

V.

BRONZE AGE URNS OF CLAY FROM ORKNEY AND SHETLAND, WITH A NOTE ON VITREOUS MATERIAL CALLED "CRAMP." BY J. GRAHAM CALLANDER, LL.D., F.S.A.Scot., DIRECTOR OF THE NATIONAL MUSEUM OF ANTIQUITIES.

Short cists containing cremated human remains sometimes accompanied by vessels of steatite, which are believed to belong to the Bronze Age, have been recorded quite frequently from Orkney and in less numbers from Shetland, but the number of graves containing clay urns of the period is limited, as can be seen in our *Proceedings*, vol. lxxvii, p. 345, where I described all the satisfactory accounts of such vessels of pottery that had come under my notice. Any other records that we can add to the list are, therefore, of more than passing interest to anyone studying the remains of the Bronze Age in these northern islands.

In one of the note-books of George Petrie, Sheriff-Clerk of Orkney, a Corresponding Member of the Society from 1848 to 1875, which are preserved in the Museum,¹ is a very clear account of a cinerary urn found at Grimbister, parish of Firth, Orkney, in 1859. Recently four sketch-books and some drawings by George Petrie were presented to the Library by a grand-niece and her daughter; on a loose sheet, dated 1st November 1859, is a coloured sketch of the urn. Unlike so many old illustrations of antiquities that have been published there can be

¹ No. 5, p. 33.

no doubt that it is a true representation of the vessel, drawn to the scale of one-fourth linear (fig. 1).

Petrie's account of the discovery as contained in his note-book runs:

"In autumn of 1859 I was informed by Robert Scarth, Esq., of

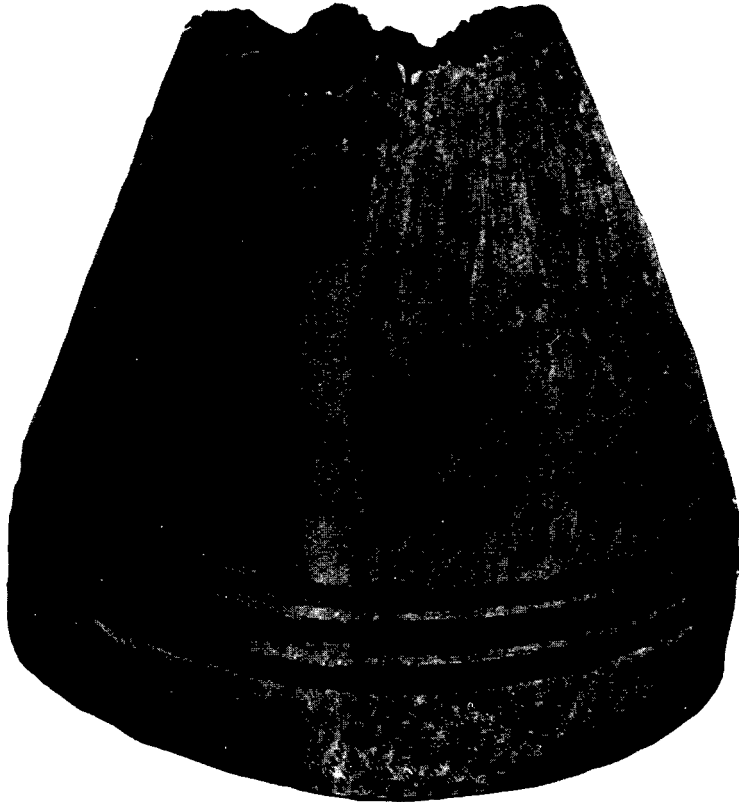


Fig. 1. Cinerary Urn from Grimbister, Orkney. (4.)

Binscarth that one of his Tenants at Grimbister in Firth had discovered a large clay Urn and at his request had left it in the position in which it was found until I could examine it. I went to the place and found the Urn, as it had been discovered, placed bottom upwards on a rudely dressed flat stone of a circular form. It was not in a cist but merely embedded in clay surrounded by large blocks of Stone and lumps of a vitrified substance known in Orkney by the name of Cramp. Some

of the Cramp resembles white opaque glass and is evidently the result of the fire by which the bodies were burnt as fragments of bone are embedded in it. I observed a portion of a human skull and jawbone with the top or upper surface of a large human tooth or grinder among the cramp. There were very few fragments of calcined bones except those embedded in cramp. The Urn was 15 inches in height, 15 inches in diameter at the mouth and 8 inches at the bottom across which a piece of stone lay. The bottom had been crushed probably by the weight of the stone and the broken pieces had fallen into the interior. The Urn was ornamented with three incised rings around the outside near the mouth and a further rude attempt at ornament was displayed in rows of tooth-like incisions running in diagonal rows between the rings and the lip of the Urn. It was very evident that the Urn occupied its original position and that when placed bottom upwards on the piece of flagstone which was under the mouth another piece of stone had been laid on the bottom of the Urn to protect it, and clay and the cramp and the blocks of stone on which probably the fire which had consumed the body had been placed, had then been gathered around the Urn so as to form a low cairn. There were appearances also of a Barrow having been over the spot, but it had been removed long ago."

The account of the discovery attached to the drawing is substantially the same, though rather shorter, but Petrie ventures the opinion that "the bottom when entire had been perforated with a small opening which was covered by the stone" that had been placed on the inverted base. Also he says that "a fragment of the jawbone of a horse was said to have been picked up," and that "fragments of a human skull were in the urn."

The vessel evidently was brown in colour and had an upper vertical decorated rim portion, and a plain body which tapered downwards to a narrow base—quite a typical late cinerary urn. Evidently the height and the width of the base mentioned were the measurements of the vessel in its damaged condition, and consequently it had been several inches higher, possibly as much as 18 inches.

The vessel was encircled at the shoulder by two rounded mouldings, and the space above decorated with oblique lines slanting down from right to left. Although Petrie described them as being formed of "tooth-like incisions," it is quite possible that they were impressions of a simply twisted cord such as occur so frequently on pottery of this type from so many parts of the British Isles. The suggestion that there had been a perforation in the base may be questioned. As for the presence of a calcined jaw of a horse Petrie does not appear to have seen it, because

it is not mentioned in one account and in the other he only states that it was said to have been picked up.

Mr J. M. Corrie, F.S.A.Scot., has drawn my attention to another old record of a clay vessel, evidently of the Bronze Age, but from Shetland, published in 1866.¹ In a grave of an irregular semi-octagonal shape, composed of six stones, measuring about 5 feet 10 inches in length and width, and covered by a large cap-stone, known as the "Giants' Grave" on the top of the hill of Hestensetter, Landsting, Shetland, were found fragments of pottery and calcined bones. As one of the shards had a "string pattern" on it and seeing it was found with cremated remains, we are justified in presuming it to have belonged to the Bronze Age. Dr Hunt, President of the Anthropological Society at the time, who wrote the description, further remarked that this pottery "essentially differs from any found elsewhere." He had discovered quite a number of steatite urns in graves, but in a mound in Bressay, and in another at Safester Sandsting, he had found pieces of what looked like urns of pottery. They were "heavier than the usual British pottery" and contained bits of mica.² One suggestion he put forward was that they were of steatite which had disintegrated under the action of fire, and another that they had been made of this material in its soft state when newly quarried. A friend, who was "no mean authority on British pottery," had no doubt as to the fragments being genuine pottery although heavier than any "specimens of British pottery known to him." Judging from examples found in Shetland in recent years, it is often very difficult to determine whether they were of decomposed steatite, or had been made of clay with crushed steatite added to it, instead of the pulverised stone which is seen in most of the prehistoric pottery all over the country.

CRAMP.

The vitreous material known as "Cramp," which has just been mentioned as having been found with the cinerary urn from Grimbister, occurs in Shetland and in many of the islands of Orkney. *Wright's English Dialect Dictionary*, quoting from Edmonston's *Etymological Glossary of the Shetland and Orkney Dialect*, 1866, gives the definition of "Cramp" as "small heaps of vitrified glass and stones found in ancient tumuli." It is light in weight, vesicular in texture, and, generally, of a light grey colour.

Mr Corrie informs me that, while surveying these parts for the

¹ *Memoirs of the Anthropological Soc. of London*, vol. ii. p. 310.

² *Ibid.*, vol. ii. p. 306.

Ancient Monuments Commission of Scotland, he had found it, often in considerable quantities, on the islands of Mainland, Papa Westray, Sanday, and Stronsay in Orkney. It was very plentiful in certain parts of Sanday, as at the south end of Els Ness peninsula, where a group of burial mounds were literally covered with it, and in the parish of Sandwick, in Mainland, it was to be found in quite a number of places. Two of the Sandwick localities may be referred to. The first is about 500 yards slightly north of west of the Ring of Brodgar stone circle, where there are a number of burial mounds showing much cramp scattered about; one of these mounds, now measuring about 34 feet in diameter and $2\frac{1}{2}$ feet in height, and showing the stones of an exposed cist on the top, had cramp spread all over it. At the second place there were great quantities lying on the surface, some of the masses being used as copestones on a garden wall. This was at Vestrafiold, near the large enclosure which adjoins the quarry that is pointed out locally as the place where the tall pillar-stones in the circles at Stenness and the Ring of Brodgar came from, although these monuments lie 7 and 6 miles away. However, a similar claim is made for a quarry nearer the circles.

In addition to the Grimbister grave, other two, in which a slag-like material, seemingly cramp, was found adhering to incinerated human bones, have been reported during the last few years, and there are also earlier records.¹ Early in 1928 a group of four short cists were unearthed on Groundwater Hill, Orphir. One cist contained the remains of an unburnt human skeleton, and two yielded cremated human bones. Professor Alexander Low, F.S.A.Scot., examined the incinerated remains from one of the cists and reported that on the lower end of a humerus could be seen small "greenish glazed deposits—on examination found to be of the nature of a slag, due to fusion of sand grains."² Again, in 1933, a cinerary urn of clay containing burnt human bones and the lower part of what was probably a vessel of similar character were found in a mound on the farm of Blows, Deerness. These bones were also submitted to Professor Low, who stated that parts of the bones were covered with "a slag-like material."³

Cramp has also been found on the island of Rousay, which lies immediately to the north of the western half of Mainland.

¹ In a large urn of steatite found in a stone cist at Orem's Fancy, Stronsay, were cremated human remains and "several lumps of cramp" (*Proc. S.A. Scot.*, vol. viii. p. 348). A similar urn, also enclosed in a cist in a large burial mound at Stenness, was filled to about one-third of its depth "with calcined bones, largely mingled with vitrified matter" (Anderson, *Scotland in Pagan Times—The Iron Age*, p. 70).

² *Proc. Soc. Ant. Scot.*, vol. lxxiii. p. 383.

³ *Ibid.*, vol. lxxvii. p. 345.

On a terrace on the steep hillside rising from Eynhallow Sound, about 100 yards north of the deserted house known as Mount Pleasant, in the Frotoft district, and 300 feet above sea-level, are two large oblong slabs, the smaller one superimposed on the larger. Their western edges are in alignment, running north-north-east and south-south-west, and diagonally they lie with a tilt downwards towards the south-south-east. The lower stone measures 7 feet in length, 5 feet 9 inches in breadth, and 15 inches in thickness, and the upper one is 6 feet 8 inches in length, 4 feet in breadth, and 11 inches in thickness. Under the lower stone



Fig. 2. Structure at Mount Pleasant, Rousay, Orkney.

is a face of dry-stone building, measuring 4 feet 9 inches in length and 15 inches in height, set back from the western edge of the superincumbent slab 6 inches at the north end and 12 inches at the south end. From the latter a small flag placed on edge projects forward (fig. 2). This construction, the purpose of which has not been discovered, was examined by Mr Grant a few years ago. Fire-fractured stones and about a barrowful of cramp were found, lying about 3 feet in front of the western edge of the construction.

In the Museum are two steatite urns from Orkney which still contain the relics found in them. In one, from Rousay, presented in 1860, are three double handfuls of bones and about twenty pieces of cramp. In the other, which bears no specific locality, there are about the same quantity of bones and considerably more cramp.

Records from Shetland are very rare, but there are two urns, also in the Museum, with the remains which were found in them. The first is a cinerary urn of clay, from Papa Stour, which still retains about a gallon of burnt bones and more than twenty pieces of cramp, measuring up to $2\frac{1}{2}$ inches in length. The second, from Uyea, is of steatite; it contains a very small quantity of bones with small globules of cramp adhering to them.

So far we have been able to cite seven old records of the occurrence of cramp in interments after cremation. But the results of excavations carried out by Mr Walter G. Grant at Quandale, in Rousay, this spring so emphasise this association that they deserve fuller consideration. He examined more than a dozen short cists, some of which had been previously disturbed. In spite of this, cramp was found among the incinerated bones in at least ten of them. In one cist only one piece the size of a bean was recovered, in another two fragments, and in others more; the greatest number found in a single grave was about forty, but this was an exceptionally large representation. The fragments from these cists were invariably small, none exceeding $1\frac{1}{2}$ inch in length, and in form many resembled pieces of grey coral. One of the graves examined was in the form of a small circular building of stone containing an urn of clay, within which were found four double handfuls of cremated bones and a double handful of cramp, which, however, was generally in larger fragments than in the other graves, one piece measuring $3\frac{1}{2}$ inches in length. It is very significant that while an occasional piece of charcoal was discovered in some but not all of the cists, the total quantity found was very small—indeed it was practically negligible. There was also a complete absence of peat ash in nearly all the cists. Of course it may be argued that in collecting the remains after burning in a fire of peat no ash need be lifted. The same may be said of charcoal, but its occurrence amongst cremated bones in prehistoric graves in other parts of Scotland is quite common.

Cramp was found either adhering to the bones or the latter were embedded in the former in at least six of the Quandale graves, and also in the other seven before referred to. It is thus quite clear that these pieces must have been produced during the process of cremation. In Orkney it is a common idea that cramp was formed by the fusing of sand attached to dry seaweed while it was being burnt. May it not be that dried seaweed was the fuel used for cremating human bodies in Orkney and Shetland during the Bronze Age, especially as we are told that there was a great scarcity or an entire absence of timber in most of these islands in prehistoric times. To-day there are a few small plantations of comparatively recent date in Mainland and Rousay.

As we have seen, the pieces of cramp found in the graves are small. This is just what is to be expected, as it is reasonable to believe that only small odd pieces would be gathered up with the incinerated bones which were to be interred in a grave which might be some distance away. Larger masses would be left where the cremation took place, but no such masses have been found, so far, in the Quandale district. If the cremations which we may surmise had taken place here, and if we are right in assuming that dried seaweed was utilized, it is not unreasonable to believe that the incineration would be carried out near the seashore, where there was a supply of fuel. The winter storms sweeping in from the Atlantic would soon dissipate any cramp left within reach of the waves.

It is different in Sandwick parish, where so much cramp is still to be seen. The cremations which have taken place here must have been very numerous, as more than one hundred burial mounds can still be counted within its area, and short cists are very common. It may be remarked that in Orkney the published discoveries of inhumed burials are infinitely fewer than are those of burials after cremation. As most of the parish lies miles from the shore, it would be necessary at times to transport the seaweed a long distance to the place of cremation, where the resultant cramp would be left lying about or, as we have seen, sometimes thrown on to a burial mound.

A SERIES OF SPECIMENS OF "CRAMP" FROM ORKNEY, SUBMITTED BY WALLACE THORNEYCROFT, Esq., AND DR. J. GRAHAM CALLANDER, TO THE GEOLOGICAL SURVEY AND MUSEUM, LONDON, WERE EXAMINED PETROGRAPHICALLY BY MR. C. F. DAVIDSON, B.Sc., F.R.G.S.E., F.G.S., WHO REPORTED AS FOLLOWS:—

Specimens Examined.

- (i) From Vestrafiold, in north-west corner of parish of Sandwick, about $1\frac{1}{2}$ miles north of the Bay of Skail.
- (ii) From south-west slope of Blotchnie Fiold, at Mount Pleasant, near Hullion, south side of Rousay.
- (iii) From a steatite urn, Rousay.

Microscopic Characters.

Thin sections were prepared from fragments of the rock previously treated with synthetic resin.

The specimens are quartzo-feldspathic slags. There are few relics

of the original structure of the rocks, and it is difficult to say definitely whether the original rocks were sedimentary, igneous, or metamorphic. From their general appearance and from the absence of ferromagnesian minerals it is believed that they were argillaceous quartzose sandstones, rocks also commonly used in the vitrified forts.

The slags are highly vesicular, and large empty bubbles of rounded or amoeboid form are visible, commonly ranging from 0.1 mm. to 3 mm. in diameter, but exceptionally reaching 1 cm. or more. Much of the groundmass of the rocks is formed of a siliceous glass, the refractive index of which is close to that of Canada balsam (1.540). Irregular felted growths of an obscure acicular mineral are locally present in large amount. Because of their extremely minute size, the needles cannot readily be identified with accuracy, but as they survived treatment for several weeks by cold hydrofluoric acid, they are most probably sillimanite.

A great number of small irregular fragments of quartz, a little potash feldspar, and occasionally plagioclase are evident. The amount of these fragments varies considerably from place to place, and fewest are seen where fusion is most pronounced.

Chemical Analysis.

Mr. Thorneycroft instructed me to have an analysis of the "cramp" carried out. A specimen from locality (i) was accordingly analysed by Dr. Naima Sahlbom of Stockholm. Her results are given on p. 450, along with analyses of other rocks for comparison.

I. "Cramp," Vestrafiold, parish of Sandwick, Orkney, about $1\frac{1}{2}$ miles north of the Bay of Skail. Anal. Dr. Naima Sahlbom.

II. Sandstone of Lower Old Red Sandstone age, Penning Hill Quarries, $\frac{1}{3}$ mile N.W. of Tulloch Hill, near Darvel, Ayrshire. Anal. E. G. Radley. Quoted from "The Geology of North Ayrshire," *Mem. Geol. Survey*, 1930, p. 56.

III. Composite analysis of 253 sandstones. Quoted from F. W. Clarke, "The Data of Geochemistry," *Bull.* 695, United States Geological Survey, p. 29, 1920.

IV. Composite analysis of 78 shales. Quoted from F. W. Clarke, *op. cit.*, p. 29.

Part of specimen (iii) (from a steatite urn, Rousay) was examined for iodine by Mr. C. O. Harvey. No iodine was found. It should be noted that this specimen was in an earthy and decomposed condition.

	I	II	III	IV
SiO ₂	72.92	70.87	78.66	58.38
TiO ₂	0.96	0.54	0.25	0.65
Al ₂ O ₃	13.85	11.66	4.78	15.47
Fe ₂ O ₃	0.64	2.38	1.08	4.03
FeO	1.44	1.81	0.30	2.46
MnO	0.04	0.21	trace	trace
MgO	0.59	3.03	1.17	2.45
CaO	1.12	1.79	5.52	3.12
BaO	...	0.02	0.05	0.05
Na ₂ O	2.50	1.77	0.45	1.31
K ₂ O	3.29	2.29	1.32	3.25
Li ₂ O	...	trace	trace	trace
H ₂ O + 105° C.	0.51	2.50	1.33	3.68
H ₂ O - 105° C.	0.20	0.26	0.31	1.34
P ₂ O ₅	0.38	0.11	0.08	0.17
CO ₂	n.f.	1.09	5.04	2.64
Cl	0.61	n.f.	trace	...
F	n.s.d.	n.f.
S	trace
C (estimated)	0.79	0.81
SO ₃	0.07	0.65
	<hr/>	<hr/>	<hr/>	<hr/>
	99.84	100.33	100.41	100.46
less O for Cl and F	0.14
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	99.70	100.33	100.41	100.46

Temperature and Conditions of Formation.

It appears likely that the rocks fused in the formation of "cramp" were commonly the local Old Red Sandstones. Little scientific information is available on the temperature of fusion of these rocks in a dry state. If we regard the sandstones as essentially quartz-feldspar aggregates, we may expect them to have melting temperatures not far removed from those of granites. Daly (*Igneous Rocks and the Depths of the Earth*, 1933, p. 66) places the fusion and flowage of granites between 1215° C. and 1255° C. Recent work, however, by Greig, Shepherd and Merwin (*Carn. Inst. Washington Year Book*, No. 30, 1931, p. 75) indicates that fusion may take place at much lower temperatures than these *if the rocks are heated over long periods*—thus, heated for one week at 800° C. dry powdered granite became half liquid, and in one specimen melting occurred as low as 570° C.

The presence of fluxes would appear to be required, however, to bring rock-fusion within the range of temperatures readily obtainable by early man; and these fluxes may possibly have been supplied by vegetable

ashes. Dr. Callander has ingeniously suggested that the fuel used in these bronze age cremations in which "cramp" was formed was dried seaweed. This may well have been so, considering the scarcity of wood fuel in Orkney—the growth of trees in the islands in Bronze Age times was probably no greater than to-day (*vide* G. Erdtmann, "Studies in the Postarctic History of the Forests of North-western Europe. I. Investigations in the British Isles," *Geol. Fören. Stockh. Förhandl.*, vol. 1, 1928, p. 123).

The chemical analysis of "cramp" (I) already quoted lends some support to this view. If compared with an average analysis of sandstone (III) the rock is seen to be high in alumina, and consequently it is most probable that the original sandstone of the "cramp" was moderately argillaceous—the other analysis of Old Red Sandstone quoted (II), also high in alumina, is that of a rock containing fragments of basic lavas, and is consequently rather high in iron oxides and magnesia. It will be seen, also, that the "cramp" is decidedly low in lime, although many Orkney Old Red sandstones are markedly calcareous. But by far the most interesting facts of the analysis are the notably high content of alkalies (both soda and potash) and of chlorine, the high phosphorus, and the considerable content of organic matter.

The ash of seaweed, variously known as "kelp" or "varec," ranges considerably in composition, but usually contains about 10 per cent. to 12 per cent. potassium sulphate, 20 per cent. to 25 per cent. potassium chloride, 5 per cent. sodium carbonate, 18 per cent. to 20 per cent. of other sodium and magnesium salts, and 40 per cent. to 50 per cent. of insoluble ash (carbonaceous and siliceous matter, etc.). The iodine content may range from 1 per cent. to 6 per cent. Accordingly the high content of alkalies and chlorine in "cramp" may quite readily have been derived from a seaweed fuel, part of the ash of which became fixed in the slag during fusion. The absence of iodine found on chemical analysis of the decomposed "cramp" from the Rousay steatite urn does not necessarily invalidate this view, for the alkali iodides are volatile compounds, and free iodine, which one would not expect present, itself vapourizes at about 184° C. The marked volatility of these iodine compounds is reflected in the care taken, in burning seaweed for "kelp," not to let the smouldering mass burst into flame or rise to a high temperature.

The high content of phosphorus is difficult to account for, but may have been derived from the bone ashes from the cremation. The absence of a considerable amount of lime would, however, appear to contradict this view.

The temperatures available by simple heating with fuel could, of course, be considerably increased by a blast action, and from the scoriaceous nature of the slags—which in some cases are even of a pumiceous character—it seems not unlikely that some action of this kind has been carried out. It is difficult otherwise to account for the extremely *vesicular appearance* of the “cramp.”