THE ORIGIN OF MODERN HUMANS

SALLY McBREARTY
Brandeis University

Recent fossil finds and new information from the field of molecular genetics have led to a reassessment of the question of the origin of modern human beings. Modern human fossils dating to approximately 100,000 years ago have been found both in Africa and in the Near East, but the genetic evidence favours Africa as the probable source of modern Homo sapiens. This hypothesis has profound implications for evaluating the status of the Neanderthals, for reconstructing the behaviour and phylogenetic relationships of early modern humans and their ancestors, and for interpreting the worldwide Later Pleistocene archaeological record.

Where, when, and how did modern human beings first appear? These pivotal questions have engaged anthropologists since the birth of their science. For the last several decades palaeoanthropologists have concentrated upon solving the problems of the Plio–Pleistocene origins of our genus, Homo. Interest in this issue remains intense, but recently we have grown to appreciate that the origin of our species, Homo sapiens, is the outcome of an equally interesting and complex set of evolutionary factors (see, for example, Stringer 1978; 1985; Howells 1981; Ronen 1982; Trinkaus 1983c; Smith & Spencer 1984; Pilbeam 1986; Andrews 1986; Stringer & Andrews 1988; Mellars 1989).

A conference held at Cambridge University\(^1\) brought together over fifty researchers from more than a dozen nations to address the many questions associated with the origin of modern Homo sapiens and its dispersal throughout the globe. These questions concern the events leading to the first appearance of the species, the possible phylogenetic relationship between modern humans and their most recent hominid predecessors, and the reconstruction of early Homo sapiens behaviour. The information brought to bear upon these issues was derived primarily from the fields of archaeology and biological anthropology, and the conference was important in illustrating the rewards and difficulties of meshing the strands of evidence from the two subdisciplines.

The fossil evidence

Most palaeoanthropologists agree that Homo sapiens, broadly defined, arose out of Homo erectus some time before 200,000 years ago. Africa is currently favoured by many investigators as the place of origin of anatomically modern humans (e.g. Brücher 1984a; 1984b; Stringer 1984b; Stringer & Andrews 1988). This view is the result of a new synthesis of evidence from recently discovered fossils and from the study of human nuclear and mitochondrial DNA.

Early Homo sapiens fossils, which share primitive features with Homo erectus, are termed ‘archaic’ Homo sapiens to distinguish them from ‘anatomically modern’ Homo

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sapiens (Homo sapiens sapiens), people essentially like ourselves. The archaic group includes the classic Neanderthals, which were the first ancient hominids to be recognised as such (Schaafhausen 1858). The known geographic range of the Neanderthals includes Europe, the Near East, and western Asia. Non-Neanderthal archaic Homo sapiens fossils are known from Africa and elsewhere in Asia. Historically, the relationship of the Neanderthals to modern Homo sapiens has been the subject of heated debate, some authors favouring an ancestral status for the Neanderthals (e.g. Brace 1964; Wolpoff 1980), others rejecting this claim (e.g. Boule 1923; Howell 1951; Vallois 1954; Le Gros Clark 1964; 1984).

It is largely because Neanderthal cranial capacities fall within the range of those for modern human populations that they are included in our species, and certain apparent ritual behaviours, such as burial of the dead, reinforce the impression of their humanness. But the Neanderthals possess a number of features which give them a somewhat primitive appearance despite their big brains. The cranial vault is long and low, the postcranial skeleton is robust, the face is prognathic, the brow ridges are massive, and the occipital region of the skull is heavily built into the characteristic Neanderthal ‘bun’ (Howell 1957; Huber 1978; Smith 1984; Trinkaus 1986).

Non-Neanderthal archaic Homo sapiens groups do not appear to have buried their dead. Deliberately interred human remains are more likely to be preserved than those buried by natural processes, and partly for this reason our skeletal sample for the Neanderthals greatly exceeds that for non-Neanderthal archaic Homo sapiens. Fossils from Africa and the Far East show a mosaic of archaic and modern traits. Like the Neanderthals, they had large brains contained within robustly built skulls (Pickel 1975; Bräuer 1984a; 1984b; Rightmire 1984a; 1984b).

Chronology

The chronological relationships among archaic Homo sapiens fossils are difficult to sort out, because this crucial period of human prehistory lies outside the range of reliability for current standard dating techniques. The conventional potassium-argon method is not reliable for samples much under half a million years old (Curtis 1966), and at the conference, John Gwalt (University of Liverpool) emphasised that due to contamination problems, even accelerator radiocarbon dates much over 20,000 or 30,000 years should be regarded as minimum estimates (cf. Gowlett & Hedges 1986).

The classic Neanderthals are known to have persisted well into the Later Pleistocene, not disappearing from western Europe until after 35,000 years ago, when the first anatomically modern Homo sapiens appeared rather suddenly on the scene (Vandermeersch 1985). In Europe and the Far East the known age of anatomically modern Homo sapiens does not exceed 40,000 years (Kennedy 1979; Oakley et al. 1975; Brothwell 1960; Stringer et al. 1981; Stringer et al. 1984; Mellars & Bricker 1986). In Australia, the oldest known human fossils date to about 30,000 b.p. (Thorner 1971).

In Africa the picture is quite different. Largely on the basis of his finds from the sites of Kanam and Kanjera, Kenya, Louis Leakey (1935) long asserted an extreme antiquity for African anatomically modern Homo sapiens. Despite Leakey’s claims, the age of the Kanam and Kanjera fossils has never been conclusively established.

In the last two decades, however, anatomically modern human fossils have been found in Africa which are substantially older than any yet found outside the African continent, suggesting that Leakey may have been correct in postulating an African
origin for modern people. For example, thorium–uranium dates on shell suggest that the modern looking cranium, Omo Kibish I, may be as old as 130,000 years (Leakey et al. 1969; Day 1972; Butzer et al. 1969). A pair of uranium series dates on bone indicate a similar antiquity for the small and apparently modern human molars excavated at Mumba cave in northern Tanzania (Brätter & Mehlman 1988). But the most exciting and widely cited finds from Africa bearing on this issue are those from the cave site of Klasies River Mouth on the Cape coast of South Africa (Butzer 1978; 1982; Rightmire 1976; Singer & Wymer 1982). These fossils are undeniably the remains of anatomically modern *Homo sapiens*. Geological evidence and the oxygen isotopic content of associated marine shells suggest a correlation with last interglacial sea levels dating back more than 100,000 years (Shackleton 1982).

The stratigraphic evidence from Klasies was critically examined at the Cambridge conference. John Wymer (Norfolk Archaeological Unit) reported on excavations made by him and Ronald Singer in the 1960s. Hilary Deacon (University of Stellenbosch) described his recent extensions of Singer and Wymer’s excavations. The oxygen isotope age estimates of Shackleton (1982) for the Klasies hominin material seem to be confirmed by detailed biostratigraphy and results from a variety of dating methods, including uranium series and electron spin resonance (Deacon & Thackeray 1984; Hendley & Volman 1986; Deacon et al. 1986; Thackeray 1987; Goede & Hitchman in press).

John Parkington (University of Capetown) suggested that evidence from another South African cave should perhaps be regarded with caution. Border Cave, on the Zululand–Swaziland border, has produced the remains of several anatomically modern individuals (Beaumont & Boshier 1972; de Villiers 1976; Rightmire 1979). The cave deposits have been estimated to be between 115,000 and 90,000 years old, on the basis of inferred sedimentation rates (Beaumont 1980; Beaumont et al. 1978; Butzer et al. 1978; Protsch 1975). There have been doubts about these inferences, as well as about the provenance of the finds, due to the circumstances of their recovery. Significantly from a taphonomic point of view, the material is in an excellent state of preservation compared to the fragmentary nonhuman bone from the site. At the conference, Parkington criticised the over-confident sedimentological and environmental inferences of Butzer and Beaumont, and suggested that the human remains may be substantially younger than is claimed in their estimates.

If the dates from Klasies, Omo and elsewhere are accurate, they are startling, because they show that modern human beings in Africa predate those in Europe by many tens of thousands of years. The only claims for anatomically modern *Homo sapiens* outside Africa of an age approaching that of the African finds are those for modern human specimens from the Levantine site of Qafzeh. At the conference, Ofer Bar–Yosef (Harvard University) and Bernard Vandermeersch (University of Bordeaux) presented sedimentological and faunal evidence that the Qafzeh material may be as much as 80,000 or perhaps 100,000 years old (Tchernov 1981; Vandermeersch 1982; Bar–Yosef & Vandermeersch 1981; Bar–Yosef et al. 1986). More recently, this team has reported thermoluminescence dates on burned flints from the hominin-bearing level at Qafzeh of the order of 92,000 years (Valladas et al. 1988). These dates are consistent with either an African or a southwest Asian origin for modern people.
The genetic evidence

On the basis of the fossil evidence, then, both Africa and the Near East might be regarded as good candidates for the birthplace of modern *Homo sapiens*, but recent research in the field of human molecular genetics has lent support to the idea of an African origin for our species. Data from the study of human mitochondrial DNA (mtDNA) were outlined at the Cambridge conference by Mark Stoneking (University of California, Berkeley). African samples of contemporary human mitochondrial DNA show a higher degree of variability than samples from other populations. Because the degree of variability reflects the time elapsed since population members shared a common ancestor, this finding suggests a greater antiquity for the African material. As mtDNA is inherited only through the female line, Cann *et al.* (1987) propose that all human mitochondrial DNA was inherited from a single African female or closely related group of females. According to their estimates of mtDNA mutation rates, the mitochondrial ancestor lived between 140,000 and 280,000 years ago.

A number of issues are raised by this research which can only be addressed by further sequencing of mitochondrial genomes. First, do human mtDNA base substitutions in fact proceed at a uniform rate, and if so, what is that rate? Moritz *et al.* (1987) suggest that rates are variable. Proposed rates vary from as little as 0.5% to as much as 9.3% per million years (W.M. Brown 1980; Wilson *et al.* 1985; Stoneking *et al.* 1986; Cann *et al.* 1987). In part this is due to the fact that in order to calculate mutation rates, observed mtDNA differences within populations must be calibrated with the archaeological or fossil record, which is itself imprecise. Thus, on the basis of an inferred date of 50,000 b.p. for the first arrival of humans in New Guinea, from measured differences within the modern New Guinea population, Stoneking *et al.* (1986) derive a rate of 1.8–5.6% per million years, whereas with a date of 30,000 b.p. they derive a rate of 3.0–9.3%. Secondly, how does the date for the mitochondrial ancestress relate to that for the origin of modern *Homo sapiens*? W.M. Brown (1980) has proposed that the uniformity in human mtDNA is the result of the loss of other mitochondrial lineages, and may reflect a population constriction or bottleneck coinciding with the origin of our species. However, it could as convincingly be argued that such a population reduction occurred subsequently to the origin of modern *Homo sapiens*, or that no bottleneck occurred at all. Because many women in a population will not produce daughters, the likelihood of mtDNA lineages being lost due to chance is high (Avise *et al.* 1984; Cann 1988; Moritz *et al.* 1987).

The genetic evidence for an African origin for modern *Homo sapiens* is not confined to the mitochondria, and at the conference James Wainscoat (University of Oxford) presented data from nuclear DNA which are suggestive of an African origin. Most polymorphisms among the alpha- and betaglobins are not found outside the African continent, and the degree of genetic diversity in the African sample suggests that it is indeed the most ancient (Wainscoat, Hill, Boyce *et al.* 1986; Wainscoat, Hill, Thein *et al.* 1986).

Competing human genealogies

How are we to look at the hominin fossil record in light of the genetic evidence? Did anatomically modern *Homo sapiens* evolve in Africa, then spread out of Africa to replace local archaic populations elsewhere? Were African archaic *Homo sapiens* populations ancestral to the early African modern human populations, and thence to us all? It was
clear at the conference that individual investigators can look at the same set of data and arrive at very different conclusions. Gunter Bräuer (University of Hamburg; 1984a; 1984b) and Chris Stringer (British Museum [Natural History]) 1974; 1984b) accept this reconstruction of events, while Philip Rightmire (State University of New York; 1984b) expresses reservations. Many participants concurred that this scenario provides a good explanation for the demise of the European Neanderthals and their rapid replacement by anatomically modern humans. However, there was substantial disagreement over the degree of genetic distance between archaic and modern Homo sapiens and their potential for interbreeding. Few researchers are willing to allow the Neanderthals no role at all in the evolution of modern European Homo sapiens. For example, a paper presented at the conference by Chris Stringer reveals that in terms of the degree of facial prognathism, the Neanderthals are more similar to modern Europeans than to the Cro-Magnons, their immediate successors in Europe. This suggests parallel evolution in both groups for this trait, or perhaps input from the Neanderthals into the modern European gene pool.

Tattersall (1986) suggests that the number of species within the genus Homo has been underestimated from the fossil evidence, and recommends that archaic and modern Homo sapiens be distinguished at the species level. If these two groups of fossils do in fact represent distinct biological species, and if modern people first appeared in Africa, then we would not expect to see evidence of genetic input from archaic populations outside Africa into the modern human gene pool. If many researchers who work outside the African continent have difficulty in accepting this idea, it is not entirely because they dislike seeing the fossils that have been their lives' work thrust out onto a side branch of the human family tree. At the conference, workers in four geographic areas presented evidence which they believe is not consistent with the African origin interpretation. These areas are the Near East, central Europe, China and Australasia.

Bernard Vandermeersch discussed evidence from the Near East, where a number of specimens, particularly the remains from Skhul and Qafzeh, attest to the very early presence of modern Homo sapiens in the Levant (Bar-Yosef & Vandermeersch 1981; Valladas et al. 1988). Other workers stress the continuity between archaic and modern Homo sapiens, suggesting a direct phylogenetic relationship. Fred Smith (University of Tennessee), for example, has analysed the cranial architecture of the Central European Neanderthals, particularly the form of the supraorbital and occipital regions, and finds that they show a gradual reduction through time to a condition approaching that of anatomically modern Homo sapiens (Smith 1982; 1984).

Milford Wolpoff (University of Michigan) has long been a strong proponent of genetic continuity in material from the Far East and southeast Asia. His scheme, discussed at the conference, allows for the multiple transformation of a worldwide polytypic species of Homo erectus into polytypic Homo sapiens (e.g. Wolpoff 1985). This view is in keeping with much that is known of the mechanics of speciation, and as Robert Foley (University of Cambridge) observed, it is difficult to accept that the combination of conditions required to trigger the remarkable gracilisation of Homo sapiens sapiens was not the result of unique circumstances occurring at a single place and time.

Some investigators see continuity between modern Homo sapiens and even more ancient hominids in Asia. Wolpoff has argued that the Chinese fossil sample shows
retention of peculiarly 'Mongoloid' facial and cranial traits which illustrate local continuity over the *Homo erectus—Homo sapiens* transition (Wolpoff 1985; Wolpoff *et al.* 1984). A similar case has been made for the early Australian finds (e.g. Thorne & Wolpoff 1981). Philip Habgood (University of Sydney) described the cranial and facial architecture of early Australian *Homo sapiens* and southeast Asian *Homo erectus* which he believes shows continuity within the Australasian sample (Habgood 1985).

In reply, Chris Stringer pointed out that many of the supposed Mongoloid features described by Wolpoff are primitive retentions from the ancestral state, and thus not significant for the reconstruction of phylogenetic relationships by cladistic analysis (cf. Stringer 1984a; Andrews 1984). The role of artificial cranial deformation in giving an archaic appearance to the frontal bones of some of the Australian skulls has been discussed by P. Brown (1981). Gunter Bräuer argued against a close relationship between the Australian and Javanese fossils, such as Sangiran 17, on the grounds that they are separated in time by several hundred thousand years.

The opinions of conference participants reflect a consensus that although there are considerable morphological differences between archaic and modern *Homo sapiens*, hybridisation or local continuity between the two groups cannot be ruled out. The genetic and fossil evidence together seem to indicate a period of increased gene flow from a centre of 'sapientisation', most likely in Africa, at the end of the Middle Pleistocene. Anatomically modern *Homo sapiens* may have appeared as long ago as 90,000 b.p. in the Levant, but thus far its presence is not established elsewhere prior to 40,000 years ago.

The archaeological evidence

Just as physical anthropologists place human fossils from this period into three taxonomic groups, *Homo erectus*, archaic *Homo sapiens*, and anatomically modern *Homo sapiens*, so archaeologists divide the artefacts into three categories. In Europe these are the Lower Palaeolithic (including the Acheulian), the Middle Palaeolithic (including the Mousterian), and the Upper Palaeolithic. In Africa and India it is customary to use the terms Earlier, Middle and Later Stone Ages, whose meanings very roughly coincide with the European divisions. Throughout the Old World, with the exception of the Far East, prehistorians have supposed a one-to-one correlation between these artefactual and biological categories. Thus it has been thought that *Homo erectus* was the maker of Acheulian artefacts, that archaic *Homo sapiens* was linked with Middle Palaeolithic implements, and that anatomically modern *Homo sapiens* was exclusively responsible for Upper Palaeolithic or Later Stone Age tools. Recent work has, however, shown deficiencies in this model.

First, human remains found with Mousterian artefacts are not exclusively Neanderthal. At the conference, Ofer Bar-Yosef pointed out that both Neanderthal and anatomically modern *Homo sapiens* have been found with Mousterian artefacts in the Levant. At Tabun, for example, the hominid remains from the Mousterian levels are those of Neanderthals, while at both Skhul and Qafzeh they are anatomically modern *Homo sapiens* (Vandermeersch 1969; Bar-Yosef & Vandermeersch 1981; Ronen 1985; Bar–Yosef *et al.* 1986). Secondly, Upper Palaeolithic industries in Europe are not invariably accompanied by anatomically modern *Homo sapiens*. Unquestionable Neanderthal remains have been found with an early Upper Palaeolithic (Chatelperronian) industry at the site of Saint-Césaire in the Charente-Maritime of France (Leveque &
The African origin model assumes a rapid replacement of the Neanderthals by modern *Homo sapiens*, but if true, it implies that for a brief period both kinds of hominin were present in Europe. If the dates of Valladas *et al.* (1988) for modern *Homo sapiens* at Qafzeh are accurate, the two lineages co-existed in the Near East for a considerable period of time. At the conference Francis Harrold (University of Texas) explored the archaeological implications of this co-existence in Europe. For Harrold, the Chatelperronian industry results from a 'bow wave effect'; that is, Chatelperronian artefacts were made by Neanderthals in imitation of their new modern *Homo sapiens* neighbours (Harrold 1983). Philip Allsworth-Jones (University of Ibadan) views the Szeletian industry as the 'Chatelperronian of Eastern Europe', essentially as a Mousterian industry made by Neanderthals, with the addition of blade manufacture learned from their modern human contemporaries (Allsworth-Jones 1986).

Nor can archaic *Homo sapiens* be unequivocally equated with Middle Stone Age technology in Africa. Although archaic *Homo sapiens* fossils have been found with Middle Stone Age tools at sites such as Laetoli, Tanzania (Day *et al.* 1980), the tools from other sites, such as Ndutu, Tanzania (Mturi 1976; Leakey & Hay 1982) or Saldanha, South Africa (Singer & Wymer 1968) can better be described as Acheulian. At Kabwe, Zambia (Clark 1959), and Eyasi, Tanzania (Mehlman 1984; 1987), archaic *Homo sapiens* remains have been discovered with artefacts of the Sangoan industry, which cannot be comfortably accommodated within either the Acheulian or the Middle Stone Age. Furthermore, Middle Stone Age artefacts have been found with modern, rather than archaic, human remains at Border Cave (Beaumont 1973) and Klasies River Mouth (Singer & Wymer 1982).

It is seldom appreciated that hominin bones found in association with stone tools may not be those of the tool makers. This is especially true of populations of this period in sub-Saharan Africa, in which deliberate burial of the dead was not the practice. Significantly, the human fossils from the Middle Stone Age levels at Klasies River Mouth are small isolated fragments, and many of them are charred. These bones may indeed be the remains of the occupants of the cave, but they might also simply be food remains, as originally postulated by the excavators (Singer & Wymer 1982). This idea was supported at the conference by Hilary Deacon, who reported that Tim White of the University of California at Berkeley has observed stone tool cut marks on a human frontal from Klasies (T.D. White 1987).

Archaeologists have traditionally used gradualist models to explain the transition from Middle to Upper Palaeolithic, but the search for a 'transitional' industry may be in vain. At the conference, Lawrence Straus (University of New Mexico), suggested that such industries are an artefact of archaeologists' imaginations. As was stressed by both Tony Marks (Southern Methodist University) and Art Jelinek (University of Arizona), the primary differences between Middle and Upper Palaeolithic stone tool industries are technological, not typological. Upper Palaeolithic tools are of course made on blades, whereas Middle Palaeolithic tools are made on flakes. There is a quantum leap in technology between the two modes of stone working, rendering the search for transitional forms fruitless. Blade production is common in the South African Middle Stone Age, and the blade-based Howiesonspoort of South Africa has sometimes been proposed as a candidate for a Middle to Later Stone Age transitional industry. But as pointed out at the conference by Tom Volman (Cornell University), its
stratigraphic position firmly within the Middle Stone Age disqualifies it from transitional status (Volman 1984).

Reconstructing the behaviour of archaic Homo sapiens

Motor behaviour. Discussion at the Cambridge conference centred on how morphological differences between archaic and anatomically modern Homo sapiens might reflect behavioural differences. For example, Fred Smith and Milford Wolpoff reviewed the 'teeth as tools' hypothesis, which explains Neanderthal prognathism, anterior dental wear and the occipital bun in terms of habitual manipulation of objects with the front teeth (cf. Brace 1967; Smith 1983; Rak 1986; Trinkaus 1986; 1987).

Unfortunately Erik Trinkaus (University of New Mexico) was not present at the conference, but his ideas concerning the behavioural implications of Neanderthal postcranial robusticity were very much in evidence. Trinkaus has suggested that the heavily-built Neanderthal frame reveals the level of strength and endurance required by hominids who were less well organised than modern Homo sapiens, who made use of widely dispersed resources, and who rarely survived beyond their reproductive years (Trinkaus 1983a; 1983b; 1986; Trinkaus & Thompson 1987). On the basis of unusual features of pelvic morphology, Trinkaus formerly postulated a long gestation period for the Neanderthals (Trinkaus 1976; 1983a; 1983b; 1984; 1986). From the length of the Neanderthal pubic ramus, he computed a Neanderthal pelvic inlet size larger than that of modern humans. This implied a brain size for the newborn larger than that of modern human infants, and a gestation period of 11 to 12 months. A longer birth interval and less postpartum maternal investment would have had profound implications for Neanderthal social organisation and demography. However, at the conference Baruch Arensburg (Tel Aviv University) discussed an important new find from Kebara Cave, Israel, which seems to refute Trinkaus's hypothesis. The specimen is the first complete Neanderthal pelvis to be found, and although the pubic ramus is long, the pelvic inlet size does not differ significantly from that of modern humans. This suggests a locomotor rather than an obstetric function for the long Neanderthal pubic ramus (Rak & Arensburg 1987; contra Rosenberg 1988).

Subsistence strategies. Most recent appraisals of Middle Palaeolithic subsistence strategies now emphasise their distinctiveness from those of the Upper Palaeolithic, and this trend was evident at the Cambridge meeting. Tony Marks, Richard Klein (University of Chicago), Randall White (New York University) and Olga Soffer-Bobyshev (University of Illinois) saw clear differences between Middle and Upper Palaeolithic economies, the former characterised by an opportunistic 'encounter' strategy, the latter by a more systematic and wide-ranging 'mapping on' to resources (Marks 1981; 1987; Klein 1978; 1982; 1983; 1988; White 1983; Soffer 1985; 1987). Others, such as Art Jelinek, Lawrence Straus, Philip Chase (University of Arizona), Francis Harrold, John Shea (Harvard University) and Phillip Allsworth-Jones, emphasised the technological continuities over the Middle to Upper Palaeolithic transition (Jelinek 1982a, 1982b; Clark & Strauss 1983; Harrold 1983; Allsworth-Jones 1986; Chase 1988).

It was argued by several conference participants, including Paul Mellars (University of Cambridge), Richard Klein and Lawrence Straus that the level of skill shown by Middle Palaeolithic hunters in both Europe and Africa was substantially less than that employed in the Upper Palaeolithic. Projectile weapons, game traps, and fishing and
fowling techniques are thought to have enabled Later Pleistocene populations to kill greater numbers of large dangerous animals, to crop ungulate herds more systematically, to exploit marine and avian resources more intensively, and thus to maintain much higher population densities than had been possible in previous periods (Mellars 1973; 1989; White 1982; Klein 1983; Straus 1983). It has been proposed by Trinkaus (1982; 1983b; 1986) that technological advances, plus the reduced energetic requirements of a more gracile body, gave anatomically modern Homo sapiens a clear competitive edge. At the conference Ezra Zubrow (State University of New York, Buffalo) suggested differential mortality as a mechanism for the rapid demise of the Neanderthals. His demographic modelling shows that a decrease in Neanderthal life expectancy of only 2 per cent could have led to their extinction within as little as 1,000 years.

Symbolic behaviour. Symbolic behaviour, including art and ritual, was often cited by conference participants as evidence for undisputed modern human status. Apart from burial of the dead, evidence of ritual behaviour is rare in the record of archaic Homo sapiens. Elaborate burials, body ornamentation, standardised stone tool types, and both mobiliary and cave art suggest a cultural sophistication among modern humans unknown for archaic Homo sapiens. But it must be pointed out that evidence for these accomplishments cannot be taken as a diagnostic precondition for assigning an individual fossil to modern Homo sapiens. Many contemporary societies do not produce art objects or standardised artefacts in an imperishable medium, but their members are no less anatomically modern human beings.

Increased standardisation of stone tool types within local industries and increased differentiation among the local industries of a region are characteristic of the Upper Palaeolithic. These features are interpreted as evidence for the existence of ethnic groups in the Later Pleistocene. Olga Soffer-Bobyshhev and Paul Mellars addressed the issues of increased population densities and semi-sedentism in the Upper Palaeolithic and their correlation with increased information flow and the demarcation of ethnic boundaries (cf. Wobst 1977; Soffer 1985; Mellars 1985; 1987, 1989). However, as pointed out by both Lawrence Straus and Geoffrey Clark (Arizona State University), neither the art works nor the substantial increase in technical diversity have anything to do with the first appearance of modern Homo sapiens. These striking features develop late in the European Upper Palaeolithic, some 20,000 years after the first reported modern Homo sapiens in Europe, and as much as 80,000 to 100,000 years after the first appearance of modern human beings in Africa or the Near East.

Language. It is often held that the social complexity implied by European Upper Palaeolithic art and technology is the outcome of increased human cognitive abilities and the appearance of fully modern language. A paper by Harold Dibble (University of Pennsylvania) at the Cambridge conference outlined a strong case that stone tools in themselves do not yield much information about the linguistic abilities of the hominids who made them (contra Gowlett 1984). It is probably more fruitful to look for evidence of linguistic capacity in the fossils themselves. From the fossils it appears likely that the language employed by archaic Homo sapiens differed in some respects from modern human speech. Philip Lieberman (Brown University) discussed his extensive work demonstrating that due to the position of the larynx and pharynx in the vocal tract, archaic Homo sapiens was not capable of making the full range of sounds
produced by modern humans (Lieberman 1984; 1985; cf. Laitman 1985; Laitman et al. 1979). Other evidence presented at the conference suggests that different parts of the functional complex of speech evolved at different rates. Baruch Arensberg presented data showing that the position of the larynx in the Kebara hominid was similar to that in modern humans, but an archaic mandible suggests limited tongue mobility.

Conclusions
It is clear that a number of major questions regarding the origin of our species remain to be resolved. Most pressing is the problem of chronology. No valid evolutionary scheme can be constructed without correctly ordering events in time, and this is problematic for the period concerned. Both Desmond Clark (University of California, Berkeley) and Art Jelinek stressed the urgent need for new dating methods.

There are a number of striking physical likenesses between modern humans and our archaic predecessors, but there are real differences as well. Among biological anthropologists, disagreement centres upon the degree of similarity among groups of fossils and how their morphological features may have been genetically controlled. Another question concerns what genetic traits in contemporary populations can tell us about the evolutionary histories of those populations. At the conference, Chris Stringer echoed the words of Vince Sarich, who has observed, 'I know my molecules had ancestors; the palaeontologist can only hope that his fossils had descendants' (cited in Gribbin & Cherfas 1982).

Among archaeologists, work over the last decade has led to an appreciation of the nature and magnitude of technological change involved in the shift from Middle to Upper Palaeolithic. The problem of mapping this technological change onto the biological transition from archaic to modern Homo sapiens remains. Deriving a full suite of human behaviours from details of technology or anatomy requires more than an imaginative leap, and the conference illustrated that neither archaeologists nor biological anthropologists can afford to look at their data in isolation.

For all palaeoanthropologists the hypothesis of an African origin for modern humans is central to the debate. It lends new urgency to the clarification of African archaeological sequences, where the unique circumstances surrounding the birth of our species may be revealed. It also provides workers outside Africa with a powerful new interpretive model for re-evaluating the Asian and European archaeological records.

NOTES
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1 The origins and dispersal of modern humans: behaviour and biological perspectives, organised by Paul Mellars of the Department of Anthropology, University of Cambridge, and Chris Stringer of the British Museum (Natural History), and sponsored jointly by the Cambridge Department of Anthropology, the British Museum (Natural History) and the Royal Anthropological Institute, held at Cambridge University, March 23-6, 1987. Since this article was written, a volume of papers from the conference has been published (The human revolution: behavioural and biological perspectives in the origins of modern humans (eds) P. Mellars and C. Stringer, Edinburgh University Press, 1989).
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SALLY MCBREARTY


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**L'origine des êtres humains modernes**

**Résumé**

De récentes trouvailles de fossiles et de nouvelles informations venant du domaine de la génétique moléculaire ont mené à une révision de la question de l'origine des êtres humains modernes. Des fossiles d'humains modernes datant d'il y a environ 100,000 ans ont été trouvés à la fois en Afrique et au Proche Orient, mais l'évidence génétique favorise l'Afrique comme la source probable de l'Homo sapiens moderne. Cette hypothèse a des implications profondes pour l'évaluation du statut des Hommes de Néandertal, pour la reconstruction du comportement et des relations phylogénétiques des premiers hommes modernes et de leurs ancêtres; et pour l'interprétation de l'archéologue mondiale de la dernière période du pléistocène.