RE-EXAMINATION OF THE EARLY NEOLITHIC PITCHSTONE-BEARING ASSEMBLAGE FROM AUCHATEGAN, ARGYLL, SCOTLAND

Torben Bjarke Ballin

ABSTRACT

In the present paper, the Early Neolithic pitchstone, flint, and quartz artefacts from Auchategan in Argyll, Scotland, are re-examined, compared, and discussed. This lithic assemblage was first presented by Dorothy Marshall (1978) in her original excavation report on the site. At that time few pitchstone-bearing assemblages were known in the region, and it was therefore not possible to gain any in-depth understanding of the collection’s pitchstone component. Today — more than 20 years after the publication of Williams Thorpe & Thorpe’s (1984) cataloguing and discussion of pitchstone in northern Britain — much more archaeological pitchstone has been found, from the Isle of Man to the Orkney Islands: Williams Thorpe & Thorpe’s catalogue of archaeological pitchstone in northern Britain included c. 1,300 pieces, whereas it is thought that between 5–6,000 pieces are known today.

The comparison between the three raw material groups of the assemblage shows that, although contemporary, they were all reduced according to different operational schemas, probably reflecting a combination of functional and symbolic reasoning. The three raw material groups also represent different procurement strategies, with the pitchstone having been imported from the Isle of Arran, and the flint from Northern Ireland, whereas the quartz is thought to be local. The currently available pitchstone assemblages, and their distribution across Scotland, present an outline of the territorial structure in Neolithic time, as well as of its associated exchange network, and Auchategan’s place in this network is indicated.


Keywords: Early Neolithic, pitchstone, flint, quartz, operational schemas, social territories, exchange network, functional/symbolic values

INTRODUCTION

Background, aims and objectives

In 1984, Williams Thorpe & Thorpe published their now widely cited paper on the distribution and sources of archaeological pitchstone in Britain. Based on chemical analysis of archaeological pitchstone samples, and comparison with similarly analysed samples of geological pitchstone from the Tertiary Volcanic Districts of Scotland (cf. Emelues & Bell 2005), it was concluded that most, if not all, archaeological pitchstone derives from the island of Arran in the Firth of Clyde. The paper included an appendix in which all archaeological sites with pitchstone were listed, and thoughts were put forward regarding the socio-economic mechanisms behind the observed distribution pattern.
Now, a quarter of a century later, many more pitchstone artefacts have been recovered, from archaeological excavations and fieldwork, with dramatic consequences to the general distribution pattern. In Williams Thorpe & Thorpe (1984: Fig. 2), only c. 100 find locations were known, and only four sites were mapped north of the Firth of Tay (one in the Highland region and three in the northern part of the Grampian region). The majority of the remaining archaeological pitchstone derived from either Arran itself, the Tweed valley or the area around Luce Bay in Dumfries & Galloway. Today (2006), the number of pitchstone-yielding sites has multiplied several times (e.g. Ness & Ward 2001; Simpson & Meighan 1999; Warren forthcoming; McCartan & Johnson 1991), and pitchstone artefacts have been reported from practically all parts of Scotland (apart from Shetland), as well as from northern England, Northern Ireland, and the Isle of Man. The majority of the new locations represent excavated material with well-defined find contexts (where Williams Thorpe & Thorpe’s list included many stray finds with low research potential).

As a consequence of this new situation, it was decided to: 1) re-examine all archaeological pitchstone in Scottish museums (the Scottish Archaeological Pitchstone Project); 2) produce a new complete database of these finds; and 3) re-interpret the distribution of archaeological pitchstone across northern Britain. Funding was obtained for the project’s Phase 1 (detailed characterisation and cataloguing of all archaeological pitchstone in the stores of the National Museums of Scotland), and, as many of the NMS pitchstone assemblages are surface collections or individual stray finds, it was decided to characterise one substantial, excavated pitchstone assemblage in detail. The collection from Auchategan in Argyll was thought to be best suited for this purpose, as: 1) it is one of the largest excavated pitchstone assemblages in the stores of the National Museum of Scotland (194 lithics / 90 pitchstone artefacts); 2) it includes sub-assemblages in flint and quartz, allowing technological comparison between the various flaked raw materials; and 3) the finds are well-dated by a combination of dating methods (e.g. lithic typology, technological attributes, associated pottery styles). In the original excavation report (Marshall 1978), the Auchategan lithics are only dealt with in a cursory fashion.

The Auchategan site

The site was located on a small terrace approximately 90m above the river Ruel, in Glendaruel, southern Argyll (NGR: NS 002 843; Figure 1). The archaeological investigation was carried out in the late 1970s by Dorothy Marshall (1978), who excavated the following sequence:

- Medieval structures
- Rectangular stone house with peat stack
- Evidence of early iron working
- Hut defined by postholes
- Bronze Age cists and cairn, and
- Two levels of Neolithic domestic occupation

The main excavation trench covered an area of 11m by 15.20m, which was cleared down to natural soil, at a depth of 1.20m. In the final excavation season, the trench was extended 7.50m towards the south, to find the extension of the Neolithic settlement. Levels were at times difficult to distinguish, but although some vertical movement between layers is possible, the lithics are generally thought to date to the Early Neolithic period.
The characterisation of the lithic assemblage from Auchategan is carried out with special reference to raw materials, typological composition and technology. From this characterisation, an attempt is made to date the assemblage and discuss its affinities. The evaluation of the lithic assemblage is based upon a detailed catalogue of all the lithic finds from the site, and the artefacts in this report are referred to by their number (CAT no.) in the Auchategan catalogue.

THE ASSEMBLAGE

From the excavations at Auchategan, 194 lithic artefacts were recovered. They are listed in Table 1. Below, only the flaked material is dealt with, as the purpose of this re-examination of the Auchategan finds is to provide comparative material, ‘perspective’, to the collection’s pitchstone segment. Artefacts in stone are not included — for characterisation and discussion of stone axeheads, hammerstones and worked lignite, see Marshall (1978). The site’s two polished stone axeheads were both thin-sectioned (ARG 5 and 6), and they are listed in Clough & Cummins (1988: 233).

Raw material — types, condition and sources

Apart from one piece in sandstone and one in agate, all lithic artefacts are in pitchstone (90 pieces), flint (38 pieces) or quartz (64 pieces).

The pitchstone clearly embraces a number of different varieties: approximately two-thirds of the pieces are aphyric\(^5\), with one-third being porphyritic; approximately three-quarters of the

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\(^5\) Pitchstone can be sub-divided into aphyric, or non-porphyritic, and porphyritic forms, with the former being effectively free of macroscopic phenocrysts (crystalline inclusions), whereas the latter is characterised by the presence of macroscopic phenocrysts. The presence/absence of phenocrysts, along with other geological
pieces are black, with the remainder including grey to greyish-black, greenish-black, and light brown or greenish-brown specimens; and some pieces are characterised by delicate banding, or more or less densely spaced minuscule parallel needles, which may be light or dark. The black specimens have either completely smooth surfaces or relatively rough surfaces. Although many aphyric pitchstone outcrops are known to include pockets of porphyritic material (Tyrrell 1928), and vice versa, it is thought that, at Auchategan, the most homogeneous aphyric artefacts and the most heavily porphyritic artefacts are based on raw material from different sources. The smooth and the rough black specimens are also likely to have been procured from different locations.

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<th>Quartz</th>
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**Débitage**

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<td>Microblades</td>
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**Cores**

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**Tools**

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<td>Arrowheads</td>
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<td></td>
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<td></td>
<td>1</td>
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<tr>
<td>Pieces with invasive retouch</td>
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<tr>
<td>Pieces with edge-retouch</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td>9</td>
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<tr>
<td><strong>Total tools</strong></td>
<td>6</td>
<td>22</td>
<td>28</td>
<td>2</td>
<td>38</td>
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<tr>
<td><strong>Total</strong></td>
<td>90</td>
<td>38</td>
<td>64</td>
<td>2</td>
<td>194</td>
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</table>

*Table 1: General artefact list*

attributes, was used by Tyrrell (1928) to define four main types of Arran pitchstone, each located to a particular part of the island.
At present it is not possible to precisely provenance all Scottish pitchstone forms, but Williams Thorpe & Thorpe (1984) argued convincingly that the vast majority of archaeological pitchstone derives from outcrops on Arran, and the most homogeneous aphyric pitchstone types were most likely procured from the Corriegills/Clauchlands Hills area, the Fairy Glen, or possibly the Monamore Glen. Porphyritic pitchstone is known from all parts of Arran (Ballin & Faithfull forthcoming).

It is more uncertain whether the deviant (non-black) colours represent separate sources or whether they, or some of them, represent different conditions. Some forms of pitchstone seem to acquire a grey colour after deposition in alkaline soil or exposure to oxygen, and the light brown or light greenish-brown nuances may be due to the exposure to fire (cf. the assemblage from Auchrannie on Arran; Ballin 2005a). Although pitchstone is slightly softer than, for example, flint, the pitchstone artefacts from Auchategan are generally in good condition, with relatively sharp edges and comparatively few superficial scratches.

The flint is generally fine- to medium-grained, and although some transparent vitreous pieces were recovered from the site, most Auchategan flint artefacts are opaque and matt. The flint colours vary between grey and cream, supplemented by a small number of other colours. Only 13 pieces, or approximately one-third of all flint artefacts, are cortical, with seven pieces, or slightly more than half of all flints, having fresh cortex. The fresh cortex defines the flint artefacts from Auchategan as exotic objects, and the colours and the lustre of these pieces suggest that they come from Antrim in Northern Ireland, rather than from Yorkshire in northern England.

The Auchategan quartz represents a number of sub-types, varying from milky-white to grey and almost clear, with a ‘wet’, ice-like lustre (for quartz typology, see Jones forthcoming; also Ballin forthcoming e). A small number of pieces are intersected by thin layers of mica, or they may include small specks of mica, but most of the quartz is relatively homogeneous. No saccharoidal quartz was identified. However, although the quartz appears to be of good homogeneous quality, examination of the fracture patterns of the débitage shows that this material mostly flakes in an irregular manner, leaving uneven ventral faces, or intended flakes are detached along invisible planes of weakness, causing many of the would-be flakes to turn into indeterminate pieces or chunks.

One large ‘orange-segment flake’ (CAT 146) has abraded cortex and definitely derives from the quartering of a pebble, but the general lack of cortical pieces (no other cortical quartz artefacts were identified) suggests that most of the quartz may come from vein sources. The differences in colour and lustre indicate that several vein sources may have been exploited.

**General composition**

The most noticeable difference between the three main sub-assemblages (the pitchstone, the flint, and the quartz) of the Auchategan lithic collection is the general composition of the raw material groups (Table 2). The distribution of the finds across the main categories (débitage, cores and tools) differs considerably. The most obvious variation between the three sub-assemblages is their different débitage, core and tool ratios. The pitchstone assemblage has much débitage, many cores and few tools; the flint assemblage has little débitage, few cores and many tools; and the quartz assemblage consists entirely of débitage.
The pitchstone

In total, 90 pitchstone artefacts were recovered from the site, with 77% being débitage, 16% cores and 7% tools (Table 2). The débitage includes 27 flakes, 33 blades and microblades (elongated blanks, either broader or narrower than 8mm), three indeterminate pieces, and three core preparation flakes. The blanks are in most cases quite small, with the flakes having average dimensions of 22 x 17 x 7mm, blades 31 x 13 x 8mm, and microblades 23 x 7 x 5mm. It was not possible to illustrate the dimensions of the blades in diagrammatical form, as only 11 specimens are unbroken (a number of pitchstone flakes and blades are illustrated in Marshall 1978: Figs. 8–9).

Most of the blades are distinctly curved (Figure 2), with 11 blades being defined as ‘plunging’ or ‘overshot’ specimens (Marshall 1978: Figs. 8.28 & 8.30). The curvature of pitchstone blades is generally more pronounced than one would expect in connection with assemblages in other lithic raw materials, and it is quite likely that this phenomenon is a product of the raw material’s internal structure (e.g. ‘flowbanding’). The pitchstone assemblage includes three crested pieces, one small (W = 6mm) and two large (W = 15mm), as well as one small platform rejuvenation flake (23 x 14 x 9mm).

The cores are generally small (Figures 3–4), with an average size of 20 x 12 x 10mm, that is, corresponding well to the small sizes of the site’s blades. The pitchstone cores embrace a wide range of core types, with single-platform cores being the most common ones (seven pieces; e.g. Marshall 1978: Fig. 8.259), while other core types are represented by one or two specimens only: two opposed-platform cores (e.g. Marshall 1978: 56), one core with two platforms at an angle, two irregular cores, one unspecified core, and one core fragment. The many core types are probably partly a result of the general tendency of cores being redefined and reshaped during the reduction process, but it is also possible that the use of oddly shaped tabular material from Arran’s pitchstone dykes and sills may influence which core type will be manufactured in the individual case.

Due to the flat character of the tabular raw material (see for example Marshall 1978: Fig. 8.53), most of the cores have only been flaked on one face, for which reason traditional ‘bullet-shaped’ conical cores are rare. Only CAT 27 (Marshall 1978: Fig. 8.259) approaches conical shape. One possibly burnt core (CAT 90) is listed as ‘unspecified’, as the disintegrating edges and arrisses prevents definite classification. Core fragment CAT 30 refits single-platform core CAT 49. The core fragment was detached from the original nodule, and, of the two halves, CAT 49 subsequently had a platform formed and a number of microblades were produced.

Only six pitchstone tools were retrieved from Auchategan, and of those only two are formal tools (two scrapers; Figure 5). The remainder embraces one notched flake, two flakes and one

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**Table 2: Débitage, core and tool ratios of the various Auchategan sub-assemblages**

<table>
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<tr>
<th></th>
<th>Numbers</th>
<th>Percent</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Débitage</td>
<td>Cores</td>
</tr>
<tr>
<td>Pitchstone</td>
<td>67</td>
<td>14</td>
</tr>
<tr>
<td>Flint</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Quartz</td>
<td>64</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>146</td>
<td>15</td>
</tr>
</tbody>
</table>

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blade with edge-retouch (Marshall 1978: Fig. 8.31). The scrapers include one blade-scraper (CAT 15; also see Marshall 1978: Fig. 8.30; 34 x 14 x 7mm) and one double-scraper on a flake (CAT 19; 25 x 18 x 12mm). All scraper-edges are convex and steep.

Technologically, the pitchstone assemblage corresponds to other mainland assemblages in the same raw material. It was manufactured in soft percussion, and the blades and microblades generally display distinct abrasion of the platform-edges. Most platforms are plain. The majority of the blanks were detached from single-platform cores, and it is thought that most other core types represent later stages in the reduction process.

![Figure 2: Pitchstone blades and microblades](image)

**The flint**

A total of 38 flint artefacts were retrieved from Auchategan, with 39% being débitage, 3% cores and 58% tools (Table 2). The small débitage group (15 pieces; some are illustrated in Marshall 1978: Fig. 7) only includes one blade (CAT 101), which is the distal fragment of a broad blade (width = 12mm). However, the apparently low number of blades clearly represents random fluctuations within a statistically very small population, as three knives and a scraper are based on broad blades (CAT 95, 98, 109, 11). They are all snapped implements, with an average width of 24mm, or considerably more than should be expected from any Scottish blade assemblage. The intact flakes (eight pieces) have average dimensions of 17 x 15 x 6mm.
Figure 3: Pitchstone cores

\[ y = 0.8116x + 9.6989 \]

\[ R^2 = 0.2408 \]

Figure 4: Length (mm): width (mm) of all Pitchstone cores
The only flint core recovered from the site is a tiny irregular core (CAT 126), measuring 15 x 13 x 11mm. Its size is disproportionate to the size of the site’s blades, which, according to the length of the most intact blade tool (CAT 98; Marshall 1978: Fig. 6.143) must have had platform-apex dimensions of at least 90mm. As this implement is a tertiary specimen, with parallel dorsal scars of previously detached blades, it is quite likely that the length of the original nodule of CAT 98, prior to cortex removal, was in the order of 120–150mm.

The flint tools include one fragment of a polished flint axehead, four arrowheads, five knives, five scrapers, one piece with invasive retouch, and six pieces with edge-retouch. CAT 91 is a small fragment (17 x 12 x 6mm) of a polished flint axehead. As two polished faces meet at an acute angle, this piece is most likely to be a fragment of the cutting-edge of the axe. The polish is not high-gloss, as one would expect from a high-prestige axehead, produced for display, burial or sacrifice, but slightly cruder and striated, as one would expect from a functional axehead.

The arrowheads are all leaf-shaped and include two fragments (CAT 102, 108; Marshall 1978: Figs. 7.33 & 7.40) and two intact specimens (CAT 93, 94; Marshall 1978: Figs 6.144 & 6.300). CAT 102 and 108 are both slightly uneven and with their tips missing. They are probably either discarded rough-outs or, more likely, used and repaired pieces. The two intact pieces (Figure 6) differ slightly, in terms of dimensions, with CAT 93 measuring 31 x 17 x 5mm (long and slender) and CAT 94 22 x 19 x 3mm (squat). However, in terms of outline, they definitely belong to the same general type, with sharp shoulders (‘kite’), rounded base, and concave lateral edges near the tip (‘ogival’ or ‘attenuated’, depending on the size of the arrowhead; cf. Green 1984: 21). Although points like CAT 93 and 94 may occasionally be found in mainland Britain, they are slightly more common in Ireland and on the Isle of Man (see for example the illustrated specimens from the Billown Neolithic Landscape Project, although these pieces are generally double-pointed; Darvill 1995).
Figure 6: Flint arrowheads

The site’s scale-flaked and plano-convex knives (Figure 7) have been merged into one category, as the two (poorly defined) knife forms clearly represent a morphological continuum, where one implement type is characterised by limited invasive retouch of the cutting-edge and, occasionally, the blunt edge (scale-flaked knives), where the other implement type is characterised by full, or near-full, invasive retouch of the dorsal face with occasional supplementary ventral retouch of the cutting-edge (plano-convex knives). Or in other words, the plano-convex shape of one of the knife forms is of less relevance to the distinction between the two types than the extent and quality of the modification.

Figure 7: Scale-flaked and plano-convex knives in flint
All flint knives are more or less fragmented, but two specimens appear to be based on flakes (CAT 100, 123; e.g. Marshall 1978: Fig. 7.24), and three on blades (CAT 95, 109, 111; Marshall 1978: Figs. 6.32, 7.42 & 7.147). The tips are either slightly pointed or rounded, and in most cases one lateral side is blunt, whereas the opposed lateral side is sharp. The cutting-edge may have been formed by invasive retouch of the dorsal face only, or this retouch may have been supplemented by sporadic invasive retouch of the ventral face.

Apart from CAT 124, which is a diminutive end-scraper on a primary flake (21 x 13 x 6mm), all scrapers are large (Figure 8). The blade-scaper (CAT 98; Marshall 1978: Fig. 6.143) is exceedingly large (89 x 34 x 9mm), and part of its right lateral side has broken off. The scraper-edge is relatively acute, convex and highly regular, and the left lateral side has been blunted by full-length semi-invasive retouch. Most likely, the damaged lateral side represents a cutting-edge, suggesting that the piece may have been a combined end-scraper / scale-flaked knife.

The two short end-scrapers (CAT 97, 99; Marshall 1978: Figs. 6.5 & 6.27) differ considerably. CAT 97 (38 x 25 x 11mm) is highly regular with a convex, steep scraper-edge and two fully retouched lateral sides, which may be either blunting or additional working-edges. CAT 99 (33 x 35 x 10mm) is an expedient piece with an oblique, convex, acute scraper-edge and two concave blunted laterals. One flake segment with semi-invasive lateral modification (CAT 112; Marshall 1978: Fig. 7.148) may be the fragment of a sixth invasively
retouched knife. Pieces with edge-retouch include six examples. They are all fragments of flakes, and, most likely, this tool group includes artefacts with different functions.

Due to the numerically small size of this sub-assemblage, it is difficult to assess the technological approach responsible for its production. However, the size and attributes of blade-scraper CAT 98 suggest that blade blanks were probably produced from large conical cores by the application of soft percussion, and the surviving proximal ends indicate that trimming may have been the preferred form of platform-edge preparation, where the site’s much smaller pitchstone blades generally have abraded platform-edges. The secondary technology is characterised by extensive use of invasive retouch, and flint was ground/polished to produce axeheads.

The quartz

The quartz assemblage differs considerably from the pitchstone and flint assemblages, as it includes no cores and no tools (Table 2). The 64 quartz artefacts are all débitage (Figure 9). Thirty-nine pieces are flakes, four are blades, and 21 are indeterminate pieces (a selection of quartz blanks are illustrated in Marshall 1978: Figs. 9 & 10). Only 11 flakes are intact, and their average dimensions are 34 x 24 x 12mm; the largest flake has a greatest dimension of 68mm. Due to the character of the used quartzes, with irregular breakage patterns and different forms of distractive sheens, it was only possible to define the percussion techniques safely in 13 cases: seven of those flakes are bipolar, with six having been detached by the application of hard percussion. The latter do not show any signs of schematic core preparation.

Figure 9: Quartz débitage

The four blades are metric blades, in the sense that they satisfy the metric definition of blades as being more than twice as long as they are wide, but they are not blades in the qualitative sense, as they are not characterised by parallel edges and dorsal ridges. Most likely, they are unintentional blades, manufactured in connection with the production of quartz flakes. The two intact blades have dimensions of 42 x 12 x 11mm and 28 x 10 x 9mm, respectively.
The 21 indeterminate pieces are probably also unintentional products of the site’s flake production. Although the raw material generally appears relatively pure and homogeneous, with a small number of pieces being intersected by thin mica layers, the quartzes are evidently riddled with invisible planes of weakness and they generally flake in an irregular manner. Although the curvature of many indeterminate pieces suggests that they may be fragments of flakes, these pieces do not have clearly identifiable dorsal and ventral faces, bulbar areas or any of the other attributes required for the definition of an object as a flake. The indeterminate pieces have average dimensions of 28 x 18 x 10mm.

The technology responsible for the manufacture of the quartz assemblage is generally much more robust than the technological approaches applied in the production of the pitchstone and flint assemblages. Soft percussion was not used to detach any of the blanks, and bipolar technique and hard percussion appears to have been applied in equal measure. Although no cores were found, it is almost certain that a more complete assemblage, including the parent pieces, would have been dominated by irregular and bipolar cores.

**DATING**

The lithic assemblage from Auchategan is dated by a number of elements, such as: 1) stratigraphical observations in the field (Marshall 1978); 2) diagnostic types; 3) technological attributes; 4) raw material preferences; and 5) association with other find groups (axeheads and pottery styles).

As mentioned above, the site had a complex stratigraphy, with the prehistoric part including two Early Neolithic strata as well as evidence of activities in the Bronze Age and Iron Age periods. Almost all lithic finds were associated with the Early Neolithic layers, in particular the later of the two layers.

The assemblage includes several diagnostic tool types, such as arrowheads, knife forms, and a fragment of a polished axehead. However, all the diagnostic tools are in flint, and as such they do not date the pitchstone and quartz assemblages directly. The four arrowheads are all leaf-shaped and date to the Early Neolithic period. The scale-flaked and plano-convex knives are partly modified by invasive retouch, defining them as post-Mesolithic. The fact that most of them are based on blade blanks narrows this date down to the Neolithic period, that is, no later than the early part of the Late Neolithic period. The fragment of a polished flint axe is also clearly of a Neolithic date.

The technological attributes of the pitchstone and flint assemblages defines those as early prehistoric. The manufacture of blade blanks is a feature of Mesolithic and Early Neolithic industries (Pitts & Jacobi 1979), and blade blanks were not produced after the earliest stages of the Late Neolithic period (Ballin forthcoming a; forthcoming c). The presence of multiple microblades in many pitchstone assemblages resulted in those being defined as Late Mesolithic (e.g. Ritchie 1968; Williams Thorpe & Thorpe 1984), but there is now a general consensus of microblades forming part of the earliest part of the Early Neolithic, not least due to the frequent association of pitchstone microblades with diagnostic pottery and polished flint axehead fragments (Ness & Ward 2001).

Broad blades produced in the earliest part of the Late Neolithic period are usually associated with high proportions of finely faceted platform remnants, due to their having been detached from Levallois-like cores (Ballin forthcoming a), and as finely faceted platform remnants are
missing from the Auchategan assemblage, it is most likely that the broader blades from this location represent a later phase of the Early Neolithic period rather than a Late Neolithic element. It is not entirely certain when the use of platform-edge abrasion became common practice, but the large number of abraded platform-edges in this case is consistent with an Early Neolithic date (cf. the blade assemblage from Garthdee Road; Ballin forthcoming b).

The flint blades are generally much broader than the pitchstone blades. Most of the pitchstone blades are narrower than 10mm, whereas the flint blades have an average width of 22mm. Blades wider than 20mm are highly unusual in Scotland, and it is thought that, in this particular case, the blade width is not a chronological indicator, but a regional one. Most likely, the flint blades were produced in Northern Ireland, and the Antrim flint (with its fresh cortex) exported from that region in the form of finished blanks and tools, rather than raw nodules. This is also supported by the shape of the two intact leaf-shaped points (sharp shoulders and ogival lateral sides), which would be more ‘at home’ in an Irish/Isle of Man environment.

Apart from the quartz, which is likely to be local, the Auchategan assemblage seems to be based entirely on exotic material. The pitchstone is thought to be from Arran (Williams Thorpe & Thorpe 1984), and most of the flint probably derives from Antrim in Northern Ireland (see raw material section, above). Although some exchange in lithic and stone raw materials may have taken place in the Mesolithic period, it seems that, in Britain, widespread and systematic exchange in lithic and stone raw materials and objects is a Neolithic phenomenon (Bradley & Edmonds 1993: 157). The many pitchstone-bearing assemblages in the Biggar area (Ness & Ward 2001), with their associated carinated pottery and Group VI stone axeheads, indicate a mainly Early Neolithic date for mainland Scottish pitchstone collections, although there are indications of some trade in pitchstone into the Late Neolithic period (this paper).

The Scottish south-west is rich in domestic and other assemblages in Antrim flint (e.g. the hoards from Campbelltown and Portpatrick; Saville 1999; other examples listed in Saville 1994), and the diagnostic types in this material (particularly knife forms), as well as the find contexts of these implements (many are from ritual and burial contexts), indicate that Antrim flint was not traded systematically until the Early Neolithic.

At Auchategan, the lithic finds were associated with two diagnostic find groups, namely pottery and polished stone axes. The pottery itself suggests a post-Mesolithic date, and the pottery style, which Scott (in Marshall 1978) defined as typical Grimston style, suggests an Early Neolithic date (also see Cowie 1993). The two polished stone axeheads have both been thin-sectioned (ARG 5 and 6), and they are listed in Clough & Cummins (1988: 233). They are in Cumbrian tuff (Group VI) and, although it has been difficult to date the actual quarrying of this material (Manby 1979: 72; Bradley & Edmonds 1993), the Biggar assemblages indicate that the earliest Scottish Group VI axes form part of a ‘material culture package’ in that area, including Early Neolithic carinated pottery and pitchstone artefacts.

The quartz assemblage is almost devoid of chronological indicators. The analysis of Scottish quartz assemblages (Ballin forthcoming e) has shown that, due to the flaking properties of this material, it was rarely attempted to produce proper blades in quartz. The only exception from this rule is the so-called ‘greasy quartz’ recovered from, for example, the Shieldaig site in Wester Ross (Ballin et al. forthcoming b), as this material flakes almost as well as flint-like raw materials. The discussion of the quartz assemblage from Scord of Brouster (Ballin 2005b)
suggests that Early Neolithic quartz assemblages may be characterised by slightly more elongated blanks than later assemblages, and it is possible that the blades, or ‘blade-like flakes’ from the Auchategan quartz assemblage indicate an Early Neolithic date.

In summary, the above elements suggest that the lithics recovered at the Auchategan site were deposited during the Early Neolithic period. The site stratigraphy suggests that the location may have been visited several times during that period. The site’s radiocarbon date (2820–2690 cal BC; I-4705) indicates a possible brief visit to the location in the Late Neolithic period, but there are no lithic indications of activity at Auchategan during this period, or for that matter in any other earlier or later prehistoric periods. Trevor Cowie (1993: 19) notes that this radiocarbon date ‘now looks increasingly isolated’ in terms of our current understanding of Early Neolithic Scottish pottery (such as that recovered from Auchategan) and its chronological framework.

**SUMMARY AND DISCUSSION**

A total of 194 lithic artefacts were recovered from Auchategan. Ninety pieces are in pitchstone, with 38 pieces being in flint, 64 in quartz, one in sandstone, and one in agate. The quartz assemblage is thought to be based on locally procured raw material, whereas the pitchstone was imported from Arran in the Firth of Clyde, and the flint from Northern Ireland (Antrim flint). Due to the find circumstances, it is not entirely certain that the pitchstone, the flint and the quartz were produced by the same group of people, during the same visit to the site, but the three artefact groups were probably manufactured during the same general period, namely the Early Neolithic. Being contemporary, *sensu largo*, the three raw material groups provide a fine opportunity to gain insight into Early Neolithic raw material use and raw material preferences, as well as the territorial structures and exchange patterns of the time.

The most obvious differences between the three sub-assemblages are: 1) general composition (débitage, core and tool ratios; Table 2); 2) composition of the three main categories (types of débitage, cores and tools; Table 1); 3) dimensions; 4) operational schema; and 5) procurement. In terms of general composition, the pitchstone assemblage has much débitage, many cores and few tools; the flint assemblage has little débitage, few cores and many tools; and the quartz consists entirely of débitage. The pitchstone débitage is characterised by the production of microblades and narrow macroblades, whereas the flint is characterised by the production of very large broad blades, and the quartz by the production of flakes and indeterminate pieces. The pitchstone assemblage is the only raw material group with a substantial number of cores (14 pieces), most of which are diminutive single-platform cores; one exceedingly small irregular core in flint was recovered. The flint assemblage includes numerous tools (28 pieces), many of which are fairly sophisticated pieces, such as ‘fancy’ leaf-shaped arrowheads, well-executed scrapers, and scale-flaked/plano-convex knives, whereas the few pitchstone tools (6 pieces) are relatively plain scrapers and expedient notched or edge-retouched pieces.

In terms of size, the pitchstone artefacts are generally very small, whereas the flint artefacts are large, and the quartz artefacts are of intermediate sizes. These differences are most likely related to the general sizes of the original nodules, where much exported Arran pitchstone may have been in the form of tabular ‘scrap’ (*cf.* the finds from Torrs Warren; Cowie 1996); the Antrim flint was procured in the form of large nodules or blocks (with a greatest dimension of 90mm, the largest blade tool in flint suggests a nodule size of as much as 120–150mm), whereas the raw quartz probably varied considerably in size, depending on the
attributes of the specific source (vein quartz, beach/river pebbles, erratic quartz; Ballin forthcoming e).

Three different operational schemas were applied, depending on the raw material (nodule size and shape, as well as flaking properties). The pitchstone blanks were largely manufactured on diminutive single-platform cores, characterised by plain platforms and abraded platform-edges; the flint blanks were probably produced on large conical cores, characterised by plain platforms and trimmed platform-edges; and the quartz blanks are likely to have been detached almost exclusively from irregular and bipolar cores.

The three main raw materials were procured in very different forms. The quartz was procured mainly from local vein sources, although pebble quartz was also used; the pitchstone was probably acquired in the form of tabular ‘scrap’; and the flint in the form of finished tools. The latter is suggested by the unusual style of the leaf-shaped arrowheads, and the size of the blades, which are much larger than commonly seen in Scottish contexts, but similar to the size of blades generally produced in Early Neolithic Northern Ireland (see examples in Herity & Eogan 1989). The two polished stone axeheads add to the impression of Auchategan forming part of an extensive exchange network, as both pieces are in Cumbrian tuff (Clough & Cummins 1988: 233) and imported from north-west England.

Two questions appear particularly pertinent in relation to the interpretation of the present lithic assemblage, namely: 1) why did the settlers of Auchategan exploit three (very different) raw materials; and 2) what was the character and extent of the involved exchange network? As to why one or the other lithic raw-material was used in prehistory, a number of reasons can be proposed. They are either functional or non-functional (symbolic).

In terms of functionality, the three raw materials differ considerably: 1) the sources are more or less accessible; 2) the flaking properties vary; and 3) the raw materials are more or less durable. Scarce resources or remote outcrops may have been deemed irrelevant in terms of supplying the raw material for functional (i.e. non-prestige) tools needed in large numbers; prehistoric knappers probably preferred to work the more easily controlled raw materials; and, most likely, some less durable materials were unsuitable for certain tool types.

Generally, flint is probably the best overall raw material, as it has good predictable flaking properties (apart from a small number of impure forms), and it provides highly durable edges. The opaque Antrim flint is dense and particularly suited for the production of polished axes (one fragment recovered from Auchategan; CAT 91). Pitchstone has good flaking properties, but it is softer and more brittle than flint. This makes it more difficult to control, when robust reduction techniques are applied, such as the bipolar technique. However, it is a well-known fact that volcanic glasses provide the thinnest and sharpest cutting-edges (Whittaker 1994: 19), and pitchstone is therefore excellent for the production of cutting implements. The brittle character of the raw material may explain why serrated pieces in pitchstone are rare, whereas this tool type is comparatively common in Early Neolithic flint assemblages (Saville 2002). Although the Auchategan quartz is relatively homogeneous, with reasonable flaking properties, it does not flake as regularly as flint and pitchstone, and the outcome is therefore less predictable. Instead, the edges are sharp and strong, and this raw material is therefore well-suited for more robust cutting, graving or chopping work.

However, it is not possible to carry out a straightforward cost-benefit analysis of the pitchstone, flint and quartz, as the various weaknesses/benefits of the three raw materials may
be counter-balanced by other factors. For example, it may be of little importance to a knapper that a raw material has relatively poor flaking properties, or that it is less durable, if this material is easily accessible in large quantities. One example of this is Southern Uplands chert (cf. Ballin & Johnson 2005), which is a relatively poor material widely used in southern Scotland. In this case, easy access, and the availability of large quantities, out-weighs material flaws: even if many blanks or tools broke during production or use, they could easily be replaced.

In terms of non-functional, or symbolic, values, it is easy to understand how prehistoric man may have perceived pitchstone, flint and quartz very differently. The most important attributes in this respect are the colours, lustres and patterns of the three raw materials. This subject has been discussed on several occasions, for example regarding the prehistoric and historic use of quartz (e.g. Lebour 1914; Darvill 2002), and the distribution of archaeological pitchstone across northern Britain (Williams Thorpe & Thorpe 1984; Ballin forthcoming f) suggests that this material may have been perceived as having more than just functional value (see below). It is suggested that the background to the procurement and use of pitchstone, flint and quartz at Auchategan may be a complex mixture of functional and symbolic reasoning, combining the desire for the raw materials best suited for specific tool types and the desire for raw materials with symbolic, for example totemic, connotations (see examples in Topping 2005: Appendix 1).

Recently, an assemblage from a neighbouring site (Midross, on the shores of Loch Lomond) has been analysed. Like Auchategan, it includes finds in several lithic raw materials (flint, chert, quartz, and pitchstone; Table 3), and in the report the author (Ballin forthcoming d) discusses the lithic assemblage in its territorial context (techno-complexes and social territories; cf. Clark 1975), and how the various raw materials were procured (embedded, direct, indirect procurement; Morrow & Jefferies 1989). This mixed assemblage includes not only Early Neolithic material, but also finds datable to the Mesolithic and Bronze Age periods, as well as some burnt quartz associated with a Medieval cemetery. The pitchstone from Midross is thought to date to the Early Neolithic period (like most archaeological pitchstone recovered outwith Arran; Ballin forthcoming f), and, if the Mesolithic and Bronze Age flint, chert and quartz was excluded from Table 3, the raw material composition of the Early Neolithic element would be more comparable to the composition of the Auchategan assemblage.

<table>
<thead>
<tr>
<th></th>
<th>Auchategan</th>
<th>Midross</th>
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<tbody>
<tr>
<td>Pitchstone</td>
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<tr>
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<td>20</td>
<td>37</td>
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<tr>
<td>Chert</td>
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<td>24</td>
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<tr>
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<td>36</td>
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<tr>
<td>Total</td>
<td>100</td>
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Table 3: Raw material composition at Auchategan and Midross (both Argyll), in percent. The percentages of the Midross assemblage excludes the burnt quartz strewn across graves in the Medieval cemetery of Site 5/1 (Ballin forthcoming d).

One of the main aims of the ongoing Scottish Archaeological Pitchstone Project (Ballin forthcoming f) is to catalogue all archaeological pitchstone in Scottish museums, and analyse the distribution of pitchstone artefacts across northern Britain. At present, the holdings of the National Museum of Scotland (Edinburgh), the Hunterian Museum and the Kelvingrove Art Gallery and Museum (both Glasgow) have been catalogued, and it is hoped that the
collections of the remaining Scottish museums can be added to the author’s pitchstone database over the next year or two. Presently, the database contains approximately 3,100 pieces, and it is thought that the remaining collections may bring this number to c. 5,000.

At the moment, the available material suggests that prehistoric Scotland may have been subdivided into three main zones (I–III). Arran itself represents Zone I (local procurement: general use of pitchstone throughout the Mesolithic, Neolithic and Early Bronze Age periods; all types present), the mainland east of Arran Zone II (regional procurement: pitchstone occasionally forms substantial proportions of assemblages; almost exclusively an Early Neolithic resource; most types present but with a lower implement ratio than in Zone I), and beyond this area, in Zone III, the frequency of pitchstone drops markedly (exotic procurement: individual pieces; almost exclusively an Early Neolithic resource; mostly flakes and blades, with cores and tools being rare).

It is assumed that this tripartite division of Scotland represents the rudiments of a prehistoric territorial structure. Where the three-part division of Scotland into regions based on the exploitation of quartz, flint/flint-like materials, and a combination of the two may represent different techno-complexes (Ballin 2004), the three pitchstone zones most likely represent different social territories, that is, territories with, for example, different ideologies (e.g. different perceptions of pitchstone as mainly functional [Zone I] and mainly stylistic/symbolic [Zone II and III]; cf. Ballin in press). In this sense, the Pitchstone Project represents a continuation of, and a complement to, the project ‘Quartz Technology in Scottish Prehistory’ (Ballin forthcoming e), and it forms part of the general study of the exploitation of natural resources in prehistoric Scotland.

An important element of the analysis will be scrutiny of the fall-off curve (Renfrew 1977) of the exported Arran pitchstone. A direct relationship between quantity and distance to source (the larger the distance, the smaller the quantity) would imply that Scottish pitchstone was perceived entirely in functional terms by prehistoric people, and the study of pitchstone distribution would reveal little of relevance to the understanding of the territorial structure of Neolithic Scotland. Although my impression of Scottish pitchstone distribution is presently best characterised as subjective, it is clear that the pitchstone fall-off curve is not gently sloping. The question is therefore whether the fall-off curve will turn out to be stepped, with the steps indicating the borders of territories, or whether it will have a number of peaks, each indicating a local centre of re-distribution — or whether the distribution pattern will form a combination of these two options. The results may be somewhat biased by different local levels of archaeological activity (population density, infrastructure, dedicated amateurs, etc.).

At the moment, a number of local pitchstone concentrations are known, such as the Biggar area (South Lanarkshire; Ness & Ward 2001), the Luce Bay area (Dumfries and Galloway; Ness & Ward 2001), Bute/southern Argyll (Ballin et al. forthcoming a), and Ballygalley (Co. Antrim, Northern Ireland; Simpson & Meighan 1999). In these four areas, sites are known from which more than 100 pieces of pitchstone have been recovered, indicating potential redistribution centres (Figure 10). The distribution of pitchstone is thought to have formed part of an extensive exchange network, which would also have embraced the exchange of products, such as Antrim flint, Yorkshire flint, and Cumbrian tuff. Some of these raw materials were probably traded mainly in raw form, some mainly in the form of finished tools, and some in both forms. Like pitchstone, Cumbrian tuff appears to have been traded throughout Scotland, whereas Antrim flint seems to have a western focus, with Yorkshire flint having an eastern focus.
The distribution of archaeological pitchstone across northern Britain, as well as the associated exchange network, are to be discussed in more detail in a series of future papers (Ballin forthcoming d; Ballin forthcoming f; and Ballin et al. forthcoming a).

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