XII
Museum Notes 1994

A STONE HEAD FROM WALKER

THE stone head from Walker was originally found in 1936 by a man and his daughter when they were digging for topsoil in Walker Dene. The head was accessed into the Museum of Antiquities in 1975.[1]

The head is triangular in shape with the neck continuing the line of the cheeks from the broad forehead and ending in a rough point.

Fig. 1 Stone head from Walker. Photograph: University of Newcastle upon Tyne.

Fig. 2 Stone head from Walker. Photograph: University of Newcastle upon Tyne.

The features are primitive with oval eyes and curved eyebrows in relief, a broad nose with nostrils indicated by two grooves, and a wide, off-centre mouth with thick lips. There is no moustache. Part of the right forehead and right eyebrow are missing. The back and both sides are roughly dressed. The height of the head is 250 mm, its estimated maximum width would have been 220 mm, and its maximum thickness is 136 mm.

The confirmation that this head does indeed come from Walker Dene brings the number of so-called "Celtic heads" found in close proximity to Hadrian's Wall in the Eastern Sector to three. In 1969 a sandstone head was found during building development at West Denton, close to Milecastle 8,[2] while in 1980 a head was found at Lemington, about 400 yards due south of the same milecastle.[3] In the Central Sector the discovery of a head carved into a roundel on a building stone from Milecastle 35 might also be noted.[4]

Although all these heads bear the characteristics of the "Celtic head" and can be paralleled with other examples found in the north of Britain, they bear little similarity to each other in the details of their features or in their general shape. Their interest as a group lies in their findspots and the significance of a possible link between the cult of the head in the 2nd century and the building of Hadrian's Wall.

Lindsay Allason-Jones

JET AND OTHER MATERIALS IN ROMAN ARTEFACT STUDIES

The problems of identifying the various black, shiny materials used by the Romans for making jewellery and other objects, have been acknowledged for many years. A number of techniques have been investigated in an attempt to solve the problem but progress has been hindered by the fact that the most accurate methods have been destructive while the techniques which are less harmful to the objects under study have mostly been limited to distinguishing between jet and shale, have failed to identify other materials, such as cannel coal, accurately, and have been unable to pinpoint the sources of the raw materials.[5]

In recent years the financial interests of the oil companies have directed research into oil-bearing rocks and staff at the Fossil Fuels and Environmental Geochemistry Institute at the University of Newcastle upon Tyne have been able to adapt the techniques used for fossil fuel surveys to the study of archaeological artefacts. A joint project between the Institute and the Museum of Antiquities has resulted in the accurate analysis of a group of objects from the Roman North. The conclusions have not only been surprising but are likely to have a far-reaching effect on artefact research and the study of the Roman trade patterns.

The equipment used is a reflected light microscope using oil emersion for the samples. The magnification is ×600. The important new step for the archaeologists is that the research for the oil companies has provided an extensive data base with which to compare the samples taken from the artefacts. An added benefit is that only a very small sample is required; sufficient can be obtained from drilling a 2 mm diameter hole a few millimetres into the object allowing smaller items, such as beads and finger rings, to be tested.

As far as the geological background to the work is concerned it can be stated that the black materials are black because they are rich in organic material.[6] This material may be from terrestrial plants or aquatic organisms. The terrestrial plant material can be divided into three groups: vitrinite, which is wood which has been preserved in a water-saturated anaerobic environment turning into a humic gel which hardens to a black glassy material; liptinite, which covers the fatty, waxy parts of plants which are rich in hydrogen, that is resin, spores, pollen and cuticle (leaf-coating), and algae; and inertinite, which is generally a charcoal-like material which is very rich in carbon. This latter group includes fusinite, which is wood decomposed in the presence of oxygen, often resulting from forest fires but also from slower decomposition on the peat surface. Also in this group are sclerotinite (fungal material) and micrinite (polymerised resin).

The aquatic organisms are mainly zooplankton and phytoplankton, including algae. When living in water their tissues are less strong than the terrestrial organisms and break down to a structureless material called amorphinite which, if it is heated during burial, will in turn break down to oil and eventually to gas. The formation of amorphinite requires the burial of the planktonic material in anaerobic mud on the sea floor, otherwise it will oxidize away.

A normal United Kingdom coal will consist of 60% vitrinite, 20% inertinite and 20% liptinite. The rocks which the Roman craftsmen selected for carving and polishing contain a high organic content dominated by liptinite and/or amorphinite. It is the waxy, fatty, oily fraction which will give the good polish. The high organic content also makes the rock soft and easy to carve.

As well as these variations in the nature of the organic material present there is also variation because of the intensity and duration of heating that the rock received. A steady temperature of 100–150°C for 100 million years will drive the hydrogen and volatiles off the organic material leaving an increased proportion of carbon. This is known as "rank" in coals and "maturity" in other sediments. A high rank coal, such as anthracite, contains virtually no hydrogen or volatiles. High rank coals are black, low rank coals are dark brown.

It is possible to differentiate between coals by using their botanical constituents and their rank. Rank can be determined chemically but also optically under the microscope: the higher the rank, the brighter the polished surface of the coal will appear. Identification involves measuring the reflectance of the wood (vitrinite), that is, the percentage of light reflected back from the polished surface.

The Museum of Antiquities collection includes a large number of objects which have been traditionally described as being carved from jet. In 1978, using the techniques then available, Professor J. Hemingway of the Department of Geology, University of Newcastle upon Tyne, realized that much of this material was not necessarily jet but was unable to progress further.[7] As the highest proportion of the artefacts came from South Shields and included half-worked blocks and unfinished objects, it was postulated that the Roman craftsmen were using the local Coal Measures as a source of raw material as well as the jet and shale areas of Yorkshire and Dorset. It was to test this hypothesis that the Museum of Antiquities and the Fossil Fuels and Environment Geochemistry Institute began to analyse a group of artefacts from the northern frontier.

In this paper a selection has been made of the objects tested in order to illustrate the wide range of materials used by the Roman craftsmen.

Jet

Jet was made from logs of wood which were washed from the land into the sea where they became waterlogged and sank into stagnant, anaerobic mud rich in phyto- and zoo-plankton debris. As the material changed into shale and was heated up due to burial, oil was generated which impregnated the enclosed logs of wood. The jet formed is similar to vitrinite, which is harder and more brittle, since the wood from which it is derived was not impregnated with oil as none was generated from the enclosing peat or mud. The jet preserves the cell structure of the wood which can easily be identified by thin-sectioning or on a polished surface in reflected light. The method of analysis used in the Newcastle project has proved to be accurate enough to identify jet and its possible source without the destruction of thin-sectioning.

1 Sewingshields (Acc. No. 1981.11; *Arch. Ael.*[5], XII, 95, no. 146)
Small undecorated barrel bead. Cf. Railway Excavations, York: *Eburacum* RCHM 1962, 143, pl. 70.
D:6 mm, H:5 mm
This is made from high rank jet of the Whitby type but its reflectance suggests that although it may have come from the Whitby area it was probably extracted to the south of the main source.

2 Carrawburgh (Acc. No. 1960.35.6; unpubl.)
Cylinder bead with a wide plain band, the rest of the surface being covered by a series of incised lines.
L:26 mm, T:4·5 mm
This is also true jet but its reflectance of 0·4 is higher than that of No. 1; this is too high for the Whitby area and suggests a source in the outcrops of the Ravenscar area to the south of Robin Hood's Bay.

3 Wallsend (Excav. No. N12.8.1760)
Tapering rod of circular section with a blunt head. Pin or spindle.
L:28·5 mm, T:6·5 mm
True jet but with a lower reflectance than either Nos 1 or 2, having a level of 0·25 which indicates a source in the Staithes/Port Mulgrave area, north of Whitby.

4 Wallsend (Excav. No. K13.1.1770)
Globular jet bead decorated with incised lines at the top and bottom. Cf. Allason-Jones and Miket 1984, No. 7.35.
D:11·5 mm, H:8 mm
This is true jet with the same high reflectance level (0·4) as No. 2 indicating a source south of Whitby in the Ravenscar area.

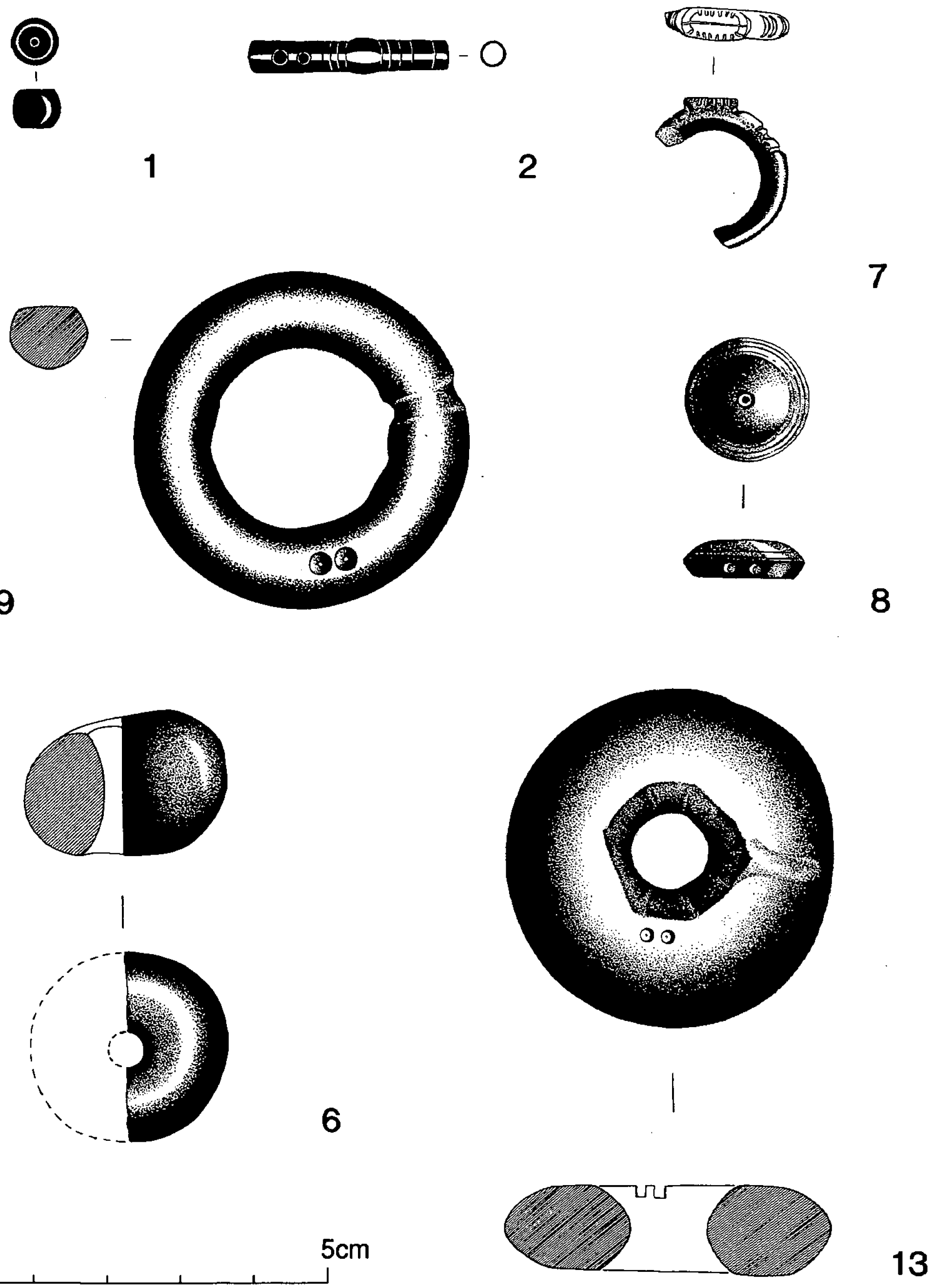

Fig. 3 Objects of jet and shale. Nos 2, 9, and 13 show the dimples left by the sampling process. 1:1. Drawn by M. Daniels.

The samples have been shown to be of variable rank indicating that a number of sources of jet, widely spread in the Yorkshire area, were exploited. Several rough blocks found at South Shields were also tested with the permission of Tyne and Wear Museums Service. These blocks are rectangular and might be termed "ingots". It had been presumed that these were locally derived shales but two were shown to be of jet: one of Whitby jet, the other of Robin Hood's Bay jet. This implies a trade from Yorkshire of jet of various quantities in rough form for finishing by local craftsmen.

Cannel Coal

Whereas most coals are fossil fen peats, cannel is a type of coal formed from plant debris laid down in lakes in the peat swamp. If the lake was exposed to sunlight, algae thrived turning the water green; when the algae died it was incorporated into the humic mud and if this was plentiful the result was an algal cannel. The name "cannel" is derived from "candle" because it will burn with a flame like a candle due to the high waxy liptinite content. In the hand specimen it does not appear banded like coal since it is made up of liptinite, spores and cuticle. There is also a variety called "curly cannel" which, when cut with a knife, produces curling shavings like wood. This is also due to the rubbery, waxy nature of the liptinite.

5 Housesteads (Housesteads Museum; Excav. No. 3134; unpubl.)
Fragment of an undecorated armlet of semi-oval section.
Int. D:40 mm, W:6 mm, T:8 mm
This has been made from a good genuine cannel, rich in spores and micrinite. Its reflectance is about 0·5, which would be acceptable for a source in mid-Northumberland or most of the Midlands or Northern coalfields.

6 Milecastle 14 (Acc. No. 1982.2; unpubl.)
Half an undecorated, unpolished, globular bead.
D:26 mm, H:19 mm, hole:5 mm
This has been carved from an algal cannel, rich in spores and Botryococcus algae set in a matrix of micrinite. The reflectance is low (0·45). This particular sample is of interest geologically as none of the liptinite flouresces but this may be of little archaeological significance.

Detrital Coal

The term "detrital coal" indicates a stage between coal and cannel where the material is made up of detrital plant debris with larger fragments than in cannel and with a higher proportion of vitrinite.

7 Sewingshields (Acc. No. 1981.11; *Arch. Ael.*[5] XII, 94, no. 145)
Incomplete finger ring with a raised central panel decorated with marginal notches. The shoulders have heavy ridge-and-groove motifs. The shank tapers away from the central panel and is semi-oval in section.
D:19 mm, Max.W:4 mm, T:5 mm
This is detrital coal rather than a cannel—the lithology might be best described as coal-durain. The reflectance of 0·7 would indicate a source in the South Northumberland area away from the Whin Sill. It is surprising that a craftsman could carve this material; a high proportion of failed attempts might have been expected.

8 Sewingshields (Acc. No. 1981.11; *Arch. Ael.*[5] XII, 95, no. 147)
Disc bead decorated with a central dimple and two incised, marginal, concentric circles. The edge slopes back from the domed face and is pierced by two circular holes of 2 mm diameter. These holes have been drilled from both sides and are badly aligned. Cf. South Shields: Allason-Jones and Miket 1984, Nos. 7.62, 7.63; Corbridge: Corbridge Museum Acc. No. 75.539.
D:16 mm, T:5 mm
This is a rather dirty detrital coal with a reflectance of 0·5–0·6 which could indicate a local origin but not one in the immediate area of Sewingshields where the strata are affected by the heat of the Whin.

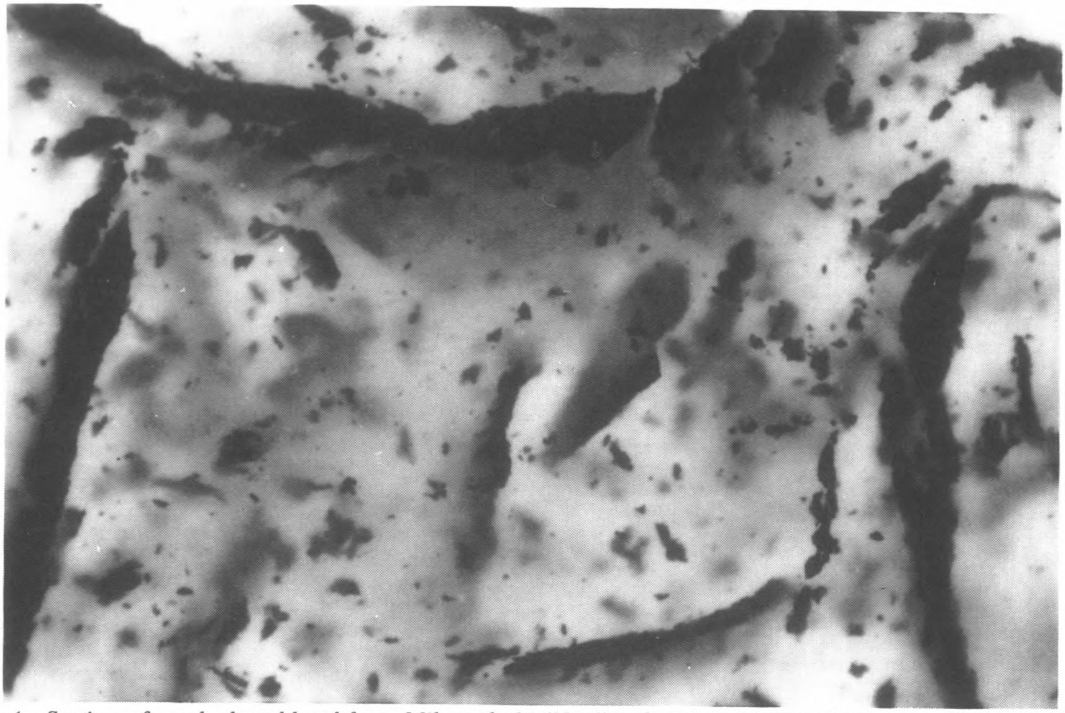

Fig. 4 Section of an algal coal bead from Milecastle 14 (No 6), taken at ×600 magnification under ultra violet light. Despite the presence of quantities of algae there is no fluorescence because of the high rank of cannel. Photograph: D. M. Jones.

Shales

Shale is compacted mud or clay turned to rock by pressure or heat. The character of shale is variable from source to source in the nature of the clay minerals of which it is composed and the plant spores and micro fossils it contains.

9 Carvoran (Acc. No. 1956.142.A; unpubl.)
Large ring of oval section with a worn groove around the shank suggesting that this was a pendant. Cf. South Shields: Allason-Jones and Miket 1984, No. 7.107; Cairngryffe, Lanark: Nat. Mus. Antiq. Scot. Acc. No. HH466; Quarrel Burn Reservoir, Midlothian: Nat. Mus. Antiq. Scot. Acc. No. FN172; Castle Law, Perth: Nat. Mus. Ant. Scot. Acc. No. GP27.
Ext.D:45 mm, Int.D:23 mm, T:10 mm
This is a bituminous shale, rich in Botryococcus algae. The reflectance (0·34) is too low for Northumberland or Durham shales. A possible source is the Midland Valley of Scotland, a suggestion which may be supported by the number of parallels from Scottish sites, but areas of Yorkshire would also produce shales with a similar reflectance.

10 Housesteads (Housesteads Museum; Excav. No. H20.5.TS.4498)
Undecorated, circular gaming counter.
D:15 mm, T:2·5 mm
This shale has a low organic content. It appears to be of high maturity although no vitrinite is discernible. It is of such an undistinguished lithology that it would be meaningless to speculate on its origins.

11 Housesteads (Housesteads Museum; Excav. No. H20.5.TS.4499)
Undecorated, circular gaming counter.
D:16·5 mm, T:4 mm

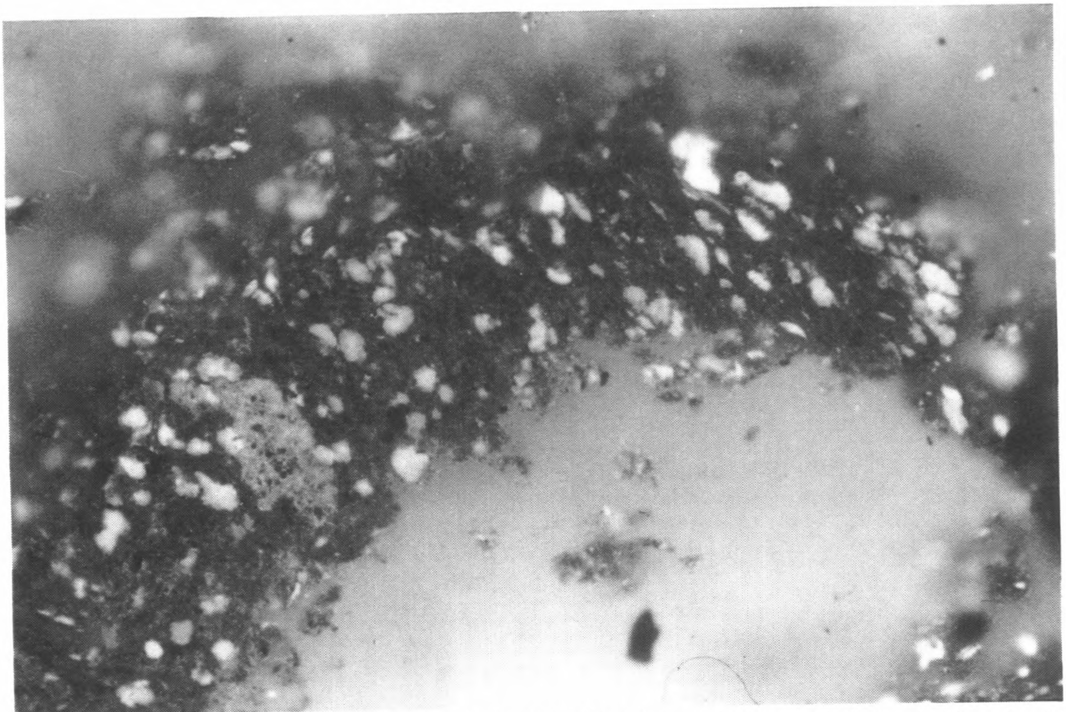

Fig. 5 Section of a torbanite ring from South Shields (No 13), taken at ×600 magnification under ultra violet light, showing the yellow fluorescing Botrococcus algae in a non-fluorescing clay matrix. Photograph: D. M. Jones.

This is a normal shale of average organic content. It has all the appearance of being local as its reflectance level of 0·9 would fit with the shales from the South and Main Tyne Valleys from Haltwhistle to the coast.

12 Housesteads (Housesteads Museum; Excav. No. H13.1.13.1410)
Fragment of an undecorated armlet of oval section.
No measurements possible.
This has been made from a material called carbargillite, that is 50:50 plant debris and clay minerals. The reflectance is 0·6 indicating, if local, a source in the Tyne Valley, north of Hadrian's Wall.

13 South Shields (Acc. No. 1929.96/97); Allason-Jones and Miket 1984, No. 7.178 (illustrated as No. 7.180)
Large ring of oval section which is undecorated but has a worn groove and traces of another across the shank suggesting that this has been a pendant. Cf. No. 9.
Ext.D:44 mm, Int.D:12 mm, T:12 mm
This is made of torbanite, a shale which is rich in yellow fluorescing Botryococcus algae in a non-fluorescing clay matrix. This appears to be identical to the classic examples from the Midlothian Scottish oil shales.

14. South Shields (Acc. No. 1929.108; Allason-Jones and Miket, 1984, No. 7.213)
Fragment of a shallow dish with a wide, flat, carved, projecting rim. Cf Kirkby Thore: Chesters Museum Acc. No. 1329.
This proved to be of Kimmeridge shale, rich in amorphinite, long known to have been used during the Roman period for the manufacture of tables, trays and jew-

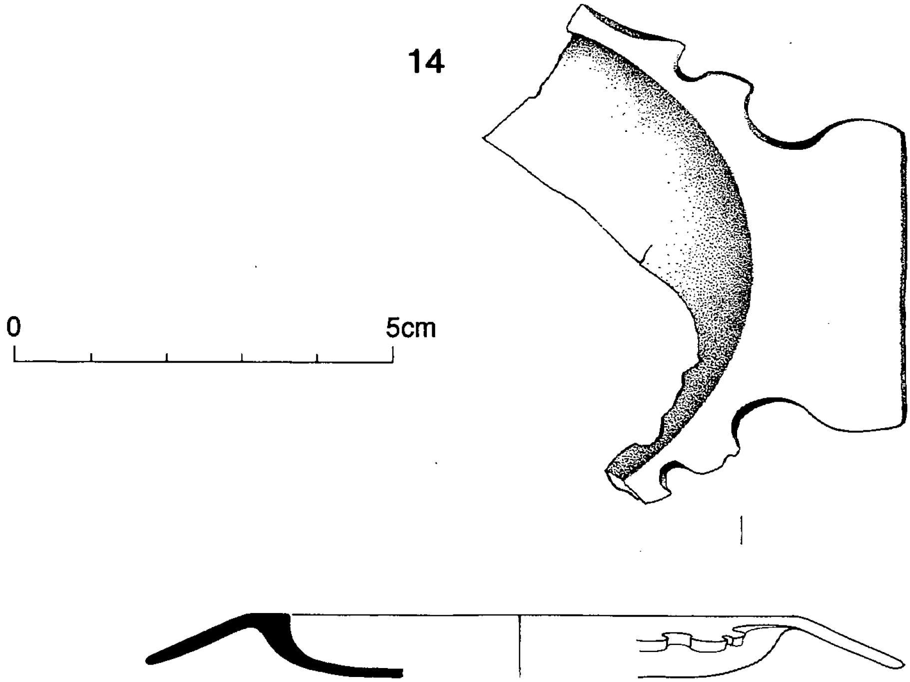

Fig. 6 The fragmentary Kimmeridge shale dish from South Shields. 1:1. Drawn by M. Daniels.

ellery.[8] No other object sampled from the region proved to be of Kimmeridge shale indicating that there was little trade in Kimmeridge shale to the frontier zone, either in raw or worked form.

This project has been limited in its scope but several conclusions have been reached. Firstly, the sources of material used by craftsmen during the Roman period for the manufacture of black jewellery or domestic artefacts were remarkably varied. The local Coal Measures were used, although there is no evidence as yet that the measures in the immediate neighbourhood of South Shields were utilized. Instead, the favoured local sources appear to have been in South Northumberland near Alston and up in the North Tyne Valley beyond Hadrian's Wall. This local material, however, does not account for the bulk of the products. Other sources which were equally favoured include Yorkshire, Derbyshire and Midlothian. Some pieces which were difficult to locate precisely may have been imported from such places as Spain or Lycia, which the Romans are known to have used as a source of *gagates* but where little modern research has been carried out.[9] It might, therefore, be suggested that South Shields was a centre for black jewellery manufacture, not because it was close to a source of the raw material but because it was a port, receiving the raw material from a variety of sources. South Shields's strength may have been in its position *vis à vis* Hadrian's Wall: it was in a prime position to tap the markets of the frontier zone with the finished products.

The objects are all of late 3rd or 4th century A.D. date. There appears to have been little call for black jewellery before this period. This was an unsettled period in Scottish history when it is unlikely that major Roman commercial activities were taking place in the area. However, it should be remembered that the gathering of coals and shales need not be a centrally organized, complex matter; it is possible that individuals or families may have been involved in extracting the rock. It is of some interest, however, that at a time when Scotland was beyond the frontiers of the Roman Empire Midlothian was an important source of one class of raw material required for luxury goods within the province of Britannia. That the ambiguous area to the north of Hadrian's Wall was also being exploited at the same time is also curious.

It should be noted that not only are the sources varied but the different materials required different techniques in order to be carved successfully. Roman craftsmen did not have sophisticated analytical techniques at their disposal but it is probable that they knew from experience that the black material from Yorkshire could be pared and whittled with a knife but that a similar black rock from Midlothian or Derbyshire would need to be kept damp to avoid it splitting. In the 19th century shale workers bedded shale in paraffin-soaked sawdust to ensure that it held together during the carving process and no doubt the 4th-century craftsmen had a similar method. Some of the shales and cannels, such as No. 7, would have needed very careful handling.

The use of different materials for similar purposes may explain why there is no Latin term for "shale". There may not have been an obvious need for a separate term; it was all black and shiny and, therefore, may all have been considered to be *gagates*. It might be pondered as to whether particular sources, such as Whitby, were prized above all the others. Jet is easier to work, retains its shine, and has the electrostatic properties which Pliny considered to be important.[10] Shale and cannel coal, on the other hand, were more easily available in larger quantities. On these matters, as on the subject as to whether one material was more expensive than others, we have no information.

The Project has shown that advanced techniques and the recently enhanced data base can identify accurately the various types of black material used in Britain in the late 3rd and 4th centuries A.D. More work needs to be done by geologists on the sources outside Britain before a full picture of the trade can be drawn but the indications are that the jewellery industry of Roman Britain was far more complex than has been previously realized.

L. Allason-Jones and D. M. Jones

NOTES

[1]1975.13. I am grateful to Mrs. F.M. Searle, who was present when the head was first discovered, for drawing my attention to this object.

[2]Originally published in *AA*[4] XLVIII (1969) 347–8, Pl. XXXIV, this head has now been donated to the Museum by the finders: Acc.No. 1993.5.

[3]Smith, D.J., "A Romano-Celtic head from Lemington, Tyne and Wear" in Miket, R., and Burgess, C.B. (eds.) *Between and Beyond the Walls: Essays on the Prehistory and History of North Britain in Honour of George Jobey*, 221–3. Edinburgh, 1984. Acc.No. 1980.15.

[4]Haigh, D. and Savage, M., "Sewingshields" *AA*[5] XII (1984) 97, Pl. IXb. Acc. No. 1981.11.

[5]See Pollard, A.M., Bussell, G.D., and Baird, D.C., "The analytical investigation of early Bronze Age jet and jet-like material from the Devizes Museum" *Archaeometry* XXIII, 2 (1981) 139–67; Hunter, F.J., McDonnell, J.G., Pollard, A.M., Morris, C.R., and Rowlands, C.C., "The scientific identification of archaeological jet-like artefacts" *Archaeometry* XXXV, 1 (1993), 69–89; Hunter, F., *An Investigation of Methods of Identifying Archaeological Jet-like Artifacts* Central Excavation Unit Report, London. 1991.

[6]For further information about coal petrology see Borntraeger, G., *Stach's Textbook of Coal Petrology* Berlin, Stuttgart. 1982.

[7]Allason-Jones, L., and Miket, R.F., *Catalogue of Small Finds from South Shields Roman Fort* Society of Antiquaries of Newcastle upon Tyne Monograph 2. Newcastle upon Tyne. 1984. Section 7.

[8]See Lawson, A.J., "Shale and jet objects from Silchester" *Archaeologia* CV (1975) 241–75; Davies, H., "The Shale Industries of Kimmeridge, Dorset" *Archaeol.J.* XCIII (1936) 200–19.

[9]Pliny *Nat.Hist.* XXXVI, 141.

[10]Pliny *Nat.Hist.*, XXXVI, 141–2.