

Archaeology and the Origins of Modern Humans: European and African Perspectives

PAUL MELLARS

Summary. This chapter compares the archaeological evidence associated with the appearance of anatomically modern humans in Europe and Africa. In Europe there is a rapid appearance of new behavioural elements that are often seen to represent a ‘revolution’ in behavioural and perhaps cognitive terms, centred on *c.* 43–35,000 years before present (BP). In Africa, new behavioural elements seem to appear in a more gradual, mosaic, fashion but show many of the distinctive features of European Upper Palaeolithic culture by at least 70–80,000 BP, including seemingly explicit evidence for fully symbolic expression. The central problem remains that of assessing how far these well-documented changes in the archaeological record reflect not only major shifts in behavioural patterns, but also underlying shifts in the cognitive *capacities* for behaviour, including increasing complexity in the structure of language.

INTRODUCTION

THE AIM OF THIS chapter is to make two basic points about the patterns of human behavioural development associated with the emergence and spread of anatomically modern populations, which I believe can now be documented with some confidence in the associated archaeological records and which are potentially central to the theme of the present *Proceedings*. The first is that the appearance of anatomically modern populations over large areas of Europe appears to be associated with a wide range of changes that evidently reflect major shifts in the behaviour and possibly the cognition of the associated human groups, what archaeologists have generally referred to as the ‘Middle to Upper Palaeolithic transition’ or (more colourfully) the ‘Upper Palaeolithic

revolution' (Gilman, 1984; Bar-Yosef, 1998b). The second is that the earliest well-documented occurrence of *many* of these distinctive new features can now be observed in the archaeological records from Africa and the immediately adjacent parts of south-west Asia at a very much earlier date than their appearance in European sites (McBrearty & Brooks, 2000; Deacon, 2000). Viewed in these terms, the archaeological evidence could be seen as at least consistent with the current Out of Africa scenarios of modern human origins, and perhaps as providing an independent line of support for this hypothesis. But as we shall see, this still leaves plenty of scope for debate over the precise significance of these patterns in terms of human behaviour and cognition.

THE EUROPEAN PERSPECTIVE

The basic features of the so-called Middle–Upper Palaeolithic transition in Europe have been analysed and debated at length (Mellars, 1973, 1982, 1989a, 1989b, 1996a; White, 1982; Kozłowski, 1990; Knecht *et al.*, 1993; Soffer, 1994; Gibson, 1996; Clark, 1997; Gamble, 1999; Klein, 1999; Hoffecker, 2002). In essence, we can now document major changes in at least a dozen different aspects of the archaeological records of the Middle–Upper Palaeolithic transition, all centred around the period 43–35,000 BP (in radiocarbon terms) and apparently reflecting shifts in many different dimensions of human culture and adaptation. Briefly, these can be summarised as follows (for a fuller discussion of these points see Mellars 1989b, 1996a).

- 1 A general shift from predominantly flake-based technologies to technologies based on the production of more regular and elongated blade forms, probably reflecting the introduction of indirect 'punch' techniques of flaking (Mellars, 1989b).
- 2 The introduction of new forms of stone tools (typical end-scrapers, various forms of burins, retouched bladelet forms, etc.), apparently implying shifts in several other related aspects of technology, such as skin working, hunting weaponry and more complex bone and antler technology (Mellars, 1989b; Gibson, 1996).
- 3 The appearance of a sharply increased element of 'imposed form' and morphological complexity in tool production, apparently reflecting an increase in the 'stylistic' as well as the functional component of the tools.
- 4 The appearance of complex and extensively shaped bone, antler and ivory tools, in a wide variety of forms. These again must reflect changes in other related aspects of technology (especially perhaps hunting projectiles) as well as new and more standardised norms of tool production (Knecht, 1993).

5 The effective explosion of explicitly decorative or ornamental items. These range from carefully perforated animal teeth and marine shells to a wide variety of laboriously shaped bead and pendant forms in a variety of raw materials (ivory, steatite, schist, etc.) (Figure 1). The majority of these almost certainly represent items of personal decoration, probably reflecting new ways of signifying the social role or status of individuals within the societies (White, 1993; Gamble, 1999; Kuhn *et al.*, 2001).

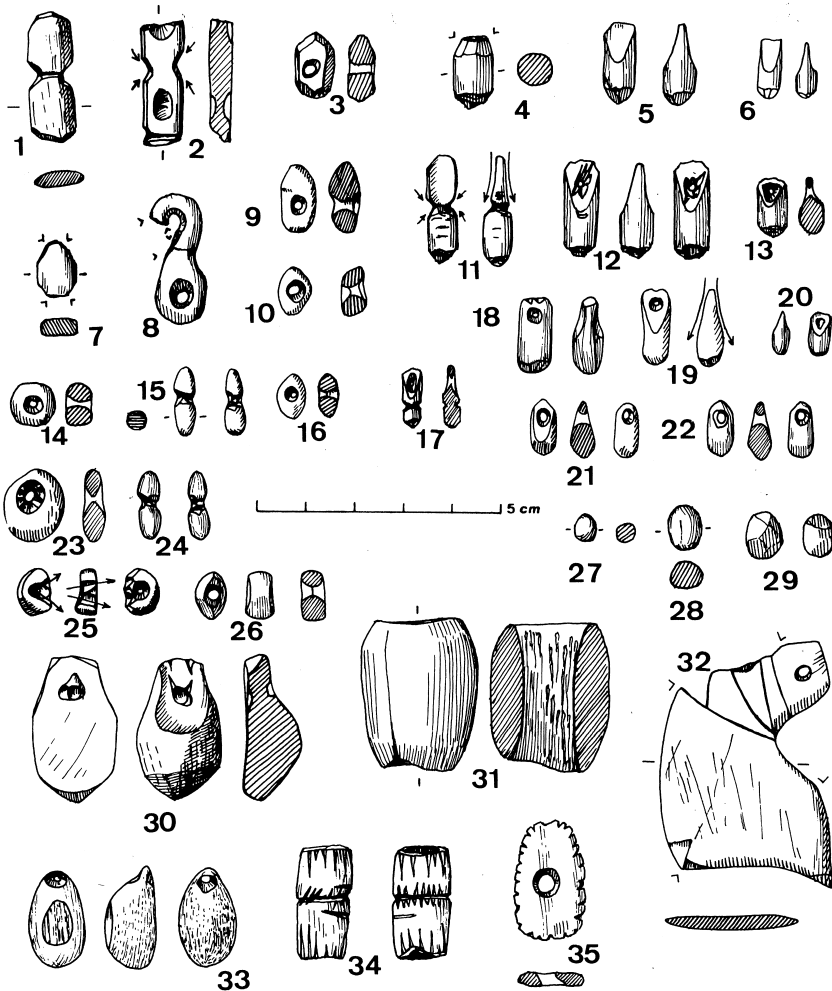


Figure 1. Perforated beads and other pendants manufactured from mammoth ivory and stone from the early Upper Palaeolithic levels of the Spy Cave, South Belgium.

- 6 The emergence of long-distance trading or exchange networks for the procurement of these ornamental items, extending in some cases, for marine shells and certain varieties of stone beads, up to distances of several hundred kilometres (White, 1993; Taborin, 1993; Gamble, 1999).
- 7 The appearance of extensively and regularly notched or incised bone artefacts, possibly representing in some cases systematic numerical or notation systems (Marshack, 1991).
- 8 The first emergence of varied and remarkably sophisticated forms of representational art. These range from representations of both male and female sex symbols, through elaborately carved statuettes of both animal and human figures to the recently discovered animal drawings in the Chauvet cave in south-eastern France (Hahn, 1993; Clottes, 2001).
- 9 The appearance of unambiguous musical instruments, best represented by the bird-bone flutes from the early Upper Palaeolithic levels of the Geissenklösterle cave in south Germany (Hahn & Münzel, 1995).
- 10 The emergence of more extensive, large-scale and apparently logistically organised systems for the procurement and distribution of lithic raw materials (Mellars, 1996a: 165–8; Gamble, 1999).
- 11 In at least some of the better documented areas of Europe (such as western France and the Czech Republic), a sharp increase in the numbers of occupied sites, apparently reflecting a marked increase in human population densities (Mellars, 1973, 1982, 2000: figures 1 and 2; Oliva, 1993; Svoboda, 1993; Demars, 1996).
- 12 More tentatively, the first evidence in Europe of explicitly ‘ceremonial’ human burials, reflected by the presence of clearly associated decorative or other grave goods, as documented apparently at Cueva Morín in northern Spain, Cro-Magnon in France and probably Mladeč in Moravia (Oliva, 1993).

These are, of course, the most archaeologically visible of the features marking the conventional Middle–Upper Palaeolithic transition, almost certainly just the tip of the iceberg of the overall spectrum of cultural and behavioural changes over this transition. In addition to the features listed, there are at least strong hints of changes in several other spheres, in the focus and range of subsistence strategies, in the maximum sizes of human residential groups, in the internal spatial organisation of occupation sites and, above all, in the spatial scale and complexity of social relationships (Mellars, 1973, 1982, 1996a; Soffer, 1994; Mithen, 1996; Gamble, 1999). Because these have generated more debate than some of the ‘harder’ aspects of the archaeological evidence, they may be better left out of the present discussion. Even without these more speculative features, however, the total spectrum of changes in the more well-documented aspects of the Middle–Upper Palaeolithic transition is sufficient

to indicate a major transformation in human behavioural patterns, potentially no less significant in their character and consequences than those of the later Neolithic revolution (Mellars, 1989a, 1996a; Mithen, 1996; Sherratt, 1997; Bar-Yosef, 1998b, 2000).

If there is now general agreement as to at least the broad patterns of these changes in the archaeological records of Europe, debate continues to focus on two main issues. Exactly what significance do these changes have for the underlying cultural and cognitive parameters of the associated human populations? And how far can these changes be associated explicitly with the appearance of anatomically modern populations in Europe, and how far could they reflect some form of rapid and essentially independent evolution of the whole spectrum of Upper Palaeolithic technology and culture among the final Neanderthal populations themselves (D'Errico *et al.*, 1998; Zilhao & D'Errico, 1999; Mellars, 1999a; Gamble, 1999; Klein, 2000; Zilhao, 2001)? A full discussion of all these issues is beyond the scope of the present chapter. On the first issue, however, attention has focused mainly on the dramatic explosion of explicitly symbolic behaviour (however that term is defined) associated with the Middle–Upper Palaeolithic transition, as reflected not only in the emergence of complex, sophisticated, art and personal ornamentation, but also in the appearance of regularly notched and incised bones, bird-bone flutes and a sharply increased element of deliberately ‘imposed form’ in the shaping of both stone and (above all) bone, antler and ivory artefacts. To many workers this ‘symbolic explosion’ is exactly what one might anticipate from a major shift in the structure or complexity of language patterns, possibly associated with corresponding shifts in the neurological structure of the human brain (Mellars, 1991, 1998; Donald, 1991; Bickerton, 1995; Pinker, 1995; Noble & Davidson, 1996; Mithen, 1996; Deacon, 1997; Klein, 2000; Derek Bickerton’s chapter in these *Proceedings*).

The second issue, of the potentially independent evolution of Upper Palaeolithic culture among the final Neanderthal populations of Europe, has generated some lively controversy in the literature over the past 2 or 3 years (D'Errico *et al.*, 1998; Zilhao & D'Errico, 1999; Mellars, 1999a, 2000; Zilhao, 2001). In broad terms there is no doubt that the majority of the most distinctive and dramatic features of the Middle–Upper Palaeolithic transition, especially those reflected in the symbolic explosion referred to above (i.e. art, personal ornamentation, long-distance transport of marine shells, bone flutes, etc.), coincide closely in chronological terms with the first well-documented appearance of anatomically modern populations within the different regions of Europe, associated in most cases with distinctively ‘Aurignacian’ or ‘Proto-Aurignacian’ technologies (Mellars, 1992, 1996a; Churchill & Smith, 2000; Kozłowski & Otte, 2000; Richards & Macaulay, 2000). The crux of the recent debate has focused on how far some of the other more ‘technological’ features of the Upper Palaeolithic ‘package’, such as increased levels of blade technology, the shaping of

simple bone tools and the appearance of some new 'type-fossil' forms, may have emerged in certain areas shortly before the arrival of the first anatomically modern populations (D'Errico *et al.*, 1998; Zilhao & D'Errico, 1999; Mellars 1999a, 2000; Zilhao, 2001). This in turn would raise the question as to how far these developments should be seen as genuinely independent inventions on the part of the local Neanderthal populations, and how far they could be the result simply of what has sometimes been referred to as a 'bow-wave' effect of technological diffusion spreading some way in advance of the expanding anatomically and behaviourally modern populations. Ultimately, no doubt, agreement on this question will depend heavily on the associated dating evidence, which is of course notoriously problematic over the period in question, due partly to the massive problem of contamination effects of radiocarbon samples in this time range and the emerging pattern of major wiggles or plateaux in the radiocarbon time-scale between *c.* 45,000 and 30,000 BP (Aitken, 1990; Voelker *et al.*, 1998; Mellars, 1999b). In the meantime, most prehistorians find the close correlation between the rapid emergence of new behavioural features and the well-documented spread of new human populations across Europe difficult to visualise in purely coincidental terms (Mellars, 1992, 1999a, 2000; Bar-Yosef, 1998b, 2000; Klein, 1999, 2000; Kozłowski & Otte, 2000). But of course this still leaves plenty of scope for debate over the precise patterns of interaction between the incoming *sapiens* and local Neanderthal populations within the different regions of Europe, and the nature of any exchange or 'acculturation' of behavioural patterns between the two populations over this time range (Mellars, 1989a, 1999a; Harrold, 1989; Graves, 1991; Kozłowski & Otte, 2000). And this would not preclude the possibility of some major adaptations in behavioural patterns among the Neanderthal populations during their 250,000 years of development in Europe, especially in response to the rapid climatic oscillations of the later Middle and early Upper Pleistocene periods. Indeed, such adaptations would seem entirely predictable and inevitable in evolutionary terms (Mellars, 1996a: 348–52; Gamble, 1999). But to suggest that this led to the independent invention of the whole gamut of characteristically Upper Palaeolithic culture in several different areas of Europe, simultaneously and coincidentally with the spread of anatomically modern populations across the continent, would seem to imply an extraordinary and highly improbable evolutionary coincidence.

THE AFRICAN PERSPECTIVE

If we accept all the arguments advanced from the recent studies of both human skeletal remains and the associated studies of DNA and other genetic variations in present-day world populations, then by far the most likely point

of origin of our species lies in Africa (Chris Stringer's chapter in these *Proceedings*; Stringer & McKie, 1996; Lahr & Foley, 1998; Relethford, 1998; Richards & Macaulay, 2000; Forster *et al.*, 2001; Templeton, 2002). The challenge to archaeologists is obvious. To what extent can we identify evidence that distinctively 'modern' patterns of technology and behaviour, broadly analogous to those reflected in the European Upper Palaeolithic, were indeed significantly earlier in Africa than in areas further to the north and west?

The interpretation of the intriguing but very patchy archaeological record from Africa certainly remains more controversial than that in Europe (Deacon, 1989, 2000; Thackeray, 1992; Clark, 1992; Yellen *et al.*, 1995; Henshilwood & Sealy, 1997; Ambrose, 1998; Deacon & Deacon, 1999; Klein, 1999, 2000; McBrearty & Brooks, 2000). Nevertheless, on one point there now seems to be a consensus: that at least in the southern parts of Africa there is evidence for the appearance of certain distinctively 'modern' features of both technology and apparently increased symbolic behaviour at a substantially earlier date than in any areas of Europe. The most explicit evidence at present comes from a number of sites close to the southern tip of Africa, most notably those of Border Cave, Klasies River Mouth, Boomplaas Cave and the newly excavated site of Blombos Cave, all in Cape Province. From the site of Klasies River Mouth, for example, we have evidence of stone tool industries that are in most respects remarkably similar to those from the classic Upper Palaeolithic sites in Europe, provisionally dated by several methods to around 70,000 BP (Figure 2). These so-called 'Howieson's Poort' industries combine high levels of blade technology manufactured from imported high-quality raw materials, with typical small end-scrapers and a range of small, carefully shaped, triangular, trapeze and crescent forms that almost certainly represent the hafted inserts of either spears or conceivably arrows (Singer & Wymer, 1982; Deacon, 1989, 2000; Deacon & Deacon, 1999; McBrearty & Brooks, 2000). In northern Europe an almost identical range of forms is characteristic of the earliest stages of the Mesolithic (as at Star Carr), where they demonstrably served as the tips and barbs of wooden arrows (Clark, 1954). From the site of Blombos Cave we have a rather different industry, comprising large numbers of small, leaf-shaped, bifacially flaked projectile points, similar to those of the European Solutrian (Henshilwood & Sealy, 1997). The age of the latter site may be closer to 80,000 BP (Henshilwood *et al.*, 2002). Equally, if not more significant, is the presence at both Klasies River Mouth and Blombos Cave of a number of simple but extensively shaped bone tools, and the occurrence at both sites of large quantities of red ochre, including two recently discovered pieces from the Blombos Cave with carefully incised linear and criss-cross motifs along their edges (Figure 3). At present, these would appear to represent the earliest unambiguous examples of intentional 'design' motifs (or abstract art) recorded anywhere in the world (Henshilwood *et al.*, 2002).

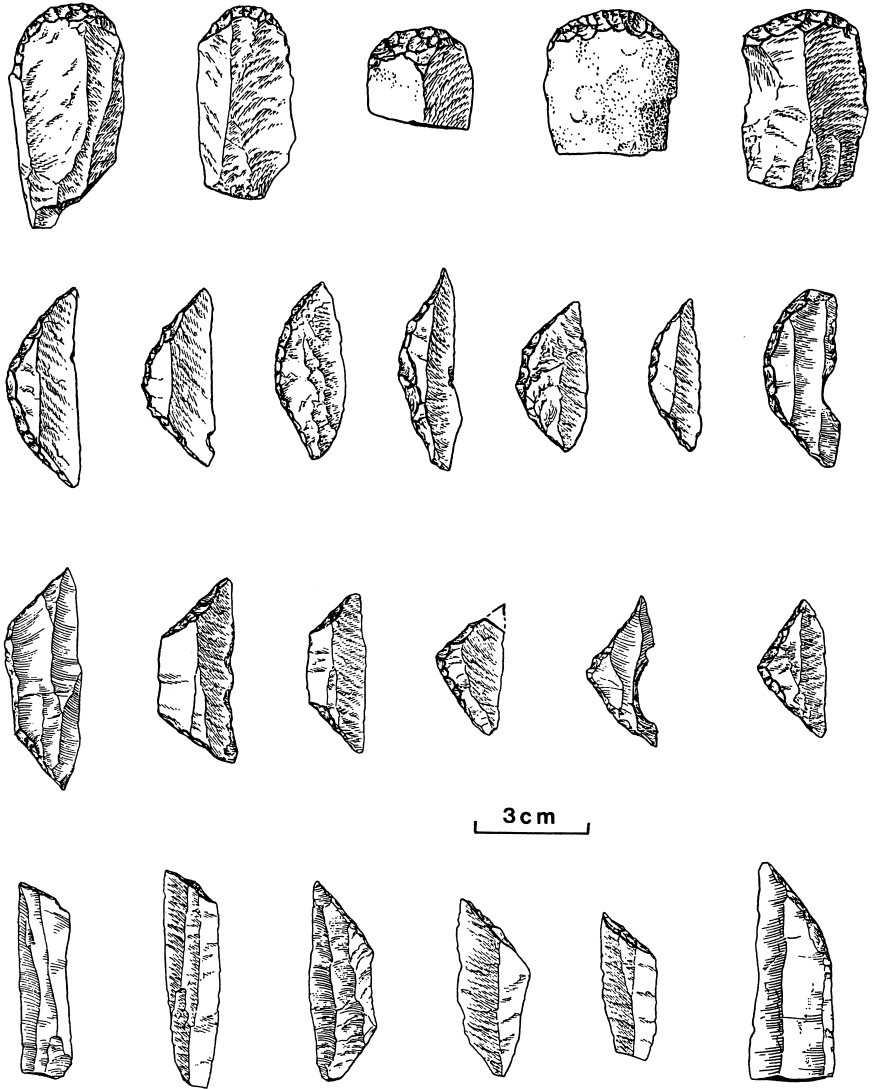


Figure 2. Stone tools from the Middle Stone Age Howieson's Poort levels at Klasies River Mouth, South Africa (c. 70,000 BP), showing typical end-scrapers and small geometric forms manufactured from blade segments, probably representing hafted inserts of arrows or spears.

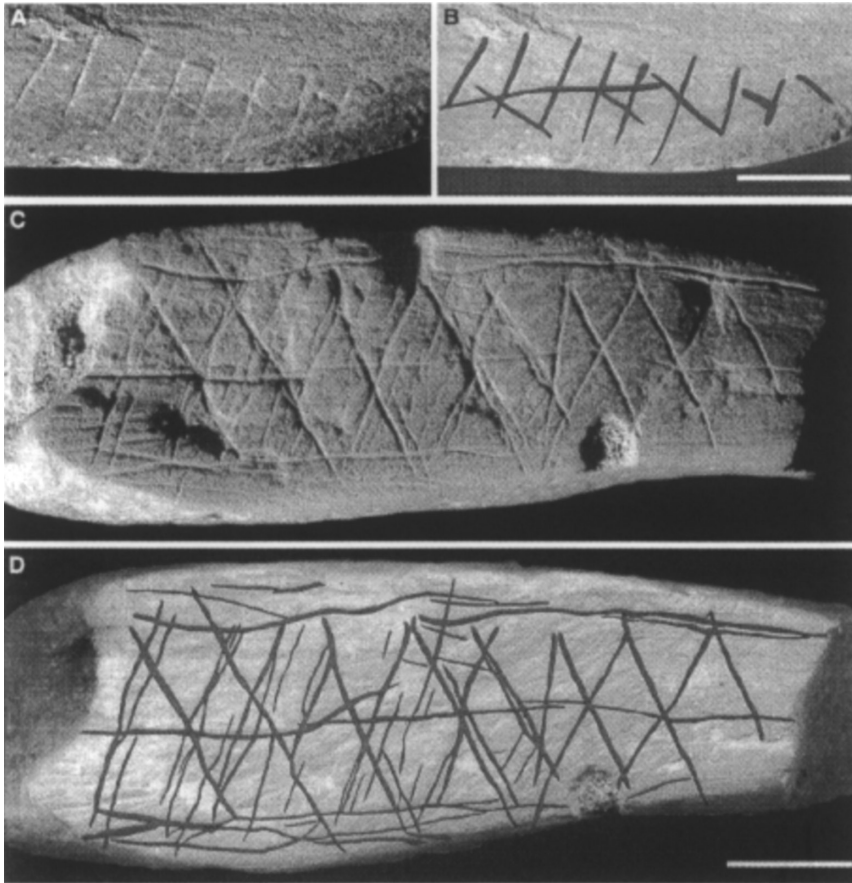


Figure 3. Engravings on red ochre from the Middle Stone Age levels of the Blombos Cave, South Africa, dated to *c.* 75–80,000 BP. Reprinted with permission from Henshilwood *et al.* (2002), *Science*, 295: 1278, figure 2. Copyright 2002 American Association for the Advancement of Science.

Further north in central and eastern Africa the archaeological records over the same time-range remain less well documented. From sites such as Mumba in Tanzania and Enkapune ya Muto in Kenya, however, there is evidence that broadly similar, essentially Upper Palaeolithic (or Later Stone Age), industries were being manufactured by at least 50,000 BP, and at the latter site there is evidence for the production of carefully shaped and perforated beads manufactured from segments of ostrich egg shell by around 40,000 BP (Ambrose, 1998). Similar beads from Mumba may date to 50,000 BP (McBrearty & Brooks, 2000). And from three separate sites at Katande (Zaire) there are rather more controversial claims for a series of remarkably modern-looking

multiple-barbed bone spear points, dated to *c.* 90,000 BP (Yellen *et al.*, 1995; McBrearty & Brooks, 2000; Klein, 2000). Finally, immediately to the north of Africa, there is the crucially important evidence for what seem to be explicitly symbolic grave goods (including a large deer antler and a complete boar's jaw reportedly 'clasped in the arms' of one of the skeletons) associated with the burials of the distinctively anatomically modern humans at the two sites of Djebel Qafzeh (Figure 4) and Mugharet es Skhul in Israel, both securely dated to around 90–110,000 BP (Defleur, 1993; Bar-Yosef, 1998a, 2000; Valladas *et al.*, 1998). From the former site there is also evidence for the presence of a range of deliberately perforated sea shells in the same occupation levels (Inizan & Gaillard, 1978). If the latter items are indeed explicitly decorative or 'symbolic' objects, as all the evidence suggests, they precede by at least 50,000 years the widespread appearance of similar perforated sea shells, animal teeth and other forms of decorative pendants in the earliest Aurignacian levels in Europe, discussed above (Kuhn *et al.*, 2001).

CONCLUSIONS

Two features of the evidence discussed above seem to me especially significant. First, that many if not most of the distinctive *technological* features of the so-called 'package' of Upper Palaeolithic culture in Europe can now be documented clearly in certain African sites at least 20–30,000 years earlier than their occurrence in Europe. Here emphasis should be placed not so much on high levels of blade technology and associated transportation of high-quality raw materials (both of which have occasionally been documented in the European Mousterian; Mellars, 1996a) but more importantly on the occurrence of typical end-scrapers (apparently implying new skin-working technology), extensively shaped bone tools and small geometric forms clearly intended as inserts for composite, hafted artefacts, and possibly implying the emergence of archery (Deacon & Deacon, 1999; McBrearty & Brooks, 2000) (Figure 2). Secondly, and potentially far more significant, is the seemingly unambiguous evidence for the early emergence of explicit symbolic behaviour, reflected most clearly in the newly discovered geometrically incised ochre fragments from the Blombos cave (Figure 3; Henshilwood *et al.*, 2002), the regularly notched and incised bones from Klasies River Mouth (Singer & Wymer, 1982), the apparently ceremonial burials (of anatomically modern humans) from Skhul and Qafzeh (Figure 4), and the presence at the latter site of perforated sea-shell ornaments. None of these features can at present be convincingly identified at European sites earlier than *c.* 43–40,000 BP. As indicated earlier, the interpretation of this kind of explicitly symbolic behaviour in cultural and cognitive terms remains controversial, but many would see it as potentially indicative of

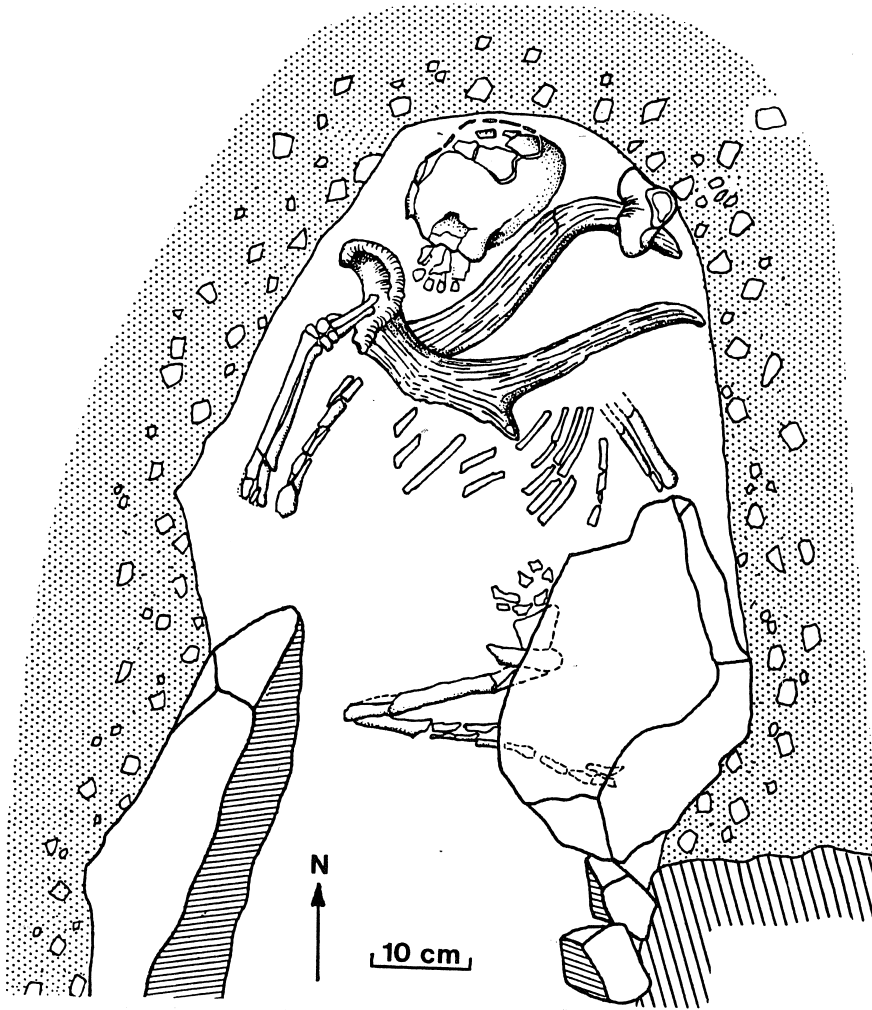


Figure 4. Burial of anatomically modern human skeleton associated with large fallow deer antlers from the Qafzeh Cave, Israel, dated to *c.* 90–100,000 BP.

the emergence of relatively complex language patterns, and quite possibly associated shifts in the neurological complexity of the brain (Donald, 1991; Mellars, 1991, 1998; Pinker, 1995; Noble & Davidson, 1996; Mithen, 1996; Bickerton, 1995; Derek Bickerton's chapter in these *Proceedings*).

Other aspects of the African evidence remain more controversial. McBrearty & Brooks (2000) and Deacon (2000) have made the obvious point that there is no reason to regard the emergence of all these features at the

African sites as a sudden or 'punctuational' event (i.e. as a 'revolution' in European terms) and have argued for a much more gradual, essentially mosaic, pattern of emergence of the distinctively 'modern' behavioural package over a long span of the African Middle Stone Age, extending back to *c.* 250–300,000 BP. This would place the evolution of these behavioural features broadly in parallel with the evolution of modern human anatomical features in Africa, as Chris Stringer (these *Proceedings*) has suggested. At the same time, as both Chris Stringer (these *Proceedings*) and Klein (2000) have pointed out, there is no way that we can exclude the possibility of relatively sudden, punctuational developments in human behaviour and mentality, potentially as a result of either major population bottlenecks or of genetic mutations influencing the structure of the brain (see also Derek Bickerton, these *Proceedings*).

One of the central questions remains exactly how and when these populations first dispersed beyond Africa. The initial appearance of anatomically modern populations in Israel at around 100,000 BP apparently did not extend into Europe, although it is conceivable that these populations expanded further to the south and east into south-east Asia and perhaps ultimately Australia (Lahr & Foley, 1998; Thorne *et al.*, 1999). In this context, the suggested redating of the clearly ceremonial red ochre human burial at Lake Mungo in Australia to around 60,000 BP (Thorne *et al.*, 1999) could be highly significant, reinforcing the evidence for early burial symbolism and ritual at the sites of Skhul and Qafzeh mentioned above. As at the two Israeli sites, the stone-tool technology associated with these early Australian remains seems to be essentially Middle Palaeolithic rather than Upper Palaeolithic in character, suggesting that the critical changes in human symbolic capacities may have occurred rather earlier in the evolution of anatomically modern humans than changes in associated lithic technology. The most likely scenario is that there was a second phase of dispersal of anatomically modern populations from eastern or northern Africa sometime before 45,000 BP, which brought certain basic elements of the distinctively Upper Palaeolithic-like package of both technology and associated symbolic and ceremonial activity initially into south-west Asia and subsequently into Europe (Ambrose, 1998; Klein, 1998, 2000; Bar-Yosef, 1998b, 2000). Needless to say there is no suggestion that fully Upper Palaeolithic culture (in the European sense) was transported wholesale into the sharply contrasting environments of last-glacial Europe, as both Deacon (2000) and McBrearty & Brooks (2000) have stressed. There would inevitably have been critical adaptations in both economy and technology, as well as in related demographic, social and symbolic patterns, associated with the dispersal of modern humans from the African savannas to the European tundras (for a fuller discussion of these points see Mellars, 1996b). But in any event it is clear that all of the present evidence puts the spotlight firmly onto southern Africa as the most likely cradle for the emergence of at least many features of the

characteristically ‘modern’ behavioural package that we see in the European Upper Palaeolithic. To what extent this process involved a radical restructuring not only in the actual *patterns* of human behaviour but also in the underlying mental and cognitive *capacities* for new forms of behaviour (Renfrew, 1996), including language, remains one of the critical questions in modern human origins research.

References

- Aitken, M.J. (1990) *Science-Based Dating in Archaeology*. London: Longmans.
- Ambrose, S.H. (1998) Chronology of the Later Stone Age and food production in East Africa. *Journal of Archaeological Science*, **25**, 377–92.
- Bar-Yosef, O. (1998a) The chronology of the Middle Paleolithic of the Levant. In: *Neanderthals and Modern Humans in Western Asia* (eds T. Akazawa, K. Aoki & O. Bar-Yosef), pp. 39–56. New York: Plenum Press.
- Bar-Yosef, O. (1998b) On the nature of transitions: the Middle to Upper Palaeolithic transition and the Neolithic revolution. *Cambridge Archaeological Journal*, **8**, 141–63.
- Bar-Yosef, O. (2000) The Middle and Early Upper Paleolithic in Southwest Asia and neighbouring regions. In: *The Geography of Neanderthals and Modern Humans in Europe and the Greater Mediterranean* (eds O. Bar-Yosef & D. Pilbeam), pp. 107–56. Bulletin No. 8. Cambridge: Peabody Museum of Harvard University.
- Bickerton, D. (1995) *Language and Human Behavior*. Seattle: University of Washington Press.
- Churchill, S.E. & Smith, F.H. (2000) Makers of the early Aurignacian of Europe. *Yearbook of Physical Anthropology*, **43**, 61–115.
- Clark, J.G.D. (1954) *Excavations at Star Carr*. Cambridge: Cambridge University Press.
- Clark, J.D. (1992) African and Asian perspectives on the origins of modern humans. In: *The Origin of Modern Humans and the Impact of Chronometric Dating* (eds M. J. Aitken, C. Stringer & P. Mellars), pp. 201–16. Philosophical Transactions of the Royal Society, Series B, 337, No. 1280. London: Royal Society.
- Clark, G.A. (1997) The Middle–Upper Palaeolithic transition in Europe: an American perspective. *Norwegian Archaeological Review*, **30**, 25–53.
- Clottes, J. (2001) *La Grotte Chauvet: L’Art Des Origines*. Paris: Seuil.
- Deacon, H.J. (1989) Late Pleistocene palaeoecology and archaeology in the Southern Cape, South Africa. In: *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans* (eds P. Mellars & C. Stringer), pp. 547–64. Princeton: Princeton University Press.
- Deacon, H.J. (2000) Modern human emergence: an African archaeological perspective. In: *Humanity from African Naissance to Coming Millennia—Colloquia in Human Biology and Palaeoanthropology* (eds P. V. Tobias, M. A. Raath, J. Maggi-Cecchi & G. A. Doyle), pp. 217–26. Florence: Florence University Press.
- Deacon, H.J. & Deacon, J. (1999) *Human Beginnings in South Africa: Uncovering the Secrets of the Stone Age*. Cape Town: David Philip.
- Deacon, T.W. (1997) *The Symbolic Species: The Co-Evolution of Language and the Human Brain*. Harmondsworth: Penguin Books.

- Defleur, A. (1993) *Les Sépultures Moustériennes*. Paris: CNRS.
- Demars, P.-Y. (1996) Demographie et occupation de l'espace au Paléolithique Supérieur et au Mésolithique en France. *Préhistoire Européenne*, **8**, 3–26.
- D'Errico, F., Zilhao, J., Julien, M., Baffier, D. & Pelegrin, J. (1998) Neanderthal acculturation in western Europe? A critical review of the evidence and its interpretation. *Current Anthropology*, **39**, S1–S44.
- Donald, M. (1991) *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition*. Cambridge: Harvard University Press.
- Forster, P., Torroni, A., Renfrew, C. & Röhl, A. (2001) Phylogenetic star contraction applied to Asian and Papuan mtDNA evolution. *Molecular Biology and Evolution*, **18**, 1864–81.
- Gamble, C. (1999) *The Palaeolithic Societies of Europe*. Cambridge: Cambridge University Press.
- Gibson, K.R. (1996) The biocultural human brain, seasonal migrations, and the emergence of the Upper Palaeolithic. In: *Modelling the Early Human Mind* (eds P. Mellars & K. Gibson), pp. 33–46. Cambridge: McDonald Institute for Archaeological Research.
- Gilman, A. (1984) Explaining the Upper Palaeolithic Revolution. In: *Marxist Perspectives in Archaeology* (ed. E. Springs), pp. 115–26. Cambridge: Cambridge University Press.
- Graves, P. (1991) New models and metaphors for the Neanderthal debate. *Current Anthropology*, **32**, 513–41.
- Hahn, J. (1993) Aurignacian art in Central Europe. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 229–42. Boca Raton: CRC Press.
- Hahn, J. & Münzel, S. (1995) Knochenflöten aus dem Aurignacien des Geissenklösterle bei Blaubeuren, Alb-Donau-Kreis. *Fundberichte Aus Baden-Württemberg*, **20**, 1–12.
- Harrold, F.B. (1989) Mousterian, Chatelperronian and Aurignacian in Western Europe: continuity or discontinuity. In: *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans* (eds P. Mellars & C. Stringer), pp. 677–713. Edinburgh: Edinburgh University Press.
- Henshilwood, C. & Sealy, J. (1997) Bone artefacts from the Middle Stone Age at Blombos Cave, Southern Cape, South Africa. *Current Anthropology*, **38**, 890–5.
- Henshilwood, C.S., D'Errico, F., Yates, R., Jacobs, Z., Tribolo, C., Duller, G.A.T., Mercier, N., Sealy, J.C., Valladas, H., Watts, I. & Wintle, A.G. (2002) Emergence of modern human behavior: Middle Stone Age engravings from South Africa. *Science*, **295**, 1278–80.
- Hoffecker, J.F. (2002) *Desolate Landscapes: Ice-Age Settlement in Eastern Europe*. New Brunswick: Rutgers University Press.
- Inizan, M.-L. & Gaillard, J.M. (1978) Coquillages de Ksar-'Aqil: éléments de parure? *Paléorient*, **4**, 295–306.
- Klein, R.G. (1998) Why anatomically modern people did not disperse from Africa 100,000 years ago. In: *Neanderthals and Modern Humans in Western Asia* (eds T. Akazawa, K. Aoki & O. Bar-Yosef), pp. 509–21. New York: Plenum Press.
- Klein, R.G. (1999) *The Human Career*, 2nd edn. Chicago: University of Chicago Press.
- Klein, R.G. (2000) Archaeology and the evolution of human behavior. *Evolutionary Anthropology*, **9**, 17–36.

- Knecht, H. (1993) Splits and wedges: the techniques and technology of early Aurignacian antler working. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 137–62. Boca Raton: CRC Press.
- Knecht, H., Pike-Tay, A. & White, R. (1993) *Before Lascaux: The Complex Record of the Early Upper Paleolithic*. Boca Raton: CRC Press.
- Kozłowski, J.K. (1990) A multi-aspectual approach to the origins of the Upper Palaeolithic in Europe. In: *The Emergence of Modern Humans: An Archaeological Perspective* (ed. P. A. Mellars), pp. 419–37. Edinburgh: Edinburgh University Press.
- Kozłowski, J.K. & Otte, M. (2000) The formation of the Aurignacian in Europe. *Journal of Anthropological Research*, **56**, 513–34.
- Kuhn, S.K., Stiner, M.C., Reese, D.S. & Güleç, E. (2001) Ornaments of the earliest Upper Paleolithic: new insights from the Levant. *Proceedings of the National Academy of Sciences of the USA*, **98**, 7641–6.
- Lahr, M.M. & Foley, R. (1998) Towards a theory of modern human origins: geography, demography and diversity in recent human evolution. *Yearbook of Physical Anthropology*, **41**, 137–76.
- McBrearty, S. & Brooks, A. (2000) The revolution that wasn't: a new interpretation of the origin of modern human behavior. *Journal of Human Evolution*, **39**, 453–563.
- Marshack, A. (1991) *The Roots of Civilization*. Mount Kisco: Moyer Bell.
- Mellars, P.A. (1973) The character of the Middle–Upper Palaeolithic transition in south-west France. In: *The Explanation of Culture Change: Models in Prehistory* (ed. C. Renfrew), pp. 255–76. London: Duckworth.
- Mellars, P.A. (1982) On the Middle/Upper Paleolithic transition: a reply to White. *Current Anthropology*, **23**, 238–40.
- Mellars, P.A. (1989a) Major issues in the emergence of modern humans. *Current Anthropology*, **30**, 349–85.
- Mellars, P.A. (1989b) Technological changes across the Middle–Upper Palaeolithic transition: technological, social and cognitive perspectives. In: *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans* (eds P. Mellars & C. Stringer), pp. 338–65. Edinburgh: Edinburgh University Press.
- Mellars, P.A. (1991) Cognitive changes and the emergence of modern humans in Europe. *Cambridge Archaeological Journal*, **1**, 63–76.
- Mellars, P.A. (1992) Archaeology and the population-dispersal hypothesis of modern human origins in Europe. In: *The Origin of Modern Humans and the Impact of Chronometric Dating* (eds M. J. Aitken, C. B. Stringer & P. A. Mellars), pp. 225–34. Philosophical Transactions of the Royal Society, Series B, 337, No. 1280. London: Royal Society.
- Mellars, P.A. (1996a) *The Neanderthal Legacy: An Archaeological Perspective from Western Europe*. Princeton: Princeton University Press.
- Mellars, P.A. (1996b) The emergence of biologically modern populations in Europe: a social and cognitive 'revolution'? In: *Evolution of Social Behaviour Patterns in Primates and Man* (eds W. G. Runciman, J. Maynard Smith & R. I. M. Dunbar), pp. 179–202. Proceedings of the British Academy No. 88. London: The British Academy.
- Mellars, P.A. (1998) Neanderthals, modern humans and the archaeological evidence for language. In: *The Origin and Diversification of Language* (eds N. G. Jablonski & L. C. Aiello), pp. 89–115. San Francisco: California Academy of Sciences.

- Mellars, P.A. (1999a) The Neanderthal problem continued. *Current Anthropology*, **40**, 341–50.
- Mellars, P.A. (1999b) Radiocarbon dating and the origins of anatomically modern populations in Europe. In: *Experiment and Design: Essays in Honour of John Coles* (ed. A. Harding), pp. 1–12. Oxford: Oxbow Books.
- Mellars, P.A. (2000) The archaeological records of the Neanderthal–Modern human transition in France. In: *The Geography of Neanderthals and Modern Humans in Europe and the Greater Mediterranean* (eds O. Bar-Yosef & D. Pilbeam), pp. 35–47. Bulletin No. 8. Cambridge: Peabody Museum of Harvard University.
- Mithen, S. (1996) *The Prehistory of the Mind: A Search for the Origins of Art, Religion and Science*. London: Thames & Hudson.
- Noble, W. & Davidson, I. (1996) *Human Evolution, Language and Mind: A Psychological and Archaeological Inquiry*. Cambridge: Cambridge University Press.
- Oliva, M. (1993) The Aurignacian in Moravia. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 37–56. Boca Raton: CRC Press.
- Pinker, S. (1995) *The Language Instinct*. Harmondsworth: Penguin books.
- Relethford, J.H. (1998) Genetics of modern human origins and diversity. *Annual Review of Anthropology*, **27**, 1–23.
- Renfrew, C. (1996) The sapient behaviour paradox: how to test for potential? In: *Modelling the Early Human Mind* (eds P. Mellars & K. Gibson), pp. 11–4. Cambridge: McDonald Institute for Archaeological Research.
- Richards, M. & Macaulay, V. (2000) Genetic data and the colonization of Europe: genealogies and founders. In: *Archaeogenetics and the Population Prehistory of Europe* (eds C. Renfrew & K. Boyle), pp. 139–53. Cambridge: McDonald Institute Monographs.
- Sherratt, A. (1997) Climatic cycles and behavioural revolutions: the emergence of modern humans and the beginning of farming. *Antiquity*, **71**, 271–87.
- Singer, R. & Wymer, J. (1982) *The Middle Stone Age at Klasies River Mouth in South Africa*. Chicago: University of Chicago Press.
- Soffer, O. (1994) Ancestral lifeways in Eurasia—the Middle and Upper Paleolithic records. In: *Origins of Anatomically Modern Humans* (eds M. H. Nitecki & D. V. Nitecki), pp. 101–9. New York: Plenum Press.
- Stringer, C.B. & McKie, R. (1996) *African Exodus: The Origins of Modern Humanity*. London: Jonathan Cape.
- Svoboda, J. (1993) The complex origins of the Upper Paleolithic in the Czech and Slovak republics. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 23–36. Boca Raton: CRC Press.
- Taborin, Y. (1993) Shells of the French Aurignacian and Gravettian. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 211–28. Boca Raton: CRC Press.
- Templeton, A.R. (2002) Out of Africa again and again. *Nature*, **416**, 45–51.
- Thackeray, A.I. (1992) The Middle Stone Age south of the Limpopo River. *Journal of World Prehistory*, **6**, 385–440.
- Thorne, A., Grün, R., Mortimer, G., Spooner, N.A., Simpson, J.J., McCulloch, M., Taylor, L. & Curnoe, D. (1999) Australia's oldest human remains: age of the Lake Mungo 3 skeleton. *Journal of Human Evolution*, **36**, 591–612.

- Valladas, H., Mercier, N., Joron, J.-L. & Reyss, J.-L. (1998) GIF laboratory dates for Middle Paleolithic Levant. In: *Neanderthals and Modern Humans in Western Asia* (eds T. Akazawa, K. Aoki & O. Bar-Yosef), pp. 69–76. New York: Plenum Press.
- Voelker, A.H.L., Sarnthein, M., Grootes, P.M., Erlenkeuser, H., Laj, C., Mazaud, A., Nadeau, M.-J. & Schlicher, M. (1998) Correlation of marine ^{14}C Ages from the Nordic seas with the GISP2 isotope record: implications for ^{14}C calibration beyond 25 ka BP. *Radiocarbon*, **40**, 517–34.
- White, R. (1982) Rethinking the Middle/Upper Paleolithic transition. *Current Anthropology*, **23**, 169–92.
- White, R. (1993) Technological and social dimensions of ‘Aurignacian age’ body ornaments across Europe. In: *Before Lascaux: The Complex Record of the Early Upper Paleolithic* (eds H. Knecht, A. Pike-Tay & R. White), pp. 277–300. Boca Raton: CRC Press.
- Yellen, J.E., Brooks, A.S., Cornelissen, E., Mehlman, M.J. & Stewart, K. (1995) A Middle Stone Age worked bone industry from Katanda, upper Semliki valley, Zaire. *Science*, **268**, 553–6.
- Zilhao, J. (2001) *Anatomically Archaic, Behaviorally Modern: The Last Neanderthals and Their Destiny (Kroon Lecture, 2001)*. Amsterdam: Amsterdam Archaeological Centre, University of Amsterdam.
- Zilhao, J. & D’Errico, F. (1999) The chronology and taphonomy of the earliest Aurignacian and its implications for the understanding of Neanderthal extinction. *Journal of World Prehistory*, **13**, 1–68.

