

# FLINT AND CHERT AVAILABILITY IN MESOLITHIC WIRRAL

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## INTRODUCTION

Flint and chert artifacts have been found on prehistoric sites throughout Merseyside. As this raw material does not outcrop naturally in Merseyside it must have been brought into the area by natural or human processes.

The Mesolithic site at Greasby, Wirral (Cowell 1992) produced an interesting chronological patterning of flint and chert. The project reported on below attempted to identify the source of this raw material by sampling the lithic contents of the local glacial till and quarries in North Wales. An explanation of how the raw material may have reached Wirral is obtained from a survey of geological and environmental research in the area. The changing environmental conditions after the last Ice Age are considered in relation to the exploitation patterns of the Mesolithic communities in Wirral and an attempt is made to suggest how the raw material was acquired.

## GEOLOGICAL BACKGROUND

### The nature of flint and chert

Flint occurs in chalk as a crypto-crystalline formation either in bands or as nodules. Chert is the mineral which corresponds to flint in limestones and is also found in some sandstones. Flint and chert form rounded nodules of widely differing forms, but chert also forms massive beds (Hamilton *et al.* 1980, 204). They may contain fossil sponge spicules or be riddled with fine holes where the spicules have dissolved (Shepherd 1972, 35). Chemically there is very little difference between typical flint and typical chert (*ibid.* 36). Many authors today refer to flint and/or chert without differentiating between the two terms. The visible differences in quality in both flint and chert are important when assessing its suitability for use as a raw material.

Flint may be subject to considerable physical changes which are reflected in its appearance. Native flint, found in chalk, is usually black but grey flint is also common (*ibid.* 22). Other colours can include dark blue, brown, yellow, red and white (Sieveking 1967, 25). All flints are liable to bleaching and colouration through a number of processes. Flints deposited in chalk soils tend to be mainly white. This whitening process, cortication, tends to be fairly rapid as the chalk soil is dry and the water naturally contained within the flint is bleached out. Within 2-3000 years a flint could become white all the way through (Shepherd 1972, 109). Patination is a thin waxy lustre which forms on the outside of flint and seldom exceeds a millimetre in thickness. It is formed by silica derived from soil water filling the emptied pores on the surface

of the flint (*ibid.* 117). Flints may become stained by iron, manganese and other minerals which produce such colours as yellow, orange, brown, pink and red. Primarily-stained flints receive their colour during the process of their formation, but secondarily-stained flints can either have cortex staining from the percolation of pigments in solution into the empty pores, or core staining, a slow process by diffusion. Sometimes two or three colours may appear together, perhaps as a result of staining at different periods (*ibid.* 122-3).

The complexity of colouration of flint makes it difficult to define any types as it is impossible to differentiate between primary and secondary staining. This causes difficulty when trying to decide whether a flint received its colour during its formation or after it had been naturally redeposited, or whether the colour had been received after its use by man. Saville had a similar problem at Grimes Graves when he found that differential colouration on rejoined halves of implements was caused by a variation in the localised depositional circumstances of the implements (Saville 1981, 2). Thus, colour could not be used as a guide to chronology.

Chert is often coloured black but can also be grey, yellow and brown and may be banded. A variation in colour and banding can often be found within one quarry (Wedd *et al.* 1923) and the quality of individual bands can also be very varied, ranging from fine-grained to gritty (*ibid.* 21).

### Sources of the raw material

The solid geology of the Wirral Peninsula is Triassic sandstone. This is divided into areas of Keuper and Bunter sandstones, which are exposed in some places. Most of Wirral is covered with glacial deposits of varying thickness consisting of predominantly till, with some stones and boulders (Wedd *et al.* 1923). Analysis of these stones and boulders has interested geologists since the nineteenth century and they all confirm the range of lithics found in the area, including Ailsa Craig riebeckite-urite from the Firth of Clyde, granite and granodiorite from Dallbeatie, Criffel and Cairnsmore in the Scottish Southern Uplands, Borrowdale series tuffs, cleaved ash and andesite and Eskdale and Shap granite from the Lake District and flint and chert from the chalk of Ulster (Mackintosh 1879; Lomas 1892; Jones 1912, 1918; Travis 1913; Slater 1929; Thomas 1985). Flint and chert are rarely mentioned in these reports. The main interest was in tracing the sources of the igneous rocks to estimate the direction of ice flow. For this reason, the quantities of flint and chert found in Wirral may not have been accurately recorded.

By identifying the source areas of these erratics it is

possible to calculate the direction of ice flow. The predominant flow was from western Scotland via the Firth of Clyde and the North Channel with subsidiary flows from the Southern Uplands, the Lake District and East and North Ireland into the Irish Sea Basin (Thomas 1985). It flowed south and south-east and in the Wirral area the ice was deflected by the opposing North Wales ice-cap through the gap into the Cheshire Plain (Slater 1929, 136). In discussing the movement of erratics within an ice sheet, Thomas cites evidence of erratics being moved considerable distances from their source area, for example, Southern Upland granite being found in North Wales, Co. Wexford and Pembrokeshire, and suggests that an explanation for this could be a recycling of the erratics in successive glacial stages (Thomas 1985, 152). It is also possible for a moving ice sheet to pick up debris from beneath the ice which is moved along upward inclined planes to higher levels within the ice. It is estimated that as much as 70% may eventually reach the end of the ice sheet (Hebblethwaite 1980, 82).

As the ice-flow was predominantly from western Scotland and the North Channel, it is possible that flint and chert could be picked up from Northern Ireland and from the Carboniferous deposits in the north-west section of the floor of the Irish Sea. Through the recycling process described above some of these erratics could reach Wirral. Lomas (1892, 401) describes flint and Antrim chalk amongst a list of smaller boulders found along the River Mersey. Jones (1912, 188) discusses olivine-dolerite found on both sides of the Mersey which is 'similar in character to those occurring in the Isle of Man, Antrim and the West of Scotland'. Travis (1913, 269) mentions finding 'pebbles of flint' and an erratic of olivine-dolerite in contact with chalk which he suggested might be from Antrim. A more recent study of the glacial deposits at Thurston, Wirral suggested that the flint may be derived from the floor of the Irish Sea (Brenchley 1968, 33).

The range of lithics deposited by the ice will be similar in the areas which were glaciated at the same time as Wirral, so if the source is in the drift the raw material could come from the Isle of Man and any of the margins of the Irish Sea down to Pembrokeshire. There are known sources of white flint in the wolds of north Lincolnshire and east Yorkshire (Jacobi 1978, 304). In North Wales there are Carboniferous outcrops which are known to contain chert (Wedd *et al.* 1923) but there is a great deal of variation within this area which would make sourcing very difficult.

There are a number of scientific methods in use for sourcing flint and chert including trace element analysis, emission spectrography, neutron activation and atomic absorption spectro-photometry (Thompson *et al.* 1986). Electron spin resonance analysis has been used on samples from Northern Ireland and the results suggest the transportation of flint from the Antrim Coast to supply raw material for the Bann Valley about

40 kilometres away. However, more tests are needed to confirm this result. It was suggested that this method could be used to distinguish between north-east Irish flint and English flint (Griffiths and Woodman 1987, 252).

There are problems still to be overcome with all of these scientific methods. Briggs considers that the only way to achieve results is to examine thoroughly flint-bearing tills together with petrographic sampling of erratics and that 'there is little point in subjecting the artifacts to geochemical analysis until the geochemistry of drift flint is known and understood' (Briggs 1986, 188).

### Transport mechanisms

The natural movement of lithic material within an ice sheet is discussed above. In theory, this is one method of transporting the flint and chert into the area.

After the last glaciation there were fluctuations in sea level, and at times of high sea-level wave action could form raised beaches. Any flint and chert in this beach material could be left behind after the raised beach was formed and might become a possible source of raw material.

It is possible for alluvial action to move pebbles gradually along the course of a river. The River Dee passes through a limestone area in North Wales and if this erodes, some chert pebbles may be brought down towards Wirral and deposited along the banks of the river.

Another possible transport mechanism is by human agency. The suggested sources for the raw material includes glacial till around the Irish Sea area, Lincolnshire, Yorkshire and North Wales. Research in Ireland has shown that there are numerous early Mesolithic sites which lie away from sources of flint. For example, at Mount Sandel, the local flint in the till was ignored in favour of flint nodules from the coast several kilometres away. Kilcomer, Co. Cork, is 40 kilometres from its flint source (Woodman 1987b). In the later Irish Mesolithic, the raw material from coastal sites appears to have been brought as blanks for use at sites further inland (Griffiths and Woodman 1987). In the north of Britain, the early Mesolithic sites in the southern Pennines obtained white flint from the wolds of north Lincolnshire and east Yorkshire (Jacobi 1978, 304). In the later Mesolithic, the flint was replaced with local chert at the Pennine sites and by transparent honey-coloured flint of unknown origin at the sites on the Lincolnshire Edge (*ibid.* 307).

The means of acquiring the raw material in Wirral may be quite complex. Woodman suggests an embedded procurement strategy for the earlier Mesolithic in Ireland, where the raw material would be gathered during normal hunting and foraging expeditions

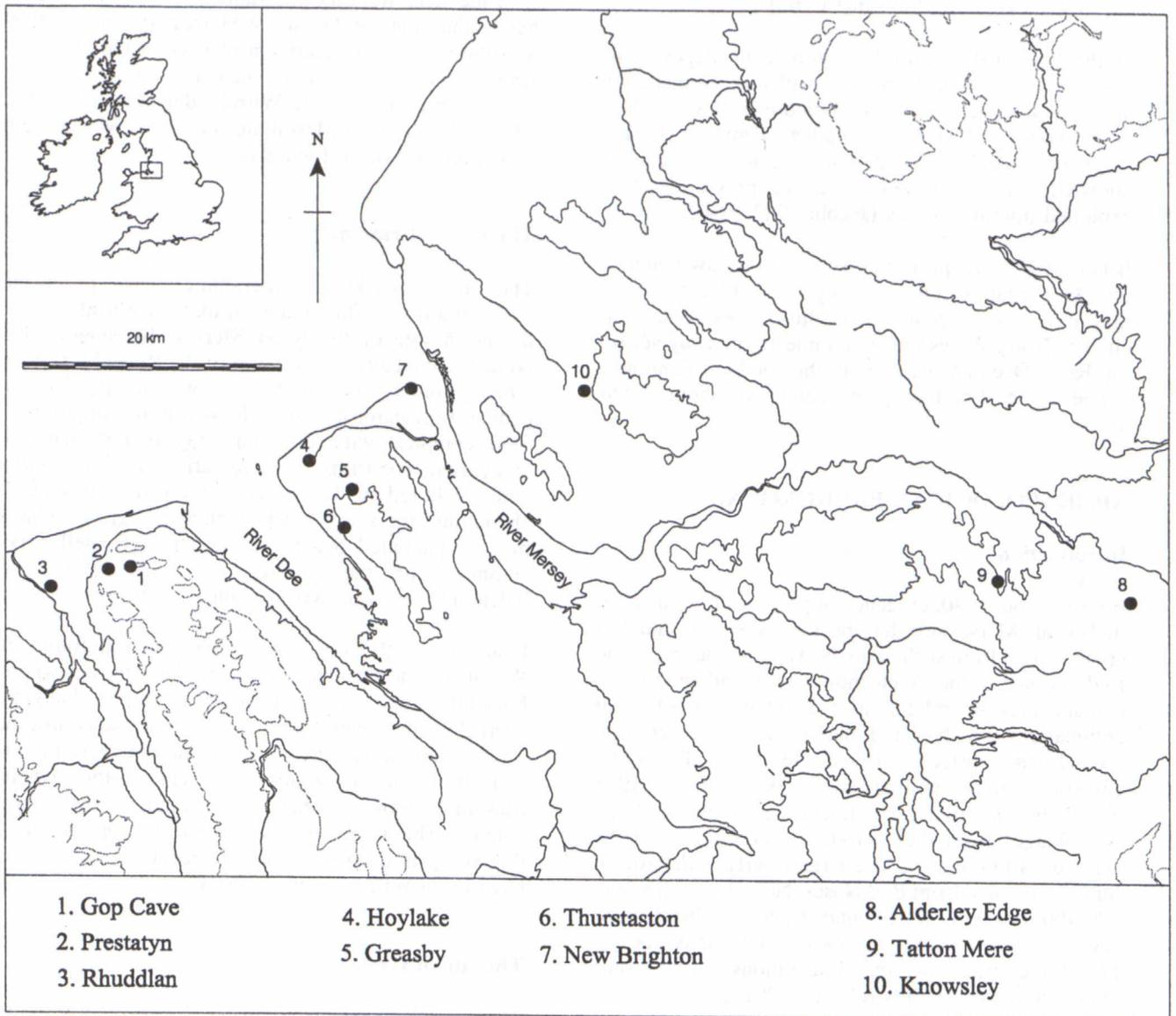


Figure 1: Mesolithic sites in the Merseyside region.

(Woodman 1987b, 142). Jacobi suggests that the early Mesolithic groups in northern Britain may have obtained their white flint from known quarries or exposures in Lincolnshire and Yorkshire with the implication of journeys or patterns of exchange extending some 112km, about five days walking (Jacobi 1976, IV 33). The evidence of exchange systems in hunter/gatherer societies recorded by anthropologists (Orme 1981) and neolithic distribution networks for flint, stone axes and pottery, suggest the possibility of artifacts being moved from one area to another in the Mesolithic period if more than one group was exploiting the same territory.

In the later Irish Mesolithic Woodman suggests the possibility of procurement by small task groups as a direct procurement strategy (Woodman 1987b, 144). After about 8000 BP in the southern Pennines the use of greater quantities of chert implies a more detailed knowledge of local sources or of previously less exploited limestone areas (Jacobi 1987, 164).

It is possible, therefore, that some of the raw material reached Wirral by human agency and that local sources may have been exploited. The limestones containing chert in North Wales are only some 16km away across the River Dee and the sites in the southern Pennines, where white flint has been found, are about 96km away.

## ARCHAEOLOGICAL BACKGROUND

### Introduction

Prior to about 1980, evidence of prehistoric occupation in Wirral, Merseyside has been very sparse and has come mainly from surface finds. The distribution of the finds located in the nineteenth century and earlier this century may be related to the enthusiasm of local antiquarians. Much of the material was discovered on eroded land surfaces around the coast. The early collections were summarised by W. Shone in 1911 where he describes a number of finds of lithic assemblages from these eroding sections around the coast of North Wirral. The largest early collection of lithic tools came from Red Noses, New Brighton where 600-700 flint tools were found (Roeder 1898). Cowell suggests that some of these tools may be of Mesolithic date, as the illustrations show some obliquely blunted points (Cowell 1991, 23).

By 1940, early Mesolithic sites were recognised in areas bordering Wirral at Gop Cave in Clwyd, North Wales, and Cresswell Crags, Derbyshire, and in Cheshire at Alderley Edge. A later Mesolithic site at Bryn Newydd, Prestatyn, North Wales had also been studied (Varley *et al.* 1940, 19).

Since then, further work in Cheshire has produced microliths, scrapers, awls and cores from Tatton Mere and surface finds from the ridge at Frodsham. Dense

concentrations of upland Pennine sites above 370 metres have been found which would probably have represented seasonal occupation and may be related to the sites in Cheshire (Longley 1987, 37).

In Merseyside, a long term programme of investigation by the Field Archaeology Section of Liverpool Museum began in the 1980s. Fieldwalking has produced two certain early Mesolithic sites on Wirral, at Thurstaston and Greasby. There are two other possible sites, one in Knowsley and another in Wirral (Cowell 1991, 23). Environmental evidence, combined with the field walking programme and surface finds, has produced about 23 sites in Merseyside for the later Mesolithic, one concentration of sites in the north of Knowsley District, the other main area on the northern and western sides of the Wirral ridge (Cowell 1991, 27). The locations of Mesolithic sites in the Merseyside region are shown on Figure 1.

### The types of raw material

The field walking programme has produced concentrations of flint and chert tools in Wirral and on the north side of the River Mersey. In general, the typical raw material used north of the River Mersey is a honey coloured flint in the interior, bluey-grey beach pebble flint nearer the coast. In Wirral, the situation is more complex, with a greater range of raw material being used. The flints are more varied in colour, being white, light red and honey. There are various groups of cherts, and there is a distinct blue/grey group which may be patinated beach flint or chert (Cowell pers. comm.). For the purposes of this study this indeterminate group will be called chert/flint.

Examples of the variation in raw material found in Wirral include the Rectory Fields, Thurstaston, where Mesolithic and Neolithic tools in light blue/grey chert/flint and honey flint were found; at the Dungeon, Thurstaston, where grey translucent flint was found; and from an excavation at Thurstaston where Mesolithic tools of chert were found (Cowell pers. comm.). The artefactual evidence to be considered in this study is derived from the recent excavations at Greasby in Wirral (Cowell 1992).

### The site of Greasby

There are three major raw material categories visually identified at Greasby: flint, chert/flint and chert. These are sub-divided into white and honey coloured flint, blue/grey chert/flint and dark grey chert, banded light grey/medium grey chert and banded greyey/blue/chert. There is a chronological pattern to the use of the raw material on the site which implies a change over time in exploitation of the source of the raw material. The source is likely to be in the local glacial till and also in North Wales or the Pennines. A study of the artifacts against the raw material would indicate possible

transport routes for human exploitation and possibly explain the reasons for the change in use of raw material.

Evidence from Greasby shows two different phases of use. The earlier phase consists of a number of small irregular shaped pits up to half a metre deep. Two of the pits were partially lined with large sandstone slabs. One pit may have had a wooden post as stone packing was found. One circular pit contained three blades and two microliths carefully laid out in the bottom and covered over with stones (Cowell 1992, 8). This may be similar to the cache of 47 blades found at Cass ny Howin in the Isle of Man (Woodman 1987a, 15) associated with a Mesolithic site dated to about 7600 BP. Some of the pits contained remains of charred hazelnuts. The presence of hazelnuts in the early phase could date its occupation from 9500 BP as Birks has shown *Corylus avellana* (hazel) to be present in the area by that date (Birks 1989, 508). The lithic artifacts associated with the pits are almost exclusively of fine chert, with approximately 1-2% of white flint, confined to an area some 30-40 square metres. Obliquely blunted points are the most abundant type, but there are also scrapers, burins, cores, retouched blades, saws and awl-like points. The pits show evidence of re-use being refilled with debris a number of times, indicating that the site was visited more than once during the pit phase.

The later phase is more generally spread across the whole site and includes a stone area composed of rounded pebbles. The spread of stones lies just to the west of the pits. The lithics associated with this stoney area are mostly small wasters with a few microliths: 60-70% are of the blue/grey coarse chert/flint, the rest are a mixture of honey and white flint and chert.

It is generally accepted that the Mesolithic had an earlier and later phase. Jacobi's research in England and Wales suggests that the early phase was from 10500-8700 BP and the later phase from 8800-5500 BP, defining the two parts by microlithic content (Jacobi 1976, II 16). Lithic analysis suggests two phases of occupation at Greasby. The earlier phase, associated with the pits, is approximately 9000 BP. There is no clear indication of date for the second phase, other than it is later (Cowell 1992).

## ENVIRONMENTAL BACKGROUND

There is considerable debate amongst geomorphologists concerning the dates of the changes in sea level during the early Holocene period. This is partly due to problems on the radiocarbon scale for the dates at 8500 BP and 8000 BP when there were changes in the atmospheric carbon-14 content (Shennan 1987, 143). Another problem is the variety of data collected and the failure to apply a consistent common scheme (Tooley 1985, 229).

In the Irish Sea basin, as the isostatic rebound diminished following the retreat of the last glaciation, the sea level began to rise. During the Flandrian period this rise was interrupted by a number of major eustatic fluctuations (Thomas 1985). A detailed survey has been carried out on the Lancashire coast at Lytham showing a series of oscillations in relative sea level (Tooley 1978). This shows that there was a rapid rise in sea level relative to the land between about 9000 and 6000 BP. In North Wales a limited amount of work has been done which shows marine transgressions affecting the coastal zone between 8500 and 4700 BP (Bowen 1977, 250). There has not been sufficient work in Wirral to give accurate measurements for this time, most of the data being from peat beds formed later in the Flandrian period (Kenna 1986). The evidence from recent storms with sea flooding over low-lying land shows how necessary it is to consider local conditions when studying sequences of deposition and interpreting them.

The early phase at Greasby is provisionally dated to approximately 9000 BP. At that date, it is estimated that the relative sea level would have been about -21m. O.D. (Tooley 1978, 199), making the coastline extend well into Liverpool Bay, and the present wide estuary of the River Dee would not have existed. Britain would still have been joined to the Continent.

The later phase of the site may fall within the period of fluctuating sea level. A borehole survey Hoyleake showed layers of marine clays are found stratified between peat beds overlying glacial till. The deepest borehole at -5.5m. O.D. gives a date of about 7300 BP (Innes *pers. comm.*). This suggests that the later phase at Greasby may have been much closer to the sea and that the mouth of the River Dee may have been close to its present position. The encroachment of the sea would have created a wide expanse of water in the estuary of the river.

There are six phases of inundation over about 4,000 years recorded at Lytham in Lancashire (Tooley 1978, 130). At times the River Dee may have been less tidal making access to North Wales easier. When considering access to chert sources in North Wales, a short journey across the river should have been fairly simple as long as the river was not in flood. At times of inundation, it would still be possible to cross but it would probably be easiest by boat at high tide. The present river estuary has treacherous sand-banks and deep channels at low tide.

If the flint sources in the drift were being exploited, the fluctuating sea level would rapidly expose fresh areas of till in areas subject to erosion.

In the Early Boreal period, Flandrian I, there was a steady rise in temperature and the winters grew milder and the summers warmer than today (Musk 1985). This coincides with the earlier phase at Greasby where the trees would have been birch and hazel with possibly elm and oak (Birks 1989), (*cf.* the finds of hazelnut

shells mentioned above). Evidence from flint artifacts suggests that there was exploitation of animals by hunting. During the first phase of the site, when the coastline was further away, there would have been a much larger area of land available to exploit. A study of the early Mesolithic sites at Rhuddlan in North Wales has suggested that the distance from the coast was not a disadvantage and that there would have been a plentiful supply of meat from such animals as red and roe deer, aurochs and wild pig (David 1985, 242; Jacobi 1980, 163). Also the diet is likely to have included gathered vegetable foods (Clarke 1976) which would leave no trace in the archaeological record, although Clarke points out that some microliths could be used in composite tools for plant-gathering and food processing.

The flints in the second phase at Greasby indicate a different kind of settlement (Cowell 1992, 14). This could mean that hunting patterns had altered as a result of the change in climate in the later Mesolithic. This was the Atlantic period, Flandrian II, when the climatic optimum had been reached. It is estimated by 6500 BP, July temperatures would be 17-18°C and the mean winter temperature 5-6°C (Musk 1985). The woodland around Wirral would now include pine, alder and possibly lime (Birks 1989). The sea and coastal resources would have been very close to Greasby and it is likely that these would have been exploited although there is no evidence from the site. Seal and whale are valuable sources of meat, oil and blubber and may have been exploited (Jacobi 1976, IV 69; Rowley-Conwy and Zvelebil 1989). Seals are present in the area today in the estuary of the river. Possibly shellfish were collected off the Welsh coast and the lack of shell middens may be because they were covered by later incursions of the sea (Jacobi 1980, 185). Fish could also have been exploited. The River Dee would have had migratory fish and remains of fish from sites in Mesolithic Denmark show the species exploited there (Rowley-Conwy and Zvelebil 1989, 53). Many migratory birds spend the winter on the mudflats in the present river estuary. Assuming the ecosystem was similar in the later Mesolithic, it is possible that some of the larger birds could have been used as a food source.

## METHODOLOGY

### Introduction

This project aimed to consider three specific questions:

- What lithic types are found in the glacial till?
- What lithic types occur in North Wales quarries?
- How do a) and b) relate to the artifacts?

Given the apparent visual complexity of the material found at Greasby, a number of additional inter-related

questions need to be posed:

- Can the raw materials be defined by type?

If so,

- Is it possible to suggest sources for each and the mechanisms by which they reached Wirral?
- Is it possible to date the use of the material?

If so,

- Would its availability be affected by the Flandrian sea level changes and its application by the changing ecosystem?

Most previous studies of the glacial till in West Wirral were directed towards an understanding of the glacial and early post-glacial events (Mackintosh 1872 and 1877; Shone 1878; Slater 1929; Brenchley 1968; Hebblethwaite 1980). There has been no specific investigation into the source and distribution of crypto-crystalline erratics. These earlier studies have shown that there are three main lithologies in the glacial till; Lower Boulder Clay, Middle Sands and Gravels and Upper Boulder Clay. Two recent surveys of the three divisions reached the conclusion that their content is very similar and was probably laid down during a single episode of ice retreat (Brenchley 1968, 33 and Hebblethwaite 1980, 241). Brenchley sampled groups of 100 erratics from several places at Thurstaston to determine whether there was a distinction between the divisions. His results showed no significant variation.

Detailed surveys of the geology of North Wales were conducted in the 1890s as part of the Memoirs of the Geological Survey of England and Wales and the area was re-surveyed in the 1920s as part of a revision of the same series. As the area containing the chert beds was not re-examined in the 1920s, the revised account is based on the previous survey. This means that there are no grid references given, the chert exposures being observed in quarries almost impossible to find in 1990, for example 'a quarry 400 yards north-west of Holywell Workhouse' (Wedd *et al.* 1924, 33). The descriptions of the colour of the chert are detailed enough to give an indication of the variety within this small area.

### Samples from the glacial till

It was decided to sample the glacial till in three ways; from pebble bands within the till, from beach material eroded from it and from ploughsoil developed above it. If the ploughsoil showed a substantially different result from the pebble bands and beach samples, it would suggest that human agency was responsible for bringing the raw material into the area.

The best exposures of till are in the 4km stretch of



- Ploughsoil
- Beach material
- ▲ Pebble bands

Figure 2: Locations of sampling sites in Wirral (Based upon the 1985 Ordnance Survey 1:25000 map with the permission of the Controller of Her Majesty's Stationary Office. Crown copyright reserved)

coast between Thurstaston and West Kirby. As Brenchley had previously sampled part of this area and found the till content similar, it was decided to take samples of groups of 100 pebbles from the base of the eroding cliff between Thurstaston and West Kirby and also samples of 100 pebbles from accessible pebble bands in the cliff face. The intention was to determine the proportions of flint, chert, other erratics and local sandstone in the till. To avoid the risk of bias in the selection of pebbles, three pebble bands between Caldby and Thurstaston were sampled, and five random spots for the collection of beach pebbles were chosen in the same area, the smallest pebble size being 0.5cm. The sites for collection were determined by there being at least one pebble of flint visible. The locations of the sampling sites are shown on Figure 2. It was decided that wet sieving of samples of glacial till, which would have provided a more accurate measurement of its constituents, was too laborious for one person to undertake and also too time-consuming and difficult to carry out in the time available.

The sites for the collection of surface material from plough soil were determined by availability of suitable fields and the permission of the local farmers. Five sites were selected in Frankby and Thurstaston. As the amount of time available for the study was limited, it was decided to survey small areas of the fields by quadrats using the method described by Gilbertson *et al.* (1985). This method should establish the optimum quadrat size to show a reliable representation of the lithic contents in each field, without having to survey a large area. All stones and other intrusive material above 0.5cm. were collected in each quadrat and bagged by quadrat for later analysis.

To provide a comparative study, four samples of 100 pebbles each were collected from the glacial deposits on the beaches in the north of the Isle of Man, as this area had experienced similar glacial events to Wirral and its erratic material should be from the same sources. Two sites were chosen on the west coast facing Northern Ireland and two others were sampled on the east coast opposite the Lake District.

Any random flint found on the beaches in Wirral and the Isle of Man was collected as an additional sample to indicate the range of size and colour of flints in both areas.

Due to restrictions of time the analysis of the material had to be fairly simple. Each sample of 100 pebbles was divided into four groups, flint, chert, other erratics, and local stone. There were occasional problems in recognising chert as its quality in the drift is very variable, so this was checked by a geologist at the University of Liverpool. The division into the four groups was done by eye and if there was some doubt, the pebble was broken to see the interior. There were particular difficulties distinguishing flint with an orange patina from quartz pebbles stained orange from the glacial till and breaking them was the only way to

determine the type. Each group was counted and weighed and the average weight calculated. The material collected from the plough soil was sorted separately and the results recorded on a printed sheet. A certain amount of man-made material was included with this collection, as it was a record of the content of the plough soil in a particular location. The finds included pottery sherds, roof slates, and coal, and these were counted but then left on one side as being irrelevant to the project.

### Samples from North Wales Quarries

It was decided to attempt to trace as many quarries as possible from the Geological Survey and also visit any quarries being worked today. Following a discussion with Mr. Donald Bell of Gronant, Prestatyn, who has done fieldwork in the area, the locations of suitable quarries at Gronant, Trelogan, Bryn Mawr and Pen yr Henblas were identified. Examples of chert were inspected in the quarry faces. As it was considered unlikely that humans in the Mesolithic period would have had access to the chert observed deep down in today's quarries, it was decided to collect dislodged material from eroding exposures towards the edge of each quarry. All visible varieties of loose chert were collected. As the main quarry at Gronant was closed and inaccessible the samples were collected from the lane alongside.

## RESULTS

### Glacial till

The 13 sampling locations in Wirral produced consistent results which show the average percentages of lithic material in the till as follows:

	%
Non crypto-crystalline erratics	90
Local sandstone	4
Chert	3
Flint	3

The ratio of chert to flint in the fields is 2.75:1 and that from the pebble bands and beach pebbles is almost 1:1. Flint and chert together formed 7% of the total pebbles from all the pebble bands and beach pebbles, and 5% by weight. From the fields, flint and chert pebbles formed 2% of the total number and 2% by weight. The field percentages are lower because the sandstone proportions are greater; 7% by number and 13% by weight. The greater significance of the sandstone is probably due to the parent rock being closer to the surface away from the shore.

Although there is no reason to doubt the original assumption that there would be a random distribution of flint and chert in the fields, the results showed that there is a high degree of randomness by the very

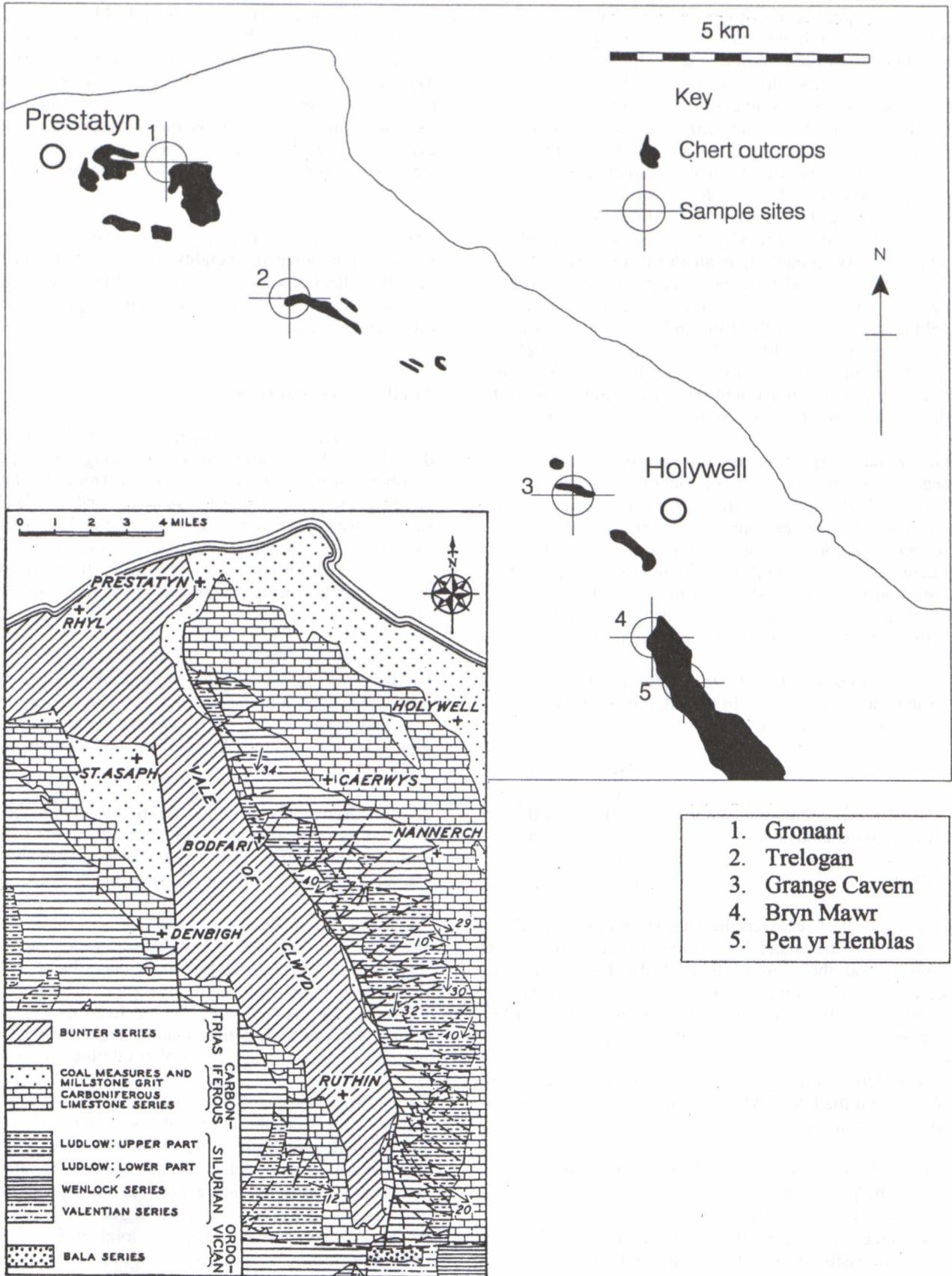


Figure 3: Geology and locations of the North Wales sampling sites (Based upon the geological map of the Vale of Clwyd and the Clwydian Range, from British Regional Geology Guide - North Wales, 3rd Edition, 1987. Reproduced by permission of the British Geological Survey (IPR/5-5) © NERC. All rights reserved)

restricted numbers of flint and chert collected. This particular methodology did not produce sufficient data to establish an ideal sample size of lithic distribution. In order to utilise the information, the results were calculated to give comparative percentages with the beach material. The results from the four Thurstaston field collections, A1 and 2, B1 and 2, show an increase in the number and weight of the sandstone where the depth of overlying till is reduced on the slopes away from the shore. The lighter weight and smaller quantity of sandstone from Frankby, C, may be the result of more intensive ploughing in an almost level field. In all the fields, the sandstone percentages are greater than the flint and chert whereas they are smaller, except in pebble band 2, than the flint and chert in the pebble bands and beach pebbles. The size of flint and chert pebbles tend to be very small in all the fields, possibly due to thermal damage and from ploughing. None of the fields sampled produced any flint or chert artifacts.

On visual inspection there was some degree of segregation in the size of pebbles in the bands deposited in the cliff face. Certain sections had consistently larger pebbles than others; Pebble Band 1 pebbles ranged between 150-300mm in size, the size range in Pebble Band 2 was 60-160mm. Although this variation was not quantified at the time, the collection of samples was made from bands of varying pebble size to ensure a sufficient sample mixture.

The four locations in the Isle of Man produced results which show a difference in the lithic types between the east and west coast as follows:

	East %	West %
Non crypto-crystalline erratics	41.0	49.0
Local slate/sandstone	47.5	8.5
Chert	1.0	4.5
Flint	10.5	38.0

The west coast received the largest quantities of flint, this part of the island being closest to the sources in Antrim and the western part of the Irish Sea. The quantity of chert on both east and west coasts was low compared to the flint, but its average weight was 42% higher.

The random collection of flints from the beaches in Wirral and the Isle of Man was divided into four visual groups for analysis:

1. white cortication over all or much of the flint
2. blue/grey flint
3. honey-coloured flint
4. uncertain due to thickness of cortex making it impossible to see the internal colour

The results showed blue/grey flint most common in the west of the Isle of Man at 65% and 66%, with the east coast of the Island and Wirral showing similar percentages, 39% and 43%. The honey-coloured flint

has the highest percentage in Wirral, 44%, with 22% on the east coast of the Isle of Man and 17% on the west coast of the island. This lends weight to the hypothesis that the honey coloured flint (sometimes referred to as toffee colour by some authors) may have its source in Cumbria, in as much as the geological evidence suggests the movement of erratics south and west from Cumbria (see below for further discussion of this point).

There was no statistically significant difference between the range of weights of flints found in the various collections from the beaches. Many more large samples would be needed to examine this question more extensively.

### North Wales Quarries

The two quarries at Gronant, SJ 094829 and SJ 095828, produced similar results, although inadequate numbers of samples were obtained from the latter because the main quarry was inaccessible. Twelve samples were collected from the former and three from the latter, their locations are shown on Figure 3. There were two main groups of chert visible: black and thin banded colours in light and dark grey, deep blue and black.

The quarry at Trelogan, SJ 118802, produced all banded chert, colours ranging through black, dark grey, light grey, deep blue and white. The bands were both thin and broad, and some produced a mottled effect along broken edges. A total of 21 samples was collected.

At the Grange Cavern, SJ 173763, a sample of 21 pieces was collected, all black chert, but most of this was inferior quality compared to the good conchoidal fractures obtained from the Gronant black chert.

At Bryn Mawr quarry, SJ 188735, a total of 52 samples was collected. There was a wider range of quality and colour here, the plain chert being black, dark grey, light grey, pale blue/grey, off-white and white and the banded chert ranged from dark grey to white with thick and thin bands. There was also a mottled effect in some pieces coloured blue/grey/white.

Pen yr Henblas quarry, SJ 194726, also had a wider range of material, the plain colours being black, dark brown, dark grey, light grey, off-white and white, and the banded colours included black, dark grey, brown, bluey grey, light grey and white. The bands were wide and narrow. There was also mottling of bluey grey and white colours on some pieces. A total of 57 samples was collected.

All the samples are of tabular chert. It was noticed that the colour of the chert was lighter in the quarries to the south-east of the study area, Bryn Mawr and Pen yr Henblas having much white and light grey chert.

### Comparison with the artifacts from Greasby

The large quantity of lithic artifacts from the site at Greasby has still to be quantified. For the purposes of this study a representative proportion from relevant parts of the site have been examined: from the earlier phase of the site, a number of pit groups and associated contexts; from the later phase, contexts from the area of the stone platform and some unstratified groups.

After an examination of the raw material from the site, it became apparent that the original three major categories and their subdivisions would need to be changed.

The flint is found in two main colours, honey and grey, with a very small number of red flints which have been grouped with the honey-coloured flint in this survey.

The white flint, on closer examination with a hand lens, was shown to contain crystals. It could not, therefore, be classified as flint, which is crypto-crystalline. Examples of chert were compared and also found to contain crystals. Some of this white material had a flat edge like a bedding plane, as seen in the flat edges of tabular chert. Occasionally there were numerous crystals along this plane, some of the planes being tinged pink by an unknown process. There was no evidence of any cortex on this material, unlike flint which often has some cortex remaining. The quality of the white material felt very dense in contrast to the more delicate feel of flint. There were a few white artifacts which may be flint as the hand lens could not pick out any crystals. This should be confirmed by examination under a microscope. It is therefore likely that the majority of the white material is chert.

The category of blue/grey chert/flint covered the colour range pale blue, grey and lavender and was banded, mottled and speckled. Similar samples of this category were found in the North Wales quarries.

The other chert categories were found to be more distinctly defined as follows: black; dark brown/dark grey with wide and narrow bands; thin bands in a variety of colours from black, brown, deep blue, grey, and white; coarse chert in brown and grey; white chert with distinct patches of deep blue; marbled chert coloured blue/grey/white.

The dark brown/dark grey banded group and the thin banded group are possibly one group as they sometimes overlap in their characteristics and were observed in the same quarries. It was decided to differentiate between them as the dark brown/dark grey group tended to be very smooth to the touch compared to most of the thin banded group which was coarser. The dark brown chert has some coarse banding within it which has attracted an orange tinge (Plate 6). This effect was not seen in any of the quarry samples. Although at present there is no proof, it is possible that

the orange colouring was acquired in its secondary position in the soil of Wirral. It is also possible, with more fieldwork in North Wales, that a source may be located there. Some of the brown chert has a flat edge which is coarse compared to the rest of the worked surface. This does not appear to be the same as cortex in flint, but more related to the bedding processes during its formation when it was deposited above a coarser layer of chert causing an intermediate plane to form between the two surfaces. Some degree of weathering on these exposed edges has added to their roughness and colouration.

With the exception of the small group of white chert with deep blue patches, all the types of chert raw material found at the Greasby site could be identified in North Wales. This small white chert group could possibly have come from a source associated with the larger white chert deposits already identified in quarries. In this survey, only 1% of the chert was of this material.

The raw material from the pit groups is distinctive in that there are no flint artifacts, the largest percentage being made up of the dark brown/dark grey smooth banded group (37%) and the thin banded group (41%). By contrast, Area XIV associated with the stone platform, has the pale blue/grey/lavender chert with the highest percentage, 33%, with the dark brown/dark grey smooth group having 27% and the thin banded group having 25% (see Figure 4).

The results of this preliminary survey suggest that the occupants in the earlier pit phase probably exploited specific areas of North Wales for dark brown/dark grey smooth and thin banded chert and also obtained good quality white chert at the same time. These raw materials were all found at Pen yr Henblas and Bryn Mawr quarries. Gronant had the dark chert but not the white.

During the later phase of the site the use of a pale blue/grey/lavender chert became common, being found widespread across the site, the pit groups showing only a minute percentage (1%) which could be explained by natural processes within the soil moving artifacts from layers above. The pale blue/grey/lavender chert was found in Bryn Mawr and Pen yr Henblas quarries and with a more in-depth survey of the North Wales area it is likely more sites for this material will be found.

The dark brown/dark grey smooth chert and the thin banded chert are also present in varying amounts across the whole site. This could mean that it continued to be exploited in the later phase, but that there was a preference for the light coloured pale blue/grey/lavender chert, or that it lay in an earlier ground surface on which later occupation took place.

Flint artifacts accounted for only 4% of the material in this study, being divided equally between the honey and grey varieties. As already established, flint is

absent from the pit groups. It is found in small quantities throughout the rest of the site. The honey flint would probably have been obtained from the local glacial till where enough good quality samples were found in this study to show a reasonable presence for exploitation. All the grey flint from Greasby is smooth and of good quality. Although some smooth examples occur in the till in Wirral, some of the grey flint found on the beaches is fairly coarse. While some may have been derived from the glacial till, others may have been brought to the site by human agency.

## DISCUSSION

This study of lithic types is the first of its kind in this area. Although a more thorough analysis will need to be carried out once all the material from Greasby has been quantified, already this survey has raised some points for discussion. By incorporating data obtained from geological and environmental research it is possible to make some suggestions concerning the acquisition of lithic raw material by Mesolithic communities in Wirral.

The excavator's initial hypothesis was that the use of dark chert from North Wales and white, possibly Pennine, flint was confined to the earliest phase of the site; its later occupants used mainly flint from an unknown source. The results from this study can only be regarded as preliminary in view of the difficulties, discussed above, encountered in attempting to source flint and chert by scientific methods and the problem of defining flint and chert. In the absence of a microscope, a hand lens was used to study the artifacts.

The dark chert, called dark brown/dark grey smooth and thin banded in this survey, is clearly associated most strongly with the early phase of the site, and has its source in North Wales. The white material is more problematic. It is impossible, without scientific analysis, to say for certain that it is all chert. The observed presence of crystals in most of the white material and the location of quarries in North Wales with white chert containing crystals suggest the likelihood of this material coming from that source (see Plate 4). There are a few white artifacts in which crystals could not be identified. It is possible that these may be flint from an unknown source. Once the quantification of lithic artifacts has been done, and if it is decided that some of them are white flint, then it may be possible to separate the periods of use of the white chert from the white flint.

The excavator originally thought the blue/grey material was patinated beach flint of unknown source. During the early stages of this survey doubts were raised suggesting it may be chert. Once the quarries had been sampled it became clear that this blue/grey material, called pale blue/grey/lavender in this survey, did have a source in North Wales and was therefore chert (see

Plate 3). More quarry samples need to be collected as there is a wide variety of colour combination observed in artifacts from the site. It has been noticed that breaks along different bedding planes produce varying effects of banding and mottling. In order to achieve a wider variety of colour range, it is suggested that some of the quarry samples should be worked.

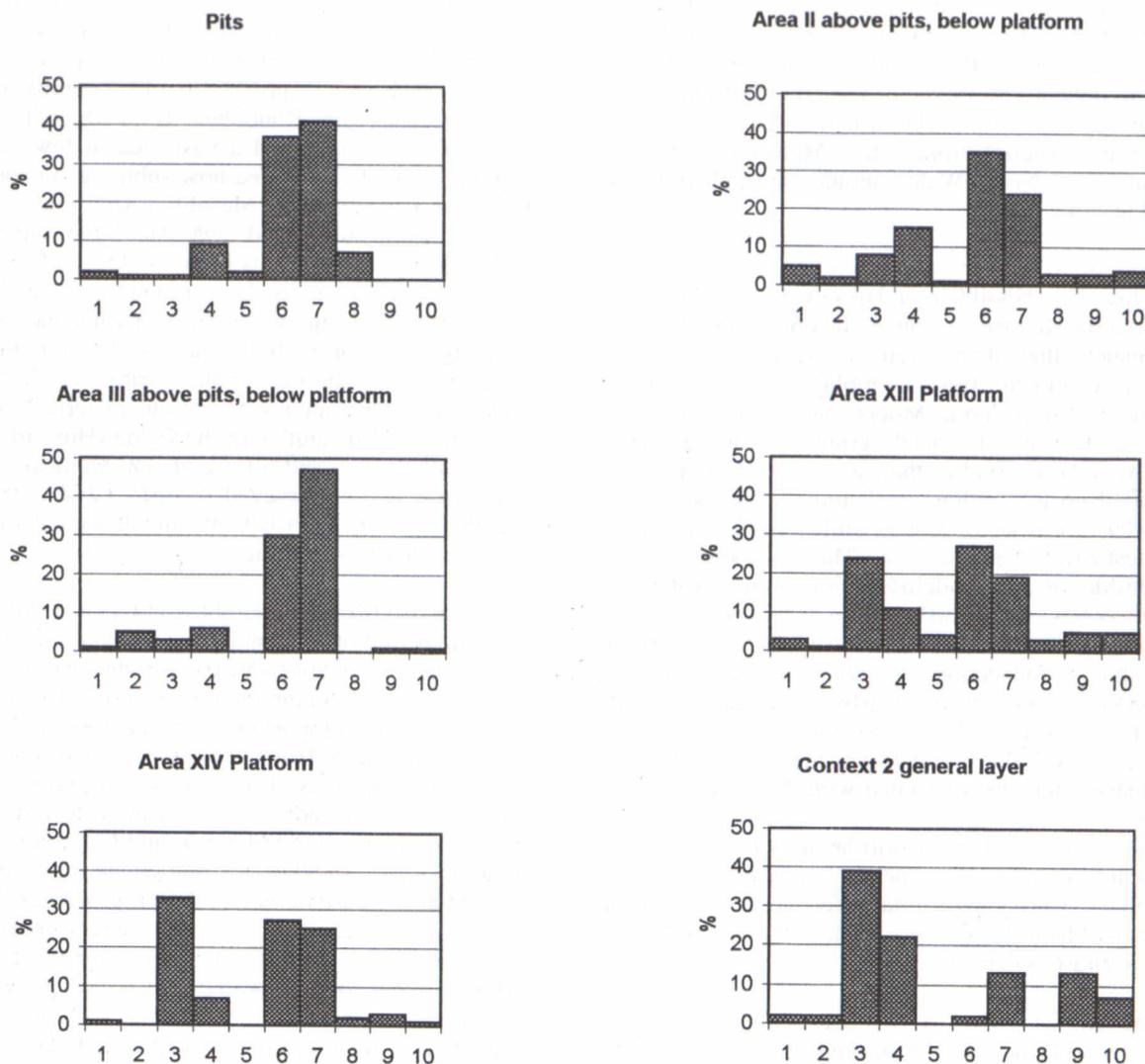
The small groups of black chert (Plate 1) and mottled blue/grey/white chert (Plate 2) also have sources in North Wales. The black chert most probably came from Gronant which has the best quality. The mottled chert is found in three quarries, Trelogan, Bryn Mawr and Pen yr Henblas. It is not possible at this stage to confine the use of these materials to any particular period as small quantities were found in most of the contexts studied in this project.

The category of coarse chert (Plates 7 and 8) may be related to the dark brown/dark grey smooth (Plate 5) and thin banded groups (Plate 6). It is possible that the coarse material could have been struck off the smooth and banded material; coarser bands have been observed in these groups. The largest percentage of the coarse material, 7%, comes from the pit groups. The fact that it is possible to join pieces in the pit groups together suggests that these hollows may have been used for working the raw material, the coarse chert being a waste product.

The chert found in the glacial till was very abraded and rounded. The quality was variable, mostly coarse and unsuitable for working. It did not appear to be like the chert found on the site, being coloured mostly dark grey.

Honey-coloured flint of unknown source is listed amongst Jacobi's classification of eight raw materials identified in Northern England (Jacobi 1976 IV 29). Descriptions of flint artifacts from the sites of Rhuddlan (David 1985) and Eskmeals (Bonsall *et al.* 1985) west of the Pennines fail to distinguish colour, merely stating they are beach-pebble flint. When colour is mentioned, there is the practical problem of people seeing colours differently. Honey-coloured flint found at Greasby had a smooth cortex where it was present suggesting that it was probably collected from nearby beaches. Its original source is uncertain, but the evidence from the beach surveys in the Isle of Man and Wirral suggest the possibility of movement in the ice from the area of the north-east Irish Sea. This is only a hypothesis and needs to be followed up by fieldwork and study of honey-coloured flints from other sites in the north-west.

Some of the grey flint from the site may have been collected off the beaches and some may have been carried into the area by human agency. All the grey flints from the site should be examined for evidence of cortex abrasion; there were a few observed in this study with a rough cortex. Those which are rough are likely to have a non-glacial origin, indicating that their



Key

- 1. Black
- 2. Mottled blue/grey/white
- 3. Pale blue/grey/lavender
- 4. White
- 5. White with deep blue mottling

- 6. Brown/grey smooth
- 7. Banded, thin
- 8. Coarse
- 9. Honey flint
- 10. Grey flint

Figure 4: Histograms showing the percentages of flint and chert found at the Greasby site.

source was in a Carboniferous area away from Wirral.

The small quantity of flint, and its absence in the earlier phase, suggests that it was probably collected off the nearby beaches as an embedded procurement strategy during hunting and foraging expeditions along the beach and river estuary. In the earlier phase, the site was further from the shore. It was probably easier to collect chert from known outcrops in North Wales by crossing the Dee than to walk some distance to the shore to collect flint. Some of the grey flint may have been brought in from further afield and it is suggested that lithic material from other Mesolithic sites in Cheshire and North Wales should be studied for a possible link.

If it is assumed that some of the white material is flint, there may be a possible correlation with the white flint found in the southern Pennines. Jacobi (1978, 307) has established that there were consistently recurring patterns within the flint assemblages in the southern Pennines, North York Moors and Lincolnshire to suggest a pair of social groupings using these territories. If the land to the east of the Pennines was exploited up to a radius of 70 miles, there seems no reason why a group or groups could not exploit land to the west of the Pennines also. There are known early Mesolithic sites at Radcliffe (Lancashire), Rhuddlan (North Wales) and Aberffraw (Anglesey) (Jacobi 1976 III 6) but it has not been established whether any of these had a connection with the Pennine sites. The analysis of material from Greasby shows that the white flint is confined to the earlier phase. To postulate a correlation with the Pennine sites, the use of white flint at Greasby must be associated with this phase.

Absolute dates for the site will be determined once the radiocarbon and environmental analyses have been completed. Chronological dates for the later groups of cherts will be difficult to establish as the microliths are so few and fragmentary.

In the earlier period of the Mesolithic, while the post-glacial climate was improving, the relative paucity of vegetation cover meant that travel across country was easier than at subsequent periods. Areas within a radius of 112km from Greasby would include the upland area of the Pennines as far north as Ingleborough and Grassington in Yorkshire, the southern fringe of the Lake District, the Peak District in Derbyshire and the whole of the upland of North Wales. All these areas have major river valleys making access to the high ground fairly easy. The lowland areas would include the Lancashire and Cheshire plains, Anglesey and an extensive area of land east of a line from the Isle of Man to Anglesey now submerged under the Irish Sea. The more restricted range of raw material used in the earlier phase at the site, and the evidence from the pits of their re-use on a number of occasions, may indicate the site was used periodically as a short-stay camp during hunting and foraging expeditions. This would include a visit to

North Wales to obtain the supply of chert which was worked into implements at the site, as indicated by the small cache of blades and microliths in one pit.

The earliest date for the North Wales early Mesolithic is the not totally satisfactory date of 8800 BP at Rhuddlan. Bearing in mind the problems associated with dating material of this age, it is possible that the period of occupation at Rhuddlan may have been earlier. The dates for Greasby are only postulated at present and may prove to be approximately contemporary with Rhuddlan. Both Rhuddlan and Greasby would have had a vast area of low land to exploit for food in the area now submerged under the Irish Sea. Contemporary Mesolithic sites undoubtedly existed in this submerged area. The large number of early Mesolithic find spots in the middle and southern Pennines indicates a regular exploitation there (Jacobi 1976, III 6). Using the 70 mile radius model, the submerged area of the Irish Sea is well within walking range and could be part of the territory exploited by bands using the Pennines. Mesolithic material has been found in small quantities in the Fylde (Howard-Davis *et al.* 1988, 16) and the areas of wetland in the north-west region surveyed recently (*ibid.*) indicates that there was an environment suitable for exploitation by Mesolithic communities.

It is assumed that the later phase at Greasby coincided with the period of fluctuating sea level. The continued use of chert from North Wales indicates that there was no obstacle to obtaining the raw material. This may be an argument for proposing an earlier date for the later phase, which may be only a generation or two later, exploiting new areas. The change to a preference for pale blue/grey/lavender chert may indicate a territorial problem. The rise in sea level would have reduced the area of land available for settlement and possibly created an increase in the number of groups exploiting the dark brown chert. If there was a heavy demand for the good quality dark brown/dark grey chert, in an effort to avoid conflict, or to ensure the supply was not exhausted, other exposures of chert may have been sought. Alternatively, the supply of the dark brown chert was already becoming reduced and from necessity other sources of chert had to be found.

The result of the study suggests that the exploitation of flint may have been confined to the latest period of occupation at Greasby, possibly much later than the chert occupation. Not enough areas of the site were studied to confirm this hypothesis. Flint was collected from the glacial till, probably off the beaches along the Dee estuary, where it is still found today. The land would have been covered in deciduous forest which would have made long distance travel more difficult. Remains of birch and oak have been found in a peat deposit above the boulder clay at Dove Point. Pollen and radiocarbon samples taken from the peat in a 1978 excavation apparently indicated saltmarsh conditions around 6420 BP (Kenna 1986, 10). Prior to this date, the north coast of Wirral possibly consisted of areas of

woodland, marsh and brackish water. The sea level would still have been lower than today, probably only a few miles off the present shore.

The environment during the early Atlantic phase would have provided a rich fauna and flora for the Mesolithic communities. The proximity of two major rivers, the Dee and the Mersey, on either side of the Wirral peninsula, together with the closeness of the sea, would have brought both freshwater and marine food sources within reach. Vegetable and animal remains would not survive in the soil. It is only possible to suggest what food sources were available. Pollen analysis will provide evidence of plants growing around the site, some of which may have been exploited as a food source. Chemical analysis will give information about plant and animal residues in the soil. This may show the types of food consumed on the site and where the food was prepared.

Anthropological studies show how hunting communities take advantage of surplus food supplies (Suttles 1968). It is quite possible that the Mesolithic communities in Wirral could have experienced times of surplus food, especially if migrating marine mammals and fish were being exploited. Perhaps these people used their excess food as a source of exchange with other groups for something they did not possess. There is no archaeological evidence to support this theory. It is quite possible that something was exchanged of a perishable nature which would not survive; perhaps a different kind of food in exchange for marine mammals which are highly productive in calorific terms as well as all the other by-products (Rowley-Conwy and Zvelebil 1989, 53).

Greasby was probably one of a large number of Mesolithic sites in the north-west, some of which will have been lost under the Irish Sea, others may be buried under sand-dunes and silts and clays deposited during the period of fluctuating sea-level. Greasby seemed ideally placed for the exploitation of its local environment, with a plentiful supply of lithic raw material only 16km away across the river Dee in North Wales. Once all the analysis on the site has been completed, it should be possible to fit it into the chronologies of other sites in the area to help build up a picture of Mesolithic activity in this part of the north-west. There are undoubtedly many other such sites waiting to be found as this area seems ideally suited to the Mesolithic lifestyle.

### SUGGESTIONS FOR FURTHER RESEARCH

Although this project has discussed a number of related problems associated with the study of lithic resources in Wirral, further detailed research would yield more satisfactory results.

A thorough survey of the glacial till should be conducted over a wider area to include both sides of

the River Dee. Mackintosh (1879, 446) reported a considerable quantity of flint in the Parkgate area. It may be possible to locate this source. The length of the pebbles in the till should be compared to the length of the artifacts from the site. This may indicate the proportion of glacial material suitable for making into tools.

The findings of this project were inconclusive regarding the source of white flint and grey flint with a rough cortex. Although a connection with white Pennine flint is postulated, flint from other Mesolithic sites within a 112km radius should also be studied. It may be possible, from this, to work out a territorial limit for individual groups and to estimate movement of flint within this territory.

The problem of sourcing honey-coloured flint is not confined to Greasby. It is mentioned fairly frequently in other lithic reports but no reference to source is given: often the statement 'from glacial till' is used. It may be worthwhile looking at flints from other sites in north-west England. From the survey in this project, the evidence suggests a source in the north-east Irish Sea area. There are Carboniferous deposits in this area but geological maps do not show any Cretaceous sediments.

Flint from the site should be studied carefully to see if there is more than one stage of cortication. This could indicate that the artifact was worked on two different occasions, separated either by site or date.

The diversity of colour, mottling and banding observed in the chert artifacts from Greasby were not completely duplicated by examples from the North Wales quarries. Further sampling needs to be carried out in North Wales to ensure adequate examples exist. It would be advisable to use a more objective system of colour description such as that provided by the Munsell Color Chart.

Suggestions such as these should be integrated into the purely typological analyses of artifacts from the site in order to place Greasby into the broader picture of Mesolithic Britain.

### ACKNOWLEDGEMENTS

Mr D Bell, Gronant, Prestatyn, for valued assistance in identifying chert samples and locating North Wales quarries. Dr P Brenchley for advice on relevant published geological material and methodology. Mr R Cowell for allowing me to work on the lithic material from the site at Greasby. Dr P J Davey for providing much welcome help from his Diploma students during the fieldwork part of the project, and for continued interest in the results. Dr H A Forbes for continued support and advice throughout the project. Ms H Davies, for advice on methodology. Dr J Innes for suggesting reference material on recent environmental

research. Mr P Phillips for allowing me to study Liverpool Museum's geology collection.

Dr G S P Thomas for advice on relevant published geological material and methodology. Dr R Wright for help in identifying difficult geological specimens.

The following farmers for allowing me access into their fields: Mr A F Colley, Thurstaston Hall Farm, Irby, Mr A Griffiths, Newton Hall Farm, Newton and Mr D Jones, Manor House Farm, Frankby.

The raw material collected during the course of this study is stored at National Museums and Galleries on Merseyside (Liverpool Museum).

Detailed analysis of the results appears in the unpublished dissertation (Longworth 1990) held at the Department of Archaeology, University of Liverpool.

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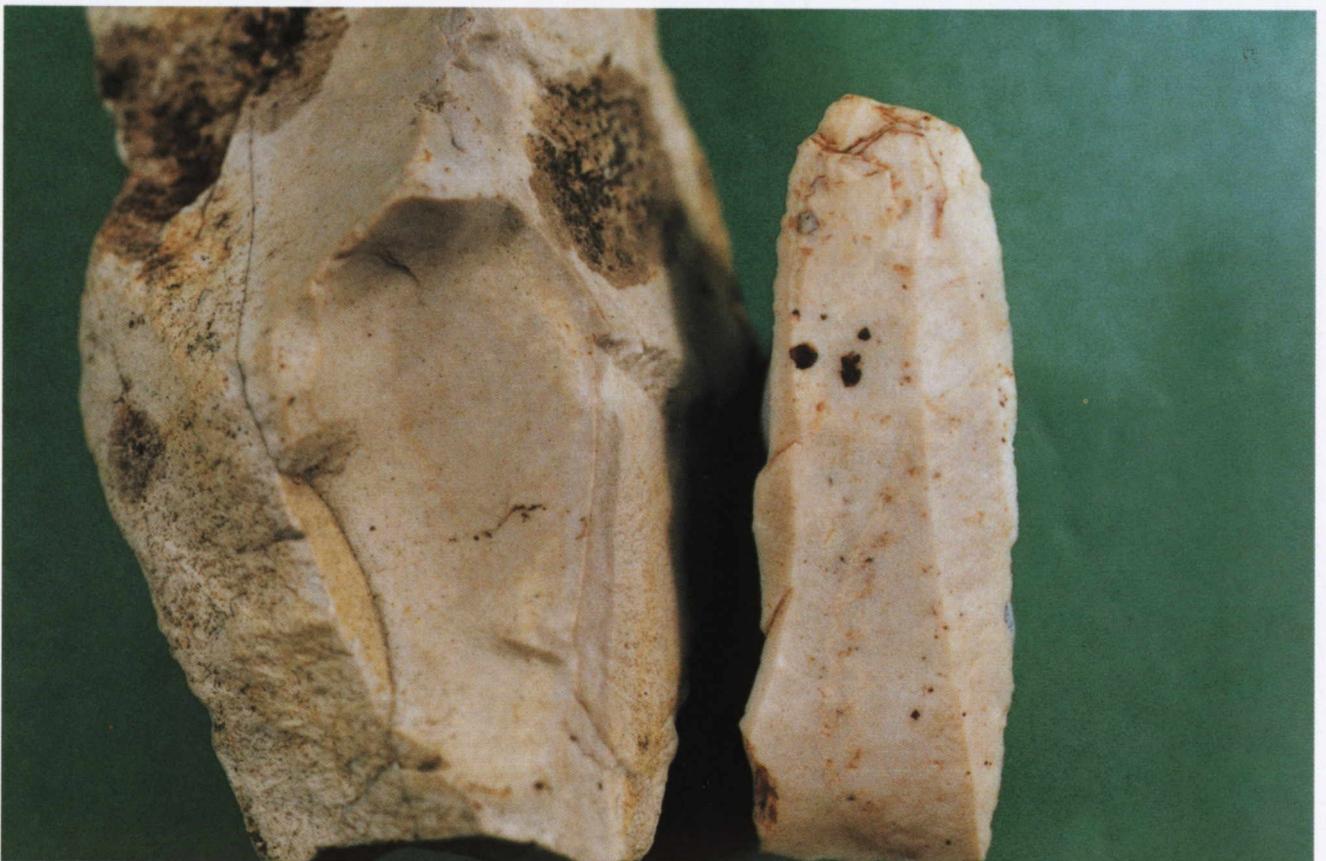
*Plate 1*  
*Black. Raw material from Gronant and tool from Greasby*



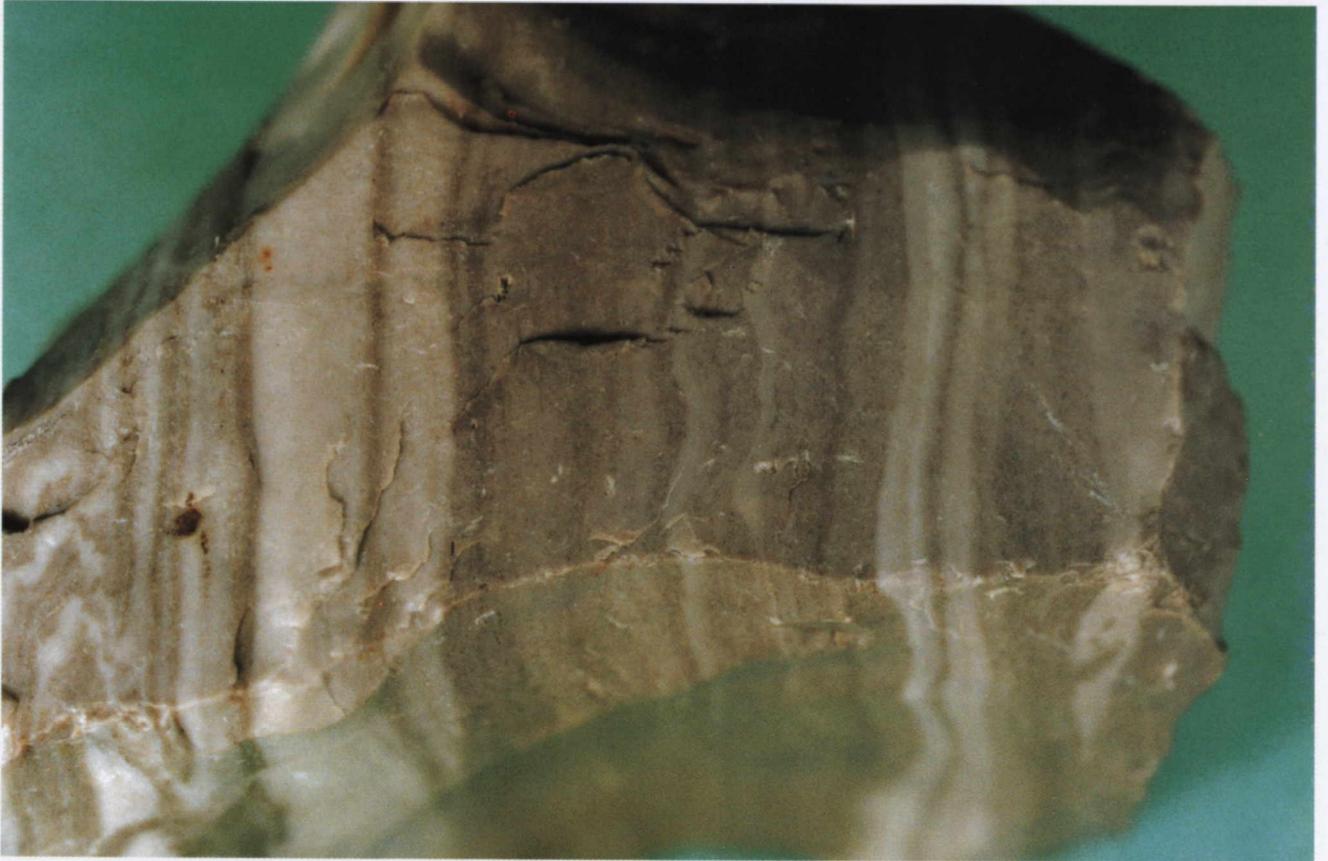
*Plate 2*  
*Mottled blue/grey/white. Raw material from Bryn Mawr and tool from Greasby*



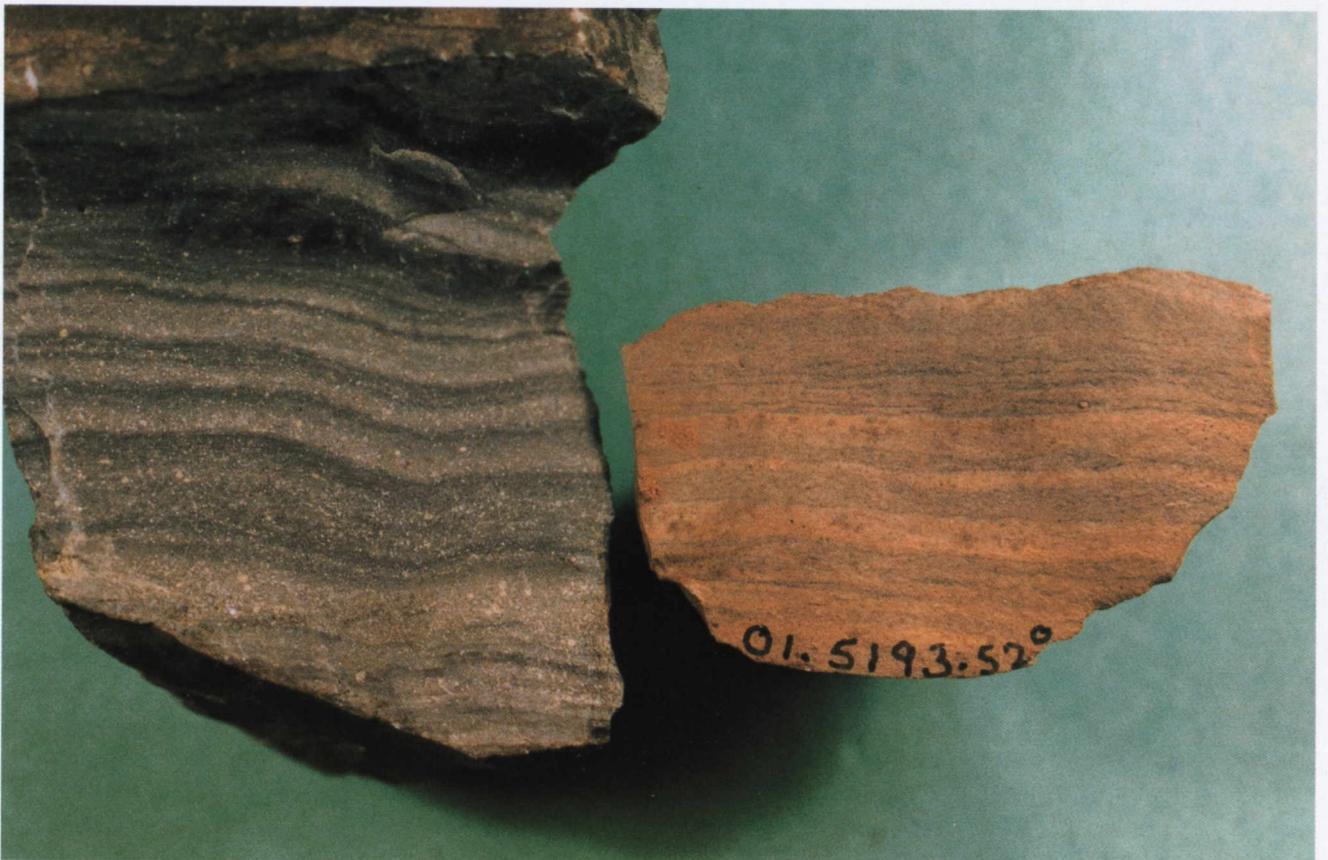
*Plate 3*  
*Pale blue/grey/lavendar. Raw material from Bryn Mawr and tool from Greasby*



*Plate 4*  
*White. Raw material from Bryn Mawr and tool from Greasby*



*Plate 5*  
*Brown/grey smooth. Raw material from Pen yr Henblas*



*Plate 6*  
*Banded, thin. Raw material from Pen yr Henblas and tool from Greasby*



*Plate 7*  
*Coarse. Raw material from Pen yr Henblas*



*Plate 8*  
*Coarse. Tools from Greasby*