments with cremation II. See Appendix II (EQ 635).

9. Central portion of a bronze blade, probably part of a razor of the common type, Class I. The fragment is 0.95 in. wide, retaining the original edges, and 0.9 in. long. It has probably been burnt. Found in 1961, with one of the cremations exposed when clearing cairn material.

10. Flat whorl of red sandstone, diameter 1.6 in., 0.5 in. deep. Unstratified in the cairn material.

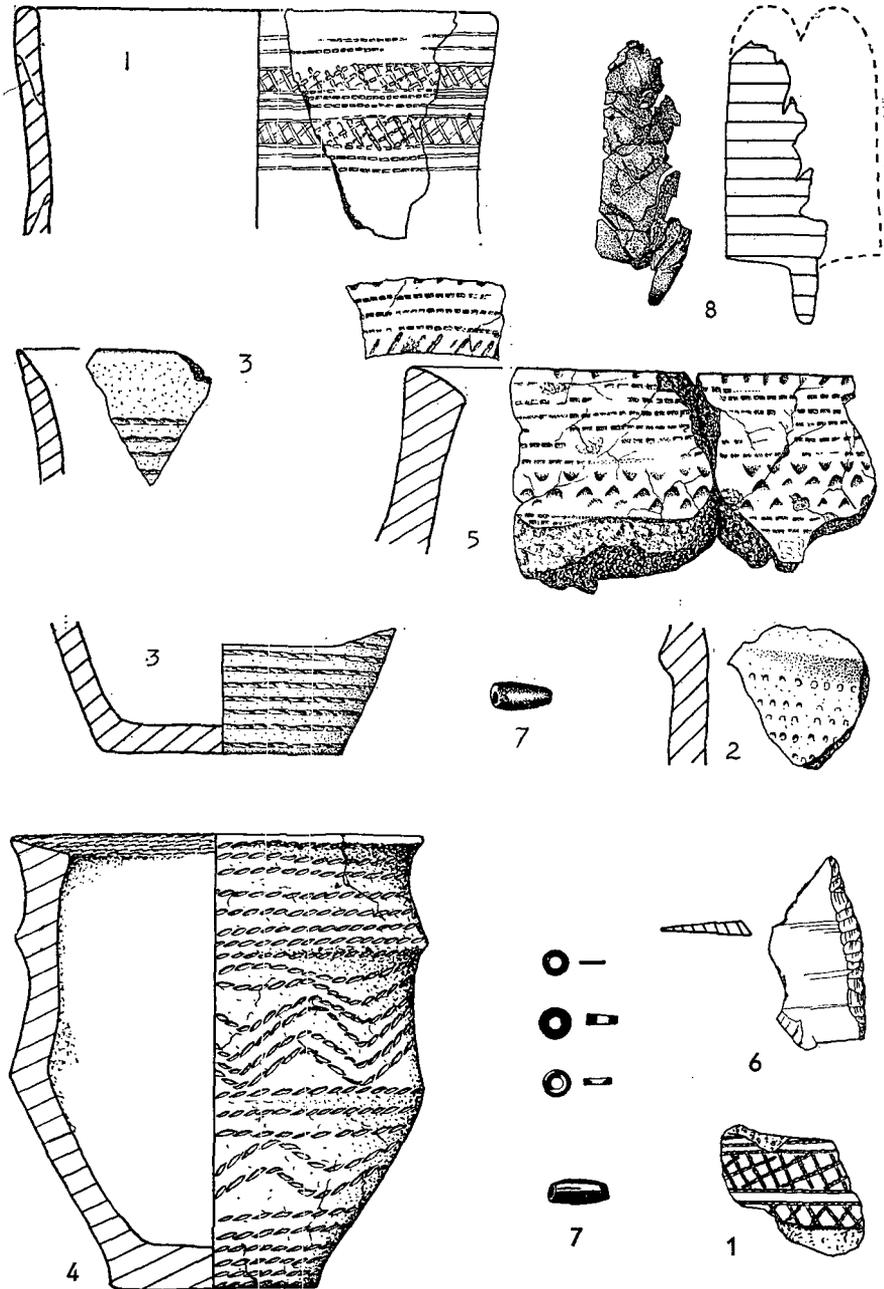


FIG. 6. Finds including (1, 4, 6 and 7) those found in Cist I during the 1956 excavation

We are very grateful to the experts in various fields, who have written the appendices which follow, for the time, trouble and patience which they have spent on the specimens we submitted and the questions we asked.

APPENDIX II

The Razor (fig. 6, 8)

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The fragments of bronze found with burnt bones in the cairn at Embo, Sutherland, appear to have belonged to a razor.¹ This in itself would not be of more than passing interest if the razor was of the common leaf-bladed tanged type that clearly belongs to the Middle Bronze Age.² Approximately three dozen of these are known from Scotland, nearly all in association with Middle Bronze Cinerary Urns.³ But the razor from Embo does not belong to this early group (Mrs Piggott's Class I) but is a member of her Class II, also called maple-leaf or bifid razors. Mrs Piggott defined her two main classes as follows:

CLASS I. The characteristics of this class are a long oval or rounded blade with a very slight midrib, and more generally none at all. Nearly all of these blades have had a tang, often with a hole at the end, while in late examples the tang disappears, and the hole is pierced through the lower part of the blade. This class tends to have a much narrower blade than those of Class II. A group from Scotland and Ireland has incised lozenge decoration down the centre of the blade. Found with cremations, but not recorded from hoards.

CLASS II. The bifid type is characterised by a deep notch at the top of the blade, and frequently a round hole is pierced through the blade below the notch. There is often a pronounced midrib, sometimes roughly decorated, and the tang is never pierced. Generally found in hoards.⁴

The Embo razor as pieced together is 2½ in. long, but its original length was more nearly 3¼ in. and its width may have been somewhere around 1½ in. It has a short tang without perforation, and the blade is clearly not oval or rounded but had more or less straight sides. At the top it seems to have had a notch, but this is not certain. However, the reconstruction is thought to be not far removed from the original. These characteristics show clearly that this razor belongs to Mrs Piggott's Class II, notwithstanding its association with a cremation rather than with a hoard. Professor Hawkes has recently subdivided Class II razors; his IIA has an even upward curving or slight angulation, obtuse, from the top of the tang into the blade proper. Class IIB razors have the division between tang and blade base sharply marked, the edge of the blade forming an acute angle with the tang, then turning sharply upwards to complete the bifid outline.⁵ Hawkes suggests that IIA dates from his Late Bronze I, while IIB is not pre-Late Bronze 2, not previous to the mid-eighth century B.C.⁶ The Embo razor as reconstructed clearly belongs to Class IIA, with its obtuse angle between tang and blade.

Class II razors as a group are a west European type, with a probable origin in coastal French industries of the late second millennium B.C. Childe points to razors, close in form to the British types, from the Ariège and Charente,⁷ and Sandars mentions other notched razors dated to Tumulus Bronze or very early Urnfield France.⁸ The distribution of Class II razors in western France has been

¹ Based on the careful reconstruction by Miss Henshall. I am indebted to her for much assistance in the preparation of this note.

² *University of London Institute of Archaeology, Annual Report* (1955), 20-52.

³ *P.P.S.*, XII (1946), 121-41. In this paper dated to the Late Bronze Age, but more recent work has amended this.

⁴ *ibid.*, 121.

⁵ e.g. *ibid.*, fig. 7, 50 and 75 respectively.

⁶ Council for British Archaeology Conference on Problems of the British Bronze Age, 1960; report in *Ant.*, xxxv (1961), 63-66.

⁷ Childe, V. G., *The Bronze Age* (1930), 100.

⁸ Sandars, N. K., *Bronze Age Cultures in France* (1957), 144, 146-7; Class IIA from Pouges-les-Eaux, Nièvre.

plotted by Savory, and their coastal spread and early associations suggest that the diffusion of the type began in early Urnfield times although the form persisted in France for some time, to become incorporated in carp's-tongue hoards such as Vénat and St Grégoire.¹ The earlier spread into Britain, however, is shown by the associations noted below, and by the examples of hybrid Class I (local Middle Bronze varieties) – Class II razors, such as occur in the Taunton Workhouse, Somerset, hoard.² Most of the developed Class II razors in Britain date by association to the late eighth-seventh centuries B.C., as at Heathery Burn, Co. Durham³ and Feltwell Fen, Norfolk,⁴ but an earlier date for the bifid razor is suggested by the Cassabile, Sicily, example which Childe thought was the forerunner of the British series.⁵ Hencken, however, pointed out that this tenth-ninth century razor must have been imported into Sicily, as it is unique in the island.⁶ British bifid razors, therefore, probably were being produced by this time. A still earlier date is provided by the Class II razor found in the primary silting of the Deverel-Rimbury enclosure at South Lodge Camp, Dorset, and another in association with a ribbed bracelet typical of southern England's 'Ornament Horizon' points to a late second millennium date.⁷ The normal British Class II razor then seems to have been developed at latest by the eleventh century B.C., probably earlier, and its use extends well into the first millennium B.C.; these should be the limiting dates for the Embo razor.

Of the dozen or so Class II razors from Scotland, there are only two that seem to bear some close resemblance to the Embo example. These both come from the Glentrool, Kirkcudbrightshire, hoard.⁸ Neither of these has a notch at the top of the blade nor have they a perforation. The angle at tang and blade base is slightly more than 90 degrees, very like the Embo blade in this regard. Glentrool with its imported objects points to a date around the twelfth century for the Embo razor.⁹ And a find from Laughton's Knowe, Holm parish, Orkney supports this. A cremation burial in a cinerary urn within a stone cist, probably secondary, in a mound was accompanied by a bronze blade.¹⁰ This is small, 3 in. long, with a fairly broad tang and rather more angular-shaped blade than the normal Class I razors have; the junction of tang and blade is more abrupt than on typical Class I razors, and the midrib and width of blade both point to Class II. If it is a hybrid type, it must date to a time late in the Middle Bronze Age, perhaps sometime near Glentrool's twelfth century. The Embo razor, through its typological connections with the Glentrool razors, and its association with a cremation as at Laughton's Knowe, was probably deposited sometime around the twelfth-eleventh century B.C.

APPENDIX III

Examination of Soil Samples

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ORIGIN OF SAMPLES

Samples submitted comprised:

A. Black material from western edge of cairn, Munsell notation and colour name (dry soil)
10 YR 2/1, black, described as contrasting sharply with sand which overlay it.

B. Dark filling from lower part of Chamber I, 10 YR 2/2, very dark brown.

C, D and E a vertical series from the cairn, slightly east of Chamber I.

¹ *P.P.S.*, xiv (1948), 165, fig. 5, list 171.

² *Arch.*, liv (1894), 87-114.

³ Childe, V. G., *op. cit.*, 99, fig. 12, 9.

⁴ *ibid.*, xxv (1959), 158.

⁵ *ibid.*, xciii (1959-60), 18, 113.

⁶ *ibid.*, lxxxv (1946-7), 173, Pl. XX:2; at present on loan to the National Museum, L.1947.3.

⁷ *Inventaria Archaeologica*, GB 43.

⁸ *Inventaria Archaeologica*, GB 35.

⁹ *P.P.S.*, xxi (1955), 160-2.

¹⁰ *P.S.A.S.*, lv (1920-1), 29-37.

C. Sand, 5 YR 3.5/3, reddish brown to dark reddish brown, not very light coloured in an absolute sense but light and clean looking compared with lower layers. From between boulders.

D. Intermediate in appearance, as in position, between C and E. 10 YR 3/3, dark brown.

E. Dark material, 10 YR 2/2, i.e. like B, actually a little darker. From interstices of slabs.

OBJECTIVES OF INVESTIGATION AND PRINCIPAL CONCLUSIONS

The first question was as follows: Is the contrast between the upper light and lower dark layers due wholly or materially to podzolisation, i.e. natural leaching and re-deposition? This was answered negatively. The following question remained: The upper layer being apparently the local sand (whether blown or placed on the cairn), what is the nature and origin of the dark material?

Sample A was found to be sand mixed with charcoal. B and E appear to have been a surface soil derived largely from sand but in part from gravel. Evidence will be presented that it came from a marshy place.

MINERAL COMPOSITION AND PARTICLE SIZE ANALYSIS

(cf. columns ii, iv, v and vi of table)

Samples were passed through half-inch mesh, which retained nothing except one piece of sandstone from sample A, then through a sieve with 2 mm. round holes, the fraction retained (gravel) being weighed and examined. From A it was mainly sandstone fragments, from the others rolled pieces of sandstone together with small pebbles of quartzite. Disintegration of cairn stones is not considered to have added appreciably to the gravel content, which differentiates B and E on the one hand from A and C on the other with D in an intermediate position.

Since the gravel content of samples of this size (c. 250–500 g.) is liable to be affected by accidents of sampling, the 'very coarse sand' (2 mm.–1 mm. diameter) was isolated by sifting, followed by weighing of a washed and dried aliquot. This analysis classified the samples in the same order as the above.

The fine earth (<2 mm.) of all samples was found by inspection to be mainly quartz of the coarse sand and fine sand grades. This observation was extended by a determination of coarse sand content in two cases. B and E were however more 'dirty' than C when moistened and probably contain the silt grade to a significantly larger extent than the others.

All samples were alkaline, pH 8.05–8.1 (soil : water = 1 : 2.5) and were found to contain shell sand, which is not a major constituent (table, col. vi) but has an important bearing on soil properties and in particular on the preservation of bone.

ORGANIC MATTER AND INCLUSIONS OF ORGANIC ORIGIN

(cf. columns iii, vii and viii of table)

Sample A is a special case in which charcoal contributes to the apparent organic matter. None of the soils is highly organic but B and E are more so than C and D, and the difference is likely to have been greater originally.

Grass opals and microscopic organic matter. Grass opals are microscopic particles of hydrated silica, of varied and characteristic forms, present in large numbers in grasses and in the surface soil of pastures. An illustrated description has been given by F. Smithson¹. They have been found by the present writer in archaeological deposits not acid enough to preserve pollen.

Preparations containing particles of the proper size were prepared by dispersion and sedimentation from soil samples B and C. Both contained grass opals, but in each they were small in numbers and limited in variety (plain rods and a few ornamented rods) often with roughened surfaces which may be due to alkaline etching or perhaps to abrasion. It is of interest to find that they have survived under distinctly alkaline conditions for some four millennia. Had B been turf this test would be expected to differentiate it from the sand.

During the above examination it was noted that the quartz grains in C (after action of hydrogen peroxide and dilute hydrochloric acid) were all clean but some of those in B had a dark brown to

¹ *J. Soil Sci.*, 9 (1958), 148–54.

black coating that had survived the action of the chemicals. B contained furthermore some dark wholly organic bodies which were plant material, probably cuticle, though hard to identify owing to their poor transparency.

Charcoal. Only A contained carbonised material larger than 1 mm. This included (in a total sample of 360 g.) two berries of *Vaccinium myrtillus* (the bilberry) or allied species, 0.7 g. of carbonised fine to very fine twigs suggestive of the same plant, and 1.6 g. of amorphous carbon particles which did not look like wood charcoal. Fine carbon was also dispersed through this sample.

Bones. Small bones numbering 389 and having an average weight of 2.1 mg. were collected during the sifting. Though commonest in the dark layers (table, col. iii) they were comparably numerous in C, the clean sand. In A they were calcined or blackened, and difficult to recover. Although often broken the bones are generally recognisable as pertaining to very small animals. They are not crumbled bone of man or domestic animals nor the remains of human meals. No attempt to identify the whole has been made, but fish vertebrae are numerous in B and occasional in others except D, although land forms are also recognisable, e.g. by a mouse incisor from C.

The minute size of all bones at first suggested wind transport from the seashore as the explanation of the aquatic component, but other calcareous littoral or dune sands seen by me are free from bones, and the state of affairs in sample B in particular seems to require another explanation, such as is suggested below.

DISCUSSION AND CONCLUSIONS

Podzolisation is typically a phenomenon of acid soils. There are other indications that it is not responsible for the differentiation of horizons in the present instance. These are the differences in gravel content and the presence of raw humus particles in the dark layer (demonstrated in B and to be assumed in the closely similar E). Sample A belongs to the sandy group and not to the gravelly group but its dark colour, due to charcoal, is not evidence for podzolisation. In addition to its stones the cairn thus incorporates sandy or earthy material of two types.

Dark materials from the chamber (B) and the lower cairn interstices (E) are closely similar. The mixture of sand and gravel found in them would arise in a patch of soil formed from blown sand plus the local gravel, cf. the terrace on which the cairn stands. Reasons have been given for thinking that the material brought to the cairn was not turf, and the organic content requires some other explanation. General dark staining with retarded decomposition of plant residues is not normal in open sandy soils under ordinary conditions but it is a feature of waterlogged soils. If the cairn builders took soil from a marsh, perhaps at a time when it was relatively dry (this open soil would drain quickly) one may understand the presence both of the plant residues and the fish bones. The few such bones in C and A could have been moved a short distance by the wind.

At intermediate levels (sample D) there has been some mixing of upper and lower deposits such as might happen through percolation of sand into incompletely filled spaces, aided by soil fauna and perhaps by disturbances of the cairn.

A tentative reconstruction of occurrences to which this appendix is relevant, based on the above findings together with the excavation report, is as follows.

1. In a first phase of cairn building slabs were used together with dark gritty earth from a wet environment. The earth may have been placed on the stone structure through which it then percolated, but the simplest interpretation of the surviving evidence is that the slabs were set in dark earth as also (later) were blocking slabs in the antechamber and passage.
2. In the upper construction of the cairn boulders were used. Brown sand on and within the cairn could have blown there at any time, but the balance of evidence is that some was placed there during the building (cf. excavation report, p. 17). Unless it were afterwards cleaned out, no considerable blown sand deposit entered the chamber, antechamber and inner passage before they were roofed.
3. Dark gritty material from the same source as before was placed on the floor of Chamber I.
4. The same material was used on a third occasion for incorporation in the blocking.
5. At an unknown date bilberry shrubs with fruit were burned on the sand at the western edge of the cairn. Sand buried the site of the fire.

I thank Miss A. S. Henshall for the opportunity to work on this project. Acknowledgment is also made to Mr D. Martin for confirming the botanical identification and to Mr E. Paterson for help with analyses.

TABLE
SHOWING RESULTS OF LABORATORY TESTS

(i) Sample	(ii) Gravel % of whole sample	(iii) Bones No. per 100 g. fine earth	Analysis of fine earth as % of oven-dry material				
			(iv) Very Coarse Sand 2 to 1 mm.	(v) Coarse Sand 2 to 0.2 mm.	(vi) Calcium Carbonate	(vii) Loss on Ignition	(viii) Organic Matter
A. Sand with charcoal	1.5	1.7	1.65	—	—	5.74	3.98
C. Brown sand	2.3	30.3	1.85	45.7	0.74	2.24	0.98
D. Intermediate layer	8.8	8.3	6.03	—	—	3.40	1.30
E. Dark cairn material	22.5	39.7	7.49	—	—	4.50	2.30
B. Dark chamber filling	13.1	54.7	9.60	57.4	2.97	4.56	2.14

(v) Shell sand not included.

(vi) From Ca content of HCl extract.

(vii) Method of Walkley and Black. Overestimates O.M. in sample A.

APPENDIX IV

The Human Bones

(now in the Department of Anatomy, Edinburgh University)

by R. G. INKSTER, M.A., M.D.
Late Reader in Anatomy, Edinburgh University

Besides the bones detailed below there were also many very small fragments. Bones found in 1956 and already listed in *P.S.A.S.*, xv, are indicated by a dagger†. ¹

CHAMBER I, LOWER LAYER

(a) *Adult probably over 30 years old.* Reconstructed skull,† very broken, with very well worn teeth. From the chamber.

(b) *Adult.* Fragments of skull including R. and L. rami of mandible with roots of second R. lower molar and pieces of maxilla with tooth sockets. The L. side of the upper jaw shows what has been an abscess in the region of the root of the L. lateral incisor which had been lost during life. From the chamber.

Other adult bones. Pieces of an ulna which measures 23 to 24 cm. in length which, given normally proportioned limbs would yield a calculated height of 5 ft. 3 in. to 5 ft. 4 in.; second R. metacarpal 2 first phalanges; second phalanx; cuboid; pieces of tibia; patella; one thoracic and one cervical vertebra and pieces of other vertebrae; R. scapula†; L. clavicle†; ankle bone† (the last three from a

¹ My thanks are due to David Adams, B.D.S., B.Sc., lecturer in the Department of Anatomy, for his advice on the teeth.

small adult). All from the chamber. Also R. maxilla; fragment of skull vault; fragments of ribs and limb bone shafts. Teeth from a person over 20 years old: upper L. and R. central incisors; first upper L. premolar. From the antechamber.

(c) *Child 10-11 years old.* Most of the vault of a skull was present and was built up to a considerable extent from loose pieces. The vault showed the coronal and lambdoid sutures to be completely open as were all the other sutures available except the sagittal suture which was found to be completely fused. This anomaly led to some doubt as to the age but, in the reconstruction of the side and base of the skull, the sphenoccipital synchondrosis is sufficiently wide open to indicate an age of well below 18 years, and in the maxillae which could also be fitted in place were teeth indicating an age of not less than $9\frac{1}{2}$ years and probably 10 or 11 years.

The bones of the vault agree with this estimate in that they are thin and the type of skull is female. The question of sex is, however, very doubtful in view of the age. Similarly the length (max. 174 mm.; nasion-inion 171 mm.) and breadth (max. interparietal 135 mm.) give a mesaticephalic index but growth might well alter this, especially in view of the fused sagittal suture.

Loose teeth probably belonging to this skull: second upper L. deciduous molar; first and second upper L. premolars (the stage of development is reversed from the normal if they are from one skeleton, the first premolar indicating an age of 9-10 years, the second premolar indicating an age of 10-11 years in terms of growth, but a missing tooth in the lower jaw might account for this); second R. milk molar; second R. upper premolar crown; developing lower L. second molar; upper R. lateral incisor; crown of second R. upper molar, unworn (uncertain whether it had erupted or not, must have come from a child between 8 and 12 years old); upper L. lateral incisor; deciduous R. second upper molar showing complete resorption of its roots. Other bones: fragment of young scapula; piece of rib. All the bones and teeth of this child are from the antechamber.

(d) *Infant about the newborn stage.* Fragments of limb bones and skull. From the antechamber.

Bones almost certainly from the lowest layer of the chamber and antechamber found in 1956, recovered from the cist in 1960. These bones to which black soil still adhered are attributed to the lowest layer. Presumably they mainly belong to (a), (b) and (c) above, but there is no conclusive evidence that this is so. These bones may be grouped as follows:

(e) *Adult between 25 and 40 years old.* Skull, represented by parts of an upper jaw and some teeth, six pieces of vault and most of a frontal bone. These are all rather thick (5 to 8 mm.) and include a fragment of parietal bone which shows part of the lambdoid suture with fusion of the inner table only. This would indicate an age of over 26 years, almost certainly under 40 years. The thickness suggests that the age is in the lower half of the bracket. One piece of upper jaw is from the L. side with first and second permanent molars *in situ*. The first molar shows marked wear, the second shows some wear, and part of the socket for a third molar is present. The third molar socket indicates an age of 25 years, and the amount of wear on the second molar indicates that the owner was probably over 30 years old, except that some allowance may be made for the excessive wear caused by rough food.

Other adult bones. At least 5 vertebrae from lumbar, thoracic and cervical regions; a few small pieces of shafts of long bones; metacarpal; first phalanx; 2 second phalanges; L. calcaneum; head of first metatarsal; L. fourth metatarsal; acromion process with part of spine of a L. scapula indicating an age of 25 years or more since the epiphysis has completely fused.

(f) *Child of 10-13 years old.* R. and L. rami of lower jaw, which the appearance of the lower molar socket on the R. side which may not have been erupted suggests these are from a child about 13 years of age. However, the rami fit well with the maxilla of skull c. Also fragments of bones in a good state of preservation: R. femur with epiphysis missing and lower part of similar L. bone; upper end L. humerus; fragments of tibia; three pieces representing most of R. half of pelvis, the conjoined ramus of pubis and ischium have completely joined and the lines of fusion in the acetabulum are completely open, again indicating an age of about 10 years.

CHAMBER I, UPPER LAYER

Includes bones found in 1956 and recovered from the cist in 1960, not having black soil adhering

and therefore assumed to come from the upper layers. In some cases they match well with bones certainly from this layer (e.g. the two parts of pelvis of *(m)*). In the list below the disturbed bones are marked with a star *.

(g) Adult. Nine fragments of skull vault which are unduly thick, as much as 11 mm. in the vicinity of the R. parietal eminence. The sagittal suture has closed on the inner surface but is visible on the exterior, suggesting an age of over 30, but the excessive thickness casts doubt on the normality.

(h) Adult of about 30 years old. Partially reconstructed skull vault and two temporal bones. The pieces of vault are relatively thin (3 to 6 mm.) and represent a well formed cranium which, however, could not be measured. The coronal suture has fused on the inner surface; the sagittal suture is almost completely closed on the external surface as well as the inner surface. This suggests an age of about 30 years.

(i) Seven fragments of skull, three making up a rather thick piece of posterior edge of a R. parietal bone.* These were among the disturbed bones and may be part of *(e)*.

Other adult bones. Upper part R. ramus of mandible with condyle and coronoid process; upper end and part of the shaft of a large adult male R. femur with strong markings (the head is damaged but has had a diameter in the region of 50 mm.); also parts of the shaft of a tibia of similar build; female L. innominate bone†; L. radius†; almost complete ulna, length approx. 24 to 25 cm. yielding a calculated height of 5 ft. 5 in. to 5 ft. 6 in.; piece of fibula; fragments of R. and L. scapulae; L. calcaneum; 2 first phalanges of big toe; metacarpals of thumb and middle finger; R. fifth metacarpal; pieces of three other metacarpals*; terminal phalanx; second phalanx; piece of shaft of L. radius*; 2 cervical vertebrae*; most of humerus.* Teeth: first upper R. molar; lower premolar*; lower canine; upper R. central incisor.

(j) Adolescent between 15 and 20 years. Lower first permanent molar with slight wear; most of L. ulna with upper epiphysis incompletely fused (14 to 15 years if female, 18 to 19 if male)*; upper part of radius with epiphysis of the head missing.

(k) Child about 10 years old, or somewhat older. Part of shaft of a small tibia.

(l) Child of about 10 years. Piece of tibia; shaft of L. femur slightly larger than that included under *(f)*.

(m) Child of about 10 years. Part of L. femur,† slightly larger than that of *(l)*. Also bones of child of 12 years old or less, possibly belonging to *k*, *l* or *m*: a few ribs*; R.* and L. parts of pelvis; upper R. second premolar*; piece of scapula.*

(n) Child 5 years old or slightly less. Upper part of a humerus; ramus and R. half of mandible with a developing wisdom tooth.†

(o) Infant about the newborn stage. Petrous temporal bone; part of R. frontal bone; a few pieces of long bones; clavicle; upper part of tibia.

Bones found in disturbed material over and immediately outside the top of the chamber, probably derived from the upper layer in the chamber.

(p) Adult. Fragments of skull including frontal bone. Fragments of the R. half of the body and chin of a lower jaw,† fitting together, edentulous in molar and premolar regions. A large R. lower molar thought to come from the lowest layer in the chamber (among the bones found in Cist I in 1960) fits a socket in this jaw, and an incisor listed under *(b)*, certainly from the floor of the antechamber, appears to fit another socket. There is therefore some doubt as to the level to which the jaw belongs. Third metacarpal; most of fifth metacarpal; 2 phalanges; L. scaphoid; piece of shaft of ulna; fragments of limb bones; upper L. incisor, well worn with edge to edge bite, probably from skeleton over 30 years old; canine tooth. Also cervical and thoracic vertebrae†; rib fragments†; 2 fragments of L. innominate bone†; top and bottom ends of male R. femur†; shaft of L. femur†; L. and R. tibiae† both reconstructed to give an approximate length slightly over 342 mm., probably 346 mm. originally, which would give a calculated height of 5 ft. 3 in. if male or 5 ft. 1½ in. if female; additional shaft of R. femur†; R. heel bone†; shaft and lower end of R. humerus†; lower end of shaft of L. humerus†; a mass of fragments of long bones.

(q) Adolescent, about 15 years old. Part of L. side of mandible with wisdom tooth unerupted; fragment of R. side of mandible with lower first molar. Probably belonging to *(j)*.

(r) Child of about 10 years old. Head and adjacent part of scapula, the coracoid process missing

(unjoined). Parts of radius† and humerus,† ankle bone† and heel bone.† Probably belonging to (k), (l) or (m).

(s) *Infants, foetal or newborn.* Pieces of skull; humerus†; 3 femora†; fragments of skull.† Some probably belonging to (o).

DEPOSITS OUTSIDE CHAMBER I

1. *Behind stone E*

(a) *Adult.* 9 almost complete hand bones: 2 thumb metacarpals; metacarpal of index finger; 4 first phalanges; 2 terminal phalanges; canine tooth.

(b) *Child about 10 years old.* Shaft and lower end of humerus, epiphysis missing.

(c) *Infant or foetus.* Pieces of skull vault.

2. *N. of stone D*

(a) *Adult.* 3 phalanges; spine of a vertebra.

(b) *Child between 3 and 4 years old.* Fragment from L. side of mandible, '6 year old' tooth unerupted and the second lower deciduous molar unworn; developing permanent central incisor; developing canine; lower first permanent molar; lower R. and L. first deciduous molars; lower L. second deciduous molar (see also deposit 3).

(c) *Infant a few months old.* Anterior part of L. frontal bone.

3. *1 ft. 6 in. behind stone B*

Adult. Lower L. second premolar; lower L. first molar.

Child about 4 years old. R. maxilla with first and second deciduous molars *in situ*. This closely matches the piece of mandible and teeth from child (b) found in deposit 2 above.

CHAMBER II

All the bones represent one adult, aged about 25 years old judging from the skull and teeth. L. temporal bone and fragments from skull, the thickness of vault 4 to 8 mm.; ramus of mandible; most of L. clavicle; pieces of radius and ulna; 4 carpal bones; pieces of metacarpals and phalanges. Six teeth: 3 lower R. premolars in series, the first shows moderate wear, the second is less worn, and the third is only slightly worn; the second lower R. and L. premolars show moderate wear; a lower R. premolar shows less wear than the others and may be from a separate skeleton but this is not conclusive.

CIST I†

(a) *Adult female.* Two pieces of L. and R. adult lower jaw with well worn teeth, and some loose teeth; L. and fragment of R. female innominate bone; piece of sacrum; fragments of vertebrae and ribs; fragments of tibia including the upper end of the L.; L. humerus shaft and upper end of R. humerus; parts of L. ulna; shaft of radius; upper end L. fibula and fragment of fibula; cuboid; patella. There were also pieces of three femora, one R. presumably being intrusive due to confusion at the time of the 1956 excavations. The L. femur was reconstructed to yield a length of approximately 428 mm., giving a calculated height for the individual of approximately 5 ft. 1½ in. if female (5 ft. 3 in. if male). There were fragments of the shafts of two R. femora.

(b) *Infant approximately at the time of birth.* Fragments of skull vault, and lower end of humerus. These pieces may be intrusive from the burials surrounding the cist.

CIST II

(a) *Child aged about 6 months.* Part of R. maxilla showing tooth sockets with evidence of the beginnings of root formation in one of the upper incisor sockets; crowns of R. first upper molar; L. and R. upper molars; L. and R. Upper canines; upper half of L. femur.

(b) *Infant about the time of birth.* Pieces of skull vault; shaft and lower end of a humerus (6 cm. long without the upper end, diameter 5 mm., very slender, possibly the result of malnutrition and matched by two known full term skeletons from an Egyptian collection).

SUMMARY

As both layers of burials in Chamber I had been disturbed before the excavation, it is not known whether all the bones which had been deposited in the chamber were recovered, but it is unlikely that any quantity were missing.

The bones of individuals of roughly the same age can seldom be distinguished unless there is a duplication of bones. The following summary therefore lists the minimum number of burials.

The bones from the first deposit in the chamber are consistent with the burial of three adults (two skulls were observed by J. W. Mackay in 1956), one child and an infant. The infant and child were placed in the antechamber; adult bones came from both the antechamber and the chamber itself. The bones from the upper deposit suggest the burial of three adults (a large male, and another male judging by the femora, and one female judging by the pelvis), an adolescent, three children of about 10 years old, one of about 5 years old and two infants about the newborn stage.

The adult human remains from the curious deposits round the chamber consist entirely of teeth and bones from hands and feet, with the exception of one piece of vertebra. A child of about 10 years old is represented only by the upper part of a humerus. One, or possibly two, children between 3 or 4 years old are represented by part of an upper jaw, part of a lower jaw, and by teeth (from two deposits). There are also pieces of skull from an infant of a few months, and an infant or foetus.

It is evident that in Chamber I the skeletons are incomplete (the items listed as pieces are mostly very small). It also seems unlikely that the bone has been lost by decay. In the upper levels the bone is very well preserved, and only the bones pressed into the floor of Chamber I are in a decayed condition. All the larger bones were broken. There was a preponderance of bones from the hands, feet, and wrists – the smaller bones which would tend to be left behind if bones were being moved. This incompleteness of the skeletal material is now an accepted feature of burials in chambered tombs.

The bones from Chamber II, which had been so greatly disturbed and robbed, appear to belong to one adult. The fact that all the bones come from the upper part of the skeleton suggests that the burial, though not found articulated, was less disturbed than those in Chamber I.

The burial in Cist I was an adult female. There may also have been an infant with her, but these remains may have come from the surrounding burials. There was evidently some confusion of bones during the 1956 excavations, for part of an extra femur was included among the bones. Cist II contained parts of a child of about six months and an infant. These had probably been articulated inhumations but the bone lying on the ground had mainly decayed and only the parts lying in the earth above could be recovered.

APPENDIX V

The Cremations

by F. P. LISOWSKI, PH.D., L.R.C.P.I., L.R.C.S.I., L.M.
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The human cremations were found among the stones of the cairn. They consist of three lots: Embo I, Embo II and Embo III. According to the archaeological report Embo I and II were undisturbed and their sites were 3 ft. apart. Embo III was situated 16 ft. away and had been disturbed. It was noticed that this cremation had been placed at the side of the neolithic chamber after the latter had been partly destroyed perhaps in the Early Bronze Age.

METHODS

The method of investigation follows that used on previous occasions by the author¹ and is based on the exhaustive work of Gejvall.² The cremated remains were in a fairly clean condition. Traces of charcoal were only found in Embo II.

¹ 'The cremations from Barclodiad y Gawres' in Powell, T. G. E., and Daniel, G. E., *Barclodiad y Gawres* (1956), 62-69, and *P.S.A.S.*, LXXXIX (1955-6), 83-90.

² *Fornvännen*, 1947, 39-47, and *Kungl. Vitterh. Hist. och Antikvit. Akad. Handl.*, 60, 2 (1948), 153-80.

The material was washed on a sieve of 2 mm. mesh¹ and then carefully dried. All foreign matter was removed. The cremated remains were sorted according to their skeletal origins, and the remainder of the fragments were grouped into unidentified long bones and miscellaneous unidentified osseous material. Actual reconstructions were impossible, only a few fragments could be glued together.

Finally an attempt was made at estimating the actual number of individuals cremated, their sex and their age. The number of cremated individuals can be estimated fairly accurately if certain skeletal parts are present. However, the diagnosis of sex is obviously only approximate and in the present series was practically impossible. Similarly, the individual age, which is usually assessed anatomically, was difficult to determine.

RESULTS

Embo I

General. Colour greyish-white. Elliptical cracks and distortions common. Fragments vary in length from 3 to 92 mm. The following could be identified.

Skull. Right and left petrous temporal fragments; the orbital margin of the right frontal bone with its zygomatic process; numerous fragments of the vault showing serrated sutural edges; several intersutural bones; parts of the maxillae with tooth sockets; a mandibular fragment of the body with smallish tooth sockets. (None of the sutures present showed signs of obliteration.) Fragments range from 3 to 55 mm. in length. *Teeth* Various incisors and roots of small molar teeth. *Vertebral column* Parts of vertebral bodies and articular processes, sacral fragments. *Ribs* A few shaft fragments. *Scapula* One fragment of the glenoid region. *Humerus* Parts of the shaft and lower end, up to 60 mm. in length. *Hand* One metacarpal and several phalangeal fragments. *Tibia* One piece of the lower end. *Various epiphyseal fragments.* *Long bone fragments* Numerous, up to 92 mm. in length. *Miscellaneous fragments* Numerous, ranging from 3 to 53 mm. in length.

Pathology. None.

Number of individuals. One.

Sex. ? Female. Sex difficult to determine owing to probable age.

Age. ? 15-17 years.

Embo II

General. Colour grey to grey-blue. Elliptical cracks and distortions common. Fragments vary in length from 3 to 75 mm. The following could be identified.

Skull. Petrous parts of the right and left temporal bones; a left zygomatic fragment; an occipital fragment showing the confluence of the sinuses; the orbital margin of the left frontal bone with the superciliary ridge and frontal air sinus; numerous fragments of the vault with serrated sutural edges; a maxillary piece with tooth sockets; part of the mandible. Fragments range from 3 to 65 mm. in length, some of them could be fitted together. *Teeth* Fragments of incisor, canine, premolar and molar teeth. *Vertebral column* Various vertebral fragments. *Ribs* A few shaft fragments. *Pelvis* Parts of the innominate bones. *Scapula* One fragment of the glenoid region. *Humerus* One shaft fragment (55 mm. long) and one from the lower end. *Ulna* Two shaft fragments. *Hand* A few metacarpal and phalangeal pieces. *Femur* Several shaft fragments showing the linea aspera and ranging from 25 to 75 mm. in length. Some of these could be fitted together. *Patella* Two pieces. *Tibia* One fragment of the shaft. *Foot* Metatarsal and distal phalangeal fragments. *Long bone fragments* Numerous, up to 75 mm. in length. *Miscellaneous fragments* Numerous, ranging from 3 to 37 mm. in length.

Pathology. None.

Number of individuals. One.

Sex. ? Male. Sex difficult to determine.

Age. ? 20-26 years.

¹ Atkinson, R. J. C., *Field Archaeology* (1953), 69-70.

Embo III

General. Colour yellowish-brown. Elliptical cracks and distortions. Fossilised and heavy. Fragments range from 3 to 60 mm. in length. The following could be identified.

Skull A few vault fragments, from 15 to 31 mm. in length. *Ribs* Two shaft pieces. *Femur* Two shaft fragments which show the *linea aspera*, 38 and 48 mm. in length. *Tibia* ? One piece of the shaft 37 mm. long. *Talus* One fragment of the trochlea region. *Long bone fragments* Several, ranging from 13 to 60 mm. in length. *Miscellaneous fragments* Several, varying from 3 to 35 mm. in length.

Pathology. None.

Number of individuals. ? One.

Sex. Unknown.

Age. Unknown.

Remarks. Fossilisation indicates that this cremation is probably older than either Embo I or Embo II.

CONCLUSIONS

As the amount of material available is not very large it is difficult to be precise. Certain facts however, can be established. Embo III, owing to its fossilisation, seems the oldest of the three cremations. Embo I is certainly the cremation of a young person by virtue of the separate epiphyses, the smaller mandible, the teeth and the open sutures. Embo I and II are definitely two different individuals. The petrous portions of the temporal bones and the differing thicknesses of comparable calcined bones indicate this. Nor has there been any mixing of the two cremations.

My sincere thanks are due to Miss A. S. Henshall for sending me the material and for giving me the necessary archaeological information.

APPENDIX VI

The Animal Bones

(now in the Department of Natural History, Royal Scottish Museum, Edinburgh)

by A. S. CLARKE, B.SC., PH.D.

Royal Scottish Museum, Edinburgh

CHAMBER I, LOWER LAYER

(1) In the main chamber: part of the pelvis of a bird, most nearly matches lapwing; bit of mollusc shell; fish (? cod) bones. Also probably from this level dog metapodial; bird bones, possibly young fulmar; limpet. (2) In the antechamber: bird vertebra; canine tooth probably of pole-cat; fish fin ray.

CHAMBER I, UPPER LAYER

(1) Found in discoloured sand and pressed into top of black chamber filling: phalanx, calcaneum and part humerus of pig; femur, in two pieces, of great auk, and another abraded femur probably of great auk; humerus of guillemot; opercular bone of gurnard; amphibian bones. (2) in sand round Cist I: left and right femurs, red squirrel; metatarsal of medium terrier (looks more recent); most of pelvis of dog; calcaneum and metacarpal of sheep, scapula, rather juvenile, possibly sheep, Shetland size; sternebra, small ox; part of sternum of capercaillie; left ulna of great auk; part skull of fulmar; fish and amphibian bones.

CHAMBER I, LEVEL UNCERTAIN

Bit of skull and proximal half right mandible of dog; heads of two humeri, duck sp., as large as domestic; tarso-metatarsus of duck sp., smaller than previous specimen; fish bones, probably a bit of gurnard and a bit of cod; land snail, *Helix* sp.; winkle; dog-whelk.

DEPOSITS ROUND OUTSIDE OF CHAMBER I

(1) Behind stone F: proximal end femur of great auk; humerus of guillemot (? or small great auk); humerus small duck sp.; sternum, ? duck sp.; 1 fish bone. (2) Between stones E and F, 3 ft. 10 in. below turf: canine tooth of dog showing peculiar wear as if opposing tooth malformed or bite distorted; pelvic girdle and left femur, shag or small cormorant; many small fish vertebrae. (3) Behind stone E: metatarsal of dog; proximal end tibia, distal end tibia of sheep; right femur, lacking proximal tip, of otter; caracoid, right tarso-metatarsal of great auk; right pelvis, anterior part sternum, part humerus and part radius of guillemot; distal tip left ulna and proximal third right mandible of gannet; fish and amphibian bones. (4) Behind stone D: tarso-metatarsus of grebe, ? red-necked; fish bone. (5) Behind stone B: juvenile bones, ? sheep; humerus and anterior sternum of guillemot; fish and amphibian bones.

FROM DISTURBED CAIRN MATERIAL OVER CHAMBER I (p. 17)

Part of skull, 2 bits of mandible, and last upper molar of dog, medium terrier size, also part mandible, tooth and atlas vertebra of dog, bit of rib, ? dog; incisor of horse; tooth, eroded mandible and phalanx of sheep; ox tooth; right tibia of otter: femur of *Turdus* sp., ? blackbird; humerus of starling; proximal half ulna, distal third ulna of smaller bird, distal end humerus of gannet; head of humerus, duck sp.; tarso-metatarsal, femur of razorbill; coracoid, ? of guillemot; tarso-metatarsus, humerus of guillemot or razorbill; amphibian and fish bones; dog-whelk; cockle; winkle, scallop, *Cyprina islandica*, mussel, piece of lobster claw.

In three places in the sand surrounding Cist I deposits of minute bones were noticed. These bone fragments were so small that they merely looked like sand of a slightly different texture until closely examined. The deposits were about the size of a cricket ball. When washed and sieved they appeared to be roughly one-third sand and the remainder nothing but small fish bones, indeterminate with the exception of one tooth plate of a Ballan wrasse. This seems to me a most curious circumstance, and the excavators have no explanation to offer.

APPENDIX VII

The Charcoal

Examined at the Royal Botanic Gardens, Kew

Unfortunately, owing to the small size of the pieces of charcoal and also because many of the diagnostic microscopical characters are obscure it is not possible to do more than make tentative suggestions concerning their identity.

Specimens from the floor of Chamber I

1. A conifer, probably Scots Pine (*Pinus sylvestris*)
2. Possibly hazel (*Corylus* sp.)
3. Possibly birch (*Betula* sp.)

Specimens from Cremation I

1. A few fragments of oak (*Quercus* sp.)
2. Hazel (*Corylus* sp.)
3. Beech (*Fagus* sp.)? This identification is by no means certain.
4. Willow (*Salix* sp.) or Poplar (*Populus* sp.)



1. Embo: the site from the S. after excavation



2. The same: Chamber I from the S. showing Cist I resting on the black chamber filling (a corbel stone in place bottom right corner)



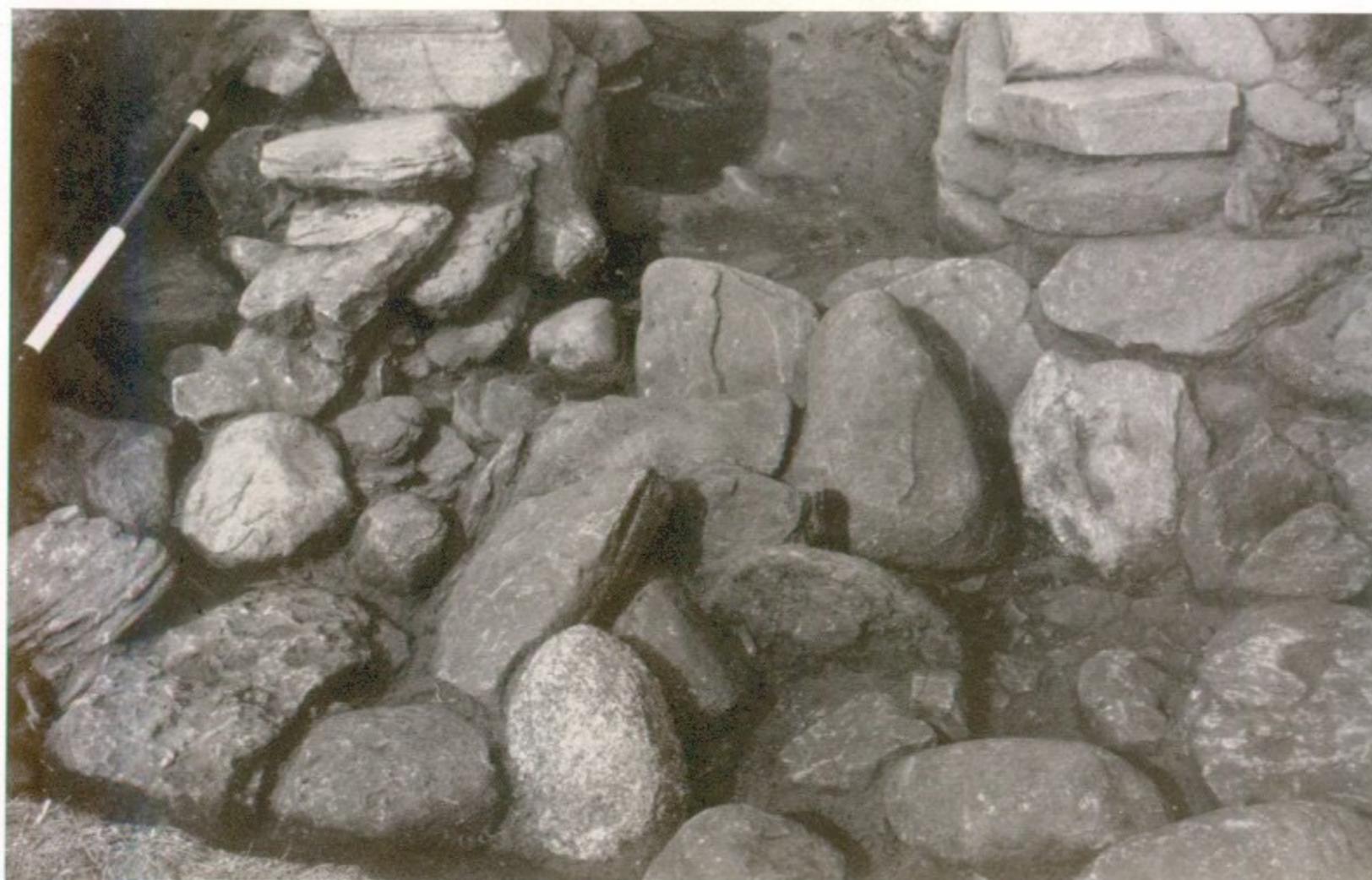
2. The same: the lowest layer of blocking in the passage of Chamber I



1. Embo: Chamber I from the S., with Cist II and Chamber II behind



1. Embo: the antechamber with passage beyond, from the NE., Chamber I



2. The same: blocking outside the entrance, Chamber I



1. Embo: the NW. corner of Chamber I showing the upright stone blocking the entrance to what was probably a side cell



2. The same: Chamber I from the NE., the ranging pole marking the entrance to the antechamber