III.

AN ACCOUNT OF THE EXCAVATION OF THE BROCH OF AYRE, ST. MARY'S HOLM, ORKNEY. BY A. SUTHERLAND GRAEME, F.S.A. SCOT.

Locality.—To the west of the village of St Mary's Holm lies the Loch of Ayre, so called from the "Ayre" or raised beach that divides it from the sea to the south. The broch is situated on the north bank of the loch and between the main Kirkwall road on the east and a small burn which flows into the loch on the west. Prior to excavation the spot was marked by a low mound, rising to some 10 or 12 feet above the surface of the water, and oval in shape. The major axis lay approximately east and west, and was about 200 feet long. The minor axis measured about 150 feet. That it concealed the remains of some building had long been considered probable, the chief evidence—besides its characteristic shape—being the very stony state of the bed of the loch which circled the mound from south-east to south-west, at an average radius of 250 feet from the centre of the mound.

Excavation.—Work was commenced in December 1901, the first trench being made from the east. A slight natural depression led directly to the summit of the mound, and it was anticipated that by this means the main wall would be struck with but little work. The conclusion that the highest part of the mound marked the centre of the building was erroneous, and it was found, naturally enough, that it marked the highest portion of the main wall. At about 15 feet from the adit a wall was encountered, of which there remained only a course or two, showing strong signs of fire. The doubts about its being the main wall were confirmed by its taking a concave turn in a south-east direction. It was, however, traced out with the result as shown on the plan, the wall being marked Δ (fig. 1). Meanwhile a trench had
Fig. 1. Plan of the Broch of Ayre, St Mary's Holm, Orkney.
been started from the south-south-east, but was given up at first, as it seemed probable that it would only lead up to another part of wall A. This was afterwards found to be an erroneous opinion, as its curvature was eventually traced out.

A low portion of the mound on the north-west side seemed promising, but after a trench a couple of yards long had been driven, a low wall, obviously of a secondary nature, was encountered. This was developed, and a structure of apsidal shape laid bare. This is shown at B, the radius of the apse end being about 3 feet 6 inches, and the distance between the horns about 2 feet 6 inches.

Another attempt was then made from the north, and the main wall at length reached. It was here about 3 feet 6 inches high, and was traced in a westerly direction without any immediate increase in height being noticed. This trench terminated at the back of the wall B, whose apsidal end was found to abut on the main wall.

Entrance.—As it was anticipated that the entrance would be found on the western side, another approach was cut on the southern side of the structure at B. The main wall was again traced round, and at its lowest point was found to be only about 2 feet 6 inches high. This was on the south-west side, where there were some signs of the wall being lined with a casing of masonry about 9 inches to 1 foot thick. The structures shown at C were passed, and the entrance was eventually found on the south-east side. For facility in handling the spoil the second adit was cut through and a secondary wall found at D. Three standing stones were found grouped outside the entrance, but as the exact localities of two were not noted, only one is shown on the plan. Meanwhile the wall was being followed from the cutting on the north side, and the complete circle was eventually opened out, the subsidiary walls at E and F being discovered during the process. The main wall between the south and east was about 5 feet high. A large slab, which had evidently been the lintel stone of the doorway, was found in halves in the entrance. The jambs...
were 3 feet 6 inches apart and about 2 feet deep (fig. 2). Inside the entrance opened out to 4 feet 6 inches. On the left hand the usual recess was found in which the door-bar was housed. Set in the ground in the left re-entrant angle of the door jamb was found a socket stone and pivot stone, more or less spherical, upon which the door which closed the entrance revolved. Opposite the bar recess, and on the right-hand wall, a socket hole was found, into which the end of the bar slid when in use. On the right wall of the entrance the usual guard chamber was found. It was raised about 1 foot above the level of the entrance passage, and was rhomboidal in shape, measuring roughly 5 feet by 4 feet. The entrance passage was paved, and it was found that the slabs covered a drain built of stone in the shape of an inverted round arch about 9 inches in diameter. When first opened it was still conveying water, but subsequent operations outside the walls consolidated the loose earth into which it drained, and so stopped the flow.

**Internal Area.**—The internal area revealed the usual characteristics of the brochs. There were a number of standing stones (fig. 3) or partition slabs, the localities of some being as shown on the plan. Opposite the entrance, near the further side of the interior court, a well was found in which water was still standing, and the remains of two steps lead down to the water surface. The well was roughly 2 feet square, and was partly roofed in with a flat slab.

The usual stairway was not at first in evidence, owing to the masonry at its entrance being very much broken. There was, however, a space which did not appear to have been built over on the south-west side of the interior wall, and this was eventually shown to be the doorway leading to the stairs. These seemed to lead down below the floor level of the broch, terminating in a cavity roofed by overlapping stones. The width of the stairway was about 2 feet 6 inches. The main wall was here about 4 feet in height. There were traces of three steps, each about 9 inches deep and 1 foot wide. Part of the main
Fig. 2. View of Entrance from outside.

Fig. 3. View in internal area showing Partition Slabs.
wall on the north-east side appeared to be slightly recessed, so that its curvature was to a shorter radius than that of the principal wall. There were here many signs of fire. Part of the main wall curved round on the right-hand side of the entrance, and was built out a little way on the top of the standing stone, as shown in the plan. Three or four socket stones were found near these slabs in various places.

After the interior had been cleared the passage G was traced for a short distance, the inset H proving to be of the nature of a cupboard.

No further work was done until June 1909, when the passage I was investigated, and found to proceed in a winding direction into an open chamber 9 feet wide. On the right-hand side of this the original wall was very low, and a second wall had been built above and slightly behind it, so that a bench was left. Near the centre of the chamber was found a curious grouping of flag stones. The chamber concluded in a small tunnel, which led out through the wall A, the sides being guarded with slabs, and it was roofed with flags. the hole being about 2 feet square.

This completes the record of excavation so far, but at some future date it is hoped to continue the examination of the outworks.

General Remarks.

At first sight this broch does not appear to be characterised by the isolated position that is the feature of nearly all brochs. It may, however, be fairly presumed that the "Ayre," which now separates the sea from the loch, was thrown up at a later date, and that the broch therefore originally stood on the seashore, in common with all other brochs in the neighbourhood. The low-lying ground behind it in the immediate neighbourhood of the burn would probably be less efficiently drained than it is now. This would afford the degree of impregnability that seems to have been sought after in fixing a site for one of these buildings.

In common with most other brochs, iron implements were found
within the walls of this building. By the discovery of a spearhead in the guard chamber, it is evident that weapons of iron were in use before the demolition of the broch. Of more interest is the mass of conglomerate which was found amid a bed of clay on the floor level, and surrounded with much broken pottery. The adjacent part of the main wall showed signs of fierce fire, and the fragments of pottery fused into the conglomerate point to some attempt to smelt either the metal or the ore.

In common, too, with most other brochs, numerous traces of charcoal were found. This in itself does not cast any fresh light upon the broch and its occupation. In the excavation of the passage I (in plan, fig. 1), another, and I believe a new feature, was observed. A section through this passage is given in the Appendix, showing the various layers of material found in it. In the clay composing the lower stratum H several fragments of charcoal were found, showing by their circular section that green wood was in use as fuel at that period. In the stratum of clay D were found extensive traces of peat ash. Thus prior to the demolition of the broch the occupants burnt wood, with which Orkney is known to have been largely covered at some period. After the demolition marked by stratum G, with its debris of stones fallen from the passage walls, the site has been occupied by people who only burnt peat for fuel.

So far as the masonry is concerned, very little work constructed during the secondary occupation has been opened out. Referring to the plan, the apsidal structure B and traces of masonry in the neighbourhood of the wall A are probably the only examples of secondary building, insomuch as no traces of debris were found in the immediate neighbourhood during their excavation, nor were any signs of occupation, such as clay, fuel, shells, etc., found to extend over the walls.

During the excavation of the broch, the lie of the stones of which the debris largely consisted showed very plainly that the fall had
taken place from a west or south-west direction. This evidence is also supported by the great accumulation of debris on the east side. It is owing to this covering of rubbish that the remains of the outworks have been preserved. The practical absence of outworks on the west side—and there are traces—show that they have been left exposed, and therefore open to weathering and to annexation by those who required the stones for building purposes at a later date.

The leaning and bulging state of the masonry of the outworks on the east side shows that the walls have been subjected to considerable pressure from above, such as would be caused by falling masonry.

The list of animal remains was compiled by Dr Norman Ticehurst, St Leonards-on-Sea, Sussex, and I am much indebted to him for his careful examination and identification of a large quantity of bones and other remains found in the course of excavation.

**List of the Relics found during excavation.**

**A. Iron.**

1. Spearhead, 9 inches long. Found in guard chamber.
2. Spearhead, 7\(\frac{1}{2}\) inches long.
3. Axehead, 4\(\frac{1}{2}\) inches long, blade 2 inches wide. Found under turf outside, and on south side of broch.
4. Iron shank imbedded in spherical bone handle, possibly some tool resembling an awl.
5. Mass of conglomerate consisting of burnt clay pottery and iron. Found on floor level, inside and under north wall of broch.

**B. Stone.**

1. Stone vessel, triangular in shape, probably a lamp (fig. 4).
2. Several vessels of mortar type (fig. 4).
3. Top or bottom stone of flat, rotary type of quern.
4. Two top stones of flat, rotary type of quern.
5. Two bottom stones of flat, rotary type of quern.
6. Top and bottom stones of flat, rocking or saddle type.
7. Two socket stones (one of which is shown in fig. 4).
Fig. 4. Lamp of Stone, two Mortar-like Vessels, and Socket Stone.

Fig. 5. Two Whorls and Grooved Sinker.
8. Flat circular sinker, perforated in centre; part of circumference bevelled from both sides to a fine edge, 2 inches diameter.
9. Sinker, notched, and grooved across both flat sides, 2 inches diameter, $\frac{1}{2}$ inch thick (fig. 5).
10. Hone, polished with use, 7 inches long, 1 inch wide.
11. Hone, much worn on both surfaces and on its four edges, 2$\frac{1}{2}$ inches maximum diameter, $\frac{3}{8}$ inch thick.
12. Hone; 5$\frac{1}{2}$ inches in length by 1 inch by $\frac{1}{2}$ inch.
13. Four pounding stones, oblong and oval. Ends much abraded, worn with use.
14. Fragment of pumice, deeply grooved by use, for polishing bone pins.
15. Oval stone, showing polish through use.
16. Wedge-shaped stone, showing abrasion on flat surfaces.
17. Stone whorl, 1$\frac{1}{2}$ inches diameter, $\frac{3}{8}$ inch hole, $\frac{1}{2}$ inch thick (fig. 5).
18. Stone whorl, 1 inch diameter, $\frac{3}{8}$ inch hole, $\frac{5}{8}$ inch thick (fig. 5).

C. Bone.

1. Many pieces red-deer antler, all with cuts upon them.
2. Awl, made from a sheep's leg bone, 3$\frac{1}{2}$ inches long.
3. Cylindrical piece of bone, 2$\frac{1}{2}$ inches long, $\frac{3}{8}$ inch diameter, drilled longitudinally, and hole counter sunk at one end; highly polished (fig. 6).
4. Handle of red-deer antler, 4$\frac{3}{4}$ inches long by 1 inch by $\frac{3}{8}$ inch, with rounded edges; one end broken. The larger end is drilled and grooved (fig. 7).
5. Bone weaving-comb; teeth broken off short; one corner missing; 4$\frac{1}{4}$ inches long, 1$\frac{1}{2}$ inches wide at teeth.
6. Fragment of riveted antler. Three holes contain perfect rivets,
1\(\frac{1}{4}\) inches long, and there is a fourth loose one. Dimensions of fragment, 4 inches by 1\(\frac{3}{4}\) inches. There are two smaller holes of ornamental character.

7. Fragment of riveted antler, 8 inches long by 1\(\frac{1}{4}\) inches, containing one rivet 1\(\frac{1}{2}\) inches long, one 1\(\frac{3}{4}\) inches long, and three broken ones.

8. Fragment of bone, 3\(\frac{1}{4}\) inches, with broken rivet in place.

9. Fragment of bone, 3\(\frac{3}{4}\) inches, with rivet hole.

10. Fragment of bone, 4\(\frac{3}{4}\) inches long by 1\(\frac{1}{2}\) inches wide, containing two broken rivets in place.

11. Fragment of bone, 2\(\frac{1}{4}\) inches by \(\frac{3}{4}\) inch, with two rivet holes (fig. 7).

12. Fragment of bone, 3\(\frac{1}{2}\) inches by 1\(\frac{1}{2}\) inches, with four rivet holes, slightly polished (fig. 7).

13. Fragment of bone, 2\(\frac{3}{4}\) inches by 1\(\frac{1}{2}\) inch, containing broken rivet (fig. 7).

14. Shaped and ornamented piece of red-deer antler with three rivet holes, 6\(\frac{3}{4}\) inches long by 1\(\frac{1}{4}\) inches wide (fig. 7).
15. Shaped piece of red-deer antler containing two rivet holes, 6\(\frac{1}{4}\) inches by 1\(\frac{3}{4}\) inches (fig. 7).
   N.B.—Nos. 11–15 are probably strengthening pieces riveted to the backs of combs.

16. Long-handled bone comb; teeth missing; ornamented with incised lines round the periphery; 3 inches long (fig. 8).

17. Fragment of bone, possibly part of a long-handled comb; shows signs of tooling; 5\(\frac{1}{4}\) inches long (fig. 8).

18. Sheep's-shank bone drilled through the centre, the holes being bored from each side, 4 inches long; hole, \(\frac{1}{4}\) inch in diameter.

19. Shaped blade, oblong in section, 3\(\frac{3}{4}\) inches long; one end broken, the other bevelled on both of wider surfaces to a fine edge; highly polished.

20. A similar tool to 19, with a blunt and rounded end; length 2\(\frac{3}{4}\) inches.

21. Awl of cleft bone, the end showing wear, 2\(\frac{1}{4}\) inches long.

22. Bone awl, 3\(\frac{3}{8}\) inches long.

23. Pointed fragment of bone, the end showing signs of use as an awl, 3\(\frac{3}{4}\) inches long (fig. 8).

24. Bone toggle, 1\(\frac{3}{4}\) inches long, grooved for attachment of thong.

25. Vessel made from whale's vertebra, nearly complete (fig. 9).

26. One of a set of bone dice, squared up from a cylindrical bone, 2 inches long by \(\frac{3}{4}\) inch side (fig. 10).
Fig. 9. Vessel hollowed out of a Whale's Vertebra.

Fig. 10. Two Bone Dice and their numbered faces.
27. Another of a set of bone dice as above, but solid, 1\(\frac{3}{4}\) inches long by \(\frac{3}{8}\) inch square at centre (fig. 10).

28. Half a short cylinder of bone, edges bevelled and rounded; the other half missing; \(\frac{3}{8}\) inch diameter.

29. Section of bone, showing saw-marks, evidently the first stage in the manufacture of C 28.

30. Bone pin, 3 inches long.

31. Bone pin, highly polished, 1\(\frac{1}{2}\) inches long (fig. 11).

32. Bone pin, broken, 3 inches long (fig. 11).

33. Bone pin, polished, 3 inches long (fig. 11).

34. Bone pin, polished, 3\(\frac{1}{2}\) inches long (fig. 11).

35. Bone pin, lower half, 2 inches long (fig. 11).

36. Bone pin, point half, 1 inch long (fig. 11).

37. Bone pin, 1\(\frac{1}{2}\) inches long.

38. Bone pin, point half, 1\(\frac{3}{4}\) inches long (fig. 11).

39. Bone rivet, 1\(\frac{1}{2}\) inches long (fig. 11).

40. Bone rivet, 1 inch long.

41. Bone rivet (doubtful), 2 inches long (fig. 11).

42. Bone rivet, 1\(\frac{4}{5}\) inches long (fig. 11).

43. Bone rivet, 1\(\frac{5}{8}\) inches long (fig. 11).
44. Bone rivet, 1¼ inches long (fig. 11).
45. Bone needle, highly polished, 2½ inches long (fig. 11).
46. Bone splinter, slight polish (doubtful), 2 inches long (fig. 11).
47. Bone splinter, slight polish.
48. Bone splinter, pointed (fig. 8).

D. Bronze.
1. Pin, 2½ inches long; head wanting.
2. Pin, incomplete, 1¼ inches long, with expanding flat-topped head.
3. Small ring, like the thimble of a label; much corroded and encrusted. This has unfortunately been lost.

E. Pottery.
1–4. Fragments of a large red pot; coarse. Two embossed threads, rope pattern, encircle upper part; six rows of herring-bone marking between, and two rows below the lower rope.
5, 6. Two portions of pottery. Thirteen fragments in all, forming nearly a semicircle. Probable diameter at lip, 8 inches. Waved lip, with one row of diagonal marks on lower crest.
7. Fragment of coarse red pottery, with what appear to be fern markings.
8. Fragment of coarse ornamented pottery.
9, 10. Fragments of a pot, double-lipped, with three rows of herring-bone marking.
11. Fragment of very coarse pot; embossed ornamentation, consisting of a zig-zag thread between the lip and a raised ring below. The thread has been pressed on before the pot was baked.
12. Fragment of fine pottery. Similar ornamentation to Nos. 5 and 6.
13–16. Fragments of pottery, ornamented with zig-zag and fern marking (fig. 12).
17. Fragment of coarse pottery, ornamented with three rows of herring-bone marking between the lip, and an incised line below (fig. 12).
18. Fragment of coarse pottery, ornamented with diagonal incised lines, alternating in direction, and a wavy embossed line (fig. 12).
19. Fragment of pottery, marked with an incised line above a row of punctulations with a pin-point (fig. 12).
20–23. Fragments of coarse red pottery, with rude fern ornamentation (fig. 13).
Fig. 12. Fragments of Ornamented Pottery.

Fig. 13. Fragments of Ornamented Pottery.
24, 25. Fragments of pottery, with delicate fern ornamentation (fig. 13).
26. Fragment of coarse pottery, with rude fern ornamentation (fig. 13).
27. Fragment of coarse pottery, with similar ornamentation to Nos. 24 and 25, but coarser.
28. Fragment of finer pottery, bold herring-bone marking (fig. 13).
29. Fragment of lip, horizontal marking.

Fig. 14. Fragments of Pottery belonging to one vessel.

30. Fragment of pot with double lip, similarly ornamented to Nos. 5 and 6.
31. Fragment of pottery, ornamented with three rows of herring-bone marking between lip and a raised ring below.
32, 33. Fragments of coarse pottery, with a wavy embossed line close below the lip.
34, 35. Fragments, similarly ornamented to No. 17.
36. Fragment of coarse pot, with lip incised with diagonal lines.
37–39. Fragments of double-lipped pot, with two rows of herring-bone marking, one on each side of the lower lip.
40, 41. Fragments of lip, ornamented with one row of diagonal lines.
42-44. Fragments showing rude herring-bone marking.
45. Fragment showing rude incisions.
46. Fragment of unornamented lip, with a lump of material fused on to it.
47-54. Specimens of lips of unornamented pottery.
55-60. Fragments of an unornamented pot, fine-grained, thin-walled, and yellow in colour. These pieces all fit together and form a considerable portion of a vessel about 10 inches in height. Lip

Fig. 15. Sections of the Forms of the Lips of various Pottery Vessels.

diameter 6 inches, maximum diameter 9 inches, base diameter 4 inches (fig. 14).

Note.—A very large quantity of pottery of all descriptions was found. The fragments are small, representing vessels of different sizes and thicknesses, fineness and coarseness. The majority are red and show traces of fire, and in certain cases a deposit of soot. A few are yellow, these generally being of a much finer description. The quality of the pottery is, of course, dependent upon the quality of clay from which it was made. The coarsest qualities are very gritty, and are accordingly as fragile as the finer qualities, which have been made of a purer and more extensively worked clay. Fig. 15 shows the different designs of lip.
HUMAN AND ANIMAL REMAINS FROM THE BROCH.

*Human Bones.*—Remains of at least three individuals, represented as follows:—

1. Most of the shaft of the left femur of a young individual, under eighteen years of age.

2. Part of a skull, consisting of pieces of the right half of the base. The first four cervical vertebrae, these very large and with muscular attachments very well marked. The middle portion of lower jaw, very strong, thick, and markedly bifid. A lower dorsal vertebra and the posterior half of a lumbar vertebra. The upper third of a left humerus. Portions of both clavicles, the greater part of the right scapula. Part of a first rib, a twelfth rib, and fragments of six others. Six inches of femoral shaft. A right internal cuneiform, a third metatarsal, and a single toe bone.

3. A left internal cuneiform, differing markedly in size from the right one (above), so that it probably represents a different individual. (Not knowing the conditions under which these bones were found, it can hardly be proved whether all those mentioned under (2) belong to the same individual or not.)

*Shells.*—Limpet and periwinkle, numerous. Escallop, oyster, and cockle, a very few: fragments only of the last two.

*Crab.*—A few fragments of the large claws of one of the small crabs.

*Whale and Seal.*—Sundry large bones.

*Ox.*—Many whole and broken limb bones, ribs, portions of skull, teeth and horn cores. The size and shape of the latter suggest that they belong to the Celtic Shorthorn (*Bos longifrons*).

*Pig.*—Large quantities of limb and skull bones, whole and fragmentary. The upper and lower jaw bones of pig were particularly numerous, and several “tusks” were found.

*Red-deer.*—A fair number of limb bones, vertebrae, jaw and skull fragments, and teeth were found, besides many pieces of antler, many of these being tines that had been sawn or hacked off. One of the fragments shows well-marked grooves where it had been gnawed by voles, evidently a cast antler that had been lying some time on the ground before being picked up.

*Sheep.*—Many remains, chiefly broken skull and limb bones.

*Horse.*—One or two bones only identified with certainty.

*Gannet.*—A complete skull with mandibles, a left coracoid, and part of a radius.
Cormorant.—A right tibia and a right radius.
Great Northern Diver.—Left femur and tibia.
Gull.—Upper and lower mandibles, the size of a herring gull.
Wild Swan.—A tibia.
Shag.—An ulna.
Shearwater.—Part of an ulna. Species indeterminable.
Great Auk.—Lower two-thirds of a tibia.

The majority of the mammalian bones (other than man) were those of immature individuals.

APPENDIX.

The accompanying diagram (fig. 16) shows a perpendicular section through the passage I.
Layer A.—Six to eight inches of earth mixed with small stones.
Layer B.—Twelve inches of earth mixed with larger stones. These were mostly water-worn, as were those in section A, and are similar to those still found on the adjacent seashore. A few bones were found in A, and a fairly large number in B. These were of ox and sheep entirely, and none showed signs of working.
Layer C.—Two feet thick. A mass of tumbled stone, evidently fallen debris. Water-worn stones entirely absent. Interstices filled with loose earth. The debris is probably that of fallen secondary buildings.
Layer D.—Varying from 1 to 3 inches. Thickest nearest the door end, and eventually disappearing. Consisted of yellow and brown clay, mixed with peat ash, limpet and periwinkle shells. The shells so largely predominated in places as to entirely displace the clay. A few splintered bones in this layer, in which the bronze ring D 3 was found.
Layer E.—A similar layer to C, and about the same thickness.
Layer F.—A similar layer to D, and about the same thickness, in which the shells largely predominated. The bone needle C 45, one or two pins, C 19, C 14, and the remains of the yellow pot E 55-60 were found in this layer.
Layer G.—A similar layer to C and E, of about the same thickness, passing gradually on either side of the passage into the dry-built walls of layer H. Evidently the debris resulting from the fall of the main wall of the broch.
Layer H.—Dry-built masonry walls on either side, the stones of no great size. The left-hand wall bulged considerably inwards, especially
in its upper courses. Height about 18 inches. The right wall fairly perpendicular and higher. The fallen debris of layer G partly filled the space between the walls, the splintered stones having been driven down into the soft clay that filled the lower 10 to 12 inches of this space. This clay bed rested on broken fragments of stone at the floor level. The clay was arranged—save for the distortion caused by the falling of the debris above—in regular strata of different colours: brown, yellow, and red. Small cylindrical pieces of charcoal were found in the upper layers, and the whole mass was speckled with minute fragments of charcoal. Bones of ox, sheep, and pig were numerous, many of the larger being splintered, evidently to obtain the marrow. Small fragments of crabs' claws and shells were found. The following objects were found in this layer—C 5, 6, 7, 21, 25, 26, also a large quantity of pottery. A fair number of spherical, ovoid, water-worn, white quartz pebbles also occurred amongst the clay.