

## CHAPTER 10

# COASTAL DIET, ENCEPHALIZATION, AND INNOVATIVE BEHAVIORS IN THE LATE MIDDLE STONE AGE OF SOUTHERN AFRICA

John Parkington

### INTRODUCTION

Some 35 years ago, Desmond Clark (1975) predicted that Africa was in the process of moving from peripheral to paramount in the narrative of human evolution. Nowhere has this been more dramatically vindicated than in the arena of modern human origins and in the region of southern Africa. It is now quite clear that in terms of the appearance of our species, Africa is no laggard but inarguably leader. How has this rethinking come about and what is the current understanding of the role of Africa, specifically southern Africa, in the topical debates around the emergence of anatomically and behaviorally modern people? What are the emergent patterns in the late mid-Pleistocene and early Late Pleistocene archaeology of this area? More specifically, how are dietary choices, technological innovations and arguably symbolic manifestations seen as related in the appearance of people modern behaviorally as well as anatomically?

As recently as the 1970s, the hominin cranium and postcranial fragments from Kabwe (formerly Broken Hill) in Zambia were considered Neanderthal-like (see Klein's 1973 account). They were unprofessionally excavated, had little context, and may have been associated with Middle Stone Age (MSA) stone tools. At that time, the transition from MSA to Later Stone Age (LSA) artifacts in southern Africa was regarded as late, perhaps as late as 15,000 years ago, far more recent than the supposedly similar transition from Middle to Upper Paleolithic in Europe. These now discredited views allowed non-African archaeologists to present southern Africa as a backwater housing late-surviving archaic hominins and their stone tools long after the creative explosion of *Homo sapiens*, paleolithic art, and advanced blade and burin assemblages in Europe. Few expressed alternative views, though Peter Beaumont and John Vogel pioneered the position that *H. sapiens* had, in fact, first appeared on the plains of southern Africa, another prophetic if slightly unfocused view (Beaumont and Vogel, 1972a,b).

It is perhaps not surprising that so soon after the first shift toward political independence in sub-Saharan Africa, European achievements were expected to precede similar developments elsewhere. The technological and artistic flowering of Upper Paleolithic hunter-gatherer innovations was taken to reflect the sudden emergence of "people like us."

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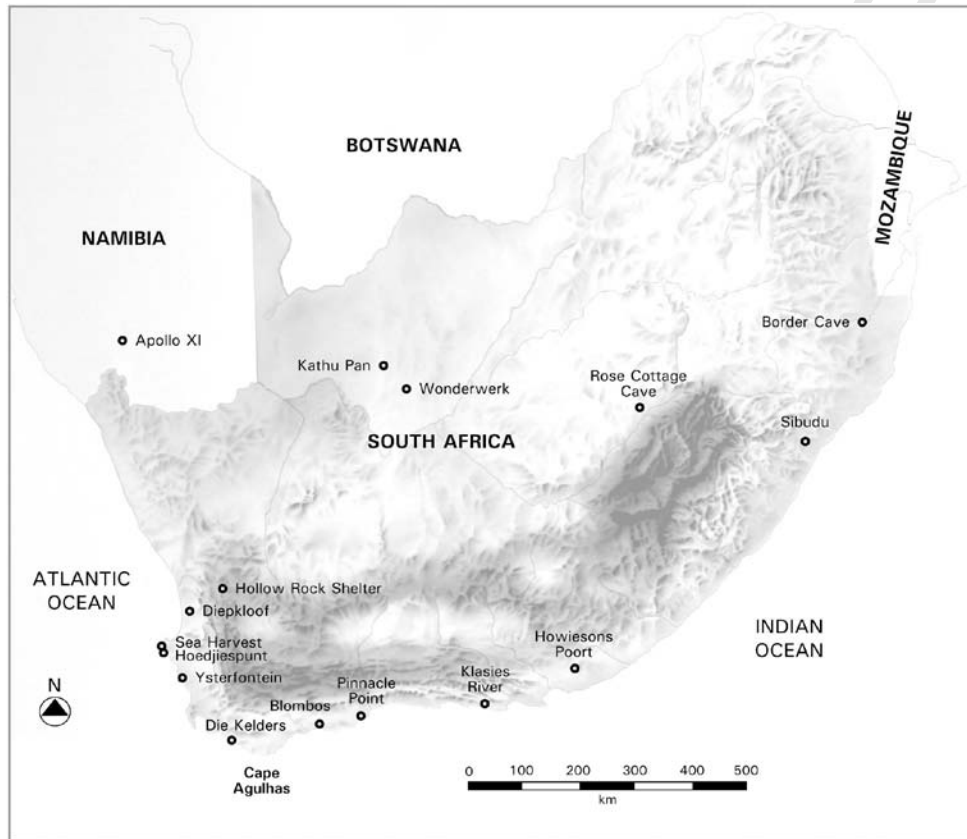
Often presented as a package of biologic and cultural features, this manifestation included the earliest *H. sapiens* in the form of Cro-Magnon skeletons; sophisticated blade and burin stone tool assemblages made with innovative punch struck techniques, later known as Mode 4 in the Graham Clarke scheme (Clarke, 1989); an array of decorative and decorated objects in stone or, more often, organic raw materials, including the earliest unquestioned portable and parietal art; and an abundance of shaped and perforated objects clearly intended as ornaments. Despite the recognition among some authorities that this apparent package appeared too suddenly to have arisen in the region, the external origin of these innovative behaviors was not emphasized. Nor was the narrative of the accretion of individual traits within the package systematically attempted, so poor was the evidence in potential source areas.

With the advantage of a much better archaeological record, I develop here a synthesis that identifies a range of innovative behaviors from southern Africa that far predate the European Upper Paleolithic, link them to the early appearance of fully modern people and associate both with a shift toward more regular and systematic exploitation of coastal resources. Our chronology for these phenomena is improving rapidly and will increasingly allow us to test the viability of the connections I propose.

## CHANGES

Things began to look somewhat different soon after this, prompted in large part by the excavations at the sites near Klasies River (for sites mentioned in the text, see Fig. 10.1) in the late 1960s and subsequent publication of the analyses in 1982 (Singer and Wymer, 1982). This fieldwork showed a deep sequence of about 20m of MSA assemblages housed in a shellfish-rich depositional matrix with interesting technological patterns and extremely important human skeletal associations. With a substantial number of radiocarbon dates near the top of this stack of shell middens, many of them infinite, it became clear that the whole of the MSA, at least here, was beyond the range of this technique. The apparent temporal dislocations of the Early Stone Age (ESA) to MSA and MSA to LSA transitions from the European equivalents of Lower to Middle and Middle to Upper Paleolithic were revealed as the result of reliance on early and spuriously finite radiocarbon dates. In particular, it was recognized that the MSA was contemporary with the Middle Paleolithic, which it closely resembles, and that Africa was at least as developed as Europe throughout the first half of the Late Pleistocene. The termination of MSA and Middle Paleolithic was more or less contemporary at approximately 35,000 years ago.

A new technique would be needed to date both Middle Paleolithic and MSA sites. John Vogel had the vision to invite to southern Africa in the mid-1980s a group of luminescence dating experts, an initiative that has resulted in a much improved chronology. After some technical innovations, the method of single-grain optically stimulated luminescence (OSL) has become one of the industry standards for dating MSA assemblages (Jacobs et al., 2008). By this procedure, anomalous grains that do not reflect the depositional events contemporary with MSA toolmaking can be rejected. Another method, not yet showing the tight distribution of age estimates claimed for OSL (see Tribolo et al., 2008), is the dating of burnt siliceous stone artifacts by thermoluminescence (TL). The transitions of ESA to MSA and Lower to Middle Paleolithic are still somewhat loosely dated and even more poorly understood, but the MSA now stands contemporary with the Middle Paleolithic, lasting from about 250,000 years ago to about 35,000 years ago, and southern Africa no longer appears technologically behind. Quite the contrary, as we will see.



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Figure 10.1 The distribution of key Middle Stone Age sites mentioned in the text. Illustration is created by and a copyright of Neil Rusch.

Alongside this has been the reevaluation of the sparse but valuable human skeletal record for the middle and Late Pleistocene of southern Africa. All reference to “Neanderthal-like” characteristics have been expunged, and the record from the early remains at Kabwe, Bodo, and Elandsfontein through Florisbad and Hoedjiespunt and on to the fragments from Klasies River, Die Kelders, Border Cave, Sea Harvest, and Blombos, all of these latter associated with MSA stone tools, is now described as a clear trend toward anatomically modern *H. sapiens* (Klein, 1999). Although the paucity of specimens leaves much to be desired and the contemporary morphological variability remains to be explained, the transition through the late Middle and early Late Pleistocene toward “people like us” stands in stark contrast to the contemporary shift toward Neanderthal morphology in Europe. What also stands out is the fact that anatomical modernity, however poorly defined, emerged between the early MSA at Florisbad, described as knocking on the door of modernity (Grun et al., 1996), and the late MSA at Klasies River, almost universally termed modern (Rightmire and Deacon, 1991, 2001). The accepted date for the Florisbad skeletal material is about 260,000 years (Grun et al., 1996) and for the bulk of the Klasies River skeletal remains about 110,000 years (Deacon, 2008). We apparently became us during the MSA, but not during the Middle Paleolithic, in Africa and not in Europe, almost certainly between these dates.

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Other biologic issues remain less clear. Because of the poverty of the fossil record, the recognition and thus explanation of a possible speciation event in Africa, perhaps from *Homo rhodesiensis* (or *heidelbergensis*, or *helmei*) to *H. sapiens* remains elusive. Given the evidence, it is very difficult to distinguish a long slow transition from any abrupt event. The contribution of genetics has obviously had a great influence on the search for modern human origins in sub-Saharan Africa (since Cann et al., 1987). However, the integration of morphological patterns in a small, invaluable skeletal sample with genetic patterns drawn from a massive but essentially modern survey remains somewhat unresolved. Nonselective genetic features and skeletal morphologies are telling two different stories. Despite general agreement that she was an African, need the putative Eve, mother of us all, have been morphologically modern? Most frustratingly, what was driving the transition toward anatomically modern populations in Africa? By general consensus, encephalization is the defining character of terminal Pleistocene and Holocene people (Martin, 1983; Ruff et al., 1997), lifting them out of the mammalian matrix from which they derive; but when and at what rate did this encephalization arise? With so few complete crania, so few of them contemporary with one another and so infrequently associated with substantially complete postcranial remains, we can hardly hope to map the march to encephalization. Samples of associated and reliable estimates of brain and body weights are embarrassingly rare. This is a great pity as encephalization is patently the bridge between the biologic and the behavioral (Parkington, 2001a) that we are looking for.

Klasies River generated, or perhaps clarified, some other key realizations. Housed within this set of stratified stone tool assemblages were those known as Howiesons Poort (hereafter HP), named from their first discovery at the small rock shelter also in the southern Cape not far to the east (Singer and Wymer, 1982; Deacon, J., 1995). Because of their perceived advanced character (they had ribbon-like blades struck from single or opposed platform cores, a preference for fine-grained stone raw materials and were marked by relatively high frequencies of backed, geometric-shaped segments), HP assemblages were expected to form a transition to the LSA assemblages of the Holocene. Some late LSA assemblages also have backed segments, though they are much smaller and struck from different kinds of cores. Interestingly, burins were noted at the type site, at Klasies River (Singer and Wymer, 1982) and in subsequent descriptions of HP assemblages (e.g., Vogelsang, 1998). The Klasies River stratigraphy showed, however, that HP assemblages were followed as well as preceded by “normal” MSA assemblages with a preference for triangular flake production based on radial or, occasionally, Levallois cores, and a lesser interest in the finer-grained raw materials (Wurz, 2005, 2008). At about the same time, Peter Beaumont’s excavations at Border Cave in the northeastern part of southern Africa confirmed the position of the HP within and not atop the MSA sequence (Beaumont et al., 1978). The HP, in other words, appeared to be an innovative blip in the MSA. The nature of this stone tool innovativeness is interesting as it highlights the production of blades and, albeit infrequently, burins.

Another innovative manifestation in the MSA, surprisingly not reflected in the Klasies River sites, is the Still Bay assemblage type (hereafter SB). Like the HP, it seemed often to occur as the only assemblage type at a site, making it difficult to place within the range of MSA variability. The innovation of the SB, at least in the domain of stone tool technology, lies in the production of bifacially flaked leaf points. With an increase in excavated sites, it has emerged that the SB precedes the HP but not by very long (Rigaud et al., 2006; Wadley, 2007). A recent subcontinent wide survey using single-grain OSL (Jacobs et al., 2008) suggested that HP assemblages date between 60,000 and 65,000 years and that SB assemblages date between 70,000 and 75,000 years, though the claim is that the durations may in fact be less than 5000 years each. If, as many believe, the MSA began

at least 250,000 years ago (Klein, 1999), then these innovative assemblage types mark the late but not, intriguingly, the latest phase of a long period of stone tool production based on flake, not blade manufacture. What attracted many European archaeologists to the HP in particular was the recognition of their Mode 4-like character at a time well before the earliest date of the Upper Paleolithic (see, e.g., Mellars, 2006).

It might be helpful to distinguish here the terms innovative and precocious. By precocious we would imply that artifact-making habits appear early and preempt or prefigure later developments. The fact is that neither the HP nor the SB is precocious in the sense of anticipating local early LSA stone toolmaking patterns. The earliest assemblages generally ascribed to the LSA in southern Africa are very informal collections dominated by the use of bipolar cores with extremely low frequencies of formally retouched artifacts, most of them made on tiny bladelets (Mitchell, 2002). In the Cape, at least, they are heavily dominated by quartz and seem difficult to relate to any MSA assemblage types. Ironically, if the HP anticipates anything, it is the Mode 4 assemblages of the European Upper Paleolithic. Innovative, in contrast, implies something new, something rarely if ever seen before. This would not be an unreasonable description of the segments and other backed tools of the HP or the bifacial points of the SB. It might also be a term realistically applied to the soft hammer produced blades of the HP, which differ in dimensions and production character from earlier blades and flake blades of the MSA and even ESA (Rigaud et al., 2006).

Even more innovative than the decisions about stone tool production are the non-stone associations of HP and SB assemblages. Although not so clearly expressed at Klasies River, these innovations have rightly made headlines at Blombos (Henshilwood et al., 2002, 2004), Diepkloof (Parkington et al., 2005; Rigaud et al., 2006; Porraz et al., 2008; Tribolo et al., 2008), and Sibudu (Wadley, 2007, 2008) where they have further distinguished the HP and SB from underlying and overlying MSA assemblages. Blombos has no HP assemblages but does have a series of SB assemblages with no MSA above them but plenty below (Jacobs et al., 2006). All are older than 70,000 years. Despite initial reservations by some, the bifacial points here are clearly associated with large numbers of ochre fragments – several of them marked, substantial numbers of perforated tick shell beads and a few, quite persuasively shaped, bone tools. All of these are innovative in the sense defined above and arguably precocious in a global context. Diepkloof has produced, along with a good deal of beveled and striated ochre, a large number of marked fragments of ostrich eggshell, some of them perforated as water-containing and storage flasks, definitively associated with HP artifacts. All are older than 63,000 years. Diepkloof and Sibudu are significant in demonstrating unequivocally the stratification of HP on top of SB assemblages, a sequence previously suspected at other sites in the subregion. Sibudu has produced worked pieces of ochre and perforated tick shell beads from SB assemblages. These are older than 60,000 years. Most of these finds are the earliest widely accepted occurrences of such things in archaeological assemblages anywhere.

Apart from a possible burial of an infant at Border Cave (Beaumont et al., 1978), possible because of some doubts as to its age (Sillen and Morris, 1996), there are no claims for regular intentional burials among later MSA people. Quite the contrary, but no less interesting, the scattered fragments from Klasies River have been interpreted as reflecting cannibalism, arguably a ritual rather than dietary practice as so often among much later societies (White, 1987; Deacon and Deacon, 1999). Symbolism is often cited as the underlying characteristic of these innovations, and most authorities are tempted to implicate language as an implicit but unconfirmed enabling framework. Without language, it is said, how could common readings of symbols be guaranteed? Thus, HP and SB people make extensive use of pigments made from ochre to denote the concept of blood, or even life,

to distinguish individuals by the wearing of personal ornaments, to mark ownership of objects by adding designs that differentiate mine from yours, and to reflect beliefs in death and what follows by deliberate interment. In short, in Donald's (1991) terms, they are communicating by making and marking the external world with mutually intelligible signs and symbols.

A useful connecting framework may be Wurz's (2008) suggestion of memory. All the innovative behaviors listed above leave tangible and lasting traces in the immediate surroundings of the makers, users, and their kin, which serve to materialize common experiences and underline common values. The surroundings, from immediate to regional, have now become landscapes marked with material items linking times, places, and people. We have no way of being sure that earlier MSA, even ESA, groups did not also do this with more subtle, less enigmatically modified objects. The increased incidence of artifacts charged with meaning, however, apparently beyond the functional and utilitarian realms, is persuasive. This is particularly important, perhaps, because this arguably symbolic innovativeness appears to coincide with the stone tool innovations of the SB and HP and, to judge by the records at Diepkloof and Sibudu, to disappear along with them before the end of the MSA. Indeed, in the emerging picture of MSA traditions in southern Africa, it is the disappearance as much as the appearance of innovations that surprises us.

These behaviors are embedded, of course, in a hunting and gathering context that needs to be understood. For some time, Richard Klein (Klein and Cruz-Urbe, 1996) commented on differences in hunting and gathering practices he sees between MSA and LSA people, as reflected in the faunal records of southern African sites. Constrained by the availability of evidence, his comparisons usually contrast Holocene LSA with much earlier MSA, sometimes including HP or SB assemblages. His assertions that Holocene and Marine Isotope Stage 5 (MIS5) practices differ are strong, but not undisputed. There may very well be robust differences in hunting choices or gathering decisions from 120,000 years ago to the recent past, and these are quite likely to be related to technological advances, increased population densities, and resultant prey selection, as some have argued (Marean, 2009). What does emerge, however, is the key role played by coastal resource use in the diets of MSA people in southern Africa, especially in the later MSA.

To situate coastal MSA sites such as Klasies River, Die Kelders, Blombos, and the Pinnacle Point caves, and even the near coastal Diepkloof and Sibudu, we need to understand MSA site distributions across the subcontinent. There are thousands of known MSA sites, almost all of them open sites, all except a miniscule fragment undated and barely described. With extremely few exceptions (Kathu Pan and Wonderwerk in Beaumont and Morris, 1990, come to mind), every one of the HP and almost all SB sites are located on or near the present coastline or in the near coastal mountain chains. A very significant proportion of MSA sites that are not HP or SB, on the other hand, all undated, is located well away from the coast. Although some SB and, less clearly, HP sites are in the open, the majority is located in caves and rock shelters. In this sense, HP and SB groups were precocious in that they anticipated the local LSA preference for rocky outcrops and some kind of sheltered overhang within them. ESA and, we might add, earlier MSA sites are usually located along pan edges or stream courses, whereas LSA people certainly, and later MSA people arguably, were more drawn to rocky terrain. Clearly, we are disadvantaged by the loss of land and sites to the Late Pleistocene rise in sea level (Fig. 10.2), but it is not simply the archaeologists' preferences that have determined a near coastal distribution for SB, HP, and early LSA occupation.

The abundance of shell midden sites from MIS5 and, perhaps, earlier (Parkington, 2001a; Marean et al., 2007) is a key element in understanding innovation in the late MSA. Since the publication of the Klasies River excavations and that of the more ephemeral

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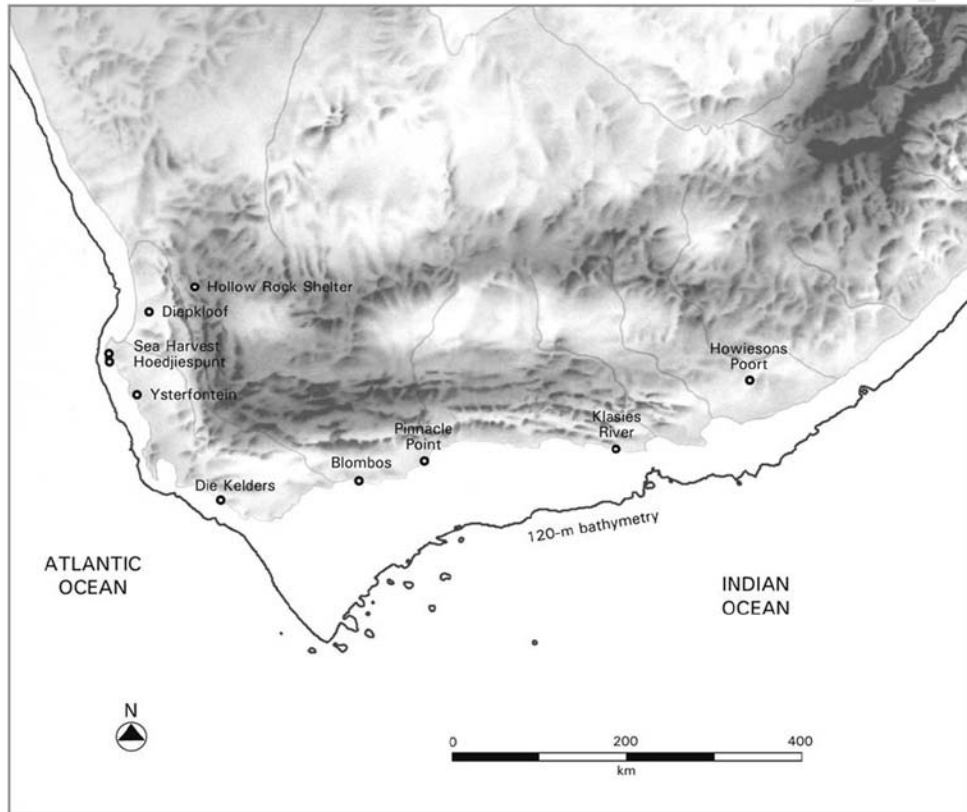


Figure 10.2 Extension of the southern African coastline to the 120-m offshore bathymetric contour. Illustration is created by and a copyright of Neil Rusch. Source data courtesy of the Council for Geoscience.

research at Sea Harvest near Saldanha (Volman, 1978), it has been clear that accumulations of marine food waste dating from Pleistocene high sea level episodes are common along both the Atlantic and Indian Ocean coastlines of southern Africa (Fig. 10.2; see also Parkington et al., 2004). Single-grain OSL and TL dating of these MSA shell middens has shown that they may date from a range of time periods when the coastline was within reach of people located along the present shore, that is, when sea levels were as they are now or a little lower. Uranium series disequilibrium and ESR dating support the assertion that these sites may be as little as 70,000 or as much as 164,000 years old although much more work is needed to obtain accurate as well as precise ages (Klein et al., 2004; Marean et al., 2007; Avery et al., 2008; Jacobs et al., 2008). It is likely that many date from the generally high sea levels of MIS5, which makes them earlier than almost all other shell middens from anywhere else in the world.

So far, no ESA shell middens have been found in southern Africa. It is not clear yet whether this results from poor preservation of early organic materials, the destruction of early shell middens by rising and falling sea level, the failure of archaeologists to detect deeply buried sites, or a real shift in behavioral patterns, an innovation in food gathering habits. There is no lack of activity among archaeologists of the region, and we should soon whittle down these possibilities. Recorded marine food exploitation begins in the MSA well before the appearance of the innovative SB and HP and includes shellfish gathering as well

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as the acquisition, perhaps by scavenging washed up carcasses, of seals, fish, and seabirds. The Pinnacle Point sites date from as early as about 164,000 years ago, in the middle of MIS6. Some foods common in the LSA shell middens, such as crayfish, are not found in the MSA, and some foods appear to have been exploited differently, less intensively.

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Shells are also a feature of some Middle Paleolithic sites in Italy (Stiner, 1994), at Gibraltar (Stringer et al., 2008), and along both Mediterranean and Atlantic coastlines of North Africa (Stringer and Barton, 2008; ~~see also Chapter 7 by Erlandson in this book~~). Here, they are associated with Neanderthal remains and appear to be later than the earliest shell middens from the southernmost parts of the African continent. The intriguing pattern of early shellfish use in the two Mediterranean landscapes of the north and south of Africa is surely not a coincidence and needs comment (see Parkington, 2001a). But first, we need to sketch in the climatic, environmental, and ecological context of the MSA exploitation of marine foods. It should be obvious by now, though, that there are near-coincident, perhaps meaningfully consecutive, innovations in diet, landscape use, stone toolmaking practices, arguably symbolic behavior, and associated shifts toward anatomical modernity within the time range of the southern African MSA. Far from laggard, the region is clearly in the vanguard of “becoming us.” The task now is to describe and understand the process and investigate its extensiveness.

## CLIMATE CHANGE

The two key and substantially correlated environmental changes that characterize the period of MSA tool manufacture are the rise and fall of sea level and the pulsing of aridity that marks the “glacial” phases of the climate cycle (Stokes et al., 1997, 1998; Carto et al., 2009). It is important to note that at present, and presumably in all warmer (“interglacial”) episodes of the last 200,000 years such as the Holocene, only a very small fraction of southern Africa, essentially the southwestern tip, is influenced by winter rainfall. For the most part, the region is under the influence of summer rainfall drawn in from the warm Indian Ocean and decreasing in amount from east to west. Even the extremely arid western half of the subcontinent north of the winter rainfall zone receives its moisture from the east. During warmer episodes, southern Africa would have resembled the landscape of the recent past – arid in the west, moist in the east. The climate history scenarios show, however, that such episodes are much shorter than the cooler times, when much greater areas would have been distinctly unattractive to hunters and gatherers and when the premium on behavioral innovation would have been much greater.

During colder periods, the Indian Ocean was cooler, less moisture was advected from it, the passage of moisture across the eastern continental ranges was impeded, and an extremely extensive aridity set in over almost all of southern Africa. Effectively at these times, the Cape Mediterranean ecosystem, although more extensive, is detached from subtropical Africa, linked only by tenuous connections along the eastern side and offered the chance to drift apart, culturally as well as genetically, from the bulk of the African continent. This is presumably how (and when) Cape Africans became recognizably different linguistically and genetically from their subtropical neighbors. The Cape is, thus, distinguished geologically as the core of the Folded Belt of mountains with characteristically poor soils, but diverse topographic habitats; climatically as the somewhat unrepresentative winter rainfall zone; biologically as the home of the Fynbos Biome, a Mediterranean-type ecosystem, the smallest of the Earth’s six plant kingdoms; and, in human terms, as the origin and core of the San hunter-gatherers with their distinctive physiology, language, and lifestyle.



The sea level history of southern Africa conforms to the global pattern of oscillations in response to the accumulation and release of ice in the polar regions. At the Cape, there is an enormous expanse of continental shelf covered by less than 120 m of seawater, meaning that rising and falling sea levels repetitively submerge and expose some ~~hundreds~~ of thousands of square kilometers of land at what would arguably be the most attractive latitude, substantially enlarging the fynbos landscape at times when the interior further north would have been all but uninhabitable (Fig. 10.2). What is of significance is the timing of the juxtapositions of marine and terrestrial resources and the relationship of these to the behaviors reflected in the archaeological record (Parkington, 2001a, 2005; Marean, 2009).

The Holocene record from excavations around the Cape makes it very clear that the key resources in the Fynbos Biome are the geophytes, underground regenerative organs that are easily the most attractive carbohydrate sources for local hunter-gatherers (Parkington, 2001b). Especially in the west, but wherever rainfall is seasonally uneven, these food parcels are generally small, more or less deeply buried, variably nutritious, and cyclically available in response to the growth regimes of the plants themselves. The edible geophytes are limited to periods after the plants have flowered, when corms develop and then remain dormant until the next growing season. Because the window of edibility is defined by the different, staggered growth cycles of individual species, there is some challenge to gatherers whose carbohydrate energy consumption is largely determined by these hidden but attractive foods. There is a premium on intelligence. The fynbos vegetation is rich in geophytes but very poor in productivity and so has a very low animal carrying capacity. Protein sources along the coastlines would have been especially attractive to gatherers as complementary nutritional contributions to a balanced diet.

The scenario envisaged is one of expansion and contraction of the Fynbos Biome in response to the falling and rising of sea levels. The exposed southern Cape can be seen as an island of some size providing a resource landscape never far from the coast, generating dietary opportunities open to those intellectually capable of understanding the fluctuations in availability and somewhat isolated from regions to the north. The interior in colder periods would have been seasonally unpleasant, though topographically diverse, and perhaps an area visited only in summers from home bases along the contemporary coastline.

Shellfish and geophytes, ~~and~~ protein and carbohydrate food parcels characterized by different but equally challenging cyclic fluctuations in availability provide the selective framework within which gatherers needed to operate and evolve. Hilary Deacon (1995) argued that the well-defined hearths associated with shellfish and what he believed to be humified geophyte remains at Klasies River, are the archaeological residue of this integrated diet, one that survived in the Cape to be well documented by literate travelers of the last three centuries (Parkington, 1984). This pattern, quintessentially San in terms of technology, landscape use, and social relations has lasted, not without modification, from some part of the later MSA. The challenges of buried geophytes and tidally submerged shellfish constitute the dietary reward for capable, strategic gatherers (Parkington, 2001a), an arena in which increased intelligence and planning would have been at a premium.

One critical reward is the acquisition of abundant long-chain fatty acid supplies by the exploitation of shellfish and other marine foods. As described elsewhere (Crawford et al., 1999; Broadhurst et al., 2002; ~~Chapter 3 by Cunnane and Chapter 2 by Crawford in this book~~), encephalization is an expensive investment and requires adequate amounts of nutrients of many kinds. We need to recognize here that encephalization is not simply, or even primarily, the selection for a *larger* brain. Human brains are far more connected, allowing far more simultaneous synaptic linkages, than those of any other mammalian

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species. Such increases in connectivity have been a long-term feature of primate evolution but have reached their peak in our own species. The notion of EQ, the encephalization quotient of Harry Jerison (1973), is a proxy, barely adequate but at least measurable, reflection of the gains in processing capacity that have been made in only the last few hundred thousand years of hominin evolution. In this sense, encephalization is the bridge between biology and behavior, the skeletal structure that reflects a massive increase in planning, forethought, mental agility, and, we might say, the capacity to innovate.

Prominent among requirements for encephalization are the lipids that constitute 60% of all brain matter, more especially docosahexaenoic acid (DHA), the long-chain derivative of the omega-3 chain that is required on all synaptic junctions and all retinal receptors (Broadhurst et al., 2002; ~~Chapter 4 by Brenna, Chapter 2 by Crawford, and Chapter 3 by Cunnane in this book~~). The effects of deprivation of this critical and essential ingredient on mental and visual acuity are well documented clinically (Cunnane et al., 2007; ~~Chapter 2 by Crawford in this book~~). Without adequate supplies, populations would not be able to respond to evolutionary imperatives to select for larger, more intricately wired brains. DHA is far more accessible through the marine food chain than either the freshwater or the terrestrial food chains. Particularly because the need for DHA is greatest in the third trimester of fetal development or in the first year of postnatal life, the capacity of mothers to access intertidal marine foods with little effort was probably crucial. Accessing the brains of game killed in the veld is less easily envisaged, and there are arguments as to the sufficiency of DHA supplies in game muscle meat (Cordain et al., 2001, 2002). Near coastal populations would have been at a distinct advantage in generating the fatty acid base to respond to an evolutionary call for larger, more connected brains by consuming preformed DHA.

## A NEW NARRATIVE

We are now in a position to generate a new narrative of later human evolution in Africa very different from that addressed by Desmond Clark in the mid-1970s. Unlike him, though, I concentrate on the likely scenario at the Cape. I omit here any discussion of the claims of East Africa as the likely source area of modern people, an idea favored by many (see, e.g., Klein, 2008). It is remarkable how different this claim is to a rival one from southern Africa, being almost completely based on the apparently early dates for rather poorly provenanced skeletal remains from Herto (White et al., 2003), Omo (McDougall et al., 2005), and Laetoli (Hay, 1987). Unlike the somewhat later remains from the Cape, these are marginally modern, tenuously dated and completely dissociated from any signs of innovative behaviors. We can expect some attempts to integrate the essentially anatomical case for East Africa with the essentially behavioral case for South Africa.

There are some serious challenges, however, to the construction of a plausible narrative for any subregion, especially in the arena of explanation and the identification of cause and effect. How might the threads of diet, technology, and brain function be connected in a way that is testable, better refutable, from the archaeological record? The first challenge is the chronological precision available to us. Even with OSL dating, our knowledge of the age of an assemblage might carry an error margin of 5000 years or more. If key changes in climate happened abruptly and reversed just as abruptly (see Carto et al., 2009), we might not be able to distinguish a time of increased aridity from a time of increasing moisture. How then could we hope to link these into a narrative implicating climate change? The second challenge is even more serious. Although some archaeologists expect and try to find links between climate, environment, and stone tool assemblages,

few are capable of generating necessary and directional linkages. How, we might ask, would making more blades, or inventing the bifacial leaf point, help in times of complex, only broadly understood climate or vegetation shifts?

I suggest that a factor worth considering is the pulsing subcontinental loss of viable territory associated with the combination of sea level change and aridity, specifically the difficult times within MIS6 between 190,000 and 130,000 years ago, and later, MIS4 between 80,000 and 60,000 years ago. Such repetitive challenges forced populations into constrained and quite specific resource landscapes, requiring initiative and rewarding innovation. I am not suggesting any specific connections between resources and artifact types, although these may well have existed, but rather the general impact of climatically related pulsing. The repeated isolation of Cape populations may well have led to cultural as well as genetic drift, with the expansion of any new forms generated into the rest of the continent, when connections increased again. The key features of the restricted core at the southern extremity of Africa were arguably seasonality and juxtaposition, with the seasonal and tidal challenges of the Fynbos Biome and Benguela upwelling structuring responses (Parkington, 2001a). Something rather similar may have led to early shellfish exploitation at another Mediterranean landscape at the northern extremity of Africa 7000 km away, with similar innovative manifestations (Bouzouggar et al., 2007).

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Like their emergent Neanderthal cousins in Europe, emergent *H. sapiens* in southern Africa would have been under persistent pressure to detect new food sources. In particular, these include foods not previously utilized because they are relatively inaccessible or require some processing – the embedded foods of Foley and Lee (1991). Through much of MIS6, especially the cold spikes associated with Heinrich Events (Stokes et al., 1997; Stokes et al., 1998; Carto et al., 2009), groups of hunters and gatherers were encapsulated in an island of fynbos landscape without a high animal biomass and with few sizable aboveground plant foods. The shoreline constituted a linear patch with easily the best returns for hunting and gathering, with guaranteed returns from sedentary, predictable items such as shellfish and washed-up seals, whales, and seabirds. These foods also contribute essential marine fatty acids as well as iodine (Crockford, 2003) to all collectors including pregnant and nursing women, the (ethnographically) traditional gatherers of shellfish. In the interior, the carbohydrate deficit was made up by developing an understanding of geophyte life cycles and corm availabilities. Gatherers smart enough to understand both of these and the ways they can be integrated, were rewarded with the potential to afford a brain that made them and their children even smarter.

6

Are abundant intertidal sources of DHA strictly essential to meet the costs of encephalization (Cunnane et al., 2007), or could hunter-gatherers have accessed enough from the more limited amounts in the terrestrial food web (Cordain et al., 2002)? This is hard to determine, especially as there is evidence that pregnant women may be able to improve the efficiency of their chain elongation of shorter fatty acid chains in response to the demands of supporting a third trimester fetus (Carlson and Kingston, 2007). Whatever the resolution of this debate, later MSA shellfish-consuming hunters and gatherers in the Cape transformed their toolmaking behavior, developed innovative networks of shared memory, and were the first unquestionably anatomically modern, fully encephalized people of whom we know. A testable prediction of this idea is that regular shellfish consumption contributes to encephalization, which in turn facilitates innovation in many spheres. As the resolution of these events in time and place becomes clear and as the interconnections between diet, encephalization, and innovation emerge, we should understand the origins of our species much better. It seems likely that the southernmost region of Africa played a key, *paramount* role.

Dedicated to the memory of J. Desmond and Betty Clark.

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