II.

NOTES ON A HOARD OF ELEVEN STONE KNIVES FOUND IN SHETLAND. BY ROBERT MUNRO, M.D., LL.D.

At the request of their owner, R. C. Haldane, Esq., seven of these knives are now presented to the National Museum.

The following letter from Mr Haldane sufficiently explains the reasons for which these interesting objects were put into my hands, as well as the conditions on which they henceforth become national property.

Lochend, Ollaberry, Shetland, 24th March 1905.

My dear Dr Munro,—I send to-day, by parcel post, seven scrapers. They were found at Esheness, Northmavine, in making a road, 9 inches deep in a gravelly subsoil. They were packed closely together with the edges uppermost. There were eleven in all, but several were broken, and I bought the best. The other four I did not see, and do not know what became of them. Nothing else was with them, and they appear to have been a store which had not been disturbed. There was no trace of any building near, but the Brough of Priesthoulland was about half a mile distant. Before these were found the superincumbent peat had been removed. The finder thought a total depth of 4 feet of peat and soil had covered the scrapers. There are said to have been two or three Picts' houses not far away, one at a place near the churchyard called Saebrig and one at Hogaland. They were found in the year 1900.

When you are done with them, if they are of sufficient interest, please

When you are done with them, if they are of sufficient interest, please present them to the Museum from me. If they do not care to have them, I will keep them. Should they keep them, I would like them all kept together. I am afraid I can give you no more information about them, and must leave it to you to spin out their history.—Yours sincerely,

R. C. HALDANE.

A mere glance at these objects shows that they possess certain characteristics which place them in a special category among ancient stone implements. They are large thin blades made of volcanic rock known as *rock-porphyry*, irregularly oval or subquadrangular in form, and highly polished on both surfaces, with the margin all round ground to what may be called a cutting edge.

With the assistance of Mr B. N. Peach, I.L.D., F.R.S., whose knowledge of the geology of Shetland is unrivalled, I have drawn up the following descriptive details of each specimen in this hoard, so as to make them available for comparison with similar discoveries elsewhere recorded:—

- No. 1. The rock of which this implement is made is quartz-porphyry, and shows double pyramids of quartz and porphyritic crystals of orthoclase in a crypto-crystalline ground-mass. It is subquadrangular in form, with a portion broken off at one end, and measures 5 by 5 inches.
- No. 2. This specimen (fig. 1) has the same composition as No. 1, but in addition shows platy flow-structure oblique to the flat surfaces of the

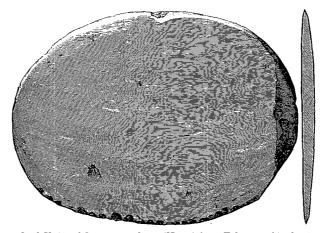


Fig. 1. Oval Knife of Quartz-porphyry (No. 2) from Esheness, Shetland. (4.)

implement. Its shape is oval, with a good cutting edge all round, and it measures 6 by $4\frac{1}{9}$ inches.

- No. 3. All the remarks made on the mineral structure of the two former are applicable to this specimen, with the addition that some layers are spherulitic. Oval in form, with one end nearly straight. Its diameters are $5\frac{\pi}{8}$ and $4\frac{\pi}{4}$ inches.
- No. 4. Made of very fine-grained quartz-porphyry with few porphyritic elements, suggesting that it came from the chilled outer edge of the volcanic mass. This implement (fig. 2) is irregularly quadrangular, three sides being nearly straight, and the fourth curved out-

wards, with a rectangular notch half an inch deep. The margin of this notch is, however, ground down to an edge like the rest of the perimeter of the implement.

No. 5. This specimen has the same composition as No. 3, but the flow-layers are nearly at right angles to the surfaces of the implement. Spherulitic structure well developed. It is oblong in shape, having a corner portion broken off, and measures 6 by 3 inches.

No. 6. Like Nos. 2, 3, and 5, but strongly spherulitic, and structure

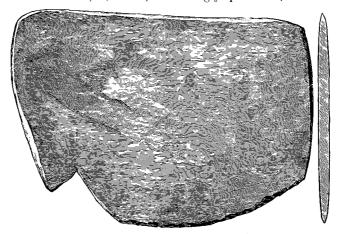


Fig. 2 Knife of Quartz-porphyry from Esheness, Shetland. (1/2.)

better seen. This implement has one end broken off, and the other is rectangular. The remaining portion measures 4 by 4 inches.

No. 7. Porphyritic and spherulitic elements well shown. It is an irregular oval and a thicker specimen than any of the others, having a maximum thickness of nearly half an inch. Its greatest and least diameters are $4\frac{7}{8}$ and $3\frac{7}{8}$ inches.

Porphyritic rocks are abundantly met with in Shetland, and it would appear that all the above-described implements had been manufactured from the same quarry. Dr Peach informs me that this kind of rock, on long exposure to atmospheric agencies, breaks up into thin laminæ, like

slaty materials, so that in reality nature performs the first and most difficult stage in the manufacture of these knives.

It may also be noted that their position under a depth of 4 feet of peat, together with the whitish layer of patina which covers them all over, gives them, *prima facie*, a claim to considerable antiquity. Though no two specimens are precisely alike, there is a general, indeed striking, resemblance between them all; and only in one instance does the ratio between their longer and shorter diameters go beyond 6 to 4 inches—the exception, No. 5, measuring 6 by 3 inches.

I shall now proceed to inquire how far the characters of the Esheness implements, and the circumstances in which they have been found, tally with the records of other discoveries which come under the general category of Picts' knives, as they are called in Shetland.

The earliest notice of this kind of implement which has come within the range of my knowledge is to be found in Low's Tour through Orkney and Shetland, 1774, pp. 82-4. After describing and figuring what was shown him as a "thunderbolt," but which is nothing more nor less than an ordinary stone axe, he goes on to say that he "was shewn likewise a stone instrument quite differently shaped from that described on the other page. This was broad and thin, much shorter than the other; seemed to have been made use of as a knife, or instrument for cutting by the hand, as the other for striking. Its edges were all well sharpened, and was supposed by the owner (Mr W. Balfour of Trenaby) to be a knife made use of in sacrifice. I procured one of the latter, the figure of which follows." This figure shows a subquadrangular implement, 5 by 3½ inches, with one corner knocked off. The sides are described as "well ground," with "a fine edge." "The greatest thickness of this instrument," he writes, "is scarce three-tenths of an inch, the edges canelled on both sides like a carpenter's axe." I

On landing at Vaila Sound, near Walls, from Foula, Mr Low writes as follows:—

¹ These stone objects were shown to Mr Low at the house of Sir John Mitchell at Sandhouse, parish of Aithsting and Sandsting.

"Here I was shewn a couple of stone instruments yet differently shaped from those taken notice of before. The largest 7 inches long and 4 broad, ground thin, shaped like the segment of a circle, the circular side edged but pretty much broke, the chord thick like the back of a knife, and left so purposely; seems to have been used as a knife. The other 4 inches long, shaped pretty much like the axe (vide p. 83 supra); might have been the head of a spear or other long weapon." (Tour, p. 117.)

Drawings of both these implements are given, and from an inspection of them there can be no doubt that the former belongs to a well-defined variety of the knives now under consideration, and which will be subsequently more fully explained. The other is manifestly a small stone celt.

Writing later, p. 140, Mr Low states that "many of the stone weapons mentioned above are found in this parish (Northmavine), particularly seven in one place, but all dispersed before my arrival. They were found underground, forming a circle, the points toward the centre."

The Rev. John Bryden, in his description of the united parishes of Sandsting and Aithsting in Shetland (Stat. Account of Zetland, 1841, pp. 112 et seq.), states that, on removing black unctuous earth from an urn discovered on the glebe, he found "lying at right angles in the bottom four pieces of broken stone axes," which appear from the context to have been portions of the oval-shaped knives. Mr Bryden explains that urns found in the locality "appeared to have been rudely wrought out of a coarse sandstone, and others out of a soft stone called kleber."

He then goes on to describe these stone axes, which he calls steinbartes, and classifies them into single- and double-edged tools, the former being described as having a semilunar cutting edge, while in the latter the edge went nearly all round. Both the title (steinbarte) and classification are taken from Dr Hibbert's work on Shetland (p. 248). It appears, however, from the illustration on the plate at the end of the volume that the single-edged steinbarte is merely the ordinary stone axe—an inference which is corroborated by the dimensions of the implement figured, viz. 6 inches long, $2\frac{1}{2}$ broad, and 1 inch thick.

"The blades of steinbartes," writes Mr Bryden, "are very abundantly found in Shetland. Not unfrequently several of them are discovered buried together,

thus indicating a little armoury, from which a number of weapons might be distributed on an emergency, by the hand of some chief, to a small band of natives met together, on the alarm of common danger. Assemblages of these weapons have been found in the parishes of Walls, of Delting, and in the island of Unst. The larger steinbarte may have been used both as an offensive and defensive weapon, either by throwing it from the hand, or striking with it, when the combatants came to close quarters; and the smaller steinbarte, it is probable, was formerly used for domestic purposes, and held a similar place in the eighth or ninth century which a knife does in the nineteenth. That they are a very ancient instrument is without doubt; for even tradition itself is silent, both as to the time when and the people by whom they were used."

Mr Bryden combats Dr Hibbert's opinion that these flat knives were inserted into wooden handles and used, either as warlike weapons, or as halberts.

With regard to the classification of the flat Shetland knives—the double-edged steinbartes of Dr Hibbert and Mr Bryden—it seems to me that they may be appropriately divided into discoidal and semilunar. Although there is no typical example of the latter among the Esheness group, we shall immediately see that the characteristics of many specimens in the national collection, and elsewhere, justify the adoption of some such classification. In using a knife showing a sharp margin all round, one part of it must be held in the hand, and in some instances I have observed a corresponding blunt portion. Other writers have recorded finger depressions on one of the surfaces, to give a better hold of the implement. But the semilunar knife is clearly defined by having an elongated shape, with one of the long sides thick and blunt, while the other is ground down for cutting purposes. A Shetland knife in the possession of Sir John Evans is thus described:—

"I have a specimen, $4\frac{1}{2}$ inches long and $3\frac{1}{4}$ inches wide at the base, formed of porphyritic greenstone, and found at Hillswick, in Shetland, which was given me by Mr J. Gwyn Jeffreys, F.R.S. Its cutting edge may be described as forming nearly half of a pointed ellipse, of which the thick side for holding forms the conjugate diameter. This side is rounded and curved slightly inwards; one of the angles between this base and the elliptical edge is rounded, and a portion of the edge is also left thick and rounded, so that when the base is applied to the palm of the hand the lower part of the forefinger may rest upon it. When thus held it forms a cutting tool not unlike a leather-cutter's knife." (Ancient Stone Implements, p. 308.)

Of twenty-two specimens recorded in the Catalogue of the National Museum, and now exhibited there, four oblong specimens, made of dark-coloured porphyry, were found together in a bog in the island of Uyea, Unst (*Proc. S. A. Scot.*, vol. xix. p. 332). One, made of porphyry, was found in each of the following localities, viz. Hillswick, Busta, Fyal Bank (Unst), and Northmavine; twelve of porphyry and one of serpentine are without any assigned locality; and one of hornblende rock, from Houland, Walls, has the peculiarity of being polished and thinned to an edge from the back. In other words, it is a semilunar tool measuring $7\frac{1}{4}$ by $3\frac{3}{4}$ inches.

On ransacking the volumes of the *Proceedings* of the Society since 1892, the date of the publication of the Catalogue, I find nine specimens (exclusive of the Modesty hoard) recorded among the purchases for the Museum. These are all stated to be made of porphyritic rock; one is from Unst, and the other eight from Northmavine. The Unst specimen measures $4\frac{7}{8}$ by $2\frac{1}{2}$ inches, and differs from the normal type inasmuch as it is brought to a sharp edge only on one of the two longer sides. Among the eight from Northmavine, one is differentiated from the others by having the form of a segment of a circle, almost crescentic in appearance, like the well-known flint knives or saws of Scandinavia. It is $7\frac{3}{8}$ inches in length and $2\frac{1}{8}$ in its greatest breadth.

We now come to the consideration of one of the most important discoveries of the kind hitherto made in Shetland, viz. a hoard of nine stone axes of the ordinary types of the Stone Age, and about fourteen specimens, whole or fragmentary, of the knives now under review. The circumstances in which this assortment of objects was found are thus briefly described by Mr George Kinghorn:—

"When spending my holidays in Shetland, and residing at the house of Mr Laurence Laurenson at Modesty, about four miles north of Bridge of Walls post-office, I was shown three stone axes and three large, oval, and polished stone knives found by his boys in a grassy knoll in front of his house. The knoll is about 20 yards long and 10 yards broad. On the east and west it slopes gently and on the south abruptly, the ground being broken when the axes were found.

"The strata are composed of-

(1) Grass, turf, and sandy peat, about 8 inches.

(2) Yellow peat ashes, about 5 or 6 inches.

(3) Decomposed charred wood, about 4 or 5 inches.(4) Subsoil, red gravel, and rock.

"The axes were found in the charred wood layer.

"About eighty or ninety years ago, previous to his house being built, a bank of peat, about 4 feet thick, had been removed from the site of the house and the knoll, and this may account for the shallow depth at which the relics were found." (Proc. S. A. Scot., vol. xxix, pp. 7 and 49; xxx, p. 39.)

On making further search in the knoll, three vessels or urns of steatitic clay, some more stone implements, and a pair of saddle-quern stones were found. Fragments of the so-called urns show that the pottery was about half an inch thick, and made of very coarse materials mixed with small stones and what looks like the stalks of withered grass. The whole of the Modesty relics, consisting of nine polished stone axes of diorite, porphyrite, or hornblende, and fourteen oval knives of differently coloured porphyrites, are now preserved in the National Museum. Also, from the same place are two masses of heavy clay, apparently moulded or kneaded by hand, and fragments of charred faggots of branches or roots, from 1 to $1\frac{1}{2}$ inch in diameter.

With regard to this find there are a few points which claim attention.

(1) The urns would seem to presuppose burial, but not necessarily, as the vessels might have been used for domestic purposes. Hence, I would provisionally suggest an alternative hypothesis, viz. that the green knoll was the site of a wooden habitation which had been destroyed by fire, thus accounting for the amount of peat-ashes and charcoal as the embers of the fallen roof, which originally consisted of rafters and turf. This hypothesis cannot be summarily set aside on the ground that wood no longer grows in Shetland, because at the bottom of many peat-bogs in that locality remains of timbers several inches in diameter are to be found. Now, in the case of the Modesty habitation, the purport of the evidence goes to show that the remains belonged to a period anterior to the growth of peat in that locality; so that brushwood, or even trees,

sufficiently large to be utilised for the construction of huts, might have been then growing in this part of Shetland.

That forests, with trees probably of no great size, formerly grew in Shetland there can be no doubt. Wandering one day over a peat-moss near the town of Lerwick, I saw heaps of decayed bogwood, with stems and roots up to 5 or 6 inches in diameter, which had been collected by the peat-cutters and left there to dry.

Mr George Low (*Tour*, p. 146), while passing through the parish of Delting on his way to the island of Yell, writes thus "as proof of trees having been here at some remote period":—

"Observed near the kirk of Scalsta, in the bank where the sea had wore away the earth, a continued stratum of large pieces of wood, in a horizontal position, a few inches above the hard gravel, covered with about 10 feet of moss. This stratum is continued as far as I could search the whole length of this worn bank, and probably round the bay; it consists of pieces from 8 inches to ½ an inch diameter, roots, stocks, and in a word, all parts of a tree; seems Hazle and Aquatick woods, but so much rotten that no part can be moved. In many places of Orkney and Shetland the peat-diggers often find great heaps even of the leaves of trees."

The same author, in his description of the island of Foula (*ibid*. p. 103), makes the following remarks:—

"They have many traditions of there having once been wood in their island; they show us a valley, now a moss, which they affirm was covered with it, and to this day, in cutting peats often find large pieces of both trunks and branches of trees. Tradition says the Lewis-men in their plundering parties thro' the isles landed here, and after pillaging Foula burnt the wood, lest it should be a shelter to the natives in future times."

(2) All the knives in the Modesty group, though nowhere thicker than half an inch, have the appearance of being thicker and coarser than their analogues elsewhere, and also the peculiarity of thinning gently from the back towards the cutting edge—thus coming under the category of semilunar tools. Moreover, the cutting edge has the further peculiarity of being retouched by chipping on one face, with the exception of one which is chipped on both sides. This chipping process is probably the same feature which attracted Low's attention when he describes one of his specimens with "edges canelled on both sides like a

carpenter's axe" (see page 9). Indeed, a large number of these knives show more or less of a serrated edge which in some instances may have been due to re-sharpening the instrument.

(3) As to the antiquity of the find, the evident conclusion to be derived from the association of so many of these knives and of so many ordinary stone axes of Neolithic types, with a saddle-quern, kneaded portions of clay, fragments of three coarse vessels, together with such abundance of peat-ashes and charred wood, is that it dates back to the Stone Age, whatever the chronological horizon of that period may be in these northern latitudes.

Sir Daniel Wilson, in his *Prehistoric Annals of Scotland* (vol. i. p. 183), gives the following information of the discovery of these curious knives in the valley of the Forth, which is the only recorded instance of their having been found outside of Shetland:—

"In the Shetland and Orkney Islands especially, stone knives are common; and in other districts, knives of flint, styled by the Shetlanders Pechs' knives, are found. These are shaped like a shoemaker's paring knife, with the semicircular line wrought to an edge, while the straight line is left broad and blunt. Others are oval or irregular in form, and thinning off to an edge round the whole circumference. One of the latter, in the Scottish Antiquarian Museum, formed of a thin lamina of madreporite, was found at one of the burghs or round towers of Shetland. It measures $4\frac{1}{2}$ by 4 inches, and does not exceed, in greatest thickness, the tenth of an inch. Similar implements, in the collection of the London Antiquaries at Somerset House, are mentioned by Mr Albert Way, as probably the ancient stone instruments transmitted to Sir Joseph Banks by Mr Scott of Lerwick, in Shetland, and communicated to the Society, March 9, 1820. Sixteen were found by a man digging peats in the parish of Walls, Shetland, placed regularly on a horizontal line, and overlapping each other like slates upon the roof of a house, each standing at an angle of 45 degrees. They lay at a depth of about 6 feet in the peat-moss, and the line of stones ran east and west, with the upper edge towards the east. A considerable number of implements, mostly of the same class, were found on the clay under the ancient mosses of Blair-Drummond and Meiklewood. Some of them are composed of slate, and others of a compact greenstone. They are

¹ The antiquities of stone and bronze found under Blair-Drummond moss were exhibited at a meeting of the Society of Antiquaries of Scotland on March 13th, 1871, and I understand from Dr Joseph Anderson, who was present and examined the collection, that it contained no stone implements that could be mistaken for any of the Shetland knives. (See *Proc. Soc. Ant. Scot.*, vol. ix. p. 179.)

from four to six inches long, flat and well polished. There were also along with them a number of stone celts and axe-heads, mostly made of the same hard greenstone."

Of the sixteen above referred to as being found in a peat-moss in the parish of Walls, two are in the British Museum and figured by Sir John Evans in his Ancient Stone Implements (figs. 262 and 263). Besides these there are several other specimens, from various localities in Shetland, preserved in the Museum. "A note attached to one of them," writes Sir John Evans, loc. cit. p. 310, "states that twelve were found in Easterskild, in the parish of Sandsting. An engraving of one of them is given in Horæ Ferales (Pl. II. 15.)"

Mr J. W. Cursiter of Kirkwall, who owns a large and well-selected collection of antiquities from Orkney and Shetland, has kindly sent me the following notes on the Shetland knives in his possession:—

"There are in my collection 21 knives whole and 9 portions, all from Shetland, and I know of none but sandstone ones having been got in Orkney. They are nearly all formed of quartz-porphyry, the exceptions being two of felstone, one of striped gneiss, and one of hornblendic gneiss. There are one or two specimens which my limited knowledge prevents my finding a mineralogical niche to put them in.

"Only one of those in my possession, so far as my notes show, formed part of a hoard, viz. one of five found at the back of the yard dyke, Scarvester, Sandsting, in 1885; the other four being in Mr Umphray's collection. Nearly all my specimens were obtained from crofters who had them in their possession for some time, and who as a rule found them in course of their agricultural operations. They are very averse to part with them, for such reasons as that they serve to avert lightning, that condensation on them foretells rain, etc. I send four outlines of my largest specimens to give you an idea of their size." Their dimensions are as follows: (1) $10\frac{1}{2}$ by 5 inches, (2) 8 by $5\frac{7}{3}$, (3) $7\frac{3}{4}$ by 5, (4) 8 by $4\frac{3}{4}$. No. 1 is semilunar, and all the others more or less oval."

Mr J. Goudie, Montfield, Lerwick, writing on March 3rd, 1906, informs me that he possesses ten specimens of the Shetland knives, of which the following particulars are known:—

No. 1. This is the largest specimen I have seen, measuring no less than 13 in. by $6\frac{1}{2}$ in. It is semilunar in shape, and made of a dark grey, polished stone; found in walls.

Nos. 2 and 3. Two of a group of five found under 6 feet of peat moss, near VOL. XL.

Loch of Greesta, Tingwall, and measuring 10 in. by 4½ in. and 9 in. by 5½ in.; both are semilunar in shape.

Nos. 4 and 5. From Northmavine; dimensions $6\frac{1}{2}$ in, by 4 in., and $5\frac{1}{4}$ by

Nos. 6, 7, and 8. Three of a group of four found near Sandy Loch, Lerwick, and all measuring about 4 inches in length and 3 in breadth.

No. 9. From North Hammersland, Tingwall; 5 in. by $3\frac{1}{2}$ in.

No. 10. From Northmavine; $4\frac{1}{2}$ in. by $3\frac{1}{2}$ in.

"These implements," writes Mr Goudie, "share with the Celts a certain, though inferior, superstitious respect. They are frequently found in groups and usually at a considerable depth in the subsoil under the moss. Among those in my possession are two, found at Loch of Greesta, which are notched and flattened on the back, as if to be used with a shaft. When found they were placed on edge. Other two from Northmavine formed part of the Esheness group, the larger portion of which was secured by Mr Haldane, now in your possession. The very large knife in my possession, No. 1, was said to have been used for flenching whales."

In addition to the stone knives in the Museum of the Society of Antiquaries, London, already incidentally referred to, Sir John Evans states that there are some fine specimens from Shetland in the Ethnological Museum at Copenhagen; and no doubt careful search would disclose the existence of a few more in private keeping.

Summarising the somewhat scattered details of the various discoveries thus brought before you, it will be observed that 10 were hoards, each containing from 4 to 16 specimens—79 in all. Of these, 25 are in the National Museum, viz. Esheness 7, Uyea 4, Modesty 14,—the other 54, except the few in London, and in the collections of Mr Cursiter and Mr Goudie, having been dispersed. The total number at present known may be stated in round numbers at 100, thus accounted for: 52 in National Museum, Edinburgh; 30 in Mr Cursiter's collection; 10 in Mr Goudie's collection; and 8 (approximately) preserved in museums in London and Copenhagen.

It may also be mentioned, as a point of further specialisation of these knives, that none of them is formed of flint; nor is there any record of any of them having been found out of Shetland, with the exception of the Blair-Drummond specimens (if such they were) referred to by Sir D. The special purpose for which this class of implement was originally intended is still a matter of conjecture. It is clear from their slender make and liability to breakage that they could only have been used for dividing soft material, skinning animals, etc. The common practice in Scandinavia in prehistoric times of depositing implements, weapons, and ornaments in lakes, bogs, and fields, as a religious offering to the gods, may suggest that some of the Shetland finds were of this nature; and this idea is strengthened by the careful manner in which the specimens in some of the hoards were arranged. I prefer, however, to side with the theory that they were the stock in trade of the natives, used in commerce, which their owners, in time of danger, had deposited for safety, and which for various causes had never been reclaimed.

The age of these unique objects is the only important question which now remains to be discussed. We have already seen that some of them were associated at Modesty with implements of the Stone Age, and, problematically, were contemporary with the period when a stunted arborescent vegetation obtained in Shetland—a period which must have been coeval with the great primeval forests which formerly flourished on the islands and mainland of Scotland, remains of which are still to be found in the peat-land moors of these regions. History records that these Scottish forests had not entirely disappeared when the Roman legions penetrated into North Britain; nor are we without evidence to show that man and his works were contemporary with some of these forests, before they were overwhelmed with peat growth (Prehistoric Scotland, p. 36 et seq.). The hypothesis that these knives were in use during the Forest Age in Shetland does not, therefore, necessarily carry us back beyond the first two or three centuries of the Christian era. important factor in this problem is the relation of the knives to the relics found in the culture débris of the brochs, whose chronological range we know to extend for about a thousand years, beginning with the time of the final departure of the Romans from Britain. Notwithstanding the fact that Shetland contains close on a hundred brochs, more than a fifth of the total number in Scotland, it is a melancholy fact that not one has been sufficiently investigated to yield a collection of relics. From the structural similarity of all brochs in Shetland,

and elsewhere, there is reason to believe that it was the same people who constructed them. Although no stone knives of the Shetland type have hitherto been found in any of the brochs investigated, it does not follow that they were not used by the people of the Shetland brochs. The spade alone can decide this question; and until this is done we have fair presumptive evidence for assigning these Shetland knives to the period which preceded that of the brochs.