Stone tools have been used as cognitive/chronological, cultural/ethnic, and functional/environmental indicators in African prehistory. Consider the possible problems associated with each of these interpretative approaches.

By

Michael Brass

Introduction

African archaeologists have utilised the typological categories introduced by Goodwin and Van Riet Lowe, and the lithic Modes of Clark, to create a conceptual framework in which they could operate. However, the framework has produced tensions and constraints whose chronological, cognitive, cultural, functional and environmental problems have become particularly prevalent over the past fifteen years in the Middle and Late Pleistocene research paradigms of Africa.

There is an inherent problem within the African Acheulian and Middle Stone Age assemblages under discussion: how to recognise culture and ethnicity, and the period in which hominins evolved the cognitive ability to invent social solutions to perceived or real ecological and functional challenges. It is incorrect to uncritically equate particular lithic assemblages to set time periods and predetermined technological capabilities. In particular, the idea of "intermediary periods" as transitions between the different Modes is being exposed as implicitly fraught with these dangers. There also exists the challenge of establishing the relationships between the stone tool assemblages and the cultures which the knappers were part of.

These problems are investigated through functional, compositional, ecological and temporal analyses of the Acheulian handaxes, the Acheulian-Middle Stone Age transition, the timing of the occupancy of the central African rainforests, the Still Bay level at Blombos Cave and the Middle Stone Age layers at Klasies River. It is concluded that more sophisticated models are requiring to be developed on an integrated regional basis in order to capture and subsequently extrapolate the differential expressions of lithic technology, temporally and spatially.

Background

John Goodwin and Clarence van Riet Lowe published a seminal work in 1929 which has influenced African archaeology ever since. Entitled *Stone Age Cultures of South Africa*, Goodwin and Van Riet Lowe proposed that the Stone Age sequence be subdivided into the Early, Middle and Late Stone Age (hereafter shortened to ESA, MSA and LSA). By proposing their alternative scheme to the European sequence of Lower, Middle and Upper Palaeolithic, Goodwin and Van Riet Lowe were emphasising the distinctiveness of the African archaeological temporal sequences and typological assemblages.

The post-Second World War period witnessed the beginnings of a major overhaul of the archaeological discipline. Beginning with the advent of radiocarbon dating in the 1950s and continuing with the New Archaeology's Hypothetico-deductive-nomological model, archaeology drew upon and attempted to re-orientate itself within the hard sciences (Clarke 1973). Goodwin and Van Riet Lowe proposed a classificatory scheme that was formally approved by the Third PanAfrican Congress held in 1955 (Clark 1957, xxxiii).

The classificatory schemes outlined above for Africa and Europe were taken a step further and recombined by J.G.D. Clark on the basis of dominant lithic technologies. His resulting modes of technology divide the history of stone tools into five Modes (Clark 1968, 1977). The model, with the exclusion of Mode 3, was subsequently applied relatively uncritically by Foley and Lahr (1997) to the African archaeological record. Clark's technological modes supplied them with the framework required to "provided a coarse-grained means of comparing technologies across large regions and through evolutionary time" (Lahr and Foley 2001, 25). The modes are held to be reflective of raw material availability, functional differentiation and manifestations of hominin technological strategies. Table 1 outlines the current status of lithic mode recognition and classification.

Technological mode	Industry and *fossiles directeurs*
Mode 1	Oldowan, Early Stone Age (choppers and flakes)
Mode 2	Acheulian, Early Stone Age (bifacial hand-axes)
Mode 3	Middle Palaeolithic, Middle Stone Age (prepared cores, points)
Mode 4	Upper Palaeolithic (retouched blades)
Mode 5	Mesolithic and Late Stone Age (microlithic composite flakes and blades)

Table 1. *After (Clark 1977, Foley and Lahr 1997)*

Lahr and Foley (2001) stress that they view the categorising of the technology as reflective of the meaning and structure of a taxonomic system, whereby the accumulation of strategies does not prevent the elements of a previous mode existing within a successor mode. They also equate stone tool assemblages within Africa to the appearance and dispersal of new hominin species, one example being the controversial *Homo helmei* at the start of the MSA (Foley and Lahr 1997, Lahr and Foley 2001).

These technological strategies are manifestations of behavioural adaptations whereby knowledge and culture are transmitted through social learning. The accumulated repertoire limits the risks of invention in technological and cultural evolution, but permits their expression in a wide diversity of situations through socially mediated responses to particular internal or external stimuli (Fitzhugh 2001, Henrich and McElreath 2003).

Linearity and assumptions of progress

The mode classificatory scheme was built on the assumption of inbuilt progress in the evolution of stone tool technology. In this view (Clark 1977, 23), progress, combined with varying systems of inheritance, was enough to explain the contrasting time spans of the different lithic technologies. This framework was the intellectual birth of the model seeking to explain the advent of "modern human behaviour" as a revolution occurring between 50 kya and 40 kya (Klein 1976, Thackeray 1992). It became clear there were serious inherent defects. One such problem will be outlined in this section and its implications for African stone tool research discussed: the transitional boundary between the Acheulian and the MSA.

The replacement of the Acheulian (Mode 2) by the Middle Stone Age (Mode 3) complex is placed by most archaeologists at the oxygen isotope stage 8/7 boundary, ca. 250 kya (Henshilwood and Marean 2003, 629), and has formerly been regarded as unidirectional and gradual. These investigative approaches and derived hypotheses were reinforced by dates derived from sites such as Gademotta in Ethiopia, where the lower-most MSA lithic deposit was Potassium-Argon (K-AR) dated to 235 +/- 5 kya (Wendorf et al. 1994).

Recent publications of excavations undertaken at the Kapthurin Formation, Kenya, have called into question the timing and also the very nature of the transition. The upper age limit for the Acheulian is derived from a Bedded Tuff (K4) dated by Argon-Argon ($^{40}Ar/^{39}Ar$) dating to 285 kya (Deino and McBrearty 2002). The K4 tephra overlies interstratified assemblages containing *fossiles directeurs of the Acheulian (handaxes), Sangoan (picks) and the MSA (prepared cores). The variability present in the late Acheulian and post-Acheulian assemblages is illustrated by the unusual presence of artifacts termed "unifaces" by Deino and McBrearty (2002: 208), which are described as Levallois flake preforms retouched into handaxes. It remains uncertain whether these composite assemblages* are indicative of differential habitat or activity specific adaptations, or whether they are illustrative of the continuation of older technologies during the period of emergence and consolidation of new technological industry (Tryon and McBrearty 2002).

Further complicating the nature and timing of the transition to the MSA is the composition of the assemblage from the recently published site of Herto, Ethiopia (Clark et al. 2003). The Upper Herto Member can confidently be constrained, by $^{40}Ar/^{39}Ar$, to lie between 160 +/- 2 and 154 +/- 7 kya (Clark et al. 2003).

The archaeological assemblages were derived from the same lower 1 meter of sand unit which yielded the earliest known skeletal remains of an anatomically modern human (White et al. 2003). The composition of the assemblages is variable, with MSA Levallois-like cores, blades, flakes and points interspersed with Acheulian bifaces such as cleavers. Interestingly Clark et al. (2003: 750) regard the Acheulian handaxes and cleavers as having been manufactured utilizing the Levallois method.

Manufacturing techniques, raw material availability and functionalism

Interwoven with the investigations on the transitional period from the Acheulian to the MSA is the issue of how the stone tools were manufactured, what materials were utilised, the sources of the raw material procurements and what is signified in terms of the knappers' functional and cognitive capacities.

Inquiries into the uniformity or regional distinction of Acheulian handaxes need to account for the composition of stone procured, the flaking properties of the raw materials and the reduction sequences utilised. A 1990 study by Thomas Wynn and Forrest Tierson looked at Middle Pleistocene samples gathered from four regions of the world, including East Africa. The East African sites of Olorgesaille, Isimila, Kariandusi and Lewa were selected (Wynn and Tierson 1990). The results obtained in particular from Kariandusi reinforce previous studies (Jones 1981) that the form of the Acheulian bifacial implements was constrained by the raw materials utilised. Through function analysis, Wynn and Tierson were able to achieve a 75% success rate in sorting the Kariandusi handaxes into their correct raw material constituents. The remaining unaccounted for 25% was attributed to conscious cultural expression. However, given the time span of the East African sites chosen for the study (700-200 kya), Wynn and Tierson failed to adequately account for the possibility of temporal variation as viable alternative explanation.

This is an argument that has been picked up by Iain Davidson, in particular. Davidson rejects the hypothesis that the Acheulian handaxes were a product of deliberate intentionality. He argues that the observed patterning is insufficient evidence of the intent of the knappers and demonstrates the cognitive inability to communicate using symbols (Davidson 2002). Defined as "the assumption that the objects which the archaeologist recovers represent final forms corresponding to the self-consciously articulated, prior intentions of their one-time makers" (Ingold 1993, 340), the Davidson's Finished Artifact Fallacy hypothesizes differences between artifacts which are distinctive, repetitive and standardized, and those artifacts which have had form imposed upon them.

In place of the Finished Artifact Fallacy, Davidson advocates the re-examination of the Acheulian industry due to archaeologists having conducted selective studies through choosing which materials to analyse. He argues that archaeologists have unwittingly introduced patterns based upon both their selections and the procedural practices and technological steps utilized by the makers of the artifacts. This makes it extremely difficult to arrive at an understanding of the intentions and cognitive capabilities of the makers without eliminating and understanding these biases and steps. Davidson (2002, 194) argues that the Acheulian handaxes are examples of this as it is impossible to distinguish between flakes originating from cores or handaxes, and that this is therefore an indicator to the lack of guiding principles on the part of the knappers.

The functional hypothesis that the type of raw material chosen determined the shape and size of the Acheulian handaxe is a persuasive argument. Reinforcing this hypothesis is the experimental archaeology showing resharpening reduction is capable, through three to four episodes, of altering an Acheulian handaxe into a Developed Oldowan handaxe (McPherron 2000, 661). However, this demonstration of a plausible two-stage life suffers from the same inherent flaw as the Wynn and Tierson (1990) study: conflation of temporal variation.

Only two of the several clusters of late Acheulian sites mapped by Garth Sampson at Seacow Valley, South Africa, ranged within 1 kilometre of their corresponding quarry (Sampson 2001, 33). The vast majority of the sites were situated nearby river beds still within easy access distance to the quarries and the artifacts show three developments over the symmetrical bifaces of the early Acheulian. The developments have been categorized as congruency, three-dimensional symmetries and broken symmetry (Wynn 2002). An example of the latter is the twisted profile handaxes that first appear ca. 350 kya. Wynn poses the question as to why symmetry would have been imposed and queries whether it might be connected with mate selection, a hypothesis also advocated by Kohn and Mithen (1999) but which ultimately rests on an untestable psychological basis.

Signifiers of regional identity

Lithic assemblages have often been held up as representative of cultural and ethnic entities, through either *in situ* cultural evolution or population movements into new niches permitted by the expansion of existing or development of new repertoires. Illustrative of this is the distribution patterns across the landscape of the Lupemban industry, dated to c. 270 kya (Barham 2001), particularly in relation to the prior Acheulian and Sangoan site patterns.

Increasing evidence has been put forward by Lawrence Barham for the Lupemban industry exhibiting a cognitive, technological and adaptive sophistication not witnessed previously (Barham 2000, 2002). Utilising environmental reconstructions, it is claimed that while the Sangoan exhibits a resemblance in distributional patterns to the Acheulian, there was an important difference which contributed to the emerging pattern that was to become the Lupemban industry: the Sangoan sites are generally found in habitats of higher productivity (Barham 2001). This hypothesis holds that the loosening of ties to waterways and lakes permitted the subsequent knappers of the Lupemban industry to expand into and inhabit the Congo basin which, in the paleoenvironmental reconstruction (Barham 2001, 77), was forested.

Barham builds on the work done at Kalambo Falls (Clark et al. 2001), and his own work at Mumbwa Caves and Twin Rivers, to plot the known distribution of Lupemban sites over maps of the paleoenvironmental reconstruction of central Africa. The resultant model takes into account the glacial/interglacial cycles of African biogeography as well as lithic assemblage distribution mappings of 36 years ago (Clark 1967). The problems within the model are manifest and raise serious concerns over both its accuracy and the conclusions drawn from it, namely that the central African rain forest was occupied at the time of the Lupemban.

Although climatic fluctuations can be deduced from the Congo fan deposits, these deposits do not extend beyond 200 kya (Barham 2001). Neither do there exist reconstructions of climatic sequences from the internal Congo basin itself. While it is claimed that Lupemban sites existed in closed forests in Equatorial Guinea, through marine pollen profiles, more precise analyses are required for local areas and from the sites in question.

Barham (2001) claims that the Lupemban industry reflects a new composite stone tool technology: backed blades and segments, bifacial lanceolates, notched bifacial points and tranchets. These, according to his hypothesis, are the tools of a specialized hunting and gathering culture with the technological and social capabilities of extracting the nutritional requirements from closed canopy plant and animal resources.

Although Barham (2001) recognises the economic arguments brought to bear against an early occupation of the rain forests of central Africa, he fails to adequately address the concerns. The nutritional values of plant and animal resources in closed canopy forests are such that it appears unlikely modern hunter-gatherers occupied closed canopy forested areas for substantial periods of time prior to the latter portion of the LSA (Bailey et al. 1989, Eggert 1992). If this turns out to be correct, then serious questions have to be posed about the viability of hominins occupying and surviving in these environments 270 kya.

Alternative hypotheses are required to be formulated which do not relate the Lupemban composite assemblage to a new cultural, and possibly ethnic, grouping adapted to survival in forested and semi-forested environments. More profitable lines of inquiry may look at how the Lupemban was adapted to savannah and semi-woodland areas, the variability in inter-site assemblages and how the composition of this expression could be compared culturally and technologically with contemporary and later variable compositions.

Still Bay sites are only found in sub-Saharan Africa and are predominantly along the East Cape south coast. The dating of the Still Bay industry has long been an unanswered question in southern African archaeology. The results of radiocarbon dating on charcoal and shell from the Still Bay levels at Blombos Cave, on the southern Cape coast of South Africa, should be considered as infinite dates. Recent luminescence dates suggest an age of c. 100 kya for the earliest MSA layer, BBC 3 (Vogel et al. 1999). As illustrated in Figure 1, the Still Bay points come from the BBC 1 phase which underlies a sand dune layer dated by optically stimulated luminescence to c. 70 kya (Jacobs et al. 2003).

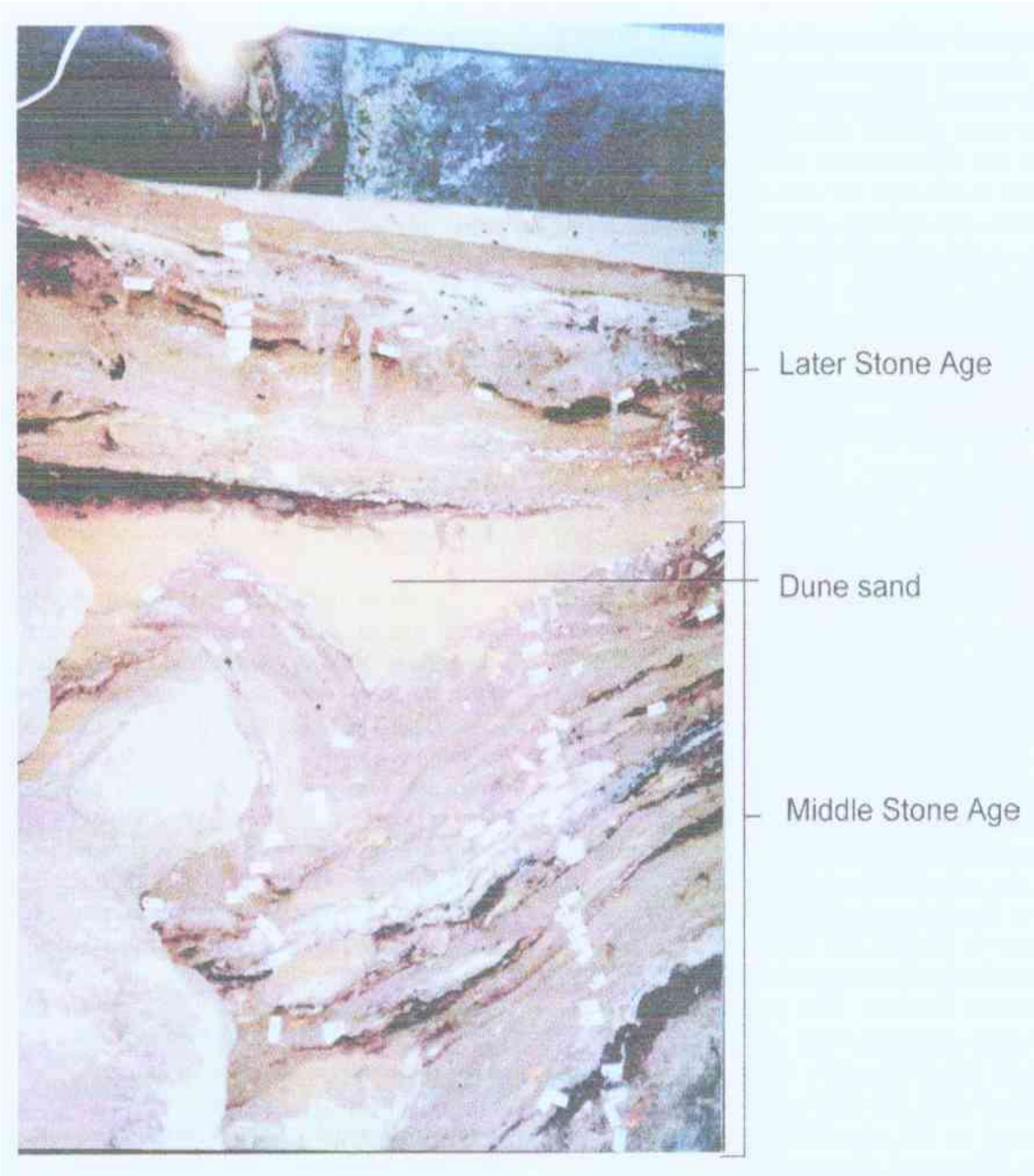

Figure 1. The stratigraphic sequence at Blombos Cave. *From (Jacobs et al. 2003, 601)*

The diagnostic feature of the Still Bay industry is the leaf-shaped, bifacially retouched point (Henshilwood et al. 2001, 444), suggested to have been used as a spearhead. The primary raw material utilized was silcrete. Its length can vary from two to three centimetres to the very large "Blombos point". Deacon (1999) has suggested that this assemblage is indicative of craft specialisation, because its function as a hunting spear point could possibly have been better served had the points been smaller. This hypothesis therefore accords stylistic symbolism to the artifacts through regarding "the Still Bay as a technological and social entity… [sharing] a number of traits with the Howiesons Poort [assemblages in southern Africa] in terms of raw material preferences, specialized technology and distinctive tool type. The Still Bay provides evidence, additional to that of the Howiesons Poort, for a period of social and stylistic elaboration within the southern African MSA." (Henshilwood et al. 2001, 445)

Integration of the environment and behavioural patterns

Although there are no Mode 3 occurrences in Africa, and thus no African antecedent for the European Upper Palaeolithic, certain viewpoints grew up around the question of the perceived lack of variation and change in the MSA. These are problematic from the viewpoint of the temporality and compositional significance of the Howiesons Poort industry in southern Africa. No site has been more central to the development of the debate than Klasies River.

Klasies River is situated on the southern-east coast of South Africa. The site is comprised of five MSA and one Holocene deposits from caves 1, 1A, 1B, 1C and 2 (see Figure 2).

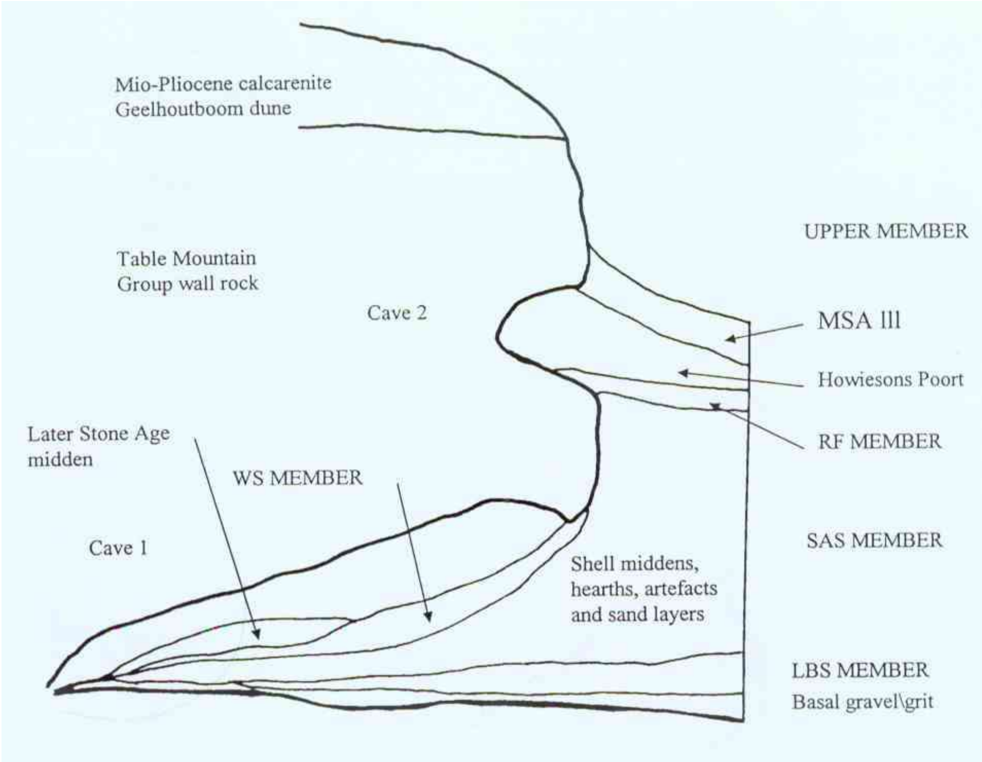

Figure 2. The depositional sequences at Klasies River. *From (Wurz 1997, 28)*

Oxygen isotopic analyses and uranium disequilibrium dating place the basal layer in correlation with MIS (Marine Isotope Stage) 5e (Deacon and Geleijnse 1988). It has been proposed that the SAS member (MSA I and II) is in the region of 90 kya and the Upper Member (MSA III and IV) no less than 50 kya, thus out of the range of radiocarbon techniques (Grun et al. 1990). Contra Parkington (1990) who hypothesized that southern African Howiesons Poort assemblages may also post-date 50 kya, the Howiesons Poort layer is underlain and overlaid by MSA II and III respectively. The Howiesons Poort is generally correlated with MIS 5a and 4, the boundary of which is estimated at around 74 kya (Deacon and Geleijnse 1988).

Retouched blades were Clark's *fossile directeur* for Mode 3. Yet although blades are one of the main characteristics of the MSA and backed artifacts of the Howiesons Poort, neither should be viewed as anticipating the advent of a lithic assemblage on a separate continent. In the case of the Howiesons Poort, there is up to 25 kya in time between it and the Aurignacian.

The changes in the technological composition of the MSA lithic assemblages at Klasies River prompted the original excavators to revive the old demon of simplistic migratory-lithic equations (Singer and Wymer 1982, 114):

> "If industrial development reflects cultural evolution, it must be concluded that the first part, possibly half, of the long sequence represents a static society, even if a successful one. The arrival of the Howieson's Poort Industry suggests a new people with different traditions and a manner of life alien to the earlier occupants of the site, who disappear until the site was vacated by the intruders. The later MSA stages show minor differences which may be the result of some connection with the Howieson's Poort."

The correlation of the Klasies River MSA sequences with periods of changing environmental conditions, and the changing assemblage compositions, led Ambrose and Lorenz (1990) to propose an ecological deterministic model of changing social conditions. Through analyses of resource structure, they claimed that the MSA inhabitants failed to respond to the changing environmental conditions in the same flexible patterns as their Holocene counterparts. These results indicated that their socio-territorial and technological systems were determined solely by the resource ranges available for exploitation with the least energy output (Ambrose and Lorenz 1990).

While recognising that the environmental stress caused by ecological changes at the start of the Howiesons Poort led to the increased resource ranges postulated by Ambrose and Lorenz (1990), their hypothesis fails to explain why access to new raw materials would automatically result in the advent of new stone tool artifacts. In order for their functionalist ecological hypothesis to account for these new artifacts, Ambrose and Lorenz would be required to "ascertain for every concrete case the causal chain which linked the initial natural impetus and the resultant cultural transformation" (Vishnyatsky 1994, 138).

Hilary Deacon has launched a scathing attack on the ecological functionalist model by proposing a structuralist alternative whereby the environmental stresses placed on the Howiesons Poort occupants resulted in attempts to maintain previously existing social structures and populations levels. Instead of adapting to nature, they modified their behaviour. Remnants of their adaptation can be found through examination of their stone artifacts in functional terms. He concludes, through analogies with backed artifacts from the southern African Wilton assemblages (8 – 4 kya), that the backed segments and trapezes are best regarded as hafted projectile points used in hunting (Deacon 1995); this analogy has subsequently been weakened by microwear and experimental analyses suggestive of the Wilton segments being components of knives instead of functioning as arrowheads (Wadley and Binneman 1995). The MSA backed pieces are larger and were more likely to have been spear points and barbs. Ethnographic writings on the Bushmen record that projectile points carry both stylistic and social meaning, marking social and linguist groups, and are used as exchange gifts. The appearance of backed artifacts in the Howiesons Poort is, therefore, viewed as an attempt by the toolmakers to mark out social boundaries and the intensification of social networks under a period of environmental duress. As the climatic conditions improved towards the onset of the MSA III, the factors that influenced this cultural selection for a high level of symbolic behaviour therefore gradually fell away (Deacon 1989).

The challenge posed by Deacon's generalised hypothesis was taken up by Sarah Wurz who, in 1995, took a random surface sample of Howiesons Poort artifacts from Cave 2. Comparisons were made with the 1968 Cave 1A top cutting (119 336 artifacts) sample (KR1A-68) of Singer & Wymer by utilising the use of the same major typological categories: waste, utilised pieces or edge-damaged pieces and formal artifacts (Wurz 1999).

Lindly & Clark (1990) theorise that the continuous lithic industries reveal no evidence of stylistic patterning over time; they concede that the Howiesons Poort layers (Layers 10-21 of Shelter 1A) demonstrate a shift in the MSA to retouched stone tools. However, they make no reference to a recent technological and typological analysis of the MSA II stage at Klasies River Mouth, conducted by Thackeray and Kelly (1988), that concludes the finished product does not necessarily represent they way things are in practice, but rather the way things should be ideally.

Howiesons Poort blades occur in greater frequency than their typical MSA predecessors and descendants, 17.44% versus 0.98% (Wurz 1999). There is also a lack of retouched and utilised artifacts. The backed artifacts have previously been suggested by Thackeray (1992) to be less standardised than their Later Stone Age counterparts, a conclusion countered by Wurz (1997). The variation coefficient obtained falls within that recorded for the LSA, demonstrating the backed artifacts from the Howiesons Poort and the Later Stone Age were designed with a comparable mental construct in mind of their shape parameters (Wurz 1999). Backed artifacts from the MSA Howiesons Poort and the Later Stone Age Wilton are design types of the same kind, although the Howiesons Poort backed artifacts range from two to three times their size (Wurz 1999).

Strengthening Deacon's argument, Wurz draws parallel between demonstrable archaeological and ethnographic usage of backed artifacts as projectiles. Amongst the Bushmen these projectiles are imbued with symbolism (Wiessner 1983). Projectiles can take many possible forms and therefore the form chosen during the Howiesons Poort was a material action of choice governed by social rules and by extension was a form of modern behaviour (Wurz 1999).

By comparing the raw material samples of KR2-1995 and KR1A-68 in terms of quartzite and non-local rock occurrences, Wurz (1997) determined that a marked difference is evident in the raw material composition. Around 27% of its Howiesons Poort artifacts were manufactured from non-quartzite (and consequently non-local) raw materials (Wurz 1999). By contrast the unbiased KR2-95 is comprised of 4% non-quartzite artifacts, with a high percentage (39%) of the retouched artifacts made from these materials. A high degree of selection is therefore present in the choice of raw materials.

Wurz used the analytical *chaine operatoire* approach in analysing the choice of raw materials by the Klasies River people for their stone tools. Non-quartzite materials increase in numbers only in the middle stages of the Howiesons Poort, before again falling to low levels (Wurz 1997, 1999). It is doubtful whether the sources for the raw materials changed significantly over time, if at all, and therefore Wurz (1997, 1999) attributes these raw material changes to conscious choices.

Wurz (1997) analysed the backed artifacts in terms of segments (crescents), intermediates and trapezes to determine whether a relationship could be established between the form and extent of backing, and the resulting artifact. The waste materials are also regarded as by-products from the main design of shaping cores for the removal of blanks. Consequently, the production and subsequent utilisation of backed artifacts were likely to have been the result of decisive decision-making and deliberate steps taken. Wurz (1999: 42) states, “The decision steps that are part of this operational sequence are the acquisition of raw material, the techniques used to produce the distinctive blade blanks, blank selection and the production and use of the backed artifacts.”

Discussion

The sites of Kapthurin and Herto exemplify warnings (Mehlman 1991) about utilising typology uncritically as chronology. The mixture of the typologies in the lithic assemblages over a period of time in excess of 100 kya is a timely reminder that a direct correlation between typology and a set chronological timeframe is an uneasy and an increasingly naïve assertion. While the revised mode hypothesis of Lahr and Foley (2001) recognises that elements of previous modes can continue to exist, the mixing of the Herto assemblage is on a greater scale than has previously been envisaged. Kapthurin poses a particular problem to Clark (1977), and Foley and Lahr (1997), as the assumptions of progress inherent within mode model did not take into account the mix of technological strategies that were employed.

It is therefore questionable whether the onset of Mode 2 is indicative of hominins having developed the ability to impose symmetry upon a stone tool or whether it was an extension of the process of tool reduction developing out of the Oldowan, Mode 1. It would be unwise to postulate a single purpose and function for Acheulian bifaces that flourished and evolved over 1.5 million years, and single purpose ideas such as sexual selection are untestable. It is more likely that the current opposing models of symmetry and reduction sequences are disguising real temporal and productive variations, which require greater chronological and stratigraphic control over the source sites to elucidate. The sequences involved are complex and varied and what is visible is the by-product of that variability, variability that itself might have changed over the course of hundreds of thousands of years. This changing variability is most vivid in the late Acheulian within the transitional period to the MSA, with Acheulian handaxes being knapped by the Levallois method.

The variability of the new MSA assemblages has led to hypotheses over cultural markings and new population settlement patterns. A recent hypothesis by Barham (2001) regarding the occupation of closed canopy forests in Central Africa is questionable on the grounds of nutritional deficiencies of rainforest resources and on the low level of climatic resolution available. Questionable too is Lahr and Foley's (2001) linkage of the appearance of the new technology with the advent of a new *Homo* species, *Homo helmei*, thus linking anatomy with technology and culture. The weaknesses in this spread of hypothesised new adaptation abilities added by a new technology driven by a new *Homo* species is highlighted not only because of the controversial taxonomic nature of the proposed species but also because "technologies might transfer between distinct populations or even different species … [and] because the time and [precise] place of origin of prepared core technologies are currently unknown" (Stringer 2002, 567).

The Klasies River MSA I and II assemblages date to the last interglacial but, contra the expectations of the Ambrose and Lorenz (1990, 24-25), there are important differences in their composition. MSA I follows a blade production strategy, with the MSA II a Levallois-like point manufacture. These lead into the Howiesons Poort via a tendency towards smaller blades in the upper MSA II sequence (Wurz 2002, 1011). This cuts across Ambrose and Lorenz's (1990) simplistic technological-ecological indicator models, undermines Parkington's (1990) use of the Howiesons Poort as a transitional phase to the LSA, negates Singer and Wymer's (1982) use of the Howiesons Poort for the arrival of new ethnic inhabitant and is a powerful indicator of changing cultural traditions which are reflected in the compositional make-up of the assemblages.

Ambrose and Lorenz (1990) see the Howiesons Poort occurrence as an adaptive response to environmental pressures that resulted in mobility pattern changes and the procurement of higher-quality raw materials for their stone tools. This viewpoint therefore presupposes that the technological changes are not related to stylistic preferences and expressions. To say that the environment determined their responses ignores the mental processes behind the conscious choices involved in making the changes they did. The Klasies inhabitants, for example, had perfectly good quartzite raw material available on the beaches, yet during the Howiesons Poort they imported silcrete from 20 km away to manufacture the backed tools (Wurz 1997). The manufacture of the Howiesons Poort artifacts was, therefore, more likely to have been governed by social rules.

Deacon (1999) has proposed that the Still Bay is an example of a MSA craft specialisation industry. Blombos and Klasies River are not a large distance apart, which suggests that the Klasies River inhabitants did indeed have access to such knowledge but made a cultural choice not to utilise it. Deacon suggests that craft specialisation resulted in reciprocal trading, but it still remains to be determined first whether the Still Bay industry is indeed a form of craft specialisation. What is clear is that the Still Bay industry points do not make for better spear points than other smaller bifacial tools, and this may have had something to do with a symbolic value being attached to them.

Conclusion

From before, but especially after, the publication of *Stone Age Cultures in South Africa*, African archaeologists have been increasingly concerned with typology. Cemented in Clark's lithic Modes, these typologies fostered a belief in a progressive lineage of lithic assemblages in Africa and contributed in particular to the Howiesons Poort being viewed as a transitional phenomenon to the LSA.

The Acheulian handaxes have been used as settlement markers in relation to their quarries and indicative of riverine resources at Seacow Valley. Kapthurin and

Herto have mixed Acheulian and MSA industries, and together span of ca. 150 000 years which also covers the period in which the Lupemban is probably inaccurately claimed to have penetrated the central African forests. The changing nature of the manufacturing process of the Acheulian handaxes, the composition of the Lupemban industry and the changing compositional nature of the MSA industries at Klasies River are suggestive of evolving cognitive abilities that are most prominently expressed in the Howiesons Poort. Although environmental factors would have influenced the territorial ranges of the MSA peoples, conscious choices were made in the choice of raw materials for their stone tools.

The untidy transition from the Acheulian to the MSA, the appearance of the regional Still Bay industry at Blombos and the integrity of the MSA at Klasies River, are strong arguments against simplistic lithic Mode and cognitive-environmental proposals. The innovation in the Still Bay and the Howiesons Poort, while maintaining lithic patterned links to the preceding and later MSA assemblages, demonstrates the folly of naively linking new lithic expressions to incoming migrants possessing a different culture; this is paralleled in the caution over linking the Lupemban to new cultural adaptations by a new *Homo* species on the basis of weak data.

Sophisticated regional models are required, taking into account the full range of technological, faunal, geological and taphonomic processes. These new models must incorporate variable cultural expressions, constrained adaptations to changing environmental conditions in terms of the existing cultural and social repertoire of the inhabitants, and the desire to link form to function when such linkages should be inferred from the data rather than attributed to it and thus constrain it technologically and temporally.

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