Biggar Archaeology group
Bringing the past to the present

The Lithology of Biggar Archaeology Group's Prehistoric Projects

by Ian Paterson & Tam Ward 2013

ABSTRACT

In the past 30 years, the Biggar Archaeology Group (BAG) has recovered, by means of fieldwalking and excavation, large amounts of lithic artefacts that date from prehistoric times. The collection consists mainly of debitage but includes a range of tools and weapons. This account describes the geology of the various lithological types and suggests possible sources for them, and also provides illustrated examples and archaeological descriptions and contexts of each type as found by BAG. Furthermore observations regarding the use of stone in the construction of a stone circle, and for use as pot boilers in burnt mounds are given, and some metal working slags are referenced.

INTRODUCTION

For more than three decades, Biggar Archaeology Group has researched an area of over 900 sq. km (Fig 1 & Pl 1) in the catchment areas of the Upper Clyde and Tweed rivers in southern Scotland. In this time, they have recovered, by means of fieldwalking and excavation, large quantities and varieties of lithic objects and also made observations on a variety of geological aspects of their work.

Fig 1

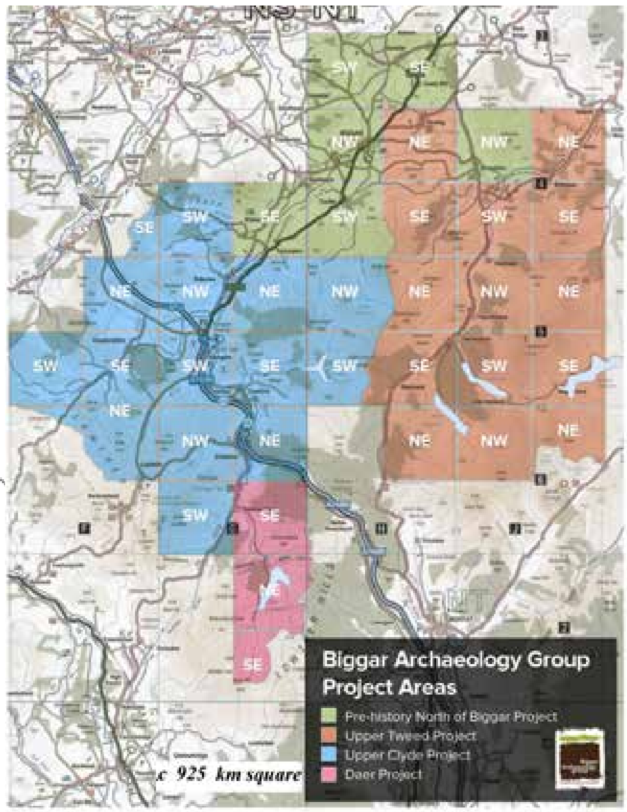


Plate 1

By far the most abundant materials in numerical terms are the locally sourced Radiolarian Chert and the more exotic flint. However, several other stone types were utilised by the prehistoric people who inhabited the landscape in the Late Upper Palaeolithic (LUP), Mesolithic, Neolithic and Bronze Age periods, during which time stone was an important element of the material culture of the inhabitants.

Several previously undiscovered or unusual stone types have been found over the years, some of these occurred in assemblages that include debitage, while others were found as single items. It is the variety of lithic types, their source and procurement, their period of use, function and the geography of their final abandonment that concerns this paper.

This report will make no pretence as to expertise in prehistoric archaeological lithics, as that is beyond the experience of both writers. However, as far as their geology is concerned, and which is the principal reason for this work, one of the authors (Ian Paterson) was, until his retirement, a professional geologist.

The geological context of the various lithic types will be discussed, and where possible described archaeologically. Archaeological descriptions should be considered for some parts as being in 'lay terms'.

It should be noted that, when dealing with fine-grained lithic materials, the normal geological practice is to prepare a thin section that can be examined by means of a high powered microscope and, as a last resort, to carry out a chemical analysis. As these procedures are destructive, they cannot be applied in the case of archaeological artefacts. Furthermore, some of the artefacts lack a geological context which would assist in their identification.

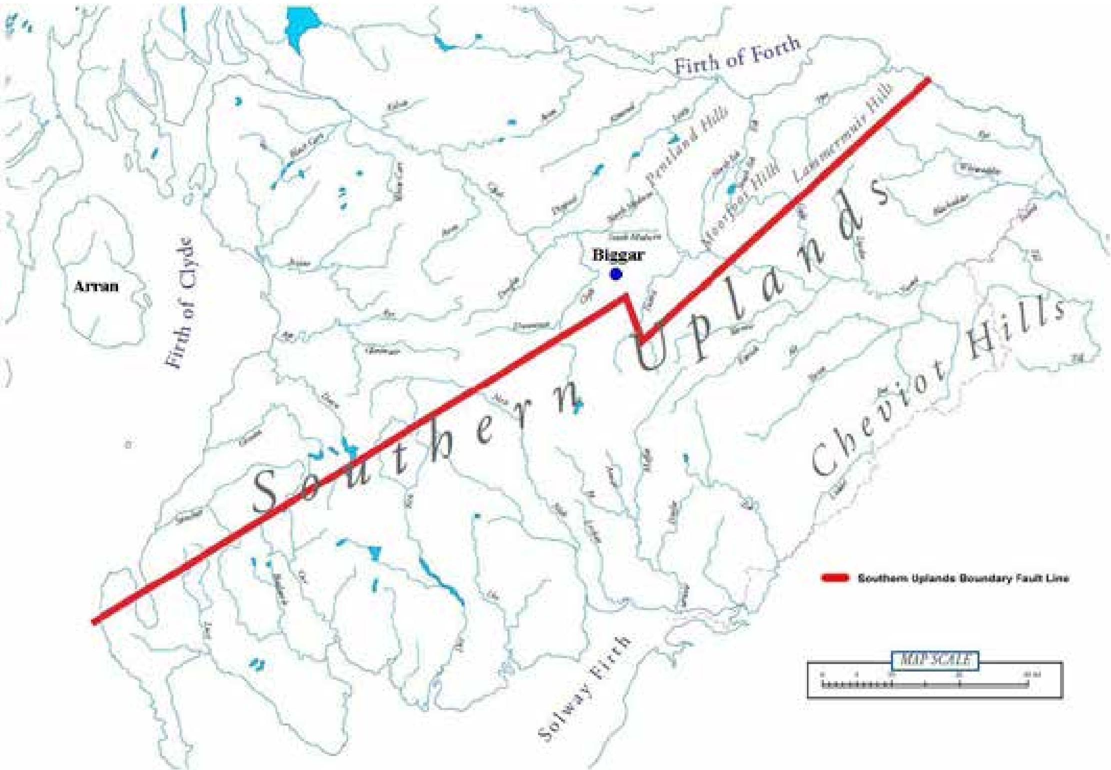


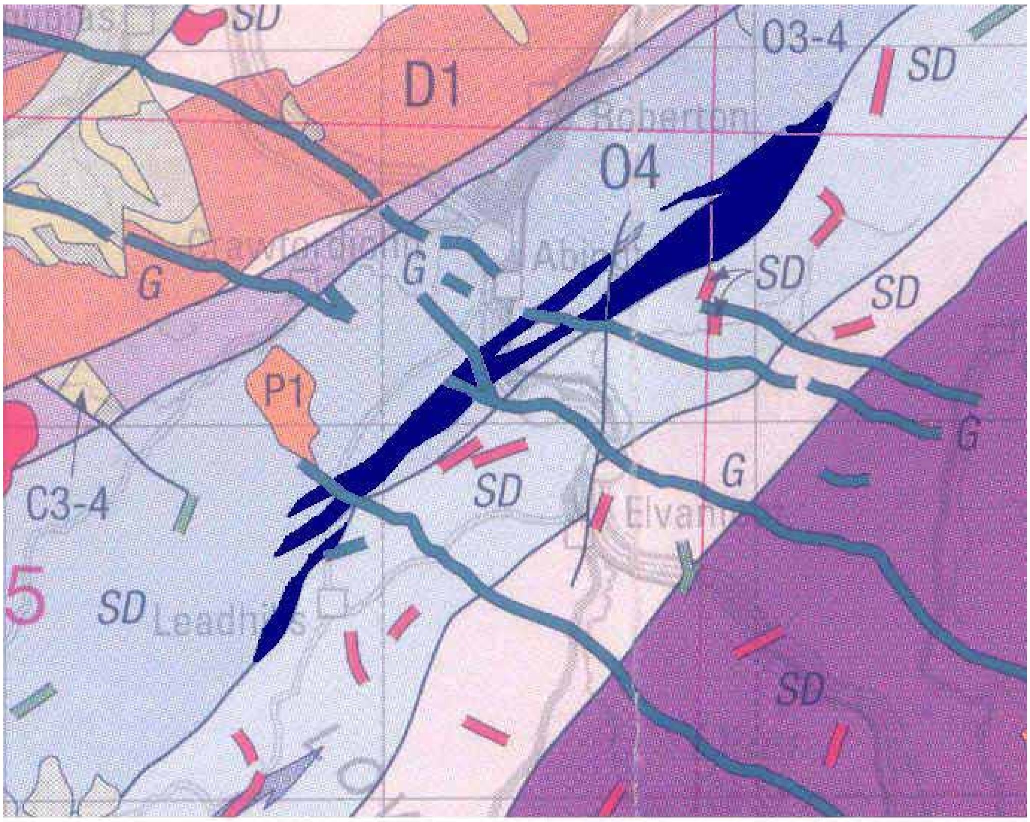
Fig 2

GEOLOGY OF THE BAG'S AREA

The geological formations in any area are conveniently subdivided into two categories – Bedrock Geology, that includes the ancient rocks, and Drift Geology, which comprises the more recent, unconsolidated deposits laid down by ice sheets and rivers. Both have been exploited in prehistoric times for tool making materials.

Bedrock Geology

The area researched by the BAG straddles the Southern Upland Fault (SUF)) (see sketchmap), a major crustal fracture that juxtaposes the older Ordovician and Silurian rocks that form the Southern Uplands to the south, against younger rocks of Devonian and Carboniferous date that underlie the Midland Valley on its north side. The strata in both areas are cut by intrusions which range in type from granite plutons to dolerite dykes. The map gives an indication of the complexity of southern Scotland's geology.



Sketch map illustrating outcrop of strata with radiolarian chert (dark blue).

From 'Bedrock Geology - UK North', British Geological Survey.

Fig 3

The strata of the Ordovician and Silurian periods consist mainly of greywacke with subordinate siltstone and mudstone. They were laid down in a deep ocean environment by 'turbidity currents'. These occur when sediment that had accumulated in the relatively shallow water of the continental shelf avalanches down into the deep ocean. The avalanches or 'turbidity flows' consisted of materials of all grain size from mud to small pebbles. In the quiet water conditions at depth, the coarser particles were laid down first, followed by particles of lesser grain size to form 'graded beds'. From time to time, however, there were periods during which greywacke beds did not form and, instead, deposits of very fine-grained mud accumulated. It was at these times that the so-called Radiolarian Cherts developed by concentrating into nodules of silica derived from the skeletons of radiolarians. Both the greywacke and the chert have been exploited by the prehistoric toolmakers.

The rocks of the Devonian period consist mainly of sandstone, laid down by rivers, with subordinate amounts of volcanic rocks. The Carboniferous rocks, which lie almost entirely outwith the BAG's area, consist chiefly of mudstones and sandstones, with seams of coal, cannel and oil shale. There are also major developments of lavas. The rocks of both formations are cut by intrusions of various ages. The rocks of the Midland Valley are mostly covered by superficial deposits – mainly till – and have principally contributed quartzite pebbles for use as hammer and grinding stones to the lithic materials of the BAG's collection.

Drift geology

The most widespread superficial or 'drift' deposit is boulder clay or 'till' which consists of material deposited by ice sheets and glaciers. It contains boulders, derived from the bedrock formations, in a matrix of finer-grained material. Selected boulders were doubtless used in the manufacture of tools. Sand and gravel deposits, laid down by rivers, have also been exploited in prehistoric times for tool-making materials.

In the Southern Uplands, peat deposits are widespread. It is perhaps unlikely that these were exploited as fuel in prehistoric times as timber was abundantly available, and peat would only have been found in prehistoric times at higher altitudes. The present valley bottom deposits of peat were mostly formed since the climatic deterioration at the end of the Bronze Age.

THE LITHIC MATERIALS

The tools and associated debitage recovered by the Group consist predominantly of the locally available Radiolarian Chert. Flint, which is next in abundance, does not occur naturally in southern Scotland. Within these two principal groups, a considerable variety of types is to be found. Of the various other lithic materials used, some, such as pitchstone, have a Scottish origin while others are exotic.

The complete list of lithic types so far recovered and discovered by the Group is as follows:-:

TYPE	ORIGINATION
Radiolarian chert	Local solid geology
Flint	Exotic, probably England
Pitchstone	Arran
'Bluestone'	Exotic, unknown
Siltstone	Unknown
Agate, chalcedony; jasper, etc	Probably local drift geology
Quartz/rock crystal	Probably exotic
Quartzite	Local drift geology
Greywacke	Local solid/drift geology
Cannel coal	Local solid geology
Tuff (Langdale Pikes)	Lake District
Haematite	Probably local
Sandstone	Local solid geology
Granite	Local drift geology
Andesite	Local solid/drift geology
Tholeiite basalt	Local solid geology

Radiolarian Chert (see also Ian Paterson 2010)

Because chert figures so frequently in local archaeology, it is given prominence here. The Radiolarian Chert occurs as two main varieties. The first of these has a rough or hackly fracture and is generally in shades of grey, ranging from medium dark grey [N 3][1] to medium grey [N 5], in colour. In a few cases, the chert of this type shows traces of the original bedding, with alternating fine-grained and coarser-grained laminae. The second variety is less abundant. It has a smooth, waxy or resinous finish and, commonly, a conchoidal fracture. It ranges in colour through olive grey [5 Y 3/2] and light olive grey [5 Y 5/2] to dark greenish grey [5 GY 4/1] or olive black [5 Y 2/1]. Note that, in order to achieve consistency, the colours of specimens are given in accordance with the 'Rock Colour Chart, prepared by the Geological Society of America, Boulder, Colorado'.

1 To achieve consistency, the colours, annotated in square brackets, used throughout the text are as defined in the 'Rock Colour Chart', prepared by the Geological Society of America, Boulder, Colorado.

Alteration and/or weathering of both main types of chert occurs, either dispersed through the specimen or as a distinct pale buff zone that was the original edge of the chert nodule or bed. This feature is more widespread in the case of the rough-fracturing chert. While it is reasonable to assume that all the chert specimens contain radiolarian skeletons, in hand specimen these are generally distinguishable - as spheres c.0.1 - 0.2mm in diameter - only in the parts where the pale alteration has occurred. It would appear that the siliceous skeletons of these organisms were more resistant to the diagenetic processes involved.

Less abundant than either of the above types is what is here termed ‘grey chert’. This is mostly light brownish grey [5 YR 6/1] in colour and occurs as both rough and smooth fracturing variants. The possibility cannot be excluded that the specimens are actually extensively altered examples of the two main types of the normal radiolarian chert.

Radiolarian skeletons are readily visible throughout almost all specimens of the ‘grey chert’. The ‘grey chert’ occurs in most assemblages but usually in small numbers.

In many of the assemblages, a small number of specimens of the smooth-fracturing variety have the olive grey or dark greenish grey coloration partly replaced by greyish brown [5 YR 3/2] or moderate brown [5 YR 3/4]. Where the replacement is complete or almost so, the fragment is, in this account, referred to the category of ‘red or brown chert’.

The principal source of information regarding the nature and distribution of naturally occurring Radiolarian Chert is the monumental memoir of the Geological Survey by B.N. Peach and J. Horne (1899). They record the occurrence near Abington of ‘red or chocolate-coloured cherts embedded in a fine ashy matrix, possibly of volcanic origin’.

It is important to distinguish the cherts found in the Southern Uplands of Scotland; the radiolarian cherts, from those types found elsewhere, and also to realise the variety of types included within radiolarian cherts; texture and colour being the most obvious differences among the samples, however, they are all radiolarian chert and the colour difference is merely caused the inclusion of different minerals. Many specimens are multi coloured indicating that colour does not differentiate typology.

As the Radiolarian Chert is readily available locally, it is not surprising that it generally forms the highest percentage of lithic types found on most sites. Significantly it does not occur at the very early Mesolithic site at Daer Reservoir, Site No 1 (Ward 2013), and it is reasonable to infer that the occupants of that site had carried with them sufficient lithic material, mainly flint, siltstone and the mysterious ‘bluestone’ (below), to make good any lost or damaged tools and weapons. Other Mesolithic sites discovered by BAG, even quite early ones, do have the local chert as the dominant lithic.

The chert was subsequently used up to and including the Bronze Age (Pl 23a) to produce a variety of tools types, mostly blades, scrapers, arrowheads, piercers and the debitage that resulted from their manufacture, including numerous cores of differing types. However, at most sites it was supplemented by other tool-making materials, principally flint.

Plate 23a

Sources **Fig's 4 & 5**

The main source of information regarding the nature and distribution of naturally occurring radiolarian chert is the monumental memoir of the Geological Survey by B.N. Peach and J. Horne (1899). On page 38 of their account, they describe the rock succession as it occurs in 'The Northern Belt', that is, in the Leadhills to Abington area, as follows.

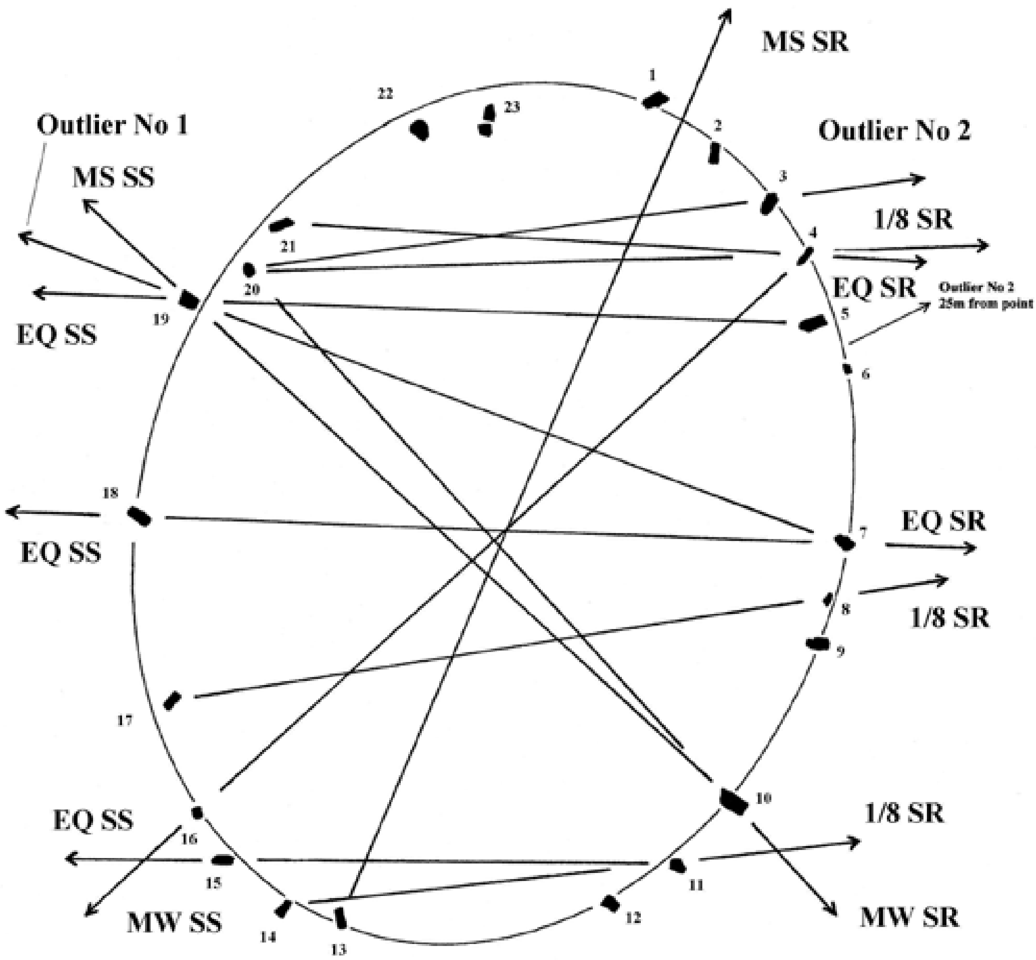


Fig 5

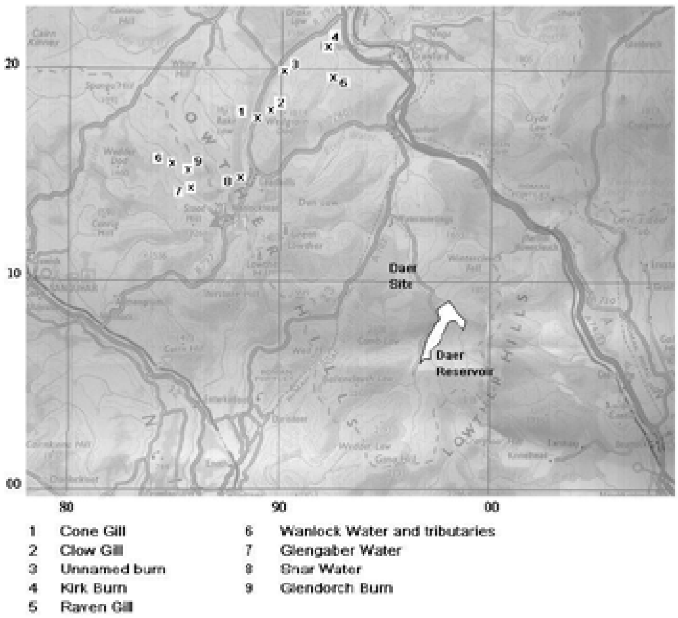
THE RADIOLARIAN CHERTS - THE NORTHERN BELT

***Rocks**.-The lowest visible strata are of volcanic origin, comprising lavas of various types (diabase, “diabase-porphyrite,” and mica-andesite), together with agglomerates and tuffs, of which perhaps the most interesting is the augite-andesite tuff of Bail Hill, Sanquhar. These are traversed by intrusive igneous materials, including dolerites and gabbros.*

Overlying the volcanic series comes an important development of cherts and mudstones, which, where typically developed in the Abington area, may be grouped in three sub-zones., The lowest of these is composed of red or chocolate-coloured cherts embedded in a fine ashy matrix, possibly of volcanic origin, which, when the matrix is exposed to weathering, bleaches to a white colour. The middle and upper sub-zones consist of green and grey cherts respectively, which occur as elongated flattened nodules from a few inches to a few feet across. Frequently they coalesce so as to form a more or less persistent bed. These banded cherts, the upper surfaces of which are often mammillated or botryoidal, vary in thickness from a few inches to a foot or more, and give rise to a remarkable ribbed contour which is a characteristic feature of the series. They are associated with green, grey, and red mudstones, sometimes several inches thick, which by the admixture of siliceous material pass laterally into chert: In one or two sections a thin seam or film of black shale is intercalated between the overlying mudstones and cherts and the underlying volcanic rocks.

***Fossi1s.** The cherts are abundantly charged with radiolaria. From the researches of Dr. Hinde, in whose hands the collection of cherts made by the Geological Survey was placed for examination, it appears that, in thin sections of the unstained rock, the organic remains, when viewed under the microscope, look like larger and smaller circles filled with somewhat lighter material than the surrounding matrix.*

Peach and Horne concluded that the rocks had been laid down in an oceanic environment. They listed a number of localities where the Radiolarian Chert could be examined. (Fig 4) Those that lie closest to the Daer valley excavations are shown on the sketch plan. It seems reasonable to suppose that the rough-fracturing grey chert, the smooth-fracturing olive or greenish grey cherts and the red chert correspond *seriatim* with the grey, green and red cherts recognised by Peach and Horne. It is hoped that this can be confirmed by an examination of the outcrops.



Map showing localities where strata of the Radiolarian Chert are exposed. From Peach and Horne, 1899.

Fig 4

The Radiolarian Chert formation is generally about 70 metres thick but its outcrop is repeated by folding and faulting. It occurs in elongated bodies along the northern edge of the Southern Uplands. The Leadhills outcrop extends north-eastwards into the lands of Burnetland, near Broughton, where, in prehistoric times, the chert was extracted in a number of quarries. An excavation of one of these was carried out in 2005 by the Biggar Archaeological Group (Ward 2011). A radiocarbon date of Cal 4080BC (85.2%) 3960BC was obtained for one of the quarries, and it was shown than sandstone pebbles (Pl 19) were used as extraction tools.

In more recent years, the complicated rocks of the Southern Uplands have been the subject of recent studies involving systematic field mapping, stream sediment and whole-rock geochemical analysis by the British Geological Survey and university researchers. A useful summary of the work is provided by Smith and others (Smith 2001). The Radiolarian Cherts, which are now assigned to the Ravensgill Formation of the Crawford Group, are considered to be of Arenig (early Ordovician) date on the basis of their conodont faunas. This is consistent with a Sm-Nd isotopic age of 490 ± 14 Ma obtained from the underlying basaltic lavas. The Crawford Group cherts have been shown to possess rare earth element (REE) characteristics typical of cherts deposited in a continental margin setting.

Plate 19

The following illustrations serve to give a flavour of the common occurrence and complexity of radiolarian chert (hereinafter described as chert) in BAG projects:

Plate 2 shows chert scree commonly found along the Southern Uplands Boundary Fault Line in Upper Clyde and Tweed hill slopes. The chert is frost shattered from close to surface outcrop and although much of it looks as if it were knapped, the conchoidal fracture that results from knapping is absent from the flakes. Nevertheless, it is possible that scree deposits were exploited for tool-making material and this will be explored by fieldwork in due course.

Plate 3 shows freshly quarried beds of chert on a floor of Burnetland chert quarries, the quarry was radiocarbon dated to Cal 4080BC 85.2%) 3960BC (Ward 2011 & Ballin & Ward forthcoming)

Plate 4 shows the commonest coloured type of chert, being blue/grey. These examples are archaeological debitage fro m Daer Mesolithic Site No 86 (Ward 2013)

Plate 2

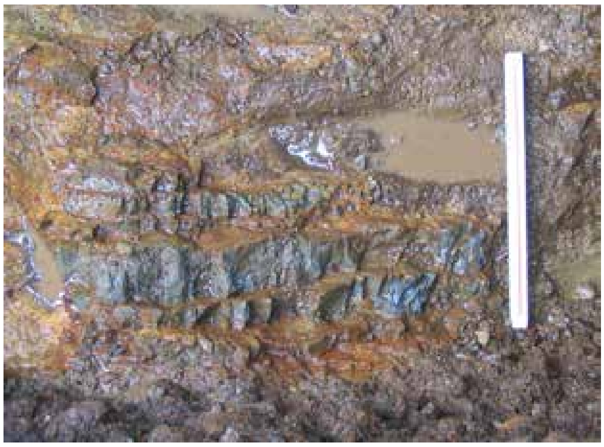


Plate 3

Plate 4

Plate 5 shows a creamy/grey variety which was commonly found on Daer Mesolithic sites.

Plate 6 shows some chocolate brown coloured flakes, less common than the blue/grey variety but often occurring as occasional pieces in assemblages and stray finds. However, at Daer some assemblages had larger quantities of brown chert suggesting a deliberate choice of colour.

Plate 5

Plate 6

Plate 6a shows a very unusual orange/brown coloured chert, perhaps originally grey, but of which these are the only examples to have been found by BAG. One specimen shows at least three generations of narrow elongate bodies, perhaps crystallites. They were found together at Melbourne (Ward 2013.1) showing that deliberate choice of colour seems to have been desired, or perhaps it was just knapping a single pebble which they happened to acquire?

Plate 7 shows two rare examples of barb and tang arrowheads made from brown chert, one from Weston and the other from Howburn.

Plate 8 shows three lumps of chert extracted from drystane dykes near Crawford. The piece on the left shows the extent of the grey weathered surface, the centre piece is fairly homogenous while that on the right has three layers or beds. All show the general character of chert which is often badly flawed with veins.

Plate 6a

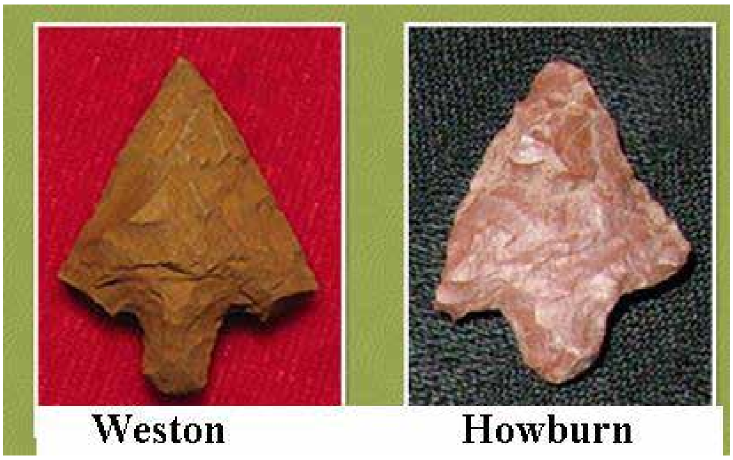


Plate 7

Plate 8

Plate 9 shows examples of chert pebbles and cobbles picked up on the River Clyde beach near Crawford. Colours range from the common blue/grey to black and brown and commonly variations of these occur in one specimen. No naturally occurring chert will be found in drift, glacial or riverine deposits south of the Southern Uplands Boundary in Clydesdale or Tweeddale, as the glacial movement was south to north and all the river systems run north from the deposits.

Plate 10 shows an example of blue/grey chert with a weathered grey band in the middle. Note the tiny specks which are fossilised radiolaria.

Plate 10

Plate 9

Plate 11 shows a currently unique olive green coloured type found in the Daer excavations, only a few pieces were recovered and no tools were found to be made of this chert which also shows the radiolaria as speckles in the rock.

Plate 12 also shows another currently unique specimen and also found at Daer, the orange colour has not been seen before and the speckles do seem to indicate that it is radiolarian chert.

Plate 11

Plate 12

Plate 13 shows the product of knapping on Site No 86 at Daer. The debitage of common blue chert is from one square metre and shows the various sizes of waste flakes down to 1mm. Incredibly, 46 microliths, some complete with others broken, were found in this batch of knapper's debris.

Plate 14 shows a fine pyramid core from Site No 94 at Daer. The blue chert has several black veins running through it.

Plate 13

Plate 14

Plate 15 shows two fine microliths made from blue chert, from Site 99 at Daer.

Plate 16 shows a group of microliths from Site No 104 at Daer, a great range of sizes and shapes are represented in the hundreds of microliths found at Daer and which await specialist analyses.

Plate 17 shows two fine scrapers of brown chert. Tools from brown chert are relatively rare compared to other chert types. However these and two fine barb and tang arrowheads (see Plate 7) show that all types and colours of chert were useable for quality tools. The scraper/knife on the left is from Biggar Common West and the round scraper is from Melbourne.

Plate 16

Plate 15

Plate 17

Plate 18 shows a barb and tang arrowhead found in a forest at Fruid, Tweedsmuir. B&T arrows are quite common in chert, indicating its continued importance as a tool making material in the Bronze Age.

Plate 19 shows a range of sandstone hammers or pounders used to quarry chert at Burnetland Farm.

Plate 18

Plate 19

Flint

Natural occurrences of flint are rare in Scotland and none lie within the BAG's area. It most commonly occurs as nodules and lenses in the Chalk formation of Cretaceous age or in gravel deposits derived from it. The nearest developments of the Chalk to the BAG are in the Hambleton Hills of Yorkshire and in County Antrim.

Flint occur as chunks and struck flakes in most assemblages, in a number of cases being formed into microliths. The flint is generally very pale grey or brown in colour and generally represents only a small percentage of the total lithic assemblage. However, in a few cases, flint is more abundant and, for example, at Site's No's 1 and 104 at Daer, it is the dominant lithic material present, and occurs in a wide variety of forms.

1. Dark yellowish brown [10 YR 4/2] with pale spots.
2. Light brownish grey [5 YR 6/1] with pale spots and darker grey mottling.
3. Brownish grey [5 YR 4/1] with off-white spots.
4. Medium dark grey [5 YR 4/1] with pale spots.
5. Greyish orange pink [5 YR 7/2].
6. Light brownish grey [5 Y R 4/1].

In a few cases, it is evident that the flint specimens had been struck from a water-worn pebble. that had originated in a beach shingle or in river or fluvioglacial gravels such as occur in the Bridlington area in Yorkshire. It is presumed that in this case the flint was derived by erosion of the Chalk formation of Cretaceous age that forms the Yorkshire Wolds.

However, a distinctive type of flint (Pl 23b) with a purple coloured tinge to the edges below the cortex was found at Daer Site No 1 and another, single piece, was recovered by the BAG at Howburn Farm (see Plate 23c).

Where preserved, the cortex is extremely fresh, rough, pitted and shows no sign of abrasion. Some specimens appears to have fossil burrows. It would appear that that these specimens had been retrieved from a primary source. Because it is so unusual, the authors here suggest a North Sea location for its provenance.

The flint in question formed a large assemblage. The fragments were in pristine condition, with extremely sharp edges and some could be fitted together – indicating that knapping had occurred on-site

This type of flintappears to be unique in Scottish archaeology and certainly it does not figure in National Museum of Scotland (NMS) collections (Alan Saville, pers comm). It must rank as a candidate for the earliest flint brought into Scotland in the Mesolithic period.

The assemblage is being studied by Alan Saville of NMS.

Flint was recovered at most of the prehistoric sites identified by the BAG. Usually it is subordinate in amount to the chert but, in a few instances, it is the dominant lithic material and in rare cases it is the exclusive one. Similar to chert in usage, it occurs in prehistoric sites of all ages including the Late Upper Palaeolithic site at Howburn. However, where chert is generally used for small tools because of its knapping characteristics, the attributes of flint allow it to be made into larger objects such as axes and laurel leaf knives (Pl 23), although such high status objects are rarities in this part of Scotland.

Plate 23

Plate 23c

Plate 23b

Plate 20 shows a range of flint types and colours found at Howburn Late Upper Palaeolithic site (Ballin, Saville, Tipping & Ward 2010, and Saville & Ward 2010 and Ward 2010).

Plate 21 shows a selection from the range of tanged points made from flint at Howburn. The Howburn flint may have been collected in the North Sea area when it was still dry land.

Plate 20

Plate 21

Plate 22 shows the fine cream coloured flint tanged point from Howburn, found as two pieces in different parts of the field.

Plate 23 (page 21) shows the finely worked polished Seamer axe and semi-polished leaf point found in a grave at Biggar Common West (Johnston 1997). The flint objects were made in Yorkshire where this distinctive blue coloured flint is found.

Plate 23a (Page 8) shows the vast range of flint items found by BAG on various projects – the illustration also shows chert items. Flint was used extensively for Microliths, Leaf arrowheads, hollow and 'duck billed' arrowheads, B&T arrowheads, different types of scrapers and knives, burins and piercers.

Plate 23c (page 21) (MB/10/75) shows an example of the type of flint found at Daer Site No 1 (see Plate 23b above and description there). It is the only other example of this material known to BAG. It was found during subsequent investigations as an isolated piece in a field at Howburn Farm.

Plate 22

Pitchstone

Pitchstone is a volcanic glass that occurs as intrusive bodies, chiefly on the Isle of Arran but also at localities on the isles of Eigg, Bute, Mull and Raasay and on the mainland at Fuinary, Morven. As described by Ballin (2009) and Ballin and Faithfull (2009), the pitchstone of Arran occurs in four main variants. At Daer, two of these are present - the Corriegills type, which shows pale and dark grey flow-lamination and a dark grey, almost black type with a resinous finish. The flow-lamination arises when the still mobile glass begins to devitrify forming minute crystals. The lamination may form into folds. At some outcrops, the pitchstone is porphyritic and contains a few or abundant phenocrysts of quartz, feldspar and the so-called 'dark' minerals such as amphiboles and pyroxenes.

Pitchstone is found as archaeological artefacts throughout Scotland from the Borders to the Orkney Isles; however, the BAG's projects have amassed the largest collections of pitchstone in Scotland, the total now numbering over 800 pieces. Many of these were found as isolated examples, recovered by fieldwalking, but collections (Pl 24) have come from concentrations in fields, and from excavations, the latter having good provenance and, in several cases, in association with radiocarbon dating.

The use to which pitchstone was put is still poorly understood. On Arran itself, tools such as microliths, scrapers, leaf shaped and barb and tanged arrowheads have been found, and these may be seen on display at Brodick Museum, but this range, covering most prehistoric periods, is not repeated elsewhere. Nevertheless recent research by Torben Ballin (Ballin & Ward 2008) shows that tools do exist in the BAG collections.

Plate 24

Practically all of the pitchstone recovered in excavations by the BAG occurs in contexts that also include fragments of EN pottery and flakes of Group VI axes. In several cases, the Early Neolithic date of the context has been confirmed by radiocarbon dating. The occurrence of the three find types in association would appear to be characteristic of the Early Neolithic period in the area.

However, the recent work in Daer valley by BAG now leads the Group to believe that some pitchstone there may date to the Mesolithic period. This impression awaits confirmation or rejection by expert analysts.

Plate 24 shows a sample of the pitchstone assemblage found at Area 1 at Melbourne.

Plate 24a shows a multi coloured flake from Site No 89 at Daer.

Plate 25 shows a grey-coloured core from Site No 86 at Daer. However, the grey colour is superficial and is a result of weathering. A thin veneer of grey is caused by oxidisation of the surface of the normal black aphyric pitchstone. Remarkably, as was observed at Daer excavations when some black pitchstone was retrieved from below peat, it almost immediately turned grey upon exposure to the atmosphere. The core may date to the Mesolithic; however, Site No 86 also had an Early Neolithic component to it.

Plate 24a

Plate 25

Bluestone

Prior to the BAG's activities, this exotic material was known from a single specimen recovered by fieldwalking at Airhouse, in Berwickshire, and is in the collections of the National Museum of Scotland. However, an assemblage was recovered by the Group in 1995 in the course of excavation on the shores of Daer Reservoir. A total of 104 pieces were recovered at Site No 1 by excavations carried out beqtween 1995 and 2003.

The material consists of silicified limestone, blue-gray in colour, hence the colloquial name applied to it here, and is unusual in that the original sedimentary structures are perfectly preserved and have not been destroyed - as tends to happen in the case of flint or chert formation. The original lithology would appear to have been a very fine-grained limestone or 'calcilutite' which in the case of the figured specimen (Pl 26) is penetrated by a worm burrow that has been infilled with faecal pellets.

Microscopic examination of thin sections prepared from two specimens show them to consist of silicified calcite mudstone with a scattering of rhombic? dolomite crystals or possibly pseudomorphs. The material was brecciated and cut by very thin, irregular quartz veins. One of the specimens contains fossil remains - several possible *Calcisphaera* and part of a gastropod shell.

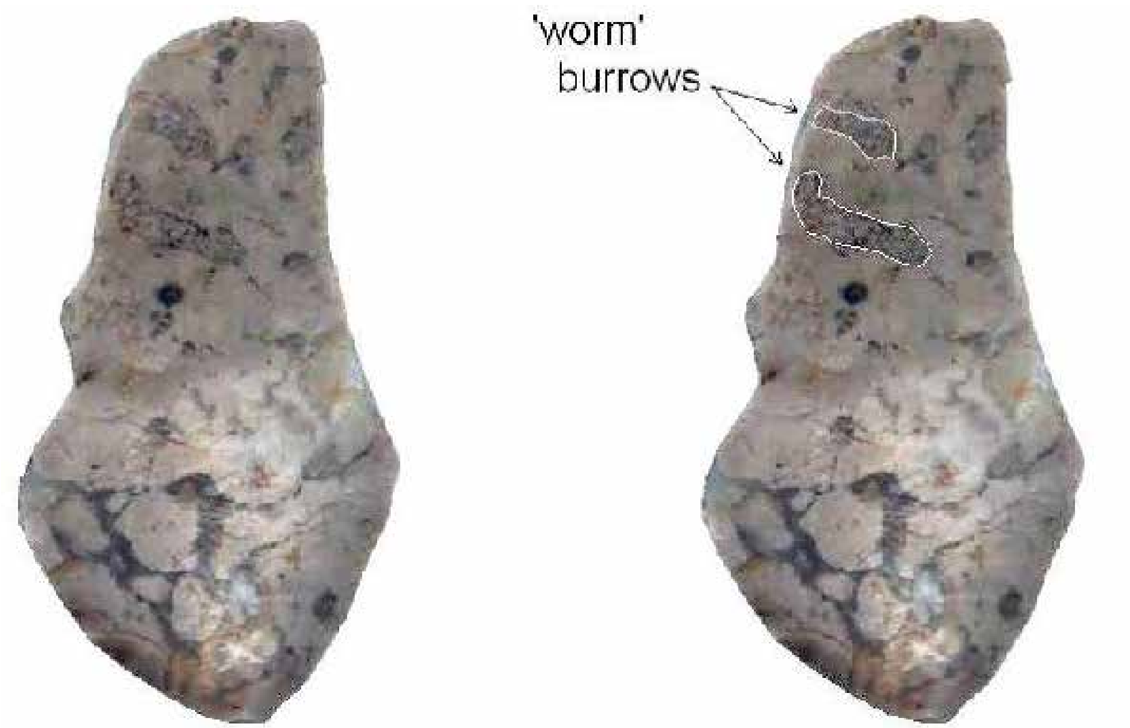


Plate 26

The material is probably of Lower Carboniferous date and was deposited in quiet water conditions, possibly in a lagoonal or 'back-reef' environment. Limestones of this type are not known in Scotland but occur in what is termed the 'Waulsortian Reef Facies' in Belgium, southern Ireland and in the Clitheroe- Bolland region of northern England.

Radiocarbon dating has shown that Daer Reservoir Site No 1 is one of the earliest known Mesolithic sites in Scotland at just over 10,000 years ago. The bluestone was brought to Daer by Mesolithic hunting parties where it was formed into microliths and used in association with another unfamiliar stone type, a flint (see above and Pl 23b, page 21) which also has no known parallels in Scotland. Given the possibilities (above) for the origination of this unusual rock type it is assumed that it is derived from an English source or perhaps the North Sea area? And was brought to Daer with the unusual flint type and also the siltstone described below.

Plate 26 shows the specimen described above.

Plates 27 & 28 show two further examples of the 'bluestone' and show its excellent knapping properties for small blades, several microliths were found to be made from it.

Plate 27

Plate 28

Siltstone

This material was recovered at Site No 1 on the shores of the Daer Reservoir but was slightly less abundant than the bluestone – only 87 pieces being found. It is pale buff in colour. A thin section showed it to be a very fine-grained sedimentary rock with faint diffuse lamination. There were no fossil remains. Possibly the material has been metamorphosed in the contact zone of an igneous intrusion. Its provenance is unknown but is possibly from the same districts as the bluestone and unusual flint which makes up the unique assemblage from Site No 1.

Plate 29 shows an example of siltstone from Daer Site No 1 where microliths were made from it. Siltstones appear on several BAG sites, clearly of different geological sources indicating that such material was acquired for tool making in prehistory.

Plates 29a & b show another siltstone object; a fine 'finger sponge' stone found in association with Bronze Age cremations at Camps Reservoir. The object is thought to have been used as a burnishing or smoothing tool, perhaps for leather or pottery?

Plate 29

Plate 29a

Agate and Chalcedony

Fragments of agate and chalcedony occur locally in the ploughsoil and were almost certainly derived from the till deposits. They are doubtless from amygdales – that is, the infillings of cavities - in the nearby developments of basaltic or andesitic lavas. Numerous attractive specimens of agate, often banded can be found in fields to the north of Biggar, and which are obviously derived from the local outcrops of andesite in the area.

Only in a few instances, for example at Daer Reservoir, Site No 1 (Pl 30), have fragments of agate and chalcedony been found in an archaeological context. It would appear that their presence there represents an investigation of their potential as a tool making material rather than their regular use. No manufactured objects of either material have been found in excavations and only a single item, a leaf arrowhead, was found in the course of fieldwalking. This single find of agate and worked into a tool type, was found in a field at Lamington near Biggar and is clearly a leaf shaped arrow (PL 31).

Since agate and other attractively coloured chalcedony types may be found naturally in the local drift geology, it seems surprising that their aesthetic qualities appear not to have been appreciated by prehistoric people.

Plate 30

Plate 31

Quartz/rock crystal

Tools made from quartz are unknown in this part of Scotland, despite its abundance. It can be found in pebble form and in veins in greywacke. It would appear that the ready availability of the other lithic types ensured that quartz was not used here as it has been in other parts of Scotland where good knapping lithic materials are more scarce. However, one object (WE 438, Plate 32), most likely not derived from the area as raw material, is the item found at Weston Farm. This consists of a chunk of clear rock crystal that has been adapted by use as a 'rubber' or grinding tool. On two opposing sides there are small indented perforations caused by drilling, and it would appear that a hole was intended but never completed, perhaps to suspend the object as a pendant. The object was found in close proximity to a large prehistoric lithic and pottery assemblage; however, as a random find, its true age is uncertain. A quartz crystal found at Howburn, may have been retained as a novelty item.

Plate 32

Quartzite (pebbles)

Quartzite occurs abundantly in the ancient metamorphic terrain north of the Highland Boundary Fault. However, a more likely source for quartzite pebbles and boulders in BAG's area is the Middlefield Conglomerate formation of Silurian date. This lies in the Lesmahagow Inlier some 20-25 miles west of Biggar (Paterson, et al., 1998). Doubtless, the Highlands were the ultimate source of the quartzite boulders in the conglomerate. The pebbles are commonly found in the drift geology over most of the BAG area and are abundant in other parts of Scotland.

The quartzite pebbles and cobbles were used, especially in the period from the Neolithic to the Iron Age, as pounders, rubbing and hammer stones. Some have been used as anvils and they are the most common larger or coarse tool types to be found. They occur in excavations and are also numerous in fields as stray finds. The rock has a distinct maroon coloured patination which, when the stone has been used for grinding or percussion, becomes chipped or worn off, clearly indicating its use as a tool. A good example of a double ended grinder is shown in Plate 33 and came from the Biggar Common West excavations.

Plate 33

Greywacke

Greywacke occur in abundance in the Southern Uplands as the principal solid geology and also as river tumbled pebbles and as fragments in the till. It has been used in a few cases for hammer stones similar to the more commonly found quartzite examples, however the greywacke would never have been as hard wearing as the quartzite. The rock was, however, much used in the manufacture of or as casual usage as saddle quern stones in the Neolithic and Bronze Age periods. Lower quern stones have been found in excavations at Carwood Hill and at Fruid Reservoir, and an unusual 'long' bowl type quern came from Melbourne, Area 4 (Pl 34). Two 'mini' saddle querns have been found as fieldwalking objects; one illustrated here (Pl 35) was found at Melbourne, and at Biggar Common West (Pl 54), while the upper rubbing quern stones, for example (Pl 36) found at Daer Site 94, are common also as stray finds. Smaller pebbles have been used as hammer stones, grinders and as anvils. These have been found in both excavation and fieldwalking contexts – a good example of a fortuitous shaped pebble being used as a convenient anvil is one from Brownsbank Early Neolithic excavations (Pl 37).

Plate 34

Plate 35

Plate 54

Plate 36

Plate 37

It is likely that pebbles of greywacke already partially shaped by river erosion were used to make the few examples of axes which have been found. A very course-grained one was found on Biggar Common and a well made fine grain axe was found at Weston Farm (Pl's 37a&b).

Greywacke pebbles, fist sized, and probably derived from river or stream beds, were used in vast numbers in the Bronze Age as pot boilers, and a great advantage to the archaeologists with burnt greywacke is that it turns a distinctive red/pink hue almost immediately on being heated (Pl 38). The illustration is of experimental archaeology by the writer.

Plate 37a

Plate 37b

Plate 38

The chemistry of iron in relation to burnt mounds. By Ian Paterson (BAG)

$$(1)\quad FeCO_3 \text{ --- } FeO + CO_2$$

That is

Ferrous carbonate (colourless but turning greenish when hydrated), on heating, converts to **ferrous oxide** (also white or colourless) and **carbon dioxide**.

$$(2)\quad 4FeO + O_2 \text{ --- } 2Fe2O3$$

That is

Ferrous oxide (colourless), on oxidisation, converts to **ferrous oxide** i.e. haematite (red/brown).

$$(3)\quad Fe_2O_3 + 3H_2O) \text{ --- } 2Fe\ (OH)_3$$

That is

Haematite (red/brown) on hydration (i.e. with the addition of water) converts to **ferric hydroxide** (colourless).

The southern Uplands of Scotland are geologically dominated by greywacke stone.

As the name implies this stone is generally grey in colour and although there are various forms of appearance from course to fine-grained and with different inclusions, the general colour seldom varies to any extent. When greywacke is heated, for example in a wood fire, and if the heat is sufficient, the rocks become modified by the heating effect which is to alter the colour of the stone.

The colour changes to a reddish or pinkish hue on the surface of the stone and this change can be seen to be graduated to the centre of the sample, in some cases if the heat was intense or the stone small enough; the colour change may affect the stone to its centre.
The colour change is quite striking and occurs rapidly and by breaking a sample open, the change may be observed in the fresh face of the sample. The other effect is an alteration in hardness although this may be a process which takes some time to come about and is caused by weathering of the stone. Depending on the conditions within which the stone lies, both discolouration and softening may be a variable process, however, examples commonly found in burnt mounds are very red coloured and very soft, in some cases converted to haematite.

The importance of these phenomena is to recognise burnt stone in an archaeological context in Southern Scotland.

Camp fires and hearths can be identified mainly by the discolouration of stones, especially when observed lying side by side with unaffected stones for comparison. If the fire was intense then the surrounding and underlying till can also be affected since it is generally composed of the greywacke geology. The till is often seen as bright orange in colour because of natural iron staining, this may then be altered to a maroon or reddish hue by heating, and if charcoal or artefacts are found in association with the burnt stones, then dating is possible either through radiocarbon dating or by the typology of objects, but preferably by both methods. Thermo luminescence dating would be another possibility for hearths although BAG has never done that.

In Post Medieval times floors of buildings were often cobbled or paved with stones, if greywacke was used and intense fires took place on the floors, as they often did, then the positions of such activity are often easily recognised by the heating effect which forms two aspects; discolouration as described and crazing of the stones surface.

In early medieval times lead smelting on the sides of hills in the valleys of the Upper Clyde and Upper Tweed rivers took place by an as yet unknown people and for an unknown purpose. These sites have been C^{14} dated to between the 9^{th} and 11^{th} centuries AD (Ward 2013); these sites also contain heat reddened stone in association with slag and charcoal.

In the Bronze Age in Southern Scotland and in other parts of Britain, an activity, which is still poorly understood, but certainly involved heating water by using hot stones, is seen in monuments known as burnt mounds. The mounds consist entirely of reddened broken rock lying within a matrix of charcoal enriched soil. The size and shapes of the deposits varies considerably depending primarily on the extent to which the site was used. Deposits as shallow as a 100mm deep may be seen, and which never developed into a mound, while mounds can be over 2m in depth. The shallow deposits merely form a scatter on the ground while developed mounds can be seen as dome shapes, elongate forms and often as curved or 'kidney shaped' features, where it is often shown that within the curve some activity took place.

Plate 39

Deposits of heat fractured stones within pits (Pl 39) of different periods may have been used as pit cooking and it is therefore important to be able to recognise these types of features. Burnt pebbles, grit and even till may indicate the position of fire places and when found as scatters of material or in the fills of pits, can help with site interpretation. The illustration given here is one of two such pits at Melbourne and date to the Late Neolithic, another example, but Early Mesolithic in date was found at Daer Reservoir.

Naturally occurring burnt stones have been seen by the writers where moor burns have taken place of heather clad hills, however, the intensity of heat in these circumstances is usually only strong enough to slightly discolour small areas of the larger stones which protruded above the ground surface, and has not been observed to discolour the underlying till, including the grit therein. More severe forest fires in the ancient past could perhaps cause more severe alteration of greywacke, but this has never been observed during the course of three decades of comprehensive fieldwork by the BAG.

Rock art in the form of cup and ring motif is common in Galloway and on outcrops of greywacke. For some reason it would appear that such art work is extremely rare in the Clyde/Tweed area and only examples cut into softer sandstone are known in Lanarkshire. However, BAG have discovered on example of concentric rings being pecked into a greywacke slab lying as the matrix of a Bronze Age burial cairn at Woodend near Broughton in Peeblesshire (Pl 40), a few other examples are known in Peeblesshire.

Plate 40

Natural cup marks

Worthy of note in this context is the phenomenon of natural cups and even rings on greywacke stones in both the Clyde and Tweed areas. The cause of the shapes, often extremely regular in design, is the dissolving of softer rock, such as calcite from original inclusions when the rocks were laid down as deep ocean sediments. Concentric cup and rings have been noted but more often the surrounding grooves are lozenge shaped, boulders with numerous and very convincing cups are often seen, and the tell tale sign that they are natural is when several of them are so irregular, perhaps deep and angular in their penetration of the rock as to be obviously natural in origin. Plates 41 – 43 are good examples of many now recorded.

Plate 41

Plate 42

Plate 43

Cannel coal/Torbanite/Oil shale

Also known as **candle coal**, it is a type of bituminous coal found in the Lower Carboniferous rocks in the Midland Valley. It is also classified as a terrestrial type of oil shale, with a large amount of hydrogen, which burns easily with a bright light and leaves little ash. A similar material, **Torbanite,** is named after Torbane Hill near Bathgate in Scotland, its main location of occurrence.

Analysis by X-ray fluorescence and X-radiology carried by Hunter Fraser of the NMS on a napkin ring (Pl 44), one of two recovered by the Group from a grave in Camps Reservoir (Ward et al 1992 & forthcoming) indicated that the raw material was oil shale. The bangle had a high concentration of iron content and was X-ray opaque compared to jet and cannel coal standards. There has been insufficient work on sources of jet-like material from Clydesdale to enable discussion of the source but a local origin would not be inconsistent with the area's geology. Examples of fragments of napkin rings are becoming frequent from various BAG projects, especially in fieldwalking, and bangle fragments have occasionally been found, for example on Biggar Common (Pl 45), where roughouts and possibly finished pieces have been recovered. Bangle fragments are quite common and also in several local Bronze Age burials, disc beads have been deposited, the examples in Plate 45a are from Camps Reservoir. Locally and nearby (but not by BAG), for example at Limefield near Wiston (RCAHMS 1978), a fine jet button was found and the spectacular assemblage from Harehope cairn in Peeblesshire (Jobey 1981) produced many find buttons and ornaments of jet which clearly is derived from Whitby in Yorkshire.

Plate 44

Plate 45a

Plate 45

Tuff

This is an epidotised volcanic tuff that was quarried or perhaps just collected from the scree slopes in the Langdale Valley in the Lake District. In the Neolithic period, it was extensively used in the manufacture of what are called the Great Langdale (Group VI) axe heads. Such axes, and numerous flakes and chips from them are found as isolated fieldwalking finds and in excavation assemblages by BAG. Group VI axes have also been found locally as 'rough outs'; semi manufactured axes with all flake scars present, presumably to be finished by polishing locally. On Tinto Hill near Biggar, a large finished axe (Pl 46) and in the possession of Biggar Museum and an equally large roughout in Kelvingrove Museum were found at different times, several examples of smaller polished axes (Pl 48) have been found by BAG.

Plate 46 shows Gilbert Rae; Biggar's first antiquarian holding the large Group VI axe found on Tinto Hill in the 1950's.

Flakes of tuff axes were also re-used and fashioned into scrapers and leaf arrowheads (Pl 47) found at Biggar Common East, Carwood Hill)), however it is believed that such tools were probably more symbolic than practical due to the relative softness of thin pieces of tuff (Finlayson –in Johnston 1997).

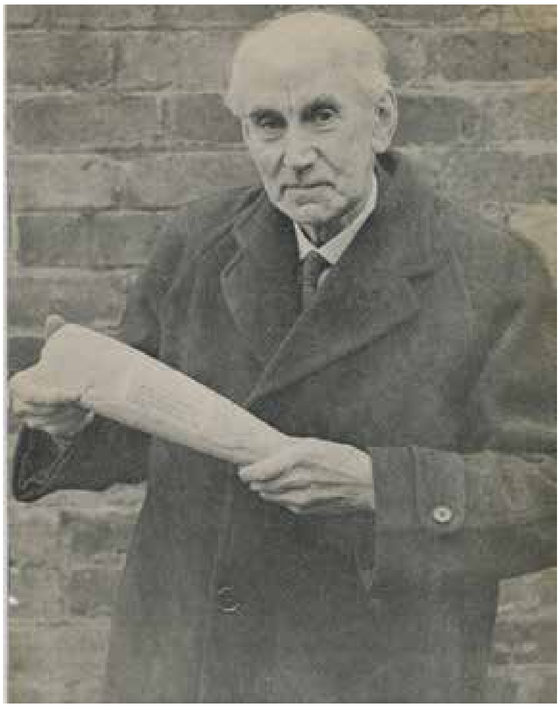


Plate 46

Plate 47

Plate 48

Haematite

The pigment here called haematite should more properly be referred to as 'red ochre'. It contains hydrated haematite as well as clay and alumina. Its use in prehistoric times on BAG projects certainly dates back to the Mesolithic. Specimens showing signs of use were recently recovered at a number of the BAG's prehistoric sites in Daer valley (Pl 49 & 50). Their context in association with Mesolithic material and lying below peat clearly indicates the early use of the material as some sort of coloring agent and, interestingly, BAG Post Medieval projects show that the same material was used consistently and in the same manner; by grinding the haematite on stones to obtain a powder, on upland farms where it appears to have functioned as keel. A coloring agent seems the most plausible use for the material and it may have been used in prehistoric times as body adornment, it is often been found in Mesolithic graves in Europe and clearly is associated with funerary practices there.

According to Peach. and Horne(1899)

(1) 'Thin veins of haematite occur in association with the red radiolarian cherts (Arenig) at various localities near the northern margin of the Silurian Tableland, as, for example, not far to the south of Lamancha in Peeblesshire; near Tewsgill in the Abington district, Lanarkshire; below the Nick of the Balloch near the head-waters of the Stinchar in Ayrshire; and on the Salachan Hill in the estate of Knockdolian in the same county. At none of these localities does this ore occur in workable quantity.

A specimen of red haematitic shale, procured by the Geological Survey at Noblehouse in Peeblesshire, was analysed by the late Professor George Wilson[2], with the following result:

Peroxide of iron	38.42
Alumina	12.19
Clay	44.62
Alkaline salts with traces of lime and magnesia	4.77
	100.00 per cent

Plate 49

Plate 50

2 Explanation of Sheet 24, p. 23.

(2) A prominent vein of haematite occurs on the Coran of Portmark, near the eastern margin of the Loch Doon granite mass, the trend of which is about NNW and SSE. The direction of this vein has been proved by various trial pits, which show that it traverses the slightly altered greywackes and shales. Thin veins of haematite have been noted also (1) on the north shore of Dally Bay, south of Corsewall Lighthouse; (2) in the neighbourhood of Mabie, south-west of Dumfries, near the margin of the Criffel granite mass; (3) in the Glenjaan Burn, north of Moniaive, Dumfriesshire;

(4) in association with the lead veins of Wanlockhead and Leadhills

(5) in association with barytes near the head of Pockmuir Burn in the Lesmahagow Inlier.

Given the importance of haematite in BAG projects a search for a local source has been conducted but with limited success. A possible and perhaps plausible source exists in Daer Valley at Hods Hill where the British Geology Survey described it on its early field maps as 'red boulder clay'. A band of haematised rock runs through the hill from north to south and is evident in burn and scree exposures (Pl 51). Pieces of the rock are also found as pebbles in the Daer Water gravels, obviously derived from the parent source given here. While experimentation shows that the Daer rock can be ground to give a colouring agent (Pl 52) the consistency of this source rock does not quite match that found in the various BAG projects, the latter being of a softer type. Thin haematised veins can often be seen among greywacke exposures (Pl 53) but veins thick enough to supply the pebbles as seen in BAG projects have not yet been discovered.

The enquiry continues but clearly both prehistoric and post medieval people in the area of Upper Clyde and Tweed found haematite an important resource, and presumably as a colouring agent as all specimens found indicate the rocks were being abraded by rubbing on coarse stones to obtain a powder.

Plate 51

Plate 52

Plate 53

Sandstone

Sandstone occurs widely in southern Scotland in geological formations ranging in date from the Silurian to the Permo-Triassic. They are composed mainly of quartz grains and mostly transported and deposited by rivers. The exception is the desert sandstone of the Permo-Triassic that was deposited by winds.

The various sandstones can generally be distinguished by colour. The Silurian sandstones of the Lesmahagow area are greyish green, the Lower Devonian sandstones are greyish purple; the Upper Devonian sandstones are brick–red in colour. The sandstones of the Carboniferous period occur in various shades of cream to pale grey. The Permo-Triassic sandstones are orange red in colour and with rounded grains.

Sandstones do not occur frequently in prehistoric assemblages in the Bag projects although there are two exceptions; Biggar Common West FC6 Area, produced a clutch of different types of sandstone fragments and which had clearly been used as grinding, or perhaps even polishing stones such as the red sandstone example in Plate 54 (Page 32). At Burnetland chert quarries (Ward 2011, ibid) (Ballin & Ward forthcoming) several examples of bun shaped pounders or hammer stones (Pl 19, page 11) were found within the chert debris of a quarry which was radiocarbon dated to Cal 4080BC (85.2%) 3960BC. It was somewhat surprising to find such soft rock used in hard rock extraction, given that harder stone is available in the vicinity such as quartzite or greywacke pebbles. Nevertheless sandstone appeared to have been consistently used to remove the chert seams from the hill side. It is plausible that a harder rock hammer would damage the chert, rendering it useless for knapping?

Granite

The use of this rock has only been found in the context of pot boilers found within the Daer Reservoir and at one site. Two examples (Pl 55) both from Site No 27 show coarse to medium grained micaceous granodiorite which have been subject to intense heat and consequently fractured. They were found with the more conventional use of greywacke pebbles in a burnt mound activity, of which there are hundreds of examples of the use of greywacke in Clydesdale and Tweeddale. The granite pebbles are found in the drift geology of Daer valley and were probably picked up without any special selection in mind. The original source of the pebbles is probably the Sanquhar area nearby.

Plate 55

Andesite

Andesite occurs as lava flows of which the Pentland Hills are a good example, the deposits are mostly seen as a purple coloured rock and as such were known as 'plum whin' to 19th century dykers and builders in Lanarkshire. The deposits run on through southern Lanarkshire from the Pentlands in an NE/SW line, following the northern side of the Southern Uplands Boundary Fault Line. Andesite is the source of local agates.

Andesite has been used as saddle quern stones in a few of BAG's projects it is abundantly availability to the north and south of Biggar where several Early and Late Neolithic sites have been discovered and excavated by BAG; at Biggar Common, Carwood, Weston, Melbourne, Nether Hangingshaw and Brownsbank Farms. Querns have been found at Biggar Common, Weston and Brownsbank, all of which places lie on andesite solid geology.

Uniquely for BAG's work, at Weston Farm, matching upper and basal stones were found together in a pit (Pl 56) It is possible that they had been ceremonially abandoned there, as the larger basal stone which is andesite, lay immediately over the rubber, which is dolerite, both being in an inverted position.

The andesite, because of its coarse texture of gas bubble cavities, would give good grinding properties.

Plate 56

Tholeiite basalt

The stones used to create the Wildshaw Burn Stone Circle (Fig 5) are all tertiary basaltic tholeiite and originate from the well known sequence of igneous dykes emanating from the island of Mull and known as the 'Mull Swarm'. The remarkable series of dykes traverse southern Scotland and reach as far as northern England. Where there are exposures; the rock cleaves off into elongate boulders, perfect for standing stones for prehistoric monuments such as the Wildshaw Burn monument.

The use of this rock at Wildshaw Burn near Crawfordjohn (Ward 2012) is probably coincidental to its location on the landscape, as an igneous dyke from which the outcropping rock is exposed (Pl 57). It is nevertheless possible that the site location was chosen for the availability of suitable stones (Pl 58) to create the monument (Fig 5). In any event the rocks were easily acquired and pulled downhill to the monument which consists of twenty three stones and two possible outliers.

Only occasional large rocks of the greywacke sequence are found on the general landscape of Upper Clydesdale and other rocks, mainly sandstone from the northern area and which is part of the geological Midland Valley, would have to be quarried to build such a monument requiring standing stones. Other outcrops of the same igneous dyke may be seen in the Daer valley near Wintercleuch and where good elongate pieces are to be found on the surface of the ground, but the location of the Wildshaw Burn Circle is more open to view the horizons, which were doubtless required for the various calendrical solar observations which can be shown to exist there (Fig 5).

Plate 57

Plate 58

Other geology

Sediments

BAG members assisted Richard Tipping of Stirling University to core a valley floor in the context of the Late Upper Palaeolithic site at Howburn Farm (Tipping 2010). The full details of that work are in prep for a final report of the Howburn site; however it seems appropriate to make brief reference to that work here as it does concern geology.

In an attempt to understand ancient lake sediments in the valley, and to clarify whether a lake was present c14, 000 years ago when the hunter camps were occupied, a programme of coring was undertaken by Stirling University and with BAG members participating in the coring.

(Plate 59 shows the core being extracted with Richard Tipping on the left; Plate 60 shows the team with some of cores, and Plate 61 shows part of the overall core which extended for about 13 metres.)

Remarkable results have been achieved, and these also include Tephra work by Rupert Housley and colleagues of the NERC 'Reset' Programme. Tephra of the Vedde Ash has been found and can be calibrated to the Greenland Ice Sheet Record to 12121 cal BP (Surely the easiest date ever to be remembered). This confirms radiocarbon dates of tiny mosses found in the cores. What it appears to mean is that an ice dam was in existence at this time and this will be new data for geologists studying the demise of the last two Ice Ages in Scotland.

Plate 59

Plate 60

Plate 61

Metallic slags

BAG has been involved in two projects where metallic slags have been produced in excavations: one is an enquiry into lead smelting sites (Ward 2013) and the other concerns iron slag (Ward 2013.2).

Some of the lead smelting sites have been shown to be co-incidentally laying adjacent burnt mounds; the aim of the project was to establish the dates of both activities with the attraction of having Bronze Age lead smelting. In the event the burnt mounds were indeed Bronze Age in date but the lead smelting sites, where they were dated, were shown to date between the 9^{th} and 11^{th} centuries AD, making them the earliest dated examples of lead smelting in Scotland. The proximity of the sites is still inexplicable but it does lead to a new line of research into Scotland's industrial archaeology; who was doing the lead smelting and why is currently unresolved and the slags (Pl 62) from various sites have not yet been professionally analysed.

The second area of interest by BAG into metal working has also met with difficulty in interpretation. Iron slag (Pl 63 & 64) was found mixed with decorated prehistoric pottery and a date of 3470 (60.6%) 3373 cal BC obtained from charcoal. The contexts are therefore mixed and currently no further work is anticipated on this mysterious site at Calla Farm near Carnwath.

Plate 62

Plate 63

Plate 64

Addendum

Plate 65 shows another unique type of lithic for BAG; a leaf arrow (A3/414) was found at Melbourne. The arrow is 24mm long by 15mm at its widest part. It was manufactured from pale grey chert. However, an even scatter through the rock of what are taken to be very small, rounded quartz grains suggest that the host rock of the nodule was an oolitic limestone. This is a rock which forms in shallow seawater in warm climatic conditions such as exist in the Bahama banks at present. They also occurred in Belgium and in southern and central Ireland during the Lower Carboniferous period.

Plate 65

Discussion/Conclusion

The work of BAG over the years has produced a large corpus of evidence for the use of a variety on lithic types and for a great range of purposes in prehistoric times. The extended period of time involved for the various Stone Ages from c14,000 years ago in the Late Upper Paleolithic to c 2500 years at the end of the Bronze Age is vast. The evidence shows what is well known in most places in that available resources were exploited to good effect; sadly in this part of the world it is extremely rare to find material other than stone from which to understand the lives of prehistoric people.

Nevertheless it can be shown that for lithic and geological studies at least, the people from the ancient past were extremely resourceful and knowledgeable in practical geology, making use of what was available locally, whilst ignoring rocks which may have been attractive in other parts of the country, for example quartz and agate, and in several instances importing rock types from considerable distances outwith the area, for their daily use. It may never be exactly understood how flint, pitchstone, tuff and other exotic lithics were acquired, or the logistics of how they came to the district, but the fact remains – they did, and because they were consistently brought to the BAG district of interest, it shows they were considered to be important.

Some of the lithic retrieved by BAG has been subject to professional analyses and much more is anticipated to be achieved, however, this has been done on a project by project basis, and it is now considered by the writer that a professional study of the entire collections would be of considerable interest. Such a holistic and professional study of BAG's work would surely be informative and be a major contribution towards understanding the extended prehistoric period in southern Scotland. The proposal is beyond the writer or BAG's intellectual and financial resource, and it is therefore suggested here, that an opportunity can be presented to achieve perhaps a unique study on this particular area of Scotland, where a particularly unique assemblage has been gathered.

Few of the collections referred to in this report are finally disposed through the Scottish Treasure Trove Panel; they ***all*** remain within the control of BAG until final disposal is undertaken and, if not currently with professional lithics analysts, are stored at Biggar Museum. It is the intention that most if not all of these collections will be subject to Treasure Trove consideration by 2014 when their ultimate disposal will be decided.

Acknowledgement

The authors of this report wish to thank all of the volunteers who over three decades have worked tirelessly to accumulate the objects referred to herein, their contribution to Scottish archaeology and the story of Scotland is immense, all that is now required is to have their work completed to the academic standard it all deserves.

Over the years various specialists have assisted with advice and support on specific matters, this has often been done in a voluntarily capacity and always in a friendly manner, and their help is greatly appreciated.

Jacquie Dryden (BAG) desktop published this report.

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