3 The Investigation of Quartz Technology – A Brief Research History

3.1 The international scene

Until approximately two decades ago, quartz studies were characterized by relatively unfocused attention. Only in the late 1970s and 1980s (eg Siiriäinen 1974; Broadbent 1979; Baker 1983; Callahan 1987; Knutsson 1988) did quartz begin to receive special consideration, and to develop into a specialized research field. Before that moment, quartz was essentially dealt with as an archaeological oddity and it was either ignored or the 'nicer' cores and tools (or pieces erroneously interpreted as such) were recovered selectively. Research designs were not tailored to fit this particular material, its specific availability, flaking properties, reduction techniques, or research potential. In general, quartz research has been characterized by contributions from a small number of countries where quartz either dominates assemblages, or where it may be an important minority resource; these are Sweden, Finland, USA, Canada, Australia and Scotland.

The period after the Second World War saw the interest in quartz artefacts and assemblages rising (eg Caldwell 1954; Luho 1956), but due to the difficulties in recognizing tools in quartz, there was a general tendency to define quartz fragments and flakes as tools, if they had any superficial resemblance to well-known tool types in flint or flint-like silica. This tendency characterized, for example, Luho's (1956) work and his definition and dating of the Finnish Askola Culture (see comments by Kinnunen 1993, 9).

In the late 1970s and the 1980s, the archaeological interest in quartz 'mushroomed', possibly as a consequence of New Archaeology's preoccupation with 'scientific' approaches and precise characterization and quantification (Renfrew & Bahn 1996, 36–7). The attention included:

- quartz as a mineral, its physical properties, and fracture patterns (eg Siiriäinen 1974)
- quartz technology and its operational schema(s) (eg Baker 1983; Callahan 1987; Knutsson 1988)
- the definition and dating of specific quartz industries, or 'cultures' (eg Siiriäinen 1977)
- quartz procurement and quarrying (eg Broadbent 1973; Broadbent 1979)
- regional aspects of quartz production (eg Sassaman *et al* 1988)
- experimental and use-wear analysis of quartz tools (Broadbent & Knutsson 1975; Sussman 1988).

The classification and interpretation of quartz assemblages were markedly transformed by the general acceptance of White's conclusion that the so-called '*outils éscaillès*' (ie scaled tools) are in fact bipolar cores, produced on anvils (White 1968). Prior to this realization, bipolar cores had been classified as implements (eg Whittle 1986) such as wedges and scrapers (for a general discussion of bipolar cores, see Ballin 1999a).

One of the main questions discussed by the 1980s Scandinavian analysts was whether quartz artefacts should be classified according to the same type schema as, for example, worked flint. As a response to the difficulties experienced in the classification of quartz assemblages, lithics specialist working in Scandinavia favoured a separate quartz typology (Broadbent 1979, 48; Callahan 1987, 65). The present author disagrees strongly with this approach, as its logical consequence is that assemblages in flint/flint-like silica and quartz cannot be compared directly (in Scotland, this would make the interpretation of mixed flint/quartz assemblages, such as the well-known Mesolithic assemblages from Jura, particularly problematic). A separate quartz typology is still very much favoured in parts of Scandinavia, where Knutsson argues that the difficulties of quartz analysis is largely a product of the automatic use of an ill-fitting flint artefact typology (Knutsson 1998, 79).

However, his examples (Knutsson 1998, figs 2 and 3) clearly demonstrate that the main problem is a prevailing tendency amongst Scandinavian analysts to classify quartz chunks and fragments as tools if they have the slightest formal likeness to traditional lithic tool types (eg Halén 1994; Knutsson 1998, 76, fig 2). This problem could be dealt with simply by adhering to a simple rule: that a quartz artefact is not a tool unless it has the distinctive retouch generally associated with a particular tool type (eg Ballin 1996). Lindgren demonstrates experimentally, and by blind-tests, how difficult it can be to recognize modification on quartz artefacts (Lindgren 1998), and it is a fact that many quartz assemblages seem to either lack quartz tools or have very low tool ratios. However, it is, in the author's view, an illusion that classification of quartz tools (ie the recognition of retouch) would become any easier with a different typology.

Since the 1980s, quartz research continued within each of the above main study areas, producing increasingly detailed results. They include: sustained discussion of bipolar debitage and cores, mainly in quartz (eg Knight 1991); experimental analysis of quartz fracturing (eg Callahan *et al* 1992); procurement, not least quarrying, of quartz (eg Abbott *et al* forthcoming); the organization of quartz artefact manufacture, and the transport and exchange of quartz implements (McNiven 1994); and exposure

to fire and possible heat-treatment of quartz (Gonick 2003). In recent years, social aspects of quartz use have been added to the list of themes, focusing on the raw material's use in the ritual sphere (eg Taçon 1991), as well as its presence on, and distribution across, settlement sites (eg Bang-Andersen 1998; Rankama 2002).

Though the low number of quartz analysts worldwide forced researchers to seek inspiration outside the borders of their own country ('go international'), communication between quartz specialists has generally been hampered by the vast distances separating people, as well as the publication of quartz literature in a multitude of national and local periodicals. With the continued development of the Internet, in conjunction with increasingly fast computers and connecting networks (eg the Broadband), this problem is in the process of evaporating. More and more quartz papers are now being published directly on 'the Net' (eg McNiven 1994), and it is today very easy to get in touch with colleagues and fellow specialists throughout the world, for instance in the form of email.

By this means, the author managed to establish contact with quartz analysts in, among other countries, USA, Canada and Finland, and it was possible to substantially increase the sum of available quartz reference material for the present paper. In the wider picture, it allowed the author to communicate with relevant individuals in the USA, who are now planning and organizing a future international quartz conference.

3.2 Scottish quartz research

With a few exceptions, Scottish quartz research developed along the lines summarized above, and, in the first half of the 20th century, quartz was mostly recovered on a selective basis (eg Calder 1956; Hamilton 1956). However, a small number of Scottish analysts were ahead of their time, and Lebour, for instance, discussed social aspects of quartz use as early as 1914 (quartz pebbles recovered from burial and ritual sites), whereas Lacaille dealt with the fracture patterns of quartz (Lacaille 1938) long before the Scandinavian experimental initiatives in this area (Knutsson 1988; Callahan *et al* 1992).

As a consequence of the distinctive quartz dominance in parts of the country, such as the Western Isles, this raw material saw a steady interest from the archaeological community, not least from AD Lacaille (Morrison 1986). Raised in Glasgow, Lacaille had a natural interest in the west of Scotland, and, during his years in Scottish archaeology, several quartz assemblages were presented and discussed (see bibliography in Morrison 1986), although in the 'broad-brush style' of the period. One of his first academic papers dealt with a small quartz surface collection from Ward Hill on Shetland (Lacaille 1933), and over the next two decades he discussed, *inter alia*, important quartz assemblages from Berie Sands on Lewis (Lacaille 1937), and Morar in Inverness-shire (Lacaille 1951).

Though Lacaille did not die until 1971, his Scottish production more or less seized in the mid 1950s, after the publication of his greatest work, *The Stone Age in Scotland* (Lacaille 1954). In terms of quartz research, the 1950s was characterized by extensive surveys and excavation activity on Shetland, where the investigation of prehistoric stone structures, such as Neolithic and Bronze Age houses and burial monuments, as well as Iron Age brochs, led to the presentation of new quartz assemblages. Calder carried out surveys for the Royal Commission's *Inventory for the County of Shetland*, and in his papers in the *Proceedings of the Society of Antiquaries of Scotland* (Calder 1956; Calder 1964) he presented many finds in quartz. His more substantial assemblages were characterized and discussed (by Henshall 1956). Hamilton published quartz sub-assemblages from the Bronze Age and Early Iron Age layers of the Jarlshof broch in southern mainland Shetland (Hamilton 1956).

Quartz reports from the inter-war period and the early post-war years are generally characterized by 'broad strokes of the brush'. In most cases, the authors presented the assemblages in terms of their general characteristics, rather than by precisely quantifying whole assemblages, and complete finds lists basically do not exist. This trend changed with the onset of the 1970s (the introduction of New Archaeology), and the commencement of Mercer's 'Jura Project', during which the Mesolithic chronology of the Isle of Jura was investigated and discussed (Mercer 1968; Mercer 1970; Mercer 1971; Mercer 1972; Mercer 1974; Mercer 1980; Mercer & Searight 1986). Mercer's main approach was to combine typological evidence with information regarding local shoreline displacement. His methodology represents a step forward, compared to the work of the archaeologists of the thirties, forties and fifties, as assemblages are now recovered in total, and the finds are characterized precisely, type by type, and with the inclusion of complete finds lists.

Unfortunately, Mercer chose to present the finds in various raw materials (flint, quartz, pitchstone and bloodstone) *en masse*, and, though he details the amounts of flint and quartz recovered from the individual sites (in pounds and ounces), it is not possible to assess whether the various raw materials are contemporary, and whether they may have been reduced by the application of one or the other percussion technique. Another major problem to the interpretation of quartz assemblages recovered during the seventies and early eighties is the lack of precise recording of finds, making it impossible to carry out chronological controls as well as distribution analysis of the retrieved material.

In the 1980s and the 1990s, Scottish quartz research developed much along the same lines as Scandinavian and American quartz studies (see above). The physical properties of quartz, and its distribution throughout Scotland, was dealt with in

papers on lithic raw materials in general (Wickham-Jones 1986; Saville 1994); quartz technology was discussed as part of Finlayson's production (eg Finlayson 1992; Finlayson 1996); and Bradley attempted use-wear analysis on quartz artefacts (Bradley 1986). The introduction of bipolar material into the general lithic type schema was carried out as a gradual process through the 1980s. This decade saw the simultaneous production of lithic reports in which '*outils éscaillèes*' were characterized as, for example, scrapers (eg Whittle 1986), and, correctly, bipolar cores (eg Hedges 1986; Finlayson 1992). After the end of the 1980s, these pieces were consistently classified as products of the hammer-and-anvil technique.

A general discussion of quartz typology has never been undertaken in Scotland, as it was in Scandinavia. It was, however, attempted to apply a separate quartz typology on one occasion, namely in connection with the presentation of the lithic finds from Tougs on Shetland:

> The physical properties of quartz play such a large part in determining the nature of the flakes produced, that implements cannot be classified along the lines used with flint assemblages (Lehane 1986, M6).

Consequently, all tools from Tougs were defined as various forms of edge-modified pieces, avoiding the use of traditional tool types (such as scrapers) and, consequently, it is not possible to compare this quartz assemblage with any other Scottish quartz assemblages or assemblages in flint. Despite the lack of a general discussion of the issue, it is thought that fellow specialists must have experienced problems when attempting to use this experimentally characterized material for comparison (as the author did), and the traditional lithic typology was simply retained without further debate.

Though the possible sources of quartz were occasionally discussed in general terms, that is, assemblages with abraded cortex are from pebble sources and assemblages without probably from vein sources, quartz procurement was not discussed in detail until recently (Ballin 2004e). Apart from Lebour's interesting and innovative paper of 1914, social aspects of quartz use have only begun to be discussed in the beginning of the 21st century (eg Darvill 2002; Warren & Neighbour 2004), as a response to the general criticism of traditional (processual) archaeology and its lack of interpretation of the meticulously characterized finds (Renfrew & Bahn 1996, 43).

The present Quartz Project has been carried out in stages over the period 2000–2005, and it deals with a number of the above issues, attempting to cover obvious lacunae in our knowledge on quartz technology in Scottish prehistory, as well as responding to specific methodological or interpretational problems (Section 2). As part of this task, a number of important 'old' assemblages were re-examined, re-classified and re-interpreted, such as two mainly Mesolithic assemblages from Mercer's Jura Project (eg Lealt Bay: Mercer 1968; Ballin 2001b), and Lussa River: Mercer 1971; Ballin 2002b); the Early Neolithic finds from Scord of Brouster (Whittle 1986; Ballin 2007a); and the potentially Final Palaeolithic finds from Kilmelfort Cave (Coles 1983; Saville & Ballin forthcoming). In this paper, quartz typology, technology and chronology is discussed, as is quartz procurement, quartz intra-site distribution and site behaviour, as well as quartz as a factor in the definition of Scottish prehistoric techno-complexes and social territories.