III.

REPORT ON SOME DISCOVERIES AT GLENLUCE SANDS, WIGTOWNSHIRE.

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I am grateful to the Council of the Society of Antiquaries of Scotland for authorising me to use one of the four permits issued by the Officer Commanding, Luce Bay Trial Bombing Ranges, to examine, as occasion arose, the sand and gravel areas within their zone of operations. When the area was taken over by the Royal Air Force it was felt that some superficial oversight by archæological observers might be desirable, as the Glenluce Sands have been for many years an area prolific of prehistoric material, and one from which there have been recovered, from time to time, probably more objects of antiquity than from any area of similar extent in Scotland.[1] It was gratifying, therefore, that the Service Authorities recognised this potential value in these waste-lands under their control, and so readily signified their co-operation, at such times as their ranges were clear of danger.

The area is situated to the NW. of Luce Bay, roughly between the Motes of Sandhead and Dunragit. The shore-line extends to about $6\frac{1}{2}$ miles. Between the high-water mark and the Sandhead–Glenluce highway it is somewhat crescentic in form, widening out in the centre to a depth of about $1\frac{1}{4}$ miles, the extent of the enclosed area being about 4 square miles.

This region appears to be irregularly divided into five zones (fig. 1), running approximately parallel to the coast-line. Inland from the high tidal-water line Zone No. 1 is a band of merse-land, having as a background Zone No. 2, an almost continuous line of sandhills, widespread in extent, but not rising appreciably above the 25-foot contour line. Zone No. 3 is a level, swampy, almost landlocked area with numerous lochans, the drainage of which is impeded by the sandhills already mentioned. In the landward direction this zone is enclosed by another range of sand-dunes which rise to slightly above the 50-foot level and which form Zone No. 4. Between these dunes and the Sandhead–Glenluce roadway is a moorland area—Zone No. 5—completely covered by bracken and heather.

The flint areas appear to be restricted to Nos. 4 and 5 Zones. Vegetation covers practically the whole area, except in the sand-dune zones, where there are considerable patches of open ground which appear to be archæologically sterile in Zone No. 2, but No. 4 has still a few sand-blown gravel

[1] R.C.A.M. (*Wigtown*), xliii.

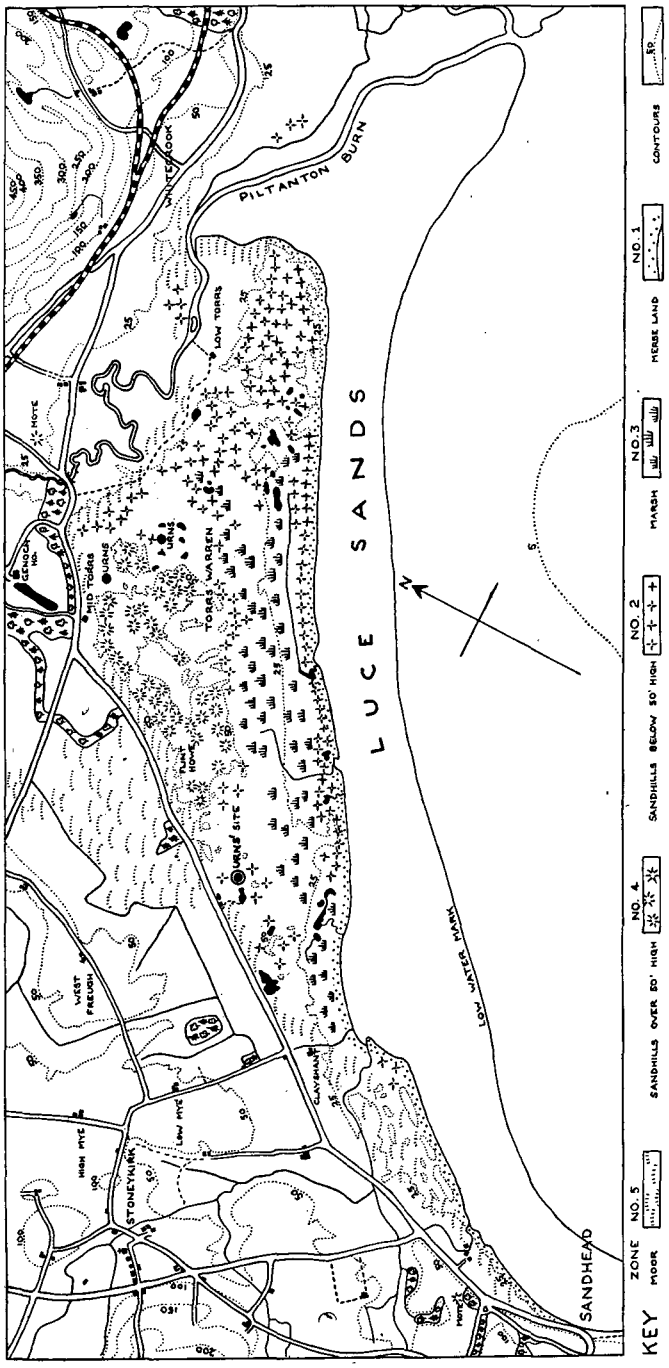

Fig. 1. Plan of Glenluce Sands showing zonal divisions.

areas in which flints are prolific. But the total flint area presently exposed is small, relative to the whole, and its complete investigation should not present undue difficulty.

As in many areas where sand-dunes are characteristic,[1] these are capricious and unstable and changes of wind-currents frequently expose prehistoric settlements, working floors and burial-places. In these features the Glenluce Sands are not exceptional. It was therefore to these areas of exposed gravels that attention was directed on the occasion of a short holiday in the Mull of Galloway in the humid summer of 1948.

From the southern end, Clayshant appeared to suggest a suitable point to begin exploration, but the whole area there was enveloped in a dense growth of fixation-grass, rushes and bracken to shoulder height. A mile north, however, a large open space appeared to offer some promise, access being simple, as a rough roadway had been constructed eastward into the dunes to facilitate the removal of sand and gravel. In that area were considerable open patches where gravels were exposed and a fair number of broken flints were visible on the surface. A superficial examination of this area, however, revealed nothing of any significance.

This area was linked to another, lying to the north, which proved to be somewhat L-shaped, one arm being a large, flat, gravel-strewn open space, while the other had a number of sand-mounds and dunes, in both of which were found large quantities of fractured flints. It was early noted that the flint areas were in patches. In a region of clean, unpebbled sand one would come across a clearly defined, circular or oval area on which the surface concentration of flint-flakes and splinters would amount to 60–70 to the square foot. This feature was characteristic of the whole site, these flint patches varying from a single yard in diameter to large areas of several hundred square yards. Attention was therefore directed to this region (Pl. X, 1), the results of which form the basis of this report.

The Pottery.

For record purposes the sites were numbered, and these references have been retained herein.

1. To the north of a little pond of water, which had apparently been recently scooped out to provide building materials, there is a small sand-dune lying approximately east and west. The gravelly bed in which the pool is situated slopes gently up to the base of a circular, bracken-covered knoll, standing prominently about 3 ft. higher than the dune. On the ascending easterly slope of this little dune is a gravel patch covering an area of about 20×10 ft. The gravel includes a number of broken stones with sharp edges, none of which is any larger than the palm of one's hand, together with

[1] The Culbin Sands in Morayshire and the Tentsmuir Sands in Fife are typical.

a small number of flint chips. The general direction of this gravelled area is about NE. to SW. (Pl. X, 1).

To the SW. of this area and about 18 ins. outwith the gravel-spread there were found exposed the crushed rim fragments of an urn, apparently *in situ* with a number of cinerated bones visible. Though badly broken, a considerable proportion of the rim remains, but little of the body, and none of the base had survived. The burial lay within 10 yds. of a site which had evidently served some military purpose, a large number of disused full and empty sand-bags bearing witness to such use.

The pottery fragments indicate an urn of about 7 ins. in diameter at the top. The material is a pale, cream-coloured clay composed of a rough, pebbly mixture, poorly fired and extremely friable, the surface of many of the fragments having flaked off. The rim, rounded both outside and inside, slopes slightly inward. The wall is $\frac{3}{8}$ in. thick at the top, widening out to $\frac{5}{8}$ in. about $1\frac{3}{4}$ ins. down, thus forming a concave band round the upper part of the vessel (fig. 2, 1). The urn appears to be devoid of any ornamentation. The stony fabric is not only visible in the broken sections but also on the outer and inner surfaces, and it gives the impression of a very rude construction. The inside surface has been fire-blackened.

The bones were bleached and were all recovered from within an area of about 4 ft. radius from the urn. Among them were found some lumps of wood charcoal about the size of a hazel nut. The area of the burial was excavated, but no evidence of any enclosing structure or flooring came to light.

2. About 3 ft. to the NE. of the above site, on the edge of the gravel area, a small part of the flat base of a second urn protruded one inch above the sand (Pl. X, 4). Strewn around, between the two urns, lay about two dozen white-quartz, rounded pebbles, of about egg-size, which appeared significant in that very few were visible elsewhere and nowhere in such a concentration.

The exposed urn-base was cracked and seemed to be rapidly deteriorating. It was not possible to brush the sand from it with a feather or a grass without detaching fragments from it, and it appeared as though it had only just lost its protective sand covering. It seemed expedient, therefore, to cover it up again in order to give time to make preparations to salve it (Pl. X, 3).

A supply of surgical tape was as much as a remote district could offer and, on the whole, it seemed to be as simple a means as could be devised to bind it together. Inch by inch, therefore, as it was uncovered, it was swathed horizontally and vertically, and after many hours of patient work the vessel was completely divested of its sand covering. Eventually, the sand was cut through two inches below the rim with a borrowed steel shelf of a domestic cooker and the urn was retrieved intact. It was carefully turned on its side and supported and packed in a box for transport. From

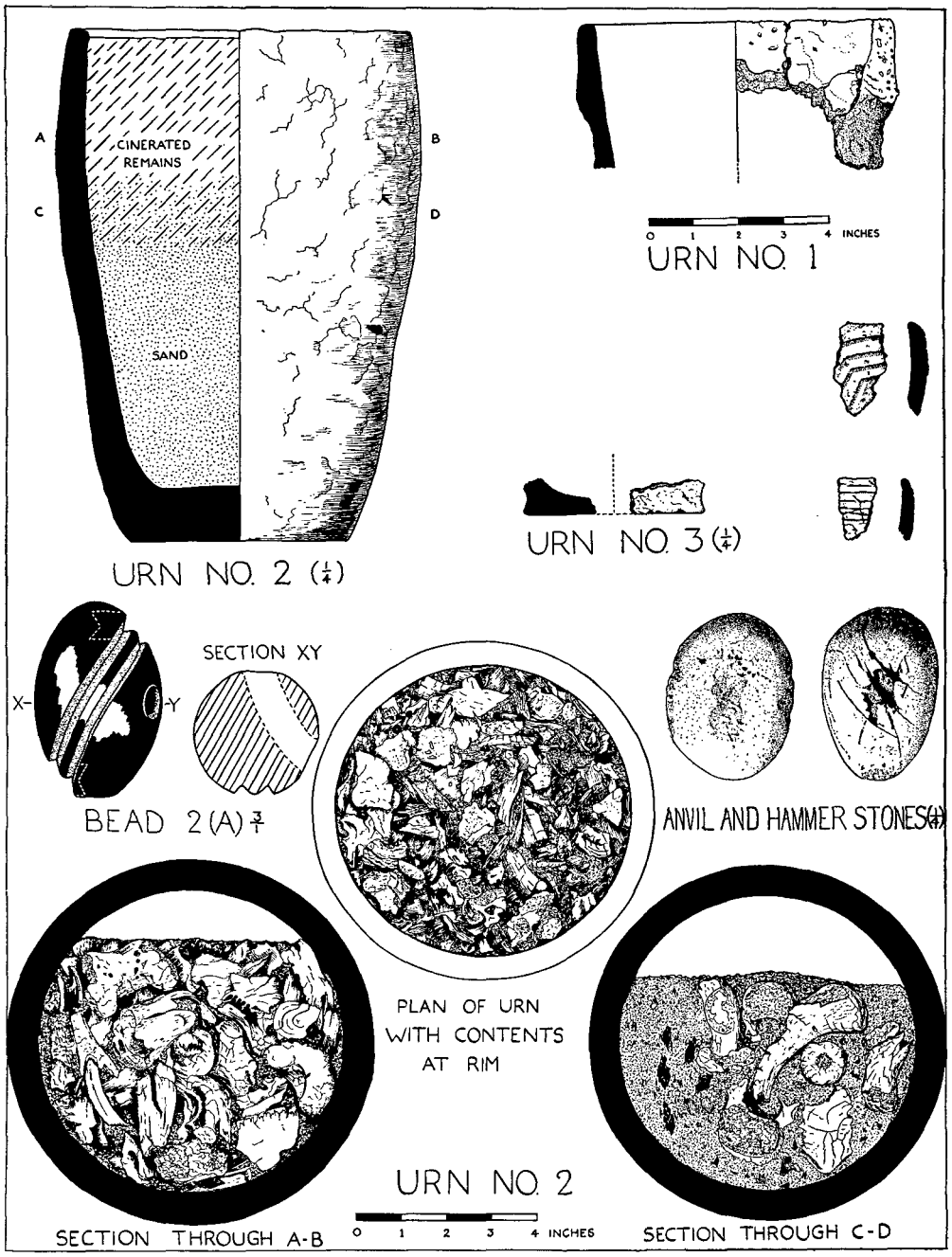

Fig. 2. Three Urns, jet bead, and two anvil and hammer stones.

this position it was not moved till over three months later, by which time the vessel itself had to some extent dried out, and as the walling then had begun to crack through pressure from the inside it was deemed advisable to unload it, which was done while it was still lying horizontally.

Contents of Urn.

The sand taken with the vessel below its rim, when released from its enveloping wrapping, fell away and revealed bone material in a compact mass, level with the brim, the packing element appearing to be mostly sand. At one inch below the brim the osseous mass was so closely compressed that it had to be gently probed out. At this depth, in the centre, a patch of carbonised wood about 2 ins. × 1 in. appeared together with a smaller area about 1 in. from the wall. At the same depth—1 in.—a small scrap of bone was found showing a green stain. Up to a depth of $1\frac{1}{2}$ ins. the central area continued very closely packed, sand becoming less in quantity and a considerable amount of bone-dust appearing, giving the mixture an earthy appearance rather than that of sand. At that level a red-stained fragment was found within $1\frac{1}{2}$ ins. of the centre together with another pocket of carbonised wood.

At 2 ins. deep there appeared some bluish-stained pieces of bone and a tooth. At $2\frac{1}{2}$ ins. a cavity was disclosed about 5 ins. across with an arc depth of about $1\frac{1}{2}$ ins. This extended to the bottom of the urn. The contents now appeared to be much more gritty with considerable quantities of sand, and from 2 to 4 ins. the bones seemed to be imbedded in sand (fig. 2, Plan and Sections).

At 3 ins. the greatest density of black materials was observed, and it was noted that these appeared in close juxtaposition near the perimeter. The bone material consisted of large pieces, including portions of a skull.

Four inches down, sand predominated, bones being in large concentrations and black material in small pockets. It early became apparent that the carbonised material was of two kinds, the one being burnt wood, the other a sooty material, built up in layers, forming a scale. This did not show a fibrous structure; the deposit of scale was adhering to the inside wall of the vessel.

The largest bone fragments now appeared: a knuckle joint, a jaw bone with tooth cavities visible and a large piece of skull. Another small piece of bone stained green was recovered here.

At $4\frac{1}{2}$ *ins., nothing* was visible except sand, some flecks of black matter and minute particles of bone.

At 5 ins. there was a little pocket of charcoal, and among it a small jet bead encased in a small covering of clay (fig. 2, 2A).

The contents of the urn having been emptied and the sand sifted, the

interior wall was found to have a quantity of the sooty deposit still adhering. This had been built up in successive layers to a depth in some places of $\frac{3}{32}$ in.

Description of Urn.

It was now possible to measure up the urn. It is a plain, bucket-shaped, red earthenware urn with a flat base. It is hand made and, in consequence, its dimensions vary considerably, those given being mean. The outside diameter at the rim is $7\frac{3}{4}$ ins. and at the base 5 ins., the height being $11\frac{1}{4}$ ins. The rim is slightly tapered inward, and the wall-thickness is fairly uniformly $\frac{1}{2}$ in. at the top, widening to $\frac{3}{4}$ in. where it merges into the base. The flat base is 1 in. in thickness (fig. 2, 2).

The urn has no ornamentation, but despite the irregularities in its construction it is rather graceful in its outline, the exterior having a slight convexity to a maximum diameter of $8\frac{1}{4}$ ins. some $2\frac{3}{4}$ ins. below the rim. It appears to have been built up in four sections, viz.: from the base to $1\frac{1}{2}$ ins., from $1\frac{1}{2}$ to 4 ins., from 4 to $7\frac{1}{4}$ ins., and from $7\frac{1}{4}$ to $11\frac{1}{4}$ ins.

Report on Human Remains from Two Cremation Burials.

The cinerated remains were submitted to Dr L. H. Wells, M.B., B.Ch., D.Sc., Senior Lecturer in Physical Anthropology, University of Edinburgh, who was good enough to furnish the following reports.

"The remains from the intact urn (No. 2) include representative portions of one human skeleton. In extracting these fragments from the filling of the urn, Mr Davidson had divided them into three parcels, corresponding to depths of 0–2 ins., 2–4 ins. and 4–6 ins. It is worthy of note that the 0–2 ins. layer (the lowest in the inverted position of the urn) was composed of a very large number of small fragments; the 2–4 ins. layer contained a smaller number of such fragments with a few of larger size, while the 4–6 ins. layer produced only a few large fragments. As Mr Davidson has remarked, this probably reflects the sequence in which the remains were deposited in the urn, the large pieces being introduced first and the smaller ones dumped on top of them. Some allowance has also to be made for settling of the contents once the pot had been inverted in the ground. Fragments of the growing ends of the limb bones, of the base of the braincase, and of the upper and lower jaws can be identified. These show the remains to be those of a child aged between two and five years, most probably round about four years.

From the dispersed burial (No. 1) there survive only a large number of small fragments of the skull, some chips which are probably portions of ribs, and one portion of the shaft of a long bone (? tibia). It seems probable that what has survived in this case represents the 0–2 ins. layer in the filling of the intact urn, the remainder having been completely destroyed by weathering. Among the skull fragments it is possible to identify the mastoid part of the right temporal bone and the outer half of the right upper orbital margin. Both these fragments

appear to have belonged to a child approaching adolescence. If the bones were those of a boy, his age is not likely to have exceeded twelve years, but in the case of a girl it might have been as much as fifteen years.

Unfortunately these fragments do not afford any clue to the physical type of the people who made these burials."

Report on Samples of Carbonised Wood.

Samples of carbonised wood from No. 2 urn were submitted to Mr James C. Gentles, B.Sc., Department of Botany, The University of Glasgow, for examination and he made the undernoted report.

"Specimens from both sets of samples were embedded in paraffin wax and sections for microscopic examination were cut both in transverse and longitudinal planes.

These sections showed that structures, called vessels, were present—a feature of the Angiosperm group of higher plants. It was also noted that these vessels were laid down in a definite ring arrangement—that the wood was 'ring porous'.

From these facts and the fact that the wood is obviously from a tree or shrub native to Britain, it is possible to narrow the search to four possible species, viz. ash, elder, elm or oak.

Of these, oak is distinctive in possessing rather wide Medullary Rays (plates of living cells running in a radial direction between the dead, lignified vessels, fibres, etc. of the wood), a feature which gives oak its characteristic grain and which is also shown by the charcoal sections.

In my opinion, therefore, the specimens examined which are similar in structure are carbonised oak wood, though the possibility of other fragments being of different origin cannot be excluded.

A microphotograph of the carbonised wood in transverse section is provided (Pl. XI, 4)."

Report on Carbonaceous Deposit.

A sample of the laminated sooty deposit from the inside wall of No. 2 urn was submitted for analysis to Messrs R. R. Tatlock and Thomson, Analytical and Consulting Chemists, Public Analysts and Gas Examiners Laboratory, Glasgow, who have made the following report.

"Analysis of a Sample of Carbonaceous Deposit from Cinerary Urn.

	Per cent.
Siliceous Matter	8·10
Oxide of Iron	·82
Alumina	4·35
Carbonate of Lime	1·15
Carbonate of Magnesia	·64
Phosphate of Lime	·22
Carbonaceous Matter	84·72
	100·00

The mineral portion of the sample consists largely of sand, but the presence of Carbonate and Phosphate of Lime may indicate the presence of bone ash.

It is impossible to identify the material from which the carbonaceous deposit originates, as organic matter on charring completely loses its character, and nothing remains in the sample to give a positive indication of its source.

There is no tarry or fatty matter in the sample and there is nothing revealed by analysis to give a definite clue to the formation of the deposit.

It appears, however, to have been built up in thin layers, suggesting repeated exposures to a sooty or carbon laden atmosphere. In other words, the earthenware pot appears to have been used many times for the same purpose, possibly involving firing with a wood fire from the inside. Could the pot have been used for heat treating in some way an article stretched over it with a view to moulding it to the shape of the pot, as for example, the moulding of hides and skins, or the beating of brass or other soft alloys, pewter, etc., and indeed any plastic material, the working of which would be facilitated by a certain amount of heat?

Another possibility which occurs to us is the use of the earthenware vessel for the purpose of tempering iron for tool-making—the cementation process,[1] which, of course, would be conducted inside the pot, heat being applied from the inside and wood charcoal providing the carbon for the temper.

We think the carbon tempering to be the more likely explanation."

3. The fragmentary remains of a third urn were found 38 yards NE. of the site of No. 2. The sherds were recovered from two places, the lesser one of which contained a few pieces which had become detached by wind action and carried a short distance away. Many fragments were collected from the main site, which differed from the surrounding gravel in that it was marked by some large flat and rounded stones which in themselves were sufficient to draw attention to it (Pl. IX, 2). Some of the fragments were large, and while it was simple to fit together a fair number of pieces, in the absence of rim or base fragments it has not been possible to reconstruct a complete section of the walling or to give a reasonably accurate picture of its build. It appears to have been a vessel of some 10 ins. in diameter and the walling varies from $\frac{1}{2}$ to $\frac{5}{8}$ in. in thickness (fig. 2, 3). Many of the sherds were defaced on one or other side by weathering, but many pieces still show soot-blackening on the inner faces. One of the fragments shows a pattern of chevron markings. A rim fragment much fire-blackened appears to be a "false-rim" made by the vessel breaking along a line where one strip of clay was pressed on the top of another. The piece seemed too sharp and thin to be the real rim of such a large and heavy pot as is indicated by the fragments (fig. 2).

The find-spot was carefully excavated and a good number of fire-blackened sherds were recovered along with three flint artifacts (fig. 4, Nos. 1, 2 and 13).

[1] Cementation is a process which consists in surrounding a solid body with the powder of other substances and heating the whole to a degree not sufficient to cause fusion, the physical properties of the body being changed by chemical combination with the powder; thus iron becomes steel by cementation with charcoal powder, and green bottle glass becomes porcelain by cementation with sand.

Miscellaneous Potsherds.

Considerable numbers of sherds were found on the surface of the site. A few have been selected because of their forms or decorative features (Pl. XII).

1. A rim fragment, fire-blackened all over and heated almost to the point of fusion. It has four lines of bold string markings within $\frac{5}{8}$ in. of its lip.

2. Three fragments of a little vessel made of fine brown clay. It is covered with fine, parallel cord impressions—about 12 rows to the inch. The base indicates a vessel of about $2\frac{1}{2}$ ins. in diameter. The rim turns out at a wide angle, giving the impression of a B beaker, but with a widely everted rim [1] (fig. 3, 2).

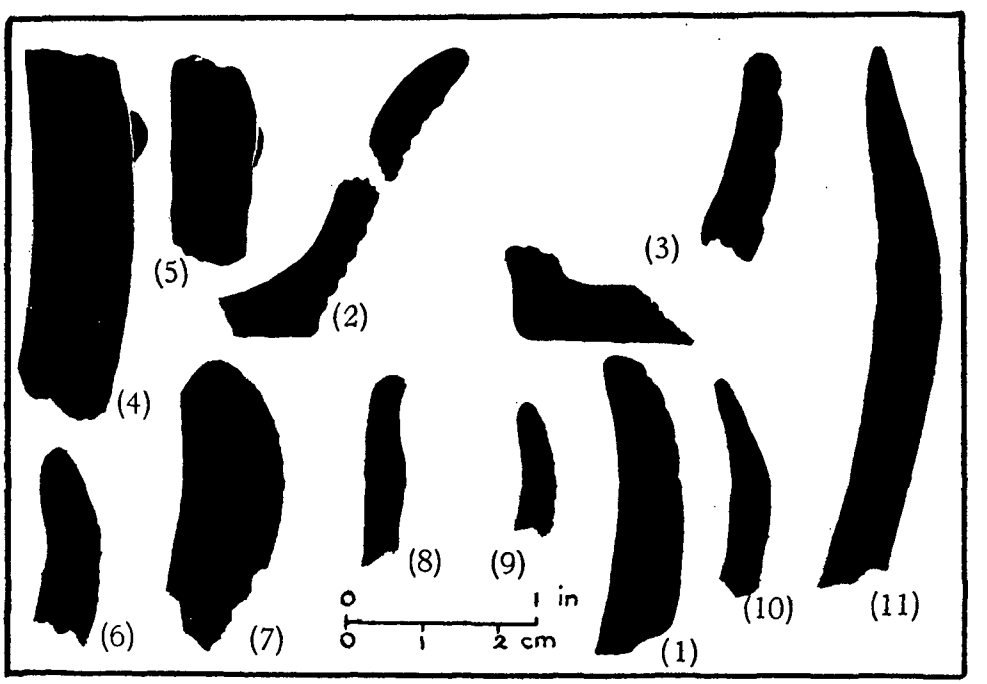

Fig. 3. Outlines of pottery sherds. Nos. 1, 2, 3 and 5 relate to the corresponding numbers in Plate XII.

3. Rim and base fragments of small vessel, both wholly fire-blackened. The outside diameter at the rim is about $4\frac{1}{2}$ ins. and the base 2 ins. Heavy impressions of cord (fig. 3, 3).

4. Sherd of light brown clay with five lines of bold string marks deeply impressed.

[1] J. Abercromby, *Bronze Age Pottery*, II (1912), pl. ci; *cf.* fig. 535*b*.

5. Thick fragment of red ware with raised band on exterior which is itself overlaid with "maggot" markings irregularly laid on.

6. Heavy-walled sherd of rather fine red texture. Impressions are faint through weathering.

7. A light brown piece with imposed band, part of which can be seen to be detached. Maggot markings are faint.

8. Fire-blackened fragment with bold string impressions.

9. Red ware with three prominent oblique markings.

10. Small rim piece with markings firmly impressed.

11. Small sherd with two clear-cut lines of small comb incisions numbering about 24 to the inch.

12. Seven fine, clearly impressed, parallel lines of cord markings in brown clay.

13. Defaced piece with five string impressions.

14. Brown sherd with six parallel lines of fine cord impressions within $\frac{7}{8}$ inch.

15. Cord impressions showing good "sand-blast" effect.

16. Seven very sharp and well-defined rows of string markings in about $\frac{1}{2}$ inch.

17. Minute impressions as though made with a comb obliquely.

18. Cord markings sand-blasted.

19. Plain grooves pressed in causing the clay to bulge out.

20. Rim fragment with plain line markings.

21. Sherd with two scores on inner face.

22. Bold chevron pattern.

Stone Artifacts.

The number and variety of the flint tools from the Glenluce Sands have long been recognised and renowned and require no recapitulation here. The site under review has been no exception, and over the whole area the surface is studded with immense concentrations consisting of many thousands of flints. In face of such potential wealth one could but be selective and pick out only those which appeared to be noteworthy. Possibly the most striking feature was to see a flint site where a single worker had been employed, his materials and debris spread around just as the pieces had been struck off, together with the manufacturing tools of hammer and anvil. Sometimes one stone had been used in the double capacity of hammer and anvil (fig. 2), but, more often, these were found separately. In the greater concentrations a number of workers must have been employed over a considerable period to leave behind such masses of fractured flints.

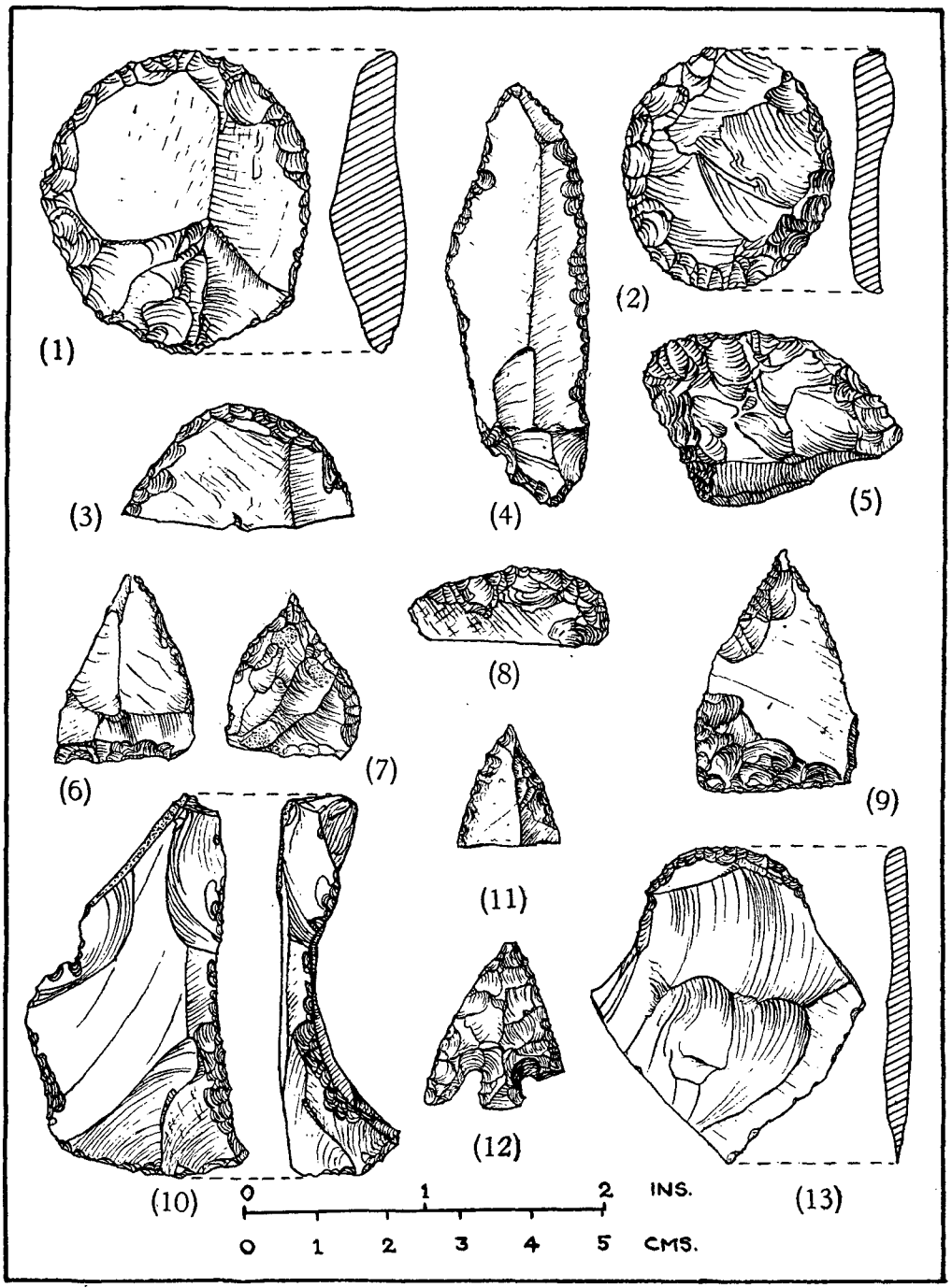

Fig. 4. Flint artifacts.

Flint Artifacts.

It will be sufficient to mention only a few good specimens of the knapper's work (fig. 4).

1. A dark bottle-green flint discoidal scraper, somewhat turtle-backed with plain reverse showing prominent bulb of percussion. Steeply trimmed opposite bulb and lightly dressed round remainder, except at bulb where it is battered.[1]

2. An opaque, almost transparent greenish flint with a $\frac{1}{4}$ in. brown band across its centre. Trimmed as above on one face only; reverse being plain, with outstanding bulb.[2]

3. Thumb-nail scraper in brown flint.

4. Knife, trimmed along both long sides.

5. Heavily backed round scraper.

6. Lance-head finely dressed along two sides; made from fine flake and showing prominent ripple marks on reverse.

7. Fine point trimmed along one side and ground on other.

8. Small, finely dressed scraper, trimmed on both sides of curved edge.

9. Fine translucent point, trimmed both edges, terminating at base in hinge fracture.

10. Hollow scraper for left-handed work.

11. Broken point in dull white flint.

12. Arrow-head, in white flint, barbed and tanged. Finely worked and polished.

13. Very thin fine flake with rounded end, very delicately dressed on one side only to form round-nosed scraper. Ripple flake scars visible front and back transversely to worked face.

Flint Howe.

About half a mile NE. of the site described above there are two small adjacent hills, called on the O.S. map Flint Howe. These bare, rounded hillocks stand less than 20 ft. high above the surrounding sand and are almost completely covered with broken stones, most of which appear to be fire fractured (Pl. XI, 1).

Around the base several small knolls were noted, and two of them were excavated to reveal small stone-built hearths. These proved to be almost circular—about 36 by 32 ins.—erections built of small stones such as are widespread in the area and without any binding matter. The centre was hollow and was completely filled with sooty debris containing fragments of carbonised wood, but no relics were discovered (Pl. XI, 2).

[1] *Cf.* J. Evans, *Ancient Stone Implements*, 270, fig. 204.
[2] *Cf. Ibid.*, 276, fig. 219.

Both hearths examined had the same characteristics. Neither of their heights was more than 9 ins. above the sand.

Hearths similar to the above have been found on Shewalton Moor, Ayrshire. They are described [1] as simply rings of stones, generally pretty much burned and consisting of a built structure of water-worn stones, without cement, 2 ft. 6 ins. in diameter and 15 ins. deep, the upper surface, where the fire was placed, being hollow. In the basin-like depression there were bits of charred branches, charcoal powder and fragments of bones.

Some 20 yds. from the base of the hillocks a large flat sand-dune disclosed a further large concentration of the same nature of sooty matter to a depth of several inches and a length of nearly 10 ft. There were neither stones nor hearth visible in this case.

Slag found with No. 3 Urn.

Along with the broken portions of the No. 3 urn there was picked up a piece which looked like the bottom of an urn, this being a quadrant forming part of a base of about $3\frac{1}{2}$ ins. diameter. It was about $\frac{5}{8}$ in. thick.

On examination after cleaning, it proved to be a piece of slag which had been left in the bottom of a vessel and had moulded its form to the inside base of a vessel with a rounded fillet between the wall and the base.

From the apparent diameter it appeared unlikely that it was related to No. 3 urn. Yet some features appeared to point to some connection: the sooty laminated deposit of carbon in the No. 2 urn; the general appearance as well as the thickness of the base of the same vessel suggested a crucible; the carbon-laden fragments of the No. 3 urn; the Report from Tatlock and Thomson; the extensive manufacture of carbon at Flint Howe—all appeared to point to a late use of a Bronze Age vessel. The slag fragment was therefore submitted to Mr H. E. Crivan, B.Sc., A.R.T.C., A.R.I.C., F.I.M., Head of the Department of Metallurgy, Coatbridge Technical College, for analysis, with the undernoted result.

Report on the Analysis of a Sample of Slag found among the Fragments of No. 3 Urn.

"The sample submitted on visual examination was found to be slag, which was confirmed by the low density of the material.

One could fairly assume that the sample had been formed during the manufacture and melting of a charge of steel and would consist principally of ferrous silicate together with smaller quantities of manganese and calcium silicates and still less of some aluminates. Iron oxide would almost certainly be present as well, but carbon could hardly exist in the oxidising atmosphere prevailing, and would be liberated as carbon monoxide and dioxide, which would escape through

[1] J. Smith, *Prehistoric Man in Ayrshire* (1895), 118.

the molten slag. Traces of this gas are often entrapped in the slag and form small blow-holes.

The presence of iron or steel in the slag is most unlikely, as the slag is much more fluid and a great deal lighter than iron or steel and floats on the latter without mixing and, in fact, acts as a protective coating to excessive oxidation, at the same time playing a large part in refining the steel by the chemical reaction of the iron oxide in the slag and the carbon and other impurities in the iron such as manganese and silicon. Consequently the carbon will be eliminated as gaseous oxides while the silicon in the iron would be oxidised by the iron oxide to silicon dioxide, this latter forming a fluid, low melting-point slag with iron oxide, viz. ferrous silicate.

Similarly, manganese is easily oxidised to manganese oxide, which forms manganese silicate with the silicon dioxide which still further lowers the melting-point of the slag, increasing its fluidity.

The low specific gravity of the sample of slag makes it clear that if any metallic iron is present, it would be finely disseminated in small globules none of which could be detected."

The sample of the slag was subsequently crushed to destruction and its analysis gave the undernoted result.

	Per cent.
Ferrous oxide, FeO	63·19
Ferric oxide, Fe_2O_3	7·15
Free metallic iron	9·04
Manganese oxide, MnO	0·60
Sulphur, S	0·017
Phosphorus, P	0·40
Carbon, C	0·164
Insoluble matter (mainly silica—SiO_2 with a little lime, CaO)	19·44
	100·00

"The above analysis seems to indicate that the specimen was tap-cinder from a wrought-iron puddling furnace, probably originating from the hearth.

Wrought iron from such a furnace has long been used for the cementation process of steel-making in crucibles, and it is a possibility that the charge of wrought iron was associated with a larger quantity of tap-cinder than usual and, mixed with charcoal in the crucible in the usual way, the charge could have been heated to a temperature sufficient to render the tap-cinder plastic without melting the steel, as the melting-point of the latter is much higher. This could account for its shape, as it would easily take the shape of the crucible in such a soft condition. Should the slag have been melted and then floated on a layer of molten steel, then the free iron in the slag would have entered the molten steel and would not have appeared in the slag analysis.

If, however, the crucible was used before the general introduction of the puddling furnace, then the above theory would no longer hold good.

There is another possibility that the tap-cinder was produced during the working of some primitive process and thus entered the crucible with the iron.

Another possibility suggests itself. The tap-cinder may have been made in the crucible, gradually accumulating in thickness and brought about by

oxidation of iron charges and the combination of the iron oxides with silica which would be introduced with the charge as impurities, or from silicon in the iron, or, perhaps, added purposely, to produce a slag. The silica could also have originated from the crucible itself. Slag accumulations are often seen at the top of crucibles which have not been properly cleaned after each melt or charge.

The carbon in the slag (0·164 per cent.) could, of course, have originated from organic carbonaceous material from the earth or have become associated with the slag from the crucible charge."

Rather than leave the question of the formation of the slag wide open, Mr Crivan generously undertook the examination and analysis of the materials from each of the urns No. 1 and No. 3 with a view to determining from their structure whether one or other could have been utilised as a crucible. He furnished the following additional Report on these vessels.

Report on Tests on Samples of Pottery from Nos. 1 and 3 Urns.

"I crushed samples of the clays of both urns, ground them with water and examined them for plasticity, in order to give an indication of the temperature to which the urns had been heated. It will be understood that when clays are heated to low temperatures, say 200–300 deg. Cent., they still retain this plasticity on crushing and grinding with water, but at temperatures sufficiently high to drive off their water of combination, they lose their plastic nature even if crushed and mixed with water. Both urns had little plasticity left although No. 1 had retained a little more than No. 3.

Different clays lose their combined moisture at different temperatures but the extreme range is usually about 450°–600° C. Repeated heating of most clays to these temperatures would gradually destroy their plasticity.

Evidence therefore exists for the belief that the urns had been subjected to a temperature of at least 450° C., No. 3 having had more heat applied than No. 1. This temperature is well above that at which any organic matter would decompose, whether it be food, plants, fuel or body remains. At 450° C. or thereabouts a carbonaceous deposit would remain but would not burn off to any extent as this would require a rather higher temperature. Some of the carbonaceous deposit has probably been burned away but it is not possible to determine the proportion.

Further tests on the samples were taken to determine the refractoriness of the clays, *i.e.* their ability to withstand heating to high temperatures. The results were as shown in the following table.

The results indicate that the clays would definitely not be suitable for high temperatures such as are used in steel-melting, as at least 1500° C. would be required and at this temperature the clays would melt and slag. The appearance of the urns indicates that temperatures even around 1100° C. had never been reached.

No. 3 urn is a little more refractory than No. 1, although the difference is not very great. The textures are, of course, different. A chemical analysis would probably reveal some difference in composition which would account for the slightly different refractoriness. Usually, the less refractory clay has a higher percentage of impurities, such as alkalies, lime, magnesia or iron oxide. Clay is

Temperature in degrees Centigrade.	No. 1 Urn.	No. 3 Urn.
850	Turns bright red. No signs of fusion.	As for No. 1. All carbonaceous matter now driven off.
1050	Still no signs of fusion.	As for No. 1.
1100	Incipient fusion on the surface of the clay.	No signs of fusion.
1150	Definite fusion penetrating into body of clay.	Signs of fusion mainly on surface.
1250	Fused slag-like appearance.	More definite signs of fusion; not to same extent as No. 1.

basically aluminium silicate with combined moisture and impurities. No. 1 urn is probably a little less refractory on account of having a lower percentage of alumina and a higher one of silica. The large particles seen in No. 1 urn appear to bear this out as they are probably of a siliceous nature, which would lower the refractoriness in this case."

Observations.

The improvised method employed to salve the No. 2 urn, while novel, was not unprecedented. Dr J. B. Mears used much the same technique in raising a cinerary urn at Brackmont Mill, Fife, about 1935,[1] the main difference being that he utilised cotton bandages with loops for lifting, and the inverted top of the urn being unsupported, the sand and bones were deposited in a heap in the excavated pit.

White Quartz Pebbles.

The presence of white quartz pebbles has been noted.[2] These have frequently been recorded from burial sites. Three such were found with a skeleton in a barrow on Elton Moor.[3] In opening Carder Low, near Hartington, about eighty quartz pebbles were found. It has been suggested that they were possibly cast into the mound during its construction by mourners and friends of the deceased as tokens of respect.[4] A quartz pebble lay among a deposit of burnt bones, accompanied by a bronze pin, in another barrow near Throwley.[5] It has also been stated that in Penmyuydd Churchyard, Anglesea, numerous skeletons were found with a white oval

[1] *P.S.A.S.*, LXXI (1936–8), 262.
[2] See above, p. 46.
[3] *Vestiges of the Antiquities of Derbyshire*, 43.
[4] *Op. cit.*, p. 63.
[5] T. Bateman, *Ten Years Diggings* (1861), 130.

pebble of the size of a hen's egg near each.[1] In the group of cinerary urns found at Stevenston, Ayrshire, four white quartz pebbles, each about ½ in. in diameter, were found with the bones from four urns [2] and, found embedded in the centre of the cover of another were about six quartz pebbles and a reddish quartz pebble about the size of a hen's egg.[3] At Musselburgh hundreds of white quartz pebbles, large and small, at one point formed a layer 9 ins. thick.[4] White stones averted the Evil Eye and carried with them the protection of heaven, whence they were said to come.[5] In the Book of Revelation there is a passage [6]: "To him that overcometh . . . and [I] will give him a white stone, and in the stone a new name written, which no man knoweth saving he that receiveth it." There is thus ample evidence of the symbolism of the white pebble which is often represented as emblematic of happiness or a happy day, and why these pebbles may have been cast into tombs or ancient graves.

Coloured Staining on Bones.

Two of the cremated bones showed green stains; one had red and some fragments had blue. Burnt bones with green staining have been reported from Langside, Glasgow [7]; Seamill, East Kilbride [8]; Pitlessie, Cults, Fife [9]; Balnabraid, Kintyre [10]; Brechin [11]; Cowdenbeath [12]; and Palmerston, Dumfries,[13] and in all these cases the stains have been attributed to the deterioration of or contact with a small object of bronze or copper.

This may be quite true, but another explanation has been offered: "The green stain, sometimes observed on bones, is not always due to the proximity of bronze or copper, but has been found on analysis to be caused by the presence of phosphate of iron, a salt which can assume various tinges of blue and green." [14]

In close proximity to the urns' site there is much evidence of iron pan. This is a hard, scaly stratum that forms below soil or sand and which is encrusted sufficiently to retain water. On its formation the wind blows the sand from above it, leaving it exposed and frequently waterlogged. The sand below it tends, also, to become blown away by wind currents, leaving the resistant scale layer until the undercutting causes it to break off. Iron pan is caused by the deposition of iron salts through the percolation of water impregnated with iron. It is not found in all sand deposits, but only where iron-bearing water has been filtering as is the condition prevailing widely at and around the urns' site.

[1] *Arch. Camb.*, 3 ser., VII, 91. [2] *P.S.A.S.*, XL (1905–6), 385. [3] *Ibid.*, 394.
[4] *Ibid.*, LXXXI (1945–7), 176. [5] Wallis Budge, *Amulets and Superstitions*, 326.
[6] Rev. ii, 17. [7] *P.S.A.S.*, XXXIX (1904–5), 528. [8] *Ibid.*, LXI (1926–7), 248.
[9] *Ibid.*, 264. [10] *Ibid.*, LIV (1919–20), 189. [11] *Ibid.*, LXXV (1940–1), 211.
[12] *Ibid.*, LXV (1930–1), 266. [13] *Trans. Dumf. and Gall. A.S.*, XVII, 85.
[14] Brit. Mus. *Guide to Antiquities of Bronze Age* (1920), 65.

From the analyses of the carbonaceous deposit inside the No. 2 urn, and that of the clays, together with the presence of much iron pan in the area, there is thus sufficient *prima facie* evidence to support the conjecture that the green and blue stains were produced by iron phosphate; and that there was more than enough iron oxide present to form red stains, as this oxide is simply rouge. There is no evidence of the presence of iron pyrites as, if this had been present originally, it would oxidise to red iron oxide on the application of heat.

Bone Content.

It has been noted that the No. 2 urn contained the remains of a child, and that the urn was filled to a depth of $6\frac{1}{2}$ ins. with sand, the osseous remains having then been placed on top. The method of placing the heavier bones into the urn first, followed by the lighter at the top, has been recorded.[1]

The inverting of the urn on burial would cause the sand to filter through the bones, thus causing the cavity noted. Mann has described a hollow cylindrical cavity up the centre of a mass of osseous contents of two cinerary vessels which he attributes to the cremated bones having been gathered up into a small sack, the mouth of which had been twisted into a rope-shape and placed downwards within the vessel. On the decay of the sack the bones became concreted and retained this position round the vacant space.[2] There was no evidence of any such feature in this Glenluce urn.

The Bead.

The jet bead is somewhat ovoid in form, being rather rounder at one end than the other. It is about $\frac{3}{8}$ in. in length and $\frac{1}{4}$ in. at its greatest diameter. The perforation does not follow the normal line of its long axis but is pierced laterally by a curved transverse hole on one side of its main axial line. On its outer surface it has a double spiral cut to form one steeply-pitched turn. This takes the form of a groove shaped in **W** form. The general appearance is well proportioned, elegant and even artistic (fig. 2, 2*a*).

Jet beads are common enough in prehistoric burials but those embodying the spiral motif are infrequent. John Smith reports one spirally twisted from Stevenston Sands, Ayrshire,[3] and one — of vitreous paste — from Shewalton Moor [4]; while another, of the same material, is recorded from Wigtownshire [5]; while one—of blue glass—from Edderton, Ross-shire, has yellow spiral inlays.[6]

[1] *P.S.A.S.*, LXXXI (1946–7), 178.
[2] *Trans. Dumf. and Gall. A.S.*, 3 ser., XVII, 94.
[3] *Prehistoric Man in Ayrshire* (1895), 43.
[4] *Ibid.*, p. 116.
[5] *P.S.A.S.*, XL (1905–6), 401.
[6] *P.S.A.S.*, V (1862–4), 312.

The curved hole suggests the V-shaped perforation associated with buttons [1] and pendants [2] which is common in England and in Scandinavia,[3] and gives the impression that the ornament was intended for suspension as a pendant or attachment as a button and not for stringing on a necklace. In view of the fact that the remains were those of a child, a simple pendant was probably the more likely use, as a button of this size would have been of little utility or service in the clothing of a very young person.

Soot-Blackening.

The presence of fire-blackening has frequently been recorded from Bronze Age burial sites as at Deerness, Orkney,[4] where a clay urn, full of ashes, was, in the upper part, darkened with soot, the lower being of a reddish colour. Another from Orkney had an incrustation of soot under the shoulder.[5] The report does not state whether these sootings were outside or inside the urns. One from Harray, Orkney, bore traces of both fire and smoke on the outside.[6] In one of a group of cinerary urns found at Stevenston, Ayrshire, hard sooty matter to an unusually large extent adhered firmly to the lower part of the interior.[7]

The Glenluce urns, particularly No. 2, were all sooted. Mr Crivan has effectively scotched the crucible theory and Tatlock and Thomson the possible domestic use, even without Professor Childe's caution that it should be remembered that domestic pottery corresponding to the cinerary urns of the funerary series is quite unknown.[8]

I have made a list of objects found on the Glenluce Sands and have not been satisfied that anything therein could come into the category of objects which Tatlock and Thomson instance as necessitating the application of a certain amount of heat. Certainly fish-hooks and many other small objects may have had heat applied, but these would be done in a simple hot flame and not within a vessel.

My only suggestion—and I advance it with much reserve—is that the repeated application of heat resulted from the firing of the vessel itself from the inside. It is conceivable that external heat alone was not giving sufficient firing to solidify the walls of these comparatively thick-walled vessels and that outward firing had to be supplemented by inward. To some degree this is substantiated by an examination of the fragments of No. 3 urn, where the heat penetration from the inside is much greater than that applied externally (Pl. XI, 3). This is itself a natural phenomenon, as the internal heat is conserved within the vessel whereas the external is dissipated into the cold air.

[1] J. R. Mortimer, *Forty Years Researches* (1905), fig. 418, 925.
[2] *Ibid.*, fig. 607.
[3] Shetelig & Falk, *Scandinavian Archæology* (1937), 63.
[4] *P.S.A.S.*, LXVII (1932–3), 350.
[5] *Ibid.*, 349.
[6] *Ibid.*, XLVII (1912–3), 421.
[7] *Ibid.*, XL (1905–6), 385.
[8] *Trans. Dumf. and Gall. A.S.*, XXIII, 141.

This suggestion may provide a reason for the hearths at Flint Howe. If the urn to be fired were inverted and set on stones placed within the hearth then heat could be applied from below, and the hearth being larger than the diameter of most urns, sufficient draught would be given to raise a considerable heat. It would also account for the lack of relic-debris within the hearth other than the carbonised wood.

It might be said that the outside surface, except possibly the base, would be smothered in smoke and would consequently also be fire-blackened. To some extent this is true, but there could not be the same concentration of heat and deposition of carbon when the smoke was escaping into the air. Whatever external blackening there was would largely be dissipated by the scouring action of the sand and the percolation of water on the surface of the vessel throughout the ages.

The Pottery Build-up.

The three urns appear to fall into Abercromby's cinerary urns—bucket-shaped—Type 6,[1] although from the scrappy nature of Nos. 1 and 3 it is only possible to be definite about No. 2. In the Mann Collection in the Glasgow Art Gallery the last has a near parallel in one found within a grave at Knockdoon, Torrs, Luce. The fabric of these two vessels suggests that they are closely allied and the method of construction similar, as the Torrs urn seems from external examination to have been built up in three ring zones.

The No. 2 urn appears to have been built up in four horizontal bands.

An attempt was made to obtain some definite information about the construction of the vessels from the sherds available. It proved a simple matter to grind the sectional faces of sherds of widely varying texture from the crude, open, stony ware of the No. 1 urn to sherds that were hard and compact and fired almost to their melting-point. A fine grade of an aluminium oxide, abrasive grinding wheel with a medium grain and a vitrified bond, 24 ins. in diameter and running at a speed of 5000 peripheral ft. per minute, gave a smooth polished surface which showed up the inner structure of the sherd without disintegrating it. The control was by hand. It was noted that, in grinding, the skin of the fired faces of the sherd tended to spark off in minute particles. This could be due to the release of the surface tension induced by shrinkage during the early drying of the clay after the urn had been made, but which did not show superficially until later, or it might also have been caused by prolonged heating in the clay which brought about a gradual disintegration, helped by the penetration of carbon into the pores.

Stevenson has suggested [2] that it would be interesting to see how often the cordons of cordoned urns are applied. Pl. IX, 3 and 4, shows how a small cordon was imposed on the surface of the $\frac{1}{2}$ in. thick wall of a vessel and how

[1] *Cf. Bronze Age Pottery*, II, pl. ci, 535*b*.

[2] *P.S.A.S.*, LXXIII (1938–9), 238.

this flat pressure joint had "sprung" from its seating. This crack extends for $\frac{3}{4}$ in. along its longitudinal face. That this rupture was purely local can be seen from the adjacent face section of the same sherd only $1\frac{1}{2}$ ins. away and which shows the line of merging of the build-up of the whole head. The maggot-design potsherds (Pl. XII, 5 and 7) have both a raised applied band, and the latter shows how this has come detached, leaving a clean, right-angled break in the centre of the photograph.

The internal make-up of urn No. 1 has been commented on. The ground face (Pl. XIII, No. 1) not only illustrates the characteristic texture of this vessel, but also shows the lines of application of the banding. The rim of this vessel is wavy (No. 2) to such a degree as to confirm the roughness of its construction but this scalloping effect appears to be intentional (No. 3). Both views show the stony content even when smoothed off to form the wall surfaces of the urn.

A fresh break of the fragment (No. 5) shows how this rude material was manipulated to produce a smooth, rounded edge.

No. 6 illustrates a 30° lap joint, and No. 7 shows the two fractured faces where the joint has come apart. The light colour penetrating from the faces of the pottery appears to indicate a structural joint.

No. 8 shows a very flat angle lap joint, and below it is illustrated the same piece with the edge ground.

Among the outlines (fig. 3) there are two specimens (Nos. 9 and 11) of false rims from No. 3 urn.

Cremation.

The relationship between skeletal remains and their containing vessel has not received much attention. Dr Wells informs me [1] that "the dried skeleton of an adult weighs 12 to 15 lbs.; that of a child, like Glenluce 2, probably not more than 3 lbs. When green bone is burned it will crack and warp tremendously, unlike dry bone which can be reduced to cinder without losing its shape. If the bones did not fall to pieces in the fire they would certainly do so on handling. Obviously, there must be a big loss on burning.

The real question seems to be that of packing volume rather than weight. My impression is that it requires a fairly fierce heat acting for quite a time to reduce a human body to bone ash. Do you remember the cremation of Hector in the *Iliad*?" [2]

[1] Letter of 23/6/52.

[2] "Perform, ye Trojans! What the rites require,
And fell the forests for a funeral pyre;
. . . . . .
These Toils continue nine succeeding days,
And high in air a sylvan structure raise."
Homer, *Iliad*, Book xxiv, Trs. by A. Pope, 1720.

1. Aerial view of Glenluce Sands at Urns Site (X) and Flint Howe (XX).
Photograph by Air Ministry.

2. No. 3 Urn Site. 3 and 4. Sectional views showing cordon applied to pottery vessel.

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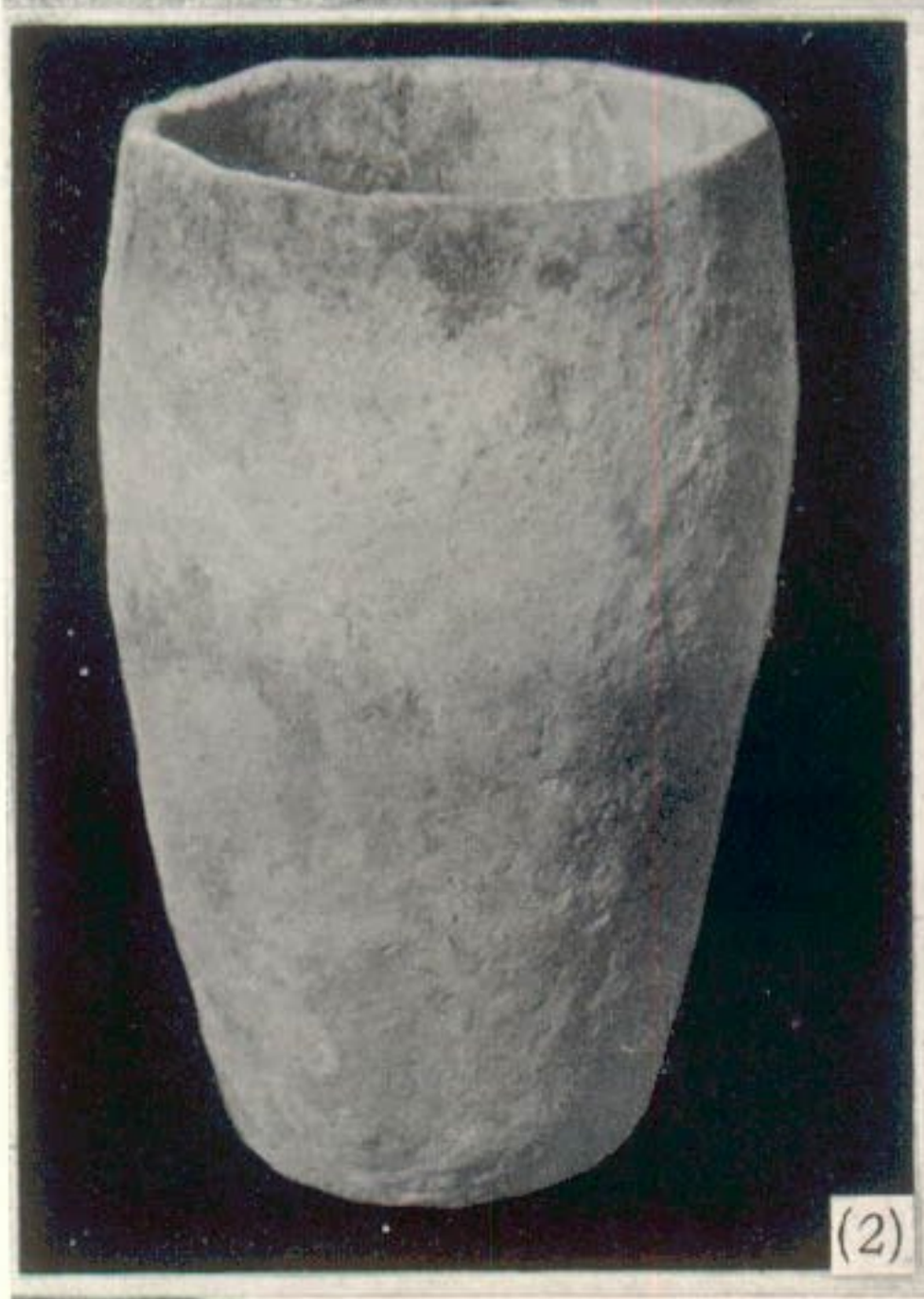
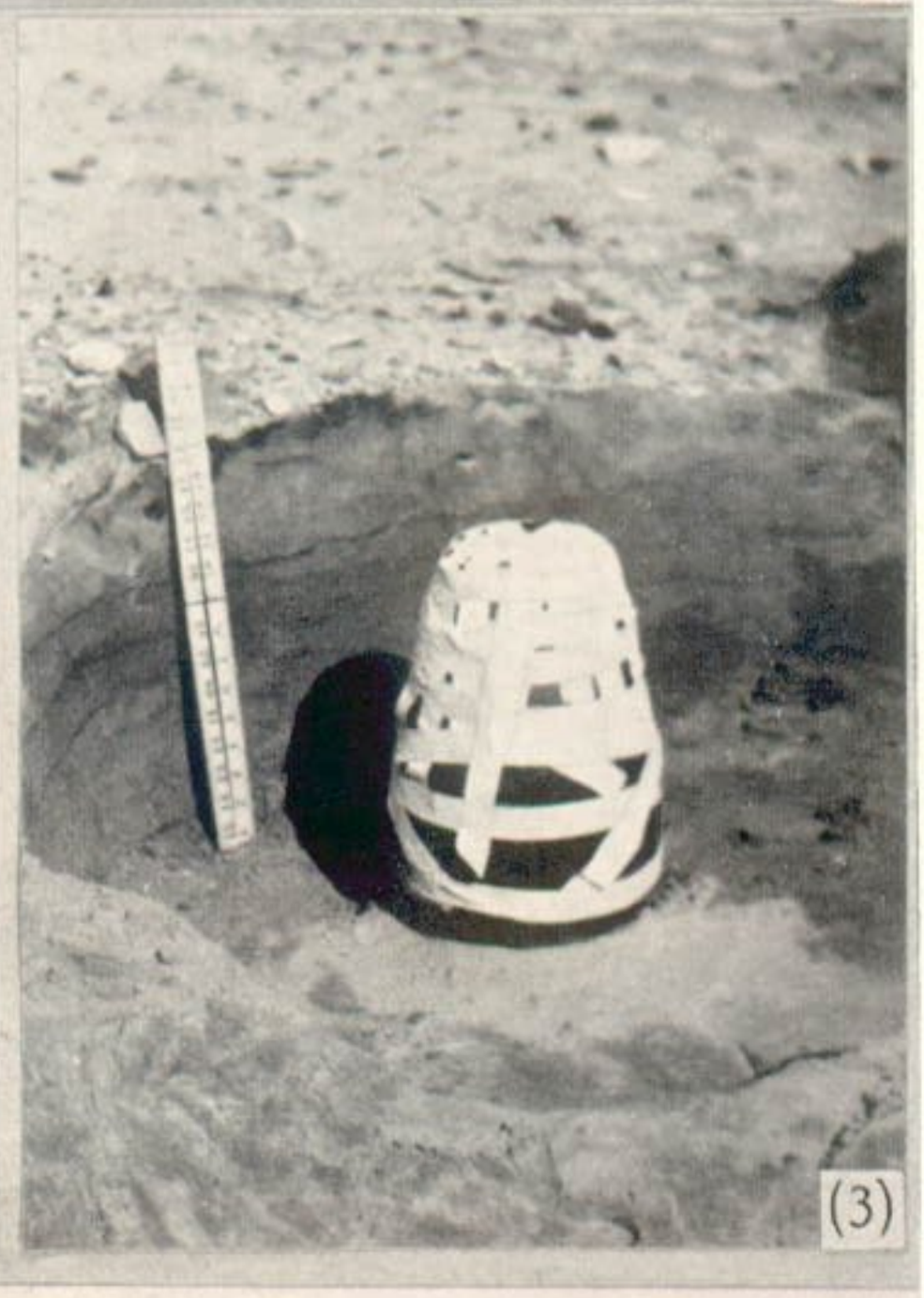
[*To face p.* 64.

(1)



(2)



(3)

(4)

1. General view of Site.—*Photograph by A. F. Gray.* 2. No. 2 Urn. 3. No. 2 Urn *in situ*.
4. Urns Nos. 1 (foreground, left) and 2 (background, right) *in situ*.

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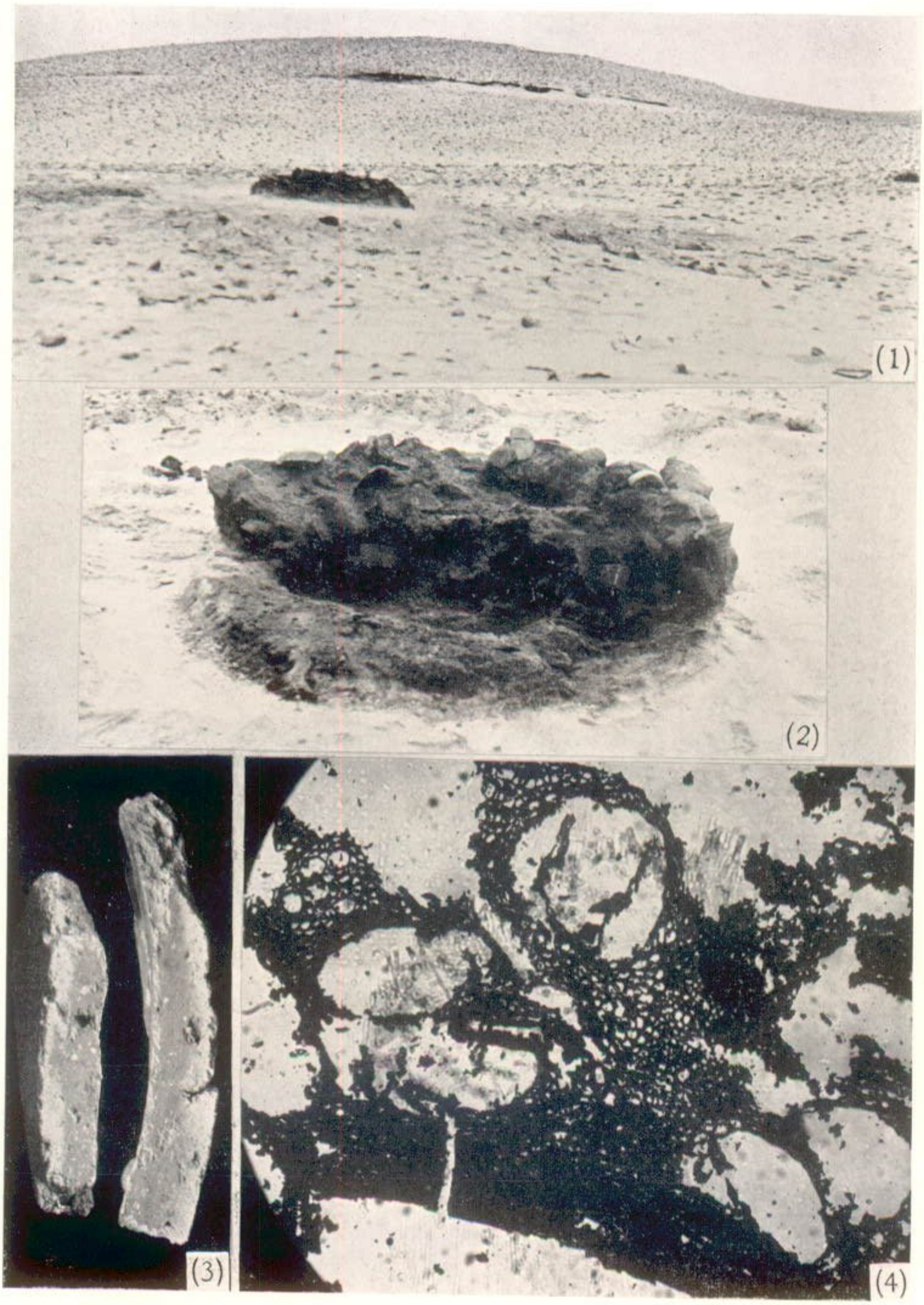

1. Flint Howe. 2. Hearth at Flint Howe. 3. Sherds showing heat penetration from inside of Urn. 4. Microphotograph—1/1500—of oak charcoal found in No. 2 Urn.

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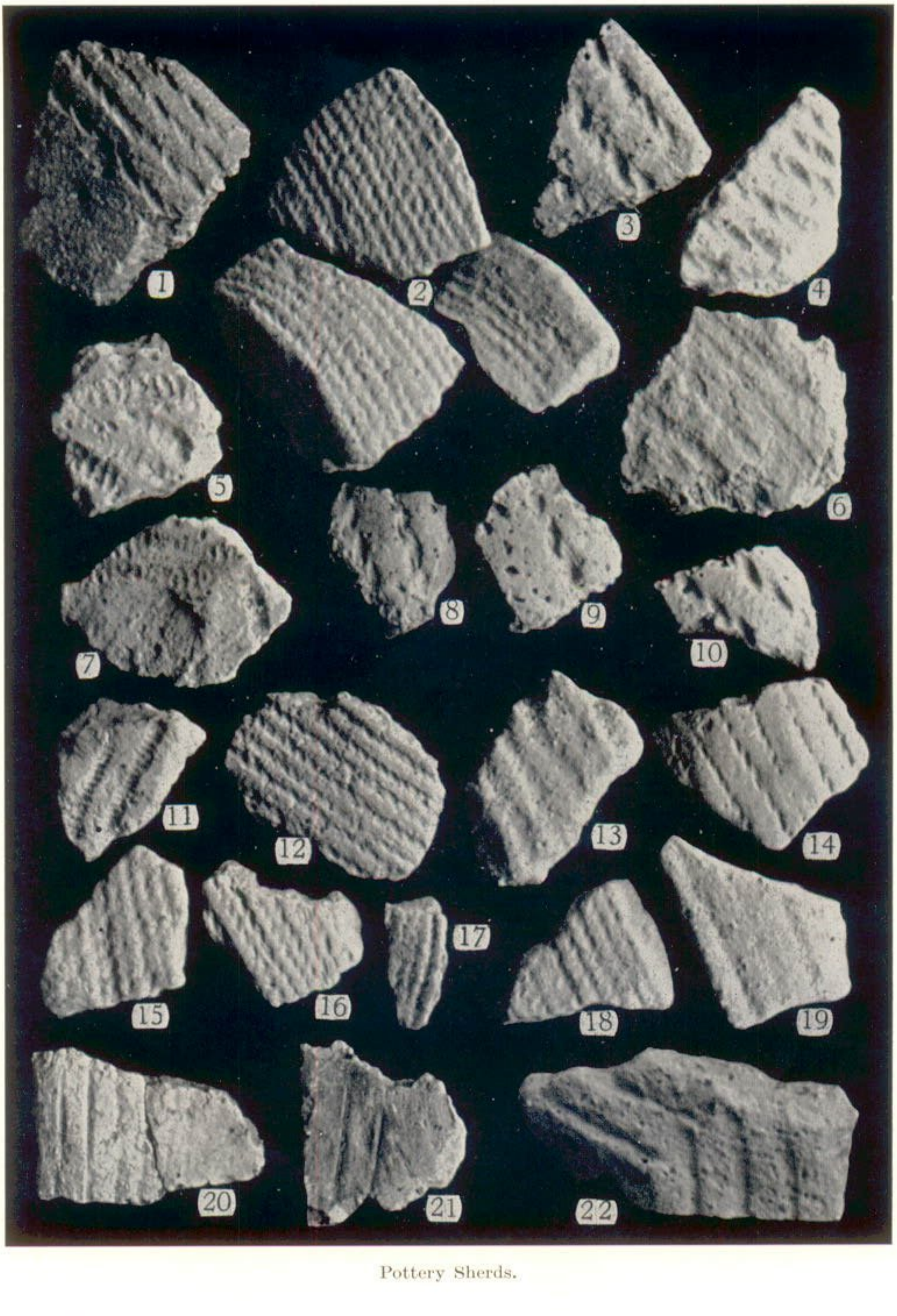

Pottery Sherds.

J. M. Davidson.

1. Internal structure of clay in No. 1 Urn. 2 and 3. Rim view of No. 1 Urn showing wavy formation. 4. Walling of No. 1 Urn showing heat penetration. 5. Material manipulated to make rounded edge. 6 and 7. 30° Lap Joint. 8 and 9. Flat Angle Joint.

J. M. Davidson.

Fairbarn reports [1] that in excavating a cairn on the southern skirts of Middlefield Law, Ayrshire, at an elevation of 1050 ft. he found nothing in it, but under it a complete circular trench was discovered containing a cremation burial along with a great quantity of charcoal of wood in unusually large fragments. It was seen from the scorched and red burnt earth that the cremation had taken place on the circular platform within the trench over which the cairn had finally been raised. At a nearby partially demolished cairn he found under the heaviest stones of the cairn a shallow pit in the sand containing a large deposit of charcoal of wood and fragments of incinerated bone, the residue probably of the funeral pyre.[2] That field cremation, even in modern times, requires much fuel is evidenced by the allowance of wood fuel for the cremation of Indian soldiers during the 1914–18 war which was 1 ton.[3] Modern cremation practice, however, can reduce a body weighing 144 lbs. to about 4 lbs. It may be taken as certain [4] that the gaseous products arising from a cremated body amount, although invisible, to no less than 97 per cent. of its weight, 3 per cent. only remaining as solids, in the form of pure white ash.

The partial filling of urns with cinerary remains is an archæological commonplace. Of the capacity of the Glenluce No. 2 urn about 56 per cent. was taken up by sand. In comparatively few of the cinerary urn records are there details of the osseous content other than a description or analysis of the bones themselves, and there are a number of reasons to account for this. Frequently the urn is broken, sometimes being found crushed and often being wrecked on removal and, in many cases, the contents were scattered; sometimes only a part of the urn was saved, in many cases the bases or parts of the bases or rims were missing; in the search for "treasure" the bones were reckoned of little consequence and were consequently lost or destroyed; in other cases only the larger calcined bones have been preserved, and frequently it is quite uncertain that all the bones have been recovered. It is therefore not altogether simple to compile reliable data from information so fragmentary. There is nevertheless some information available, and in some reports the proportion of bone remains is related to the urn space while in others the weight of the bone content is stated. The proportions vary from about $\frac{1}{4}$ of the urn capacity to "packed full" of incinerated human remains.[5] At Loanhead of Daviot a series of cremation interments of one adult in a single cinerary urn varied from 1 lb. to 2 lbs. 14 oz.[6] A general average weight appears to be round about 1 lb. 15 oz.

Information was given regarding three urns selected at random from the Collections of the National Museum and the Glasgow Art Gallery as to the weight and volume of their bone contents. It was found that, on

[1] *P.S.A.S.*, LXI (1926–7), 275.
[2] *Ibid.*, 278.
[3] *Ibid.*, LXXI (1936–7), 272.
[4] *Ency. Brit.*, 14th Ed., VI, 665.
[5] *P.S.A.S.*, LXXII (1937–8), 20.
[6] *Ibid.*, LXX (1935–6), 304 ff.

TABLE I.—BONE CONTENT RECORDED ACCORDING TO VOLUME.

Urn from	Reference. *P.S.A.S.*	Page.	Maximum urn sizes in inches.		Urn capacity. cub. ins.	Bone content.		Bone weight.				Per cent. of ashes to vol. of urn.
						Actual Proportion	Estimated. cub. ins.	Actual.		Estimated.		
			Height.	Dia.				lbs.	oz.	lbs.	oz.	
Durness	LXVII	346	15	$12\frac{3}{8}$	654	$\frac{2}{3}$	300	..	..	6	13	46·1
Orkney	,,	346	13	$12\frac{3}{4}$	788	$\frac{2}{3}\frac{3}{4}$	496	..	..	11	5	63·0
Aberdeen	LX	102	$10\frac{1}{2}$	$10\frac{1}{4}$	900	$\frac{1}{4}$	445	..	..	10	2	49·4
,,	,,	,,	$13\frac{1}{4}$	$11\frac{3}{8}$	844	$\frac{1}{2}\frac{3}{8}$	304	..	..	6	15	21·6
Quandale	LXXI	78	$6\frac{3}{4}$	$7\frac{7}{8}$	174	$\frac{3}{8}$	96	..	..	2	3	55·2
Craigentinny	LXXII	20	$8\frac{7}{8}$	8	258	Full	258	..	..	5	14	100
Stranraer	LXXVI	79	17	$12\frac{1}{2}$	1452	$\frac{1}{4}$	144	..	..	3	4	10·0
TOTAL					5070	..	2043	..	..	46	8	
AVERAGE					724		292	..	..	6	10	40·3

TABLE II.—BONE CONTENT RECORDED ACCORDING TO WEIGHT.

Orkney	XLVII	420	11	$10\frac{1}{2}$	746	..	44	1	..	..	..	5·26
Midlothian	LXVI	402	$14\frac{3}{4}$	$14\frac{3}{4}$	870	..	88	2	..	..	..	9·0
Loanhead 6	LXX	293	$13\frac{1}{4}$	$11\frac{1}{4}$	665	..	126	2	14	..	..	17·0
,, 7	,,	293	12	12	628	..	107	2	7	..	..	10·5
,, 8	,,	293	$14\frac{1}{2}$	12	660	..	112	2	9	..	..	15·0
,, 3	,,	294	$8\frac{1}{2}$	$8\frac{1}{2}$	261	..	52	1	3	..	..	18·2
,, 2	,,	294	10	9	272	..	112	2	9	..	..	37·0
,, 4	,,	294	11	12	630	..	107	2	7	..	..	15·2
Dunragit	LXXIX	168	$11\frac{1}{2}$	$11\frac{1}{8}$	654	..	63	1	7	..	..	8·8
Seamill	LXI	250	$12\frac{3}{4}$	$10\frac{1}{4}$	579	196	219	5	..	..	..	33·8
Pinkie Mains	LXXXI	177	$9\frac{1}{2}$	8	306	210	142	3	4	..	..	68·6
Outerston	LXXIII	230	$11\frac{1}{2}$	$10\frac{1}{4}$	392	52	82	1	14	..	..	13·6
Dumfries	*D. & G.* XXIII	139	$7\frac{3}{8}$	$9\frac{1}{16}$	225	..	77	1	12	..	..	30·1
TOTAL					6888	..	1331	30	6	..	..	..
AVERAGE					530	..	102	2	5	..	..	21·7

the average, 2·7 cubic inches of osseous remains weighed one ounce, and tables were compiled based on this figure. It is appreciated that the urns examined form a very small and haphazard sample of Scottish Bronze Age cinerary urns, but, accepting them at the moment on the basis of the now fashionable 1 per cent. pilot survey, they may indicate a trend in Bronze Age cremation practice. Further reservations must be made: when a vessel is reported as being $\frac{1}{4}$ full of bones, it is assumed to be $\frac{1}{4}$ of its depth and not $\frac{1}{4}$ of its volume; vessels were chosen which were more or less complete; and, wherever possible, a cremation burial was taken representing one adult only.

From Table I the proportion of ashes to the volume of the urn at 40 per cent. appears to be high, but this may be accounted for by the apparently empirical method of computing it by an approximate fraction. Had the proportions of bone content been taken relative to the volume of the urn the ash volume would have risen to 60 per cent. The urn capacity is shown as about 36 per cent. higher than the average of Table II, while the ash content is about 186 per cent. greater. The percentage of space in the urns varies from 95 to none, although even in the latter case in a packed urn some space was taken up by intrusive fibrous rootlets and in many there is a small proportion of carbonised wood. In any case it is obvious that ample provision was allowed for in selecting a receptacle to bury the cremated remains. Some of the weights in Table I convey the impression that more than one burial is made in the same urn.

Conclusions.

This late Bronze Age site has furnished a number of interesting features. The cremation burials represent two children in individual urns. The remains of the younger one were placed in an apparently new vessel, for if the urn had been utilised for any other purpose, or for any length of time, it could not have retained the sooty deposit on its inner wall. A choice had to be exercised whether to put the ashes of the children in a vessel much too large for this purpose or to fill it up with some other substance. That sand was chosen in that area is not surprising, but why in the bottom of the urn? Had it been intended to use the vessel for a subsequent interment the sand would probably have been placed over the bones in order not to disturb the ashes of the child. That the choice was made to put the sand in first may have been due to superstitious reasons.

Dr Mears [1] and others have suggested that the upturned vessel became a little house to protect the bones. It was not uncommon to find cremation burials in pits covered over by soil or sand. At one burial at Loanhead of Daviot [2] the cremated remains of six individuals had been thrown into a pit,

[1] *P.S.A.S.*, lxxi (1936–7), 277.

[2] *P.S.A.S.*, lxx (1935–6), 285.

this being subsequently filled with dark soil and ash from the pyre, and, at Drumpellier,[1] in the centre of a circle of nine stone coffins, about two barrow-loads of charred bones were found covered with sand. At Glenluce this practice of sand burial was thus maintained, with the added protection of the inverted urn to prevent dispersal of the ashes.

On the other hand, the sand may have been put in the urn to exclude malevolent influences or evil spirits, although the prevalence of cist burial lends no support to this superstition. Up to a generation ago, in Fife, it was customary to shut and lock the door of a farmhouse while the family was at dinner. Scott refers [2] to this custom, and Frazer mentions [3] that, in the opinion of savages, the acts of eating and drinking are attended with special dangers and the soul may escape from the mouth or be extracted by the arts of an enemy present.

The slag found with the remains of No. 3 urn was clearly intrusive, and may have been derived from a floor above the present level but which, through wind action, has eventually merged with the present.

The site yielded a fair amount of decorated pottery sherds, many however being much defaced through weathering. That their defacement and disintegration can be quickly brought about is evidenced by the fact that the walls and bottom of No. 1 urn had completely disintegrated, leaving not a trace, while the rim was still extant, albeit in a very parlous condition. The ware was mainly corded, and included beaker sherds, and some pieces with maggot and comb markings characteristic of the early Bronze Age.

The urn pottery may well have been manufactured in the district.

"Towards the end of the early Bronze Age, burial without cremation was, practically speaking, at an end, and during the whole of the late Bronze Age, cremation was the sole prevailing custom. From the very nature of this custom important changes were brought about in the form and furnishing of the grave; the grave is a very small chamber which only just allows room for the urn, usually a simple earthenware pot containing the charred bones, or else the urn is set unprotected in the earth. At the same time the sepulchral furniture disappears; there is no longer any demand for large costly bronzes as offerings in the grave, and neither men nor women now receive any other equipment than some unimportant trifle, a pair of tweezers, a pin, a razor, or some such article.

The urns, too, are of the simplest kind, plain earthenware pots without decoration, of the same sort as we find in the fragments of broken earthenware on the dwelling sites. The same jars as were used for food and cooking in daily life were finally made into burial urns. They are in the same category as the 'House Urns' in Germany and Italy. The symbolic idea is clear enough; the urn represents the dwelling of the dead."

[1] J. Miller, *Coatbridge, Its Rise and Progress* (1864), 98.
[2] *Old Mortality*, chap. viii, note iv.
[3] *Taboo and Perils of the Soul* (ii), 116.

The above appears to be a fair summing up of Glenluce; yet not one word refers to that site. The extract is taken from Haakon Shetelig and Hjalmar Falk's *Scandinavian Archæology*.[1] And Glenluce could hardly have had a closer or more telling analogy.

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DISPOSITION OF RELICS.

All the relics recovered, together with the aerial photographs, have been lodged in the National Museum of Antiquities, Edinburgh, by courtesy of and permission from the Officer Commanding, Luce Bay Bombing Ranges, to whom thanks are expressed for the co-operation so freely given at all times to the compiler of this Report.

[1] Trs. by E. V. Gordon (1937), 149–50.