

## III.

## THE PREHISTORIC AND EARLY USE OF PITCHSTONE AND OBSIDIAN.

BY LUDOVIC M'LELLAN MANN, F.S.A. SCOT. WITH REPORT ON PETROLOGY BY A. SCOTT, M.A., D.Sc.; AND NOTE OF EGYPTIAN AND ÆGEAN DISCOVERIES BY PROFESSOR W. M. FLINDERS PETRIE, HON. MEM. S.A. SCOT., D.C.L., LL.D., F.R.S.

Natural volcanic glass has from paleolithic times to the early Iron Age attracted the attention of man in Europe. Modern primitive peoples in all the continents have also regarded it highly. It was used for various purposes, chiefly when split into pieces, for cutting and piercing. It varies in colour from a pale greenish-yellow to an olive and to a very dark brown or even black colour. It often contains bands of lighter-coloured glass or specks of white or light-yellowish felspar. Absent from England and Wales, it is recorded from one place in Ireland, and occurs sparingly in the west of Scotland.

The volcanic glass of Scotland and Ireland is called pitchstone, and the often more solid and homogeneous natural glass found in foreign places is known as obsidian. The pitchstone of Ireland and of Scotland, except that of the Island of Arran, is apparently too much cracked into small pieces to be of use. This natural glass has been much studied by geologists, but the ethnographer and archæologist have neglected it.

I do not know of any paper written on the early or prehistoric use of pitchstone or obsidian. Pitchstone is rare in Scotland, and the Island of Arran possesses most of the outcrops. One of the largest exposed sills there is on the shore beneath the precipitous cliffs of Dun Fion, a couple of miles south of Brodick, where masses of naked, vertical columns of dark shining glass arrest attention and constitute a most impressive picture.

Pitchstone, proceeding from eruptive centres, and now showing as intrusive sills and dykes, occurs in several scores of locations in Arran, where it is almost the last product of the Tertiary period, the grandest era of volcanic activity in these parts. The Arran *loci* have occasionally scattered about them, within a radius of several hundreds of yards, fragments of the rock in the glacial detritus or in the superficial washed-down material.

Blocks of pitchstone did not transport well by ice, and no naturally-carried fragments or boulders are known in the mainland of Scotland.

It would accordingly appear that prehistoric man in Scotland, at

least in the south and south-west, obtained his pitchstone entirely from one or other of the Arran outcrops or from the scattered fragments near them.

Though not utilising it in any manner, the modern natives of Arran know of it and call it "bottle-rock," and the children discover that it cuts their fingers. Pitchstone when splintered presents razor-like edges nearly as useful as those on flint flakes for scraping, cutting, boring, and piercing.

Like flint, it fractures easily into hollow conchoidal and corresponding bulbous pieces, and the edges were in prehistoric times often strengthened by careful and minute trimming, and can, as in the case of flint, be readily differentiated from edges abraded merely by wear; but it is more brittle than flint, and does not allow of the same delicate secondary workmanship as, for example, is entailed in the cutting out of barbs on arrow-heads. For this reason, perhaps, all the five known British arrow-heads of pitchstone (one from Wigtownshire and four from Arran), and nearly all the foreign arrow-heads of the kindred obsidian, are either leaf-shaped or kite-shaped. James Robertson in 1768 visited Bute and Arran,<sup>1</sup> and notes that near Kilbride, Arran, "there is an uncommon kind of rock" —most probably pitchstone is referred to—"with which the ancient inhabitants tipped their arrows, many of which even now the natives frequently find in the Island." I have an arrow-point of this substance from Wigtownshire,<sup>2</sup> here shown in fig. 1, No. 1.

A similar point was found a few years ago by Mrs Cook, in her garden at the steading of Whitehouse, Corriegills, Arran, who kindly permits of its being engraved (fig. 1, No. 2).

Another similar specimen, found in 1909 in peat-digging at Tormore, Arran, was presented by the late Mr J. A. Balfour, to the National Museum of Antiquities, and is here illustrated (fig. 1, No. 3). It is of black pitchstone.

Still another, but broken off at the tip, of olive-green coloured pitchstone, was found in the island. The relic was presented by Professor Thomas H. Bryce to the Scottish National Collection, and it is also illustrated (fig. 1, No. 4).

In the National Collection, presented by the finder, Mr Arch. Cook, is another arrow-point, more finely worked, of the same material but of olive-green colour, similar to that of fig. 1, No. 4. It was found on a field at Corriegills in 1907, and is figured here as fig. 1, No. 5.

Some of the Arran pitchstone breaks up naturally into hard, homo-

<sup>1</sup> *Proc. Soc. Ant. Scot.*, 1898, xxxii. pp. 13 and 18; *Book of Arran*, i. pp. 275 and 277; *Proc. Soc. Ant. Scot.*, 1909, xliii. p. 376.

<sup>2</sup> *Glasgow Exhibition Prehist. Cat.*, p. 815, item 10, i.

geneous, finger-like cylindrical pieces, at times as long as 4 inches. I have several specimens which have been found at considerable distances from the outcrops. That the cylinders were anciently detected and carried by the natives far from the places of origin is almost certain.

I was told in 1917 of a small hoard of them having been discovered well down in a peat deposit at Tormore, Arran.

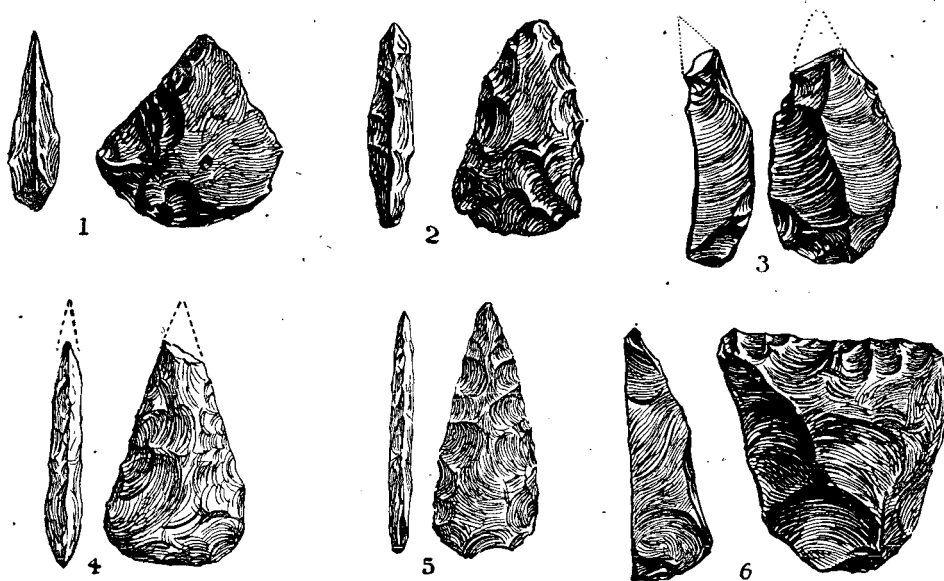


Fig. 1. Secondarily-worked Objects of West Scottish Pitchstone.

#### THE ARCHÆOLOGY OF PITCHSTONE A PECULIARLY WEST SCOTTISH PROBLEM.

Professor Thomas H. Bryce<sup>1</sup> obtained pitchstone flakes, some with slight secondary workmanship, in late neolithic tombs of Arran and Bute; and the late Mr J. A. Balfour<sup>2</sup> mentions the finding in Arran of arrow-points of this material. In Wigtownshire I have examined several domestic sites during the last eighteen years, which yielded abundantly pitchstone chippings (many minute and conchoidal), nuclei or cores, and implements in the closest association with neolithic pottery.<sup>3</sup>

In the sites of the immediately succeeding overlapping period the pitchstone relics were less common;<sup>4</sup> while in the only British site

<sup>1</sup> *Book of Arran*, 1910, i. p. 89, and *Proc. Soc. Ant. Scot.*, 1903, xxxviii. p. 77, and 1909, xliii. p. 369.

<sup>2</sup> *Book of Arran*, i. 275.

<sup>3</sup> *Glasgow Exhibition Prehist. Cat.*, 1911, p. 817, item 3.

<sup>4</sup> *Ibid.*, p. 822, item 32.

definitely known to be of the Bronze Age which has yielded a pitchstone relic, that of a burial in the same county, a fine borer or side scraper (fig. 1, No. 6) of that material was discovered lying with a number of flint and other tools.<sup>1</sup>

No worked pitchstone seems to have been recorded from Britain outside of Arran, Bute, Ayrshire, and Wigtownshire, and the only source of supply of the raw material seems to have been Arran. No prehistoric British or Irish pitchstone chippings or anciently-worked pieces are apparently to be found in English or Irish collections.

#### THE TIME-RANGE OF SCOTTISH PITCHSTONE IMPLEMENTS.

In the west of Scotland it was a favourite stone, traded and bartered as early as late neolithic times, also during the overlapping period (*circa* 2000 B.C. to 1800 B.C.); and between that overlapping time until the end of the succeeding Bronze Age (*circa* 1800 B.C. to 500 B.C.), when it almost disappears from the ken of the student of British prehistory, though flint implements continued to be made and used in great numbers throughout the last-mentioned period. Its only known occurrence in these islands during the early Iron Age is the unexpected discovery of two pieces among the very large number of relics recently found in the vitrified fort of Dunagoil, Bute, occupied a century or two before the opening of this era.<sup>2</sup> During the present era the material does not seem to have been used at all in this country.

The two artificially-worked specimens from Dunagoil are of dark olive colour. One, about 1½ inch long, is a triangular, sharp-edged, sharp-pointed, shining lustrous flake, the surface of the broader end showing a treble faceting. The other piece has a much duller surface, is cylindrical, about 3 inches long and 1 inch thick, with columnar flaked surface, and slightly irregular banding of lighter colour. Neither shows felspar crystals and neither any secondary chipping.

A deposit of pitchstone was recently noted by Dr Smellie as occurring not far from Dunagoil, and in the extreme south-east of Bute, 400 yards north-west of Roinn Chumach;<sup>3</sup> but the variety of the pitchstone there could not have been of use to the prehistoric craftsman, as it contains too many large quartz and felspar crystals, some ¼ inch in length, which do not allow of its being splintered into suitable flakes.

After long exposure upon the surface, or near the surface if the soil be loamy, the rock devitrifies, losing colour, weight, and cohesion, and becomes soft, almost chalky, in texture, bleached, and non-lustrous.

<sup>1</sup> *Glasgow Exhibition Prehist. Cat.*, 1911, p. 838.

<sup>2</sup> *Trans. Buteshire Nat. Hist. Soc.*, 1914-15, 1915-16.

<sup>3</sup> *Trans. Geol. Soc. Glasgow*, vol. xv. pp. 121-139, 1915; *ibid.*, p. 368, 1916.

The condition of ancient chippings and implements is thus dependent upon environment.

During a most superficial examination of a supposed pitchstone workshop which I detected near Brodick schoolhouse, Arran, and situated upon an outcrop of pitchstone, many of the fragments were seen to be in this deteriorated condition. A few artificially-made splinters of pitchstone have been noticed on old inhabited surfaces on Shewalton Moor, near Irvine, Ayrshire, as first mentioned by Mr John Smith,<sup>1</sup> who was a pioneer of its microscopic scrutiny.

The late Bailie Downes, Irvine, found a few flakes and chippings of pitchstone on Shewalton Moor, and presented them to the M'Lean Museum, Greenock.

#### IRISH PREHISTORIC RELICS.

The Rev. G. R. Buick, M.A., of Cullybackey, Antrim, informed Mr George F. Black that "flakes and cores of obsidian" have been found in Ireland.<sup>2</sup> In response to an inquiry, Mr E. C. R. Armstrong of the National Museum, Dublin, consulted Professor Cole, F.R.S., Dublin, of the Geological Survey, who reports: "Obsidian occurs seven miles north of Antrim town, at Sandy Braes, but none so far as I have seen it, and I know it very well, is free enough from small cracks for making implements."

Mr W. J. Knowles, M.R.I.A., of Ballymena, writes to me: "I have found several flakes of pitchstone in the sandhills with flint flakes. This was on sites where scrapers and arrow-points were made. I have over two dozen arrow-heads made of jet-black rock which I believe is pitchstone. At a meeting of the British Association I showed the flakes above mentioned to Professor Hull and he called them pitchstone."

Some years ago I examined Mr Knowles' very fine and large collection of antiquities, but did not notice any objects of pitchstone.

Mr Knowles has now sent to Glasgow specimens of the implements of "black rock." They are of very dark flint and of dark Irish radiolarian chert, and very similar to the radiolarian chert implements (not yet recorded) found in Scotland in a belt of territory running from the Heads of Ayr to Dunbar, which were made from that chert which outcrops in long, narrow, boat-shaped formations within that belt. These outcrops lie with their long axes parallel to the line of trend of the belt.

It will be seen that there is no clear evidence as to pitchstone chippings or implements having yet been discovered in Ireland.

Future research work with the microscope will doubtless determine the provenance of all Scottish pitchstone relics, and elucidate the problems

<sup>1</sup> *Prehistoric Man in Ayrshire*, 1897, p. 116.

<sup>2</sup> *Proc. Soc. Ant. Scot.*, 1890, xxiv. p. 137.

touching very early trade routes and centres of barter with a precision not attainable from an examination of flint, a material the source of which is not so readily identifiable. This question is again touched upon at the end of this paper.

#### THE TRADE IN PITCHSTONE.

Its history, archaeological and geological, is illuminating. A trade in it from Arran to the mainland and to Bute, can be distinctly made out, most active about the close of the neolithic period, dwindling gradually thereafter, and becoming extinct some 2000 years ago. It is at first sight difficult to explain why any prehistoric traffic in raw pitchstone of various qualities should have existed between Arran on the one side and Bute, Ayrshire, and Wigtownshire on the other, in which last two areas numerous pebbles of flint are to be found in certain raised and ordinary beach gravels, affording a more excellent material than pitchstone for the making of cutting implements.

That pitchstone was carried by man into Bute during Neolithic and early Iron Ages is certain. If the stone was not locally worked up into implements in Bute, it was so manipulated on the mainland, where the workshops of the neolithic period and the immediately succeeding overlap period yielded long fine flakes, testifying to greater expertness in manufacture there than is shown by the remains in the domestic sites yet awaiting adequate exploration in Arran.

The explanation may be that the Wigtownshire flint knappers, accustomed to handle an abundance of flint, were more proficient than in most other places, and that the pitchstone was brought to them as experts, because the material required even more skilful handling than flint, if it were to be turned to the best account. The less the homogeneity of the pitchstone or obsidian, the greater was the skill required to fashion it into the more complexly shaped objects.

The Maoris are said to have used obsidian to bore holes in jade; and in Scotland it may have been used in pecking out softer rock, as I found after baring the surface soil a rather thick piece of pitchstone lying in a crevice of the sculptured sandstone rock at Brodick, Arran.

Volcanic glasses of various grades have been much valued from early times. At Abydos, on the breast of the mummy of Zedher, of the XXXth dynasty, Professor Flinders Petrie found, forming part of a set of amulets made of various stones, such as limestone, porphyry, hæmatite, and steatite, six objects of obsidian, chiefly cut into animal forms.<sup>1</sup> Perhaps the finest relic of obsidian is a masterpiece of the XIIth dynasty, a head of Amenemmes III., in the collection of Rev. W. MacGregor, Tamworth.

<sup>1</sup> *Egyptian Explor. Fund Publications*, 1902, 22nd Mem., pt. i. p. 38, and pl. lxxviii.

It has been figured.<sup>1</sup> Pliny refers to *obsidianus* or *obsianus*, and the ancient Mediterranean people used the material for gem-making, obtaining it from Lipari. Some of the very early literary records as to the use of natural, shining, mineral, crystalline substances and of artificial glass are somewhat unreliable, as the ancient and classical terms were often applied indiscriminately. (In this connection may be noted references such as in Job xxviii. 17; *Herod.*, ii. 69, iii. 24; *Achilles Tatius*, ii. 3; Pliny, *Nat. Hist.*, xii. 19, 42, xxxvi. 26, 66.) In Turkey obsidian seems to be used for the teeth of the threshing sledge, though flint or quartz is preferred, a subject I have already referred to.<sup>2</sup>

At Mycenæ arrow-heads of it have been found; and on the Greek islands (as detailed later on in this note) and in Crete it was worked into implements. At Punta Trebina, Sardinia, is found an outcrop of obsidian, and chippings and arrow-heads of the material are found over the island.

A small knife of it was found in a lake-dwelling, apparently of the Stone Age, in Upper Austria,<sup>3</sup> and flakes of it have been recorded from Italian lake-dwellings and from ancient pile-structures, perhaps of the Bronze Age, in the Po valley, Lombardy, and the Theiss Valley, Hungary. Obsidian flakes have been found in East Africa.

The material was once used for implements in the Caucasus, in Teneriffe, Japan, the Admiralty Islands, and Easter Island. It was also similarly employed in both Americas, from California to the West Indies, and as far south as Tierra del Fuego. The methods of fabricating implements out of obsidian in Central America and Peru have been recorded by eye-witnesses.<sup>4</sup> In Mexico it was known as "itztli," and quarried chiefly near Timapan. The ancient Mexican fashioned from it masks and mirrors as well as cutting tools. In British Honduras the direct association of two small obsidian knives with worked flints has been described.<sup>5</sup> In Europe the association of a few flakes of obsidian with some thousands of flint implements and mammoth remains on a floor at Predmost, Moravia, tells that paleolithic man used obsidian.

#### ITS PETROLOGICAL ASPECT A GUIDE TO PLACE OF ORIGIN.

Mr A. Scott, M.A., D.Sc., Glasgow University, who has made a special study of the petrology of pitchstone, and is familiar with the Arran outcrops, kindly reports upon the Dunagoil specimens as follows:—

<sup>1</sup> *Journ. of Egyptian Archaeology*, vol. iv. pts. i.-ii.

<sup>2</sup> *Proc. Soc. Ant. Scot.*, 1904, vol. xxxviii. pp. 506-519.

<sup>3</sup> Keller, *Lake Dwellings*, 1866, 2nd English ed., 1878, ii. p. 621.

<sup>4</sup> Evans, *Anc. Stone Implements*, 2nd ed., p. 23, quoted from Tylor, *Anahuac*, pp. 99 and 331, who translates from Hernandez and from Torquemada, *Monarquía Indiana*, 1615, lib. xxvii. ch. i.; and corrected in *Comptes Rendus*, vol. lxxvii. p. 1296.

<sup>5</sup> *Annals of Arch. and Anthropol.*, Liverpool, vii., Nos. 1-2, p. 29.

"The larger specimen, which shows parallel banding megascopically, appears from its lustreless surface to be slightly weathered, but there is not much evidence of devitrification. A thin section shows occasional crystals of quartz, felspar, and augite set in a brown microlitic groundmass. The latter is obviously banded, the light-coloured layers consisting of numerous green hornblende microlites set in a colourless glass, and while the darker bands contain sporadic microlites in an apparently brown glass, a close examination shows that this glass is really colourless, the colour being due to the presence of innumerable, very minute crystals.<sup>1</sup>

"The smaller specimen has the same phenocrysts as the larger, but the alternate banding of the groundmass is much less obvious. The latter is generally colourless glass, containing numerous hornblende belonites with parallel orientation due to flow structure.

"Neither of the specimens shows any resemblance to the rock described by Dr Smellie from South Bute; nor are they like the Arran intrusions of Dun Fion, Monamore Glen, and the Corriegills district. The plumose and arborescent microlites which invariably characterise the latter are entirely absent, while the augite is not the same as the pyroxene of the Corriegills rocks. The phenocrysts resemble those of the Arran outcrops at Glen Shurig and Brodick school, but the former of these is ruled out, as its microlites are pyroxene and not hornblende. The origin is probably to be found in the latter occurrence. The schoolhouse intrusion (often called the Invercloy pitchstone) can be traced for a considerable distance in the wood behind the schoolhouse. The rock varies considerably and, while the above description does not exactly coincide with that given by Harker,<sup>2</sup> the differences are to be explained by local variations in the intrusion. The phenocrysts, in both cases, agree with the schoolhouse rock, and both types of groundmass are approached in other specimens from that locality which I have examined.

"Hence, while the two specimens differ to some slight extent, there is every probability that they both came from the schoolhouse intrusion. They are certainly more like the rock of the latter than that of any other Arran occurrence. A comparison with thin sections of the pitchstones of the Inner Hebrides (Skye, Mull, Rum and Eigg) and Ardnarmurchan shows that the specimens could not have been imported from any of these localities, as the microscopic characters do not agree with any which have been found there.

"Nor do these specimens show much resemblance to the so-called pitchstones of the mainland of Southern Scotland. The latter form a glassy

<sup>1</sup> Cf. Scott, *Trans. Geol. Soc. Glasgow*, vol. xv. p. 26.

<sup>2</sup> *Mem. Geol. Surv., Scotland, Geol. of N. Arran*, 1903, p. 123.



marginal facies of some of the great Tertiary north-west and south-east dykes, and in general have a microscopic appearance which is characteristic and differs considerably from the Arran and other West Scottish glasses."

It will be apparent from Dr Scott's report that close instrumental scrutiny of natural glass may open up new fields in prehistoric research work and lead to important far-reaching conclusions.

This possibility may be found to attach to work in the foreign as well as in the home field. The Ægean Sea and the Clyde estuary present a parallelism.

The volcanic island of Melos, measuring 14 miles east and west and 8 miles north and south, and situated at the south-west corner of the Greek Archipelago, between Greece and Crete, has long been marked as a source of early objects and a centre of primitive Ægean civilisation.

The great importance of this little island—less than one-half of the size of Arran—in prehistoric times may be accounted for by its possessing deposits of fine homogeneous obsidian, as at Konia, and at Klimatobouni where there was an ancient obsidian quarry. At Nychia, also on the island, implements of it have been found as well as at Phylakopi,<sup>1</sup> where traces have been detected of a prehistoric stronghold of three main periods containing, with pottery, some of it of peculiar character, abundant relics of obsidian.

The substance has not apparently been found naturally in or near Egyptian territory, but beads, amulets, and other objects made of it have been found in Egypt.

The rarity of Egyptian pre-dynastic obsidian relics may be gauged from their apparent absence in the large collection of objects recorded from the pre-dynastic cemetery of El Mahasna, near Abydos.<sup>2</sup> The rarity extends to the dynastic periods, but in the prehistoric or pre-dynastic cemetery of Naqada, Professor Flinders Petrie found thirteen beads of obsidian, each carefully fashioned into a disc, about the diameter and treble the thickness of a sixpence.

The discs are centrally perforated, the walls of the holes having a crushed aspect as if they had been ground out. The peripheries of the discs are neatly worked by minute secondary chipping. Under a lens the microlites become visible.

Professor Flinders Petrie has kindly compiled for this paper the following list of all references to obsidian from his excavations and collecting:—

A large block from Knossos overlooked by the excavators; rough

<sup>1</sup> *Journ. Hellenic Studies*, 1895-6, xvi. p. 353.

<sup>2</sup> *Egyptian Explor. Fund Publications*, 31st Mem., 1911.

blocks from Serabit (Sinai) and Koptos, and a larger one from Memphis; model vase of VIth dynasty (*Denderah*, pl. xxi.); comb of Mena period (*Royal Tombs*, II., xxxii. 10); five amulets, XXXth dynasty (*Abydos*, I., lxxviii. 0); pierced flake, grave 743 s.D. 60? (*Naqada*, p. 27); flakes, grave 1260, s.D. 34 (*Id.*, p. 45); tip of a *hache*, and flakes (*Id.*, p. 57); kohl-pot and stick, XIIth dynasty (*El Arabah*, p. 31); kohl-pot, now in Edinburgh, XVIIIth? dynasty (*Qurneh*, p. 8); scarabs, nearly all XIIth dynasty, rare in XIXth dynasty (*Scarabs*, p. 8); many amulets, nearly all of XXVIth-XXXth dynasties (*Amulets*). And the following are at University College, London:—roughly chipped beads, pre-dynastic, from grave 499, Naqada, and from bead factory of Ist dynasty at Hierakonpolis; a model vase of VIth or XIIth dynasty; eyeball from bull's head?; eyeballs in eyes on mummy-cases of XIXth-XXXth dynasties; beard from a mummy-case; wig from a statue (part); large scarab (part), 2½ inches across; pieces of cups, middle of Ist dynasty; gold-standard weight of 207.6 grains of XVIIIth? dynasty. In the same museum is a flake from grave 185, Gerzeh, s.D. 43-70 (*Labyrinth*, p. 24). It was examined as to its source at South Kensington Mineralogical Department, and found to be most nearly like the obsidian from Samos.

It is tempting to conjecture that, like the neolithic sea-borne trade of Western Scotland, a pre-dynastic traffic was carried on between Melos and other Ægean islands and Egypt, perhaps by way of Crete.

Confirmation of this might be secured, as a first step, by the polariscopic comparison of a section of a Naqadan bead with those of specimens of the raw material from the various Melian deposits. I have obtained one of the beads from Professor Flinders Petrie and would propose making it serve for this purpose, but meantime, no raw specimens being obtainable, the investigation is cut short.