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WHAT IS A HUMAN? ARCHAEOLOGICAL PERSPECTIVES ON THE ORIGIN OF HUMANNESS

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Defining Human, Early Scientific Efforts

During the late 17th and 18th c., natural historians and biologists wrestled anew with the problem of defining humans within the natural world. In the context of the first anatomical studies of great apes, they found morphology alone was insufficient to achieve the appropriate degree of distinctiveness they felt was warranted, so many definitions and discussions fell back on distinctions in behavior such as language, innovation, or technology. In 1699, Tyson, in the first description of chimpanzee anatomy, named the chimpanzee *Homo sylvestris*, arguing that it was only the soul that differentiated this animal from ourselves. Buffon in 1749, wrote: 'If our judgement were limited to figure [morphology] alone, I acknowledge that the ape might be regarded as a variety of the human species'. Linnaeus in 1732 put *Homo sapiens* in the same order as the chimpanzee (*Homo troglodytes*), but Blumenbach and Lamarck put humans in a separate order, *Bimana*, emphasizing our reliance on bipedalism and free hands for making tools. However, Blumenbach's definition of human: '*Homo, erectus bimanus, mentum prominulum, dentes aequiliter approximati, incisores inferioires erecti*', would have excluded not only all the apes but also the large body of fossil human ancestors without chins. Lacking fossil evidence for human evolution, some early systematists who dealt only with living populations, saw behavioral continuity between humans, 'wild children' who lacked the essential ability to speak, and apes. Newly discovered peoples, such as the 'Hottentots' of southern Africa, were sometimes accorded a less-than-human status.

With the discovery of hundreds of fossil human remains, scientists have developed biological/morphological criteria for inclusion in the human lineage, based on bipedalism, brain size, skull shape, tooth morphology and so on (Figs. 1 & 2, see page 171). These discoveries began around 1835 with the first fossil Neanderthals in Belgium (Engis) and have accelerated up to the present including new finds announced in the last few weeks (White *et al.*, 2006, e.g.), But were all of these ancestors fully human? What do we mean by human? Are even all members of the genus *Homo* human? For that matter, anthropologists do not even agree on what should be placed in the genus *Homo*. Does it start with the first signs of brain enlargement in Ethiopian and Kenyan fossils from 2.3 mya (million years ago) or only with the first individual with a larger brain, smaller teeth, modern body size and modern limb proportions found in Kenya at 1.5 mya (Wood and Collard, 1999). Should we limit the definition of 'fully human' only to members of the species *sapiens*, defined morphologically by their large brains in relation to their body size, by their small teeth, their chins, their minimal brow ridges and vertical foreheads, and by the way the face is tucked under the braincase, bringing the larynx closer to the mouth to facilitate speech? Clearly the expanding fossil record has blurred the morphological distinction between human and non-human primates which Blumenbach saw so clearly. Can behavioral contrasts provide the distinction we seek?

Behavioral Perspectives on 'What is Human?'

Even for 18th and 19th c. scholars, behavior played a major role in the definition of humans, as it did for Aristotle, Horace and other ancient writers. Distinctions cited by these and other early scholars included language, shame, reason, use of fire and tools, a sense of justice and a sense of the sacred. Once the great apes were known, these distinctions like the morphological ones became more nuanced. James Burnett – Lord Monboddo – argued in 1779-1799 that orangutans and chimpanzees were human in every way – they had a guttural form of communication believed by native Indonesians to be language, and used simple stick tools. (He also argues they had a sense of shame, built huts, used fire, and buried their dead, for which there is no modern evidence).

New research on great ape behavior has further blurred the behavioral distinctiveness of humans. All the great apes make and use simple tools, and for both chimpanzees and orangutans, tool use and other behaviors vary between populations, suggesting that a rudimentary form of 'culture' is being handed down from one great ape generation to the next. (Whiten *et al.*, 1999). While spoken language is still a major defining feature of humans, many humans use other forms of communication, and apes have proven capable of learning and passing on a rudimentary ability for sign language. (Their anatomy does not facilitate the rapid production and distinction of multiple speech sounds). Furthermore there is now evidence that babies, who share some of the same anatomical disadvantages in speaking, can communicate complex ideas in sign language long before they can talk, suggesting, if ontogeny recapitulates phylogeny, that sign language may have an older history in humans than spoken language. Psychologists (evolutionary and otherwise) are focusing on the expression, in humans, of such characters as 'theory of mind', 'ability to imitate', 'empathy', 'problem solving abilities' and so on, but in every case, at least one of the great apes (and other animals as well) has shown a degree of these features that will not permit an absolute distinction between humans and other animals.

Genetics appears to provide another biological definition of humans or at least of modern humans since the full decoding of the human genome in 2001. But genetic sequences, even those derived from fossils, actually do not shed much light on whether the bearers were fully human or not – only on their degree of relatedness to ourselves. The difference between the Neanderthal mitochondrial genome and ours tell us nothing about the complexity of Neanderthal language(s) or whether Neanderthals shared ethical constraints, held complex beliefs about death and the afterlife, whether they sang or made up poems or told stories about their ancestors. Genetics may be more informative on this issue in the future. Animal studies of behavioral genetics and the genetics of brain growth and development are just beginning to yield results. Due to the essential unity of the genetic code in all living things, such results may carry implications for the evolution of human behavior. (According to some calculations, humans share 98.5% of their DNA with chimpanzees but also ca. 50% with bananas).

Defining Human: the Archaeological Approach

If we want to study the evolution of human behavior, we must necessarily turn to the fossil and archaeological records. Fossils can reflect behavior, in the shape of bones, their chemical composition, the position and strength of muscle markings, the damages suffered over a lifetime and the disposition of the skeletal remains. Archaeological sites are formed by definition only through human activities, although Mercader *et al.* (2002) have shown that chimpanzees also leave archaeological traces of their behavior. The fossil and archaeological records are limited, however, in what they can say about the past, as they require definitions of humanness that are amenable to recovery in the material record. For example, one cannot recover fossil languages, at least not until the development of writing, although dead languages can be reconstructed up to a point from words preserved in living languages. But one can recover traces of symbolic behavior, or morphological traces of changes in brain or vocal tract morphology that suggest an ability for language. Ideologies or the capacity for abstract thought are not preserved, but one can recover traces of practices that seem to conform to ideas about spirituality – burial of the dead and cave art. Problem solving and innovativeness cannot be directly observed in the past, but one can document increases in technological sophistication and rates of innovation. And while the social networks and societies in which humans live are abstraction which must be inferred from physical evidence even in living populations, through geochemical characterization of sources, one can trace the movement of materials over very long distances, rule out natural transport and infer the size of such networks. In addition, from patterns of variability in the material record, it is possible to infer whether or not people distinguished themselves from their neighbors through their material culture, and what the size of the distinctive groupings might have been. Signs of empathy may also be evident in the survival of individuals with crippling injuries or major deficits, who could not have survived long on their own.

From the perspective of modern humans, behavioral definitions of humanness include what could be called 'living in our heads' – in reference to the fact that we do not live in a natural world but in one of our own imagination – an imagination which has led in many cases, perhaps inadvertently, to actual transformation of the natural world. Humans think up cultural solutions to scarcity, risk and the quest for food, shelter and mates, resulting in an astounding diversity of cultural forms, and the transformation (and endangerment) of vast areas of the earth's surface. Since human teeth and their two-legged gait are utterly inadequate for defense against natural predators, humans are totally dependent on invented technologies. Rather than living in a physical herd or a pack, humans live in what Anderson has called 'imagined communities', populated by individuals one may never physically encounter – distant relatives, compatriots, ancestors, and spiritual beings. Humans use symbols extensively to represent both themselves, their social groups and their thoughts. In addition, symbols are used to reify social groups to the extent that disrespect to a symbol, especially a religious symbol, is tantamount to an act of violence against a person. And humans have the ability to imagine the feelings and lives of those around us as both separate from and similar to one's own – in a way that leads to extraordinary capacities for altruism and sympathy, even for individuals one may never meet.

The capabilities of modern humans must involve at least six different faculties:

Abstract thinking: the ability to act with reference to concepts not limited in time and space. A chimpanzee can be taught to use symbols correctly to solicit a reward, but not to go the grocery store with a shopping list and remember that she forgot to write down the milk.

Planning depth – the ability to strategize in group context. Social carnivores share this ability in the immediate future, but lack our ability to plan for next year, or for contingencies that may never happen.

Problem-solving through behavioral, economic and technological innovation. Many animals are good problem solvers, but modern humans solve problems that have not yet arisen, and devise entirely new ways of living in the process.

Imagined communities. Our present communities, from family to nation, may include people we have never met, spirits, animals and people who have died and the not-yet-born. These communities exist in our heads, and never meet face-to-face as a group.

Symbolic thinking, especially with regard to information storage. This involves the ability to reference both physical objects/beings and ideas with arbitrary symbols, and to act on the symbol even if the person who planted it is no longer present. It is both the arbitrariness of such symbols and their freedom from time and space constraints that distinguish our symbolic behavior from that of animals.

Theory of mind – the ability to recognize oneself as a separate intelligence but at the same time to read the emotions and thought of others (empathy). Apes and even domestic carnivores possess this to a degree, but only modern humans can recognize and respond to humanity in individuals they will never meet.

The Early Record of Behavioral Evolution 2.6-0.6 mya

When do these abilities first appear? It is difficult to say, not only because the record is sparse and patchy but because the capability may or may not be expressed for hundreds or thousands of years after it appears, and may depend on the development of other factors, or historical events. The capability for inventing computers may have existed in the late Pleistocene, but could not be expressed without the appropriate cultural and technological milieu. The limited evidence for early expression of some of these characteristics, however, suggests however, that the total package was not assembled over a short period.

Problem-solving and technological innovation. The first stone tools date to 2.6 mya from Ethiopia, slightly later in Kenya (Fig. 3, see page 175). There is little evidence for abstract thinking in these artifacts as they consist of simple flakes directly related to the form of the raw material, although the ability to choose appropriate raw materials and to derive multiple flakes from a single block is far beyond what even the smartest apes can be taught to do. The rate of change or innovation is initially very slow; new forms such as bifacially-worked symmetrical handaxes appear only after the first 900,000 years and tools remain very static for more than 1 mya after that (Fig. 4, see page 175). Nevertheless, such tools made it possible for early humans to shift from the frugivorous diet of the great apes to one involving substantial carnivory, and also to expand into the Near East, Indonesia and China, far beyond their original range, by 1.9-1.6 mya. Technology also seems to have made possible a shift in food preparation from teeth to tools, so that teeth become smaller while body size increases. Early human diets were probably omnivorous, with meat obtained largely by scavenging, although the 'early access' pattern of marks on many bones suggests that at least some early humans confronted felid or canid carnivores at kill sites. Fire was controlled by 0.8 mya or earlier, facilitating a new diet, the use of caves, hunting, new technologies and social time at night (Figs. 5, 6, see page 176).

There is no evidence from this time for *imagined communities* or *symbolic thinking*. Stone and other materials appear to have largely derived from the immediate area, and the shapes and technologies are very similar from India to England and from France to South Africa The early presence of language in some form is also debatable, as brain asymmetries exist in early *Homo*, but modern speech would have been difficult. The symmetrical pointed or blunt-ended forms of large cutting stone tools after 1.7 mya may have carried a symbolic meaning, but since they are also utilitarian objects, their symbolic meaning, if any, is obscure.

Empathy, which appears very early in children before competent speech, may already be reflected in a very early human skull from Dmanisi in the Caucasus at 1.9 mya, (Lordkipanidze *et al.*, 2005) of an individual who had lost almost all his teeth a considerable time before death, a condition which is rarely found in wild primates. Survival of this toothless individual required either a new, very soft diet or the assistance of others. The 1.5 mya *Homo ergaster* skeleton from Kenya also appears pathological in its vertebral column, yet survived into adolescence (Fig. 7, see page 177).

The early appearance of these features does not mean they were as fully expressed as in modern humans or even that the full capacity existed as in ourselves. But it does indicate that the capacity did not arise suddenly in full-blown form but developed or evolved over time from nonhuman antecedents.

Late Archaic Humans and Neanderthals

After 600 kyr (kiloyears), most fossils exhibit essentially modern brain sizes, yet evidence of an increase in technological innovation, larger social networks or symbolic behavior is minimal until ca. 300 kyr. A new stone technology (Levallois) required a degree of abstract thought to imagine the flakes whose shapes were predetermined by the shaping of the cores. Wooden spears or javelins from Germany and numerous remains of large animals constitute the first evidence of hunting technology, which may have facilitated the occupation of much more temperate latitudes by 600 kyr, especially in Europe (Fig. 8, see page 177). One cave in Spain contains the remains of more than 30 individuals, mostly children and young adults, who lived ca. 400 kyr. It is unclear if this concentration was due to deliberate disposal of the dead or some other factor.

Neanderthals, who occupied Eurasia west of China between ca. 250 and 40 kyr, were significantly more like modern humans in their behavior than their predecessors (Fig. 9, see page 178). They buried their dead, used black and red mineral pigments found as powder, lumps and 'crayons', made stone-tipped spears, and were competent hunters of large game. Their fossil remains bear traces of both interpersonal aggression, in the form of knife wounds, and empathy, as elderly and handicapped individuals survived for much longer periods than previously. Evidence of cannibalism is also found at many sites. Although Neanderthals occupied Europe for at least 200 kyr, their technology shows very little innovation or regional differentiation over this time. Although the Neanderthal brain was similar in size to ours when adjusted for their large body mass, the relationship of the tongue and soft palate to the laryngeal space suggest that they may still not have been capable of the complex speech sounds made by modern humans. Clear evidence of symbolic behavior in the form of personal ornaments is only found at the most recent Neanderthal sites, dating to a time when anatomically modern humans were already on their periphery. Does this mean they possessed a capacity for innovation and symbolic behavior, or only a facility for imitation?

Into the 1970s it was thought that modern humans evolved in Europe. But with the advent of new fossils and better dating techniques, it became clear that the oldest anatomical *Homo sapiens* fossils were African (Fig. 10, see page 178). The oldest fossil attributed to *Homo sapiens* in Africa is more than five times as old as the oldest *Homo sapiens* in Europe. At the same time, genetic studies demonstrated that all living humans share a 'recent' African common ancestor who lived between 100 and 200 kyr, ago or more, while one group of African genetic lineages shares a common ancestor with all Eurasians and Native Americans that is considerably younger, perhaps 40-80,000 years ago or more. Although at first this result was disputed, but repeated genetic analyses have confirmed our African origin repeatedly. MtDNA has been recovered from five Neanderthals who lived as far apart as Germany and Siberia, and the resulting sequences share similarities with one another but are quite different from living humans, suggesting around 600 kyr or more of separate evolution.

The rapid appearance of modern-looking people in Europe was not some punctuated 'human revolution' or 'great leap forward' but was clearly an invasion of people with long tropical limb proportions. Asia has a more complicated but equally punctuated history, also suggesting invasion and ultimate dominance by outsiders. Indeed the first 'out-of-Africa' migrations of *Homo sapiens* were to the Near East, with modern humans appearing first at Qafzeh and es-Skhul, in Israel, by 90-100 kyr. After 90 kyr, however, as the weather became cooler and drier, the *Homo sapiens* in the Near East retreated or went extinct and were replaced by Neanderthals. A second re-expansion of *Homo sapiens* ca. 60-50 kyr was more successful, reaching Australia by at least 50 kyr. It is unclear if the migration(s) involved one route out of Africa via the Nile valley, or an additional 'Southern route' over the Bab-el-Mandeb strait.

Becoming Fully Human: the Later Evolution of Behavior

The earliest *Homo sapiens* in Europe and Asia ca. 40 kyr and later, were almost certainly capable of the same range of behaviors as we are, as indicated by their cave paintings, musical instruments, beads and other jewelry, trade networks, technological innovations, regional diversity, economic flexibility and ability to colonize the entire globe (Fig. 16, see page 181). About earlier humans in Africa who were physically similar to ourselves in many ways, there is considerable debate. Scholars like Richard Klein argue that they were physically modern but behaviorally primitive. To him and others, modern behavior came about suddenly, a 'Human Revolution' tied to a rapidly spreading genetic mutation for language. Sally McBrearty and I have argued otherwise, that the capabilities for these behaviors began to be expressed and therefore existed before modern physical appearance, with a gradual assembly of the kinds of behaviors we see later. This assembly was not unilineal but geographically and temporally spotty, with many reversals.

As archaeologists, we look especially for technological innovation and complexity, long-distance exchange, economic intensification, regional styles that change over time, and beads, images and notational pieces along with burial of the dead. For all of these material expressions of behavioral capabilities, there are modern, even living groups which lack them. While being demonstrably capable of producing such items, they clearly lack the impetus or the history to do so, so absence may not be a good marker of non-modernity. But absence of all of these over long archaeological stretches of time cannot be characterized as 'modern behavior'.

The rest of this paper will focus on three particular expressions of behavioral capabilities: technological innovation, long distance exchange and symbolic behavior. Since modern humans evolved in Africa, one should look particularly at the African evidence, which is still very scanty. There are more excavated sites dating to 250-40 kyr in the Dordogne region of France than in the vast African continent In particular the more typical tropical regions of Africa are poorly known; most of the evidence comes from the temperate regions at the northern and southern edges of the continent. Despite the limited quality of the evidence, more than 150 sites testify to the gradual assembly of innovative, social and symbolic behaviors, and to a complex interrelationship between behavior and morphology, leading to modern humans.

Before ca. 200 kyr ago, there are no known fossils attributed to *Homo sapiens* sensu strictu. The oldest examples to date are from Ethiopia, from the Middle Awash (160 kyr) and a second region in the far south, on the Omo river (195 kyr). All humans found in Africa after this date are grouped in *Homo sapiens*, distinguished by smaller teeth, a chin, a vertical face tucked under the cranium, a vertical forehead, and vocal tract proportions conducive to spoken language. Several lines of evidence converge to suggest that East Africa rather than South Africa is the likely cradle not only of our physical selves but also of our behavior. Not only are the oldest hafted points and the oldest *Homo sapiens* from there, but new mtDNA and Y-chromosome studies suggest that an east African population, the Sandawe, may reflect as deep a root of the human genetic tree as the southern African San. Genetics also suggest that the ancient east African population was larger. In central Kenya, as well as in northern Tanzania and areas of Ethiopia, archaeological remains suggest a density of human occupation that is quite rare outside this area, with the possible exception of the South African coast, where habitation areas were limited by harsh climates.

But after more than a million years with little change in technology, the African record suggests that well before the appearance of *Homo sapiens*, before 285 kyr, behavior had begun to change (Fig. 12, see page 179). New technologies produced standardized stone flakes and long thin blades, ocher processing increased, and many sites have small quantities, up to 5%, of stone material derived from sources a considerable distance away – as much as 200 or more km., the first sign of an expanded social network. The increased use of ocher in Africa might suggest body painting or possibly a more utilitarian function. And in Israel and Morocco, two slightly modified stones with traces of ocher dating to between 500 and 200 kyr may or may not represent crude images. The behavioral changes reflected in these finds are not sudden or directional. The evidence for them is interspersed with sites containing the old symmetrical large cutting tools, or simple flake technologies, or lacking evidence for ocher or exotic stone. But the general trend is towards more complex behaviors with time. By ca. 260-235 kyr, several sites in South and East Africa include carefully made stone points, designed for hafting onto spear shafts.

New Technologies

More dramatic changes in behavior occur after the appearance of *Homo sapiens* (Fig. 13, see page 180). From South Africa to Egypt and from the western Sahara to Ethiopia, evidence for complex technologies and new tools increases especially after 100 kyr. In the Middle Awash region of Ethiopia, the first *Homo sapiens* at ca. 160 kyr are associated with both advanced flake technologies and the older symmetrical large cutting tools. Before 90 kyr, stone points are large or thick, and were likely hafted onto thrusting spears in close encounters with prey. But after 90 kyr, the points become tiny and light (Fig. 14, see page 180). We measured points from a number of other sites of about the same age from North, South and East Africa and compared them to contemporaneous points made by Neanderthals. In comparing these to the range of points made by historic groups of hunter-gatherers, we concluded that these ancient examples had to have served as armatures for a complex projectile weapons system, involving a point, a haft and some sort of propulsion system, either a bow or a spear-thrower. It is also likely that these very small points, which could not have delivered a lethal blow to a large animal, were associated with the use of poison (Fig. 15, see page 181).

A projectile weapons system has parallels to a grammar, in that it involves non interchangeable forms: point, haft, binding, propulsion agent, which can be combined in a limited number of ways, with each point or haft filling a role that can only be interchanged with another similar point or haft. Such a system provides tremendous advantages to the hunter, who can now kill at a distance, with much more success and less risk to himself (or herself), resulting in greater survivorship. What were they doing with these weapons? In the western Kalahari desert, we excavated a site dating to 77 kyr on a seasonal pan, which today serves as an ambush hunting venue at the end of the rainy season, when other water sources are dry and game is concentrated around this resource. More than 600 small finely made points constitute the dominant tool class and associated animal remains suggest that humans were hunting large dangerous animals such as African buffalo and giant warthog with points weighing less than 10g, well within the range of arrowheads and spear-thrower darts known from historic peoples. At Klasies in South Africa, one of these small points was actually stuck into the cervical vertebra of a giant buffalo, providing proof of its use as a weapon (Fig. 16, see page 181).

At Mumba Shelter in Tanzania, there are also small projectile armatures, the smallest in levels dated to between 45 and 60-70 kyr (better dates are pending). But these are not triangular but geometric crescents and trapezoids, designed for hafting multiple elements in a single haft in the manner of predynastic Egyptian arrowheads. Again, this level of technological sophistication is also found in a very limited time and space in southern Africa, 60-65 kyr. What is even more interesting in the Tanzanian case is that some of the tools are made of obsidian, not from Tanzania but from central Kenya, almost 300 km away. So we are not only looking at technological sophistication, but also at a likely exchange network. A few other African sites show comparable exchange distances in small amounts (Fig. 17, see page 182).

As early as 130 kyr, another set of technological innovations appears to have focused on fishing. In eastern DR Congo, (Zaire), we discovered a series of what appeared geologically and typologically to be MSA localities along the river at a place called Katanda, following an old land surface. We excavated three sites, each with mammalian fauna and lithic artifacts but also with a series of barbed bone points. Francesco d'Errico is studying the manufacture and use of these points and has suggested that there is wear from some sort of line or string on the base, indicating probable use as a harpoon. The dates for these sites have varied, but the trapped charge dating techniques suggest an age of 80-90 kyr would be likely, and that there is no evidence for an age of less than 60 kyr. Again, this is a complex technology that appears to have been outside the competence of Neanderthals.

The associated fauna includes a very large component of fish remains, all of the same species (*Clarias*) and age, suggesting a seasonal fishing activity. The fish were very large; we caught one weighing 74 pounds and the excavated ones were larger (Fig. 18, see page 182). Thus these three sites testify to a both technological and economic innovation. In addition, fish provides important nutrients – omega-3 fatty acids – which nourish the brain. Bone points very much like this one are known from the MSA-LSA interface at WPS. Very different cylindrical bone points resembling historical bone arrow points are known from ca. 77 kyr at Blombos cave, from Peers Cave and a number of other South African coastal sites, predating 65 kyr. In each case, fish bones have also been recovered (Fig. 19, see page 183). Bone points are a major technological advance, requiring considerably more time and effort to manufacture. Their advantage, according to ethnographic accounts, is that they float, allowing the fisherman to retrieve them easily.

Small projectile armatures in a complex weapons system could have given the edge to later modern humans, allowing populations to expand both within and outside Africa at the expense of the Neanderthals and other archaic populations. Neanderthals had many injuries from personal encounters with large dangerous animals, later moderns had very few. Neanderthals also had many more signs of dietary stress in their bones and teeth than the early moderns who succeeded them.

These projectiles are also quite variable in time and space – at least as variable as the small arrow tips that succeed them. The patterning of regional variation is to a large extent independent of climate and raw material – a stone industry with geometric shapes (the Howiesons Poort) for example, is found from Namibia to the Cape Province of SA in a limited time band and is made on a wide variety of raw materials from quartz to silcrete and chert. The distribution of regional styles of early *Homo sapiens* is thus as suggestive of ethnic or regional differences as any later African stone tools (Fig. 20, see page 183).

Symbolic Behavior

So far, we have demonstrated the presence of technological innovation, economic intensification, long distance exchange and regional styles in the behavioral repertoire of early modern humans. But is there hard evidence for symbolic behavior? Until very recently, there was little evidence before 40 kyr. An image from Apollo 11 of an antelope with human hind legs, was found in a level with an old date of 27,000, although we have dated the industry found with it to 65,000 at that site (Fig. 21, see page 184). In 2002, this extraordinary piece of engraved ocher (Fig. 22, see page 184) was described from Blombos cave in South Africa. It and a second similar piece clearly suggest that ocher had more than a utilitarian function. Multiple other pieces of ocher, bone and eggshell with engraved geometric or linear designs are known both from this site and from other sites in southern Africa, such as these fragments of decorated ostrich eggshell containers from ca. 65 kyr at the coastal site of Diepkloof (Fig. 23, see page 185).

Bead and other body ornaments are unequivocal evidence for symbolic behavior and for fully human status, as they have little utilitarian function (Fig. 24, see page 185). In traditional hunting societies, beads provide the basis of exchange networks that serves to tie distant people together in a mutual support network, which can be activated when times are bad. Individuals deliberately build these networks up as they grow into middle age, and acquire major responsibilities for raising and marrying off children or for supporting elderly parents. As they age and their needs decrease, individuals begin to reduce the size of these networks. Beads and personal ornaments such as rings, or headpieces, also serve as markers of social identity or status worldwide, from wedding bands to the colorful collars of the Maasai to the diamond necklaces of society women (or men). Despite extensive excavation, no beads are known from Europe before ca. 40 kyr. Early African sites have yielded a few ostrich eggshell beads in early sites – an unfinished one from South Africa (Boomplaas) dated to ca. 60-80 kyr, and several from Tanzania (Mumba) dated directly to between 45 and 52 kyr. In 2004, a series of perforated shell beads from the coast of South Africa, dated to 76 kyr, made headlines as the oldest evidence for body ornaments. New finds of shell beads, of the same genus, will shortly be published from even older sites in North Africa and the Middle East, in direct association with modern humans at one site, but dated to as much as 110 kyr (Fig. 25, see page 186). More and older bead sites are being reported, as we excavate more sites with modern technologies.

The evidence for human burial practices within Africa is limited, due in part to poor excavation practices, but there is an elaborate modern human burial at Qafzeh, in Israel dated to 90-100 kyr. The individual was associated with 71 pieces of red ocher, and also with a perforated bivalve shell (Fig. 26, see page 186). Although the perforation could have been natural, the shell was brought to the site and placed in the burial, along with some possible offerings of animal remains. This is the clearest evidence for symbolic burial with grave goods, and red ocher, practices which suggest a belief in the survival of a spirit after death.

Summary: Why Humanness Is a Gradual Process, Not a Sudden Event

The accelerating rate of technological innovation was a stepwise process, not a sudden event related to language. By 70 to 60 kyr, well before the out-of-Africa event that led to Neanderthal extinction, anatomically modern humans in Africa (and occasionally in the Levant) had: light complex projectile weaponry, fishing and bone fishing spears, long distance exchange networks, ocher, deliberate burial with grave goods, regionally distinctive point styles, symbolic engravings and personal ornaments. Within Africa, there is probably a complex web of inter-regional migration and local extinction that makes the record patchy and discontinuous. In addition, demographic and climatic factors may affect the degree to which any of these modern human capabilities are expressed; ethnographic studies suggest that symbolic expression, subsistence practices, and regional networks intensify under condition of resource stress. It is also interesting that the first Australians, who must have come from Africa but entered an empty continent ca. 50 kyr, lack evidence for any of these behaviors until after 30 kyr when the population had grown to fill the available regions, and the climate turned hyperarid.

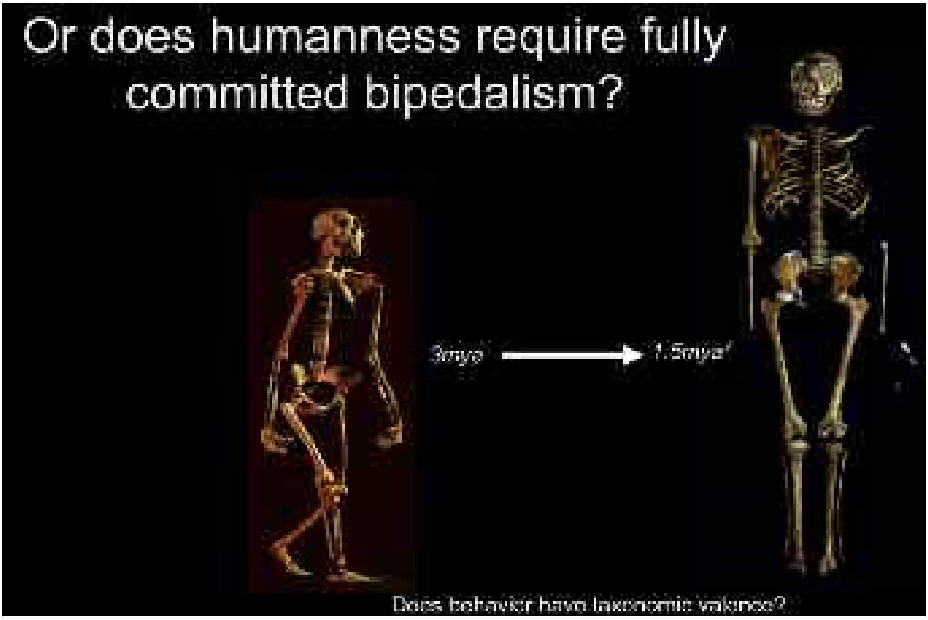
Neanderthals, on the other hand, before 40 kyr, had hafted spear points, but possibly mainly in the Levant, they used a large amount of black coloring materials (they probably had light-colored skin) and simple burials without offerings or ocher. There is little evidence for Neanderthal fishing and none for bone tools, musical instruments, cave art or personal ornaments. After 40 kyr, when the modern humans were already on their periphery or perhaps in their midst, Neanderthals responded to pressure by developing or adopting some of the same traits – particularly the beads, and stone technologies. But they still lacked small light projectile armatures, they never went fishing and really long-distance raw material transport is only marginally present towards the end at the northeast end of their range in Eastern Europe and Central Asia, where we would expect human territories to be very large and populations sparse.

Why was *Homo sapiens* able to replace Neanderthals in Eurasia after 50kyr but not before? There seem to be three possibilities: one is the sudden genetic mutation theory, one is about technological superiority, and one concerns the development of more sophisticated social networks, supported by a greater use of symbols, which buffered human populations against risks, much like the naming and gift-giving relationships of the Kalahari hunter-gatherers.

While the answer is almost certainly more complicated that any of these simple hypotheses, and may involve combinations of them and other arguments, I would argue that the evidence against a revolutionary genetic event is strong when you look at Africa. That continent is characterized by the earlier appearance of technological and economic complexity, as well as of complex symbolic behavior. The patterning of change both during and at the end of the Middle Stone Age period of early *Homo sapiens* is also very different from that consistent with a revolution, as it is both spotty and gradual. Such patterning is much better explained by the existence in earlier anatomically modern humans of modern behavioral capabilities that are variably expressed when conditions call for them – when either climate or population growth creates effective crowding, in an otherwise sparsely inhabited landscape.

At what point did *Homo* become fully human? The more we know the harder it is to draw a line between human and non-human or pre-human. The evidence suggests that the capabilities for 'living in our heads' were present before 130 kyr, and developed in a step-wise fashion, possibly in a feedback relationship with our morphology. Capacities for some of the most human qualities: creativity, empathy, reverence, spirituality, aesthetic appreciation, abstract thought, and problem solving (rationality) were already evident soon after the emergence of our species.

Figure 1.



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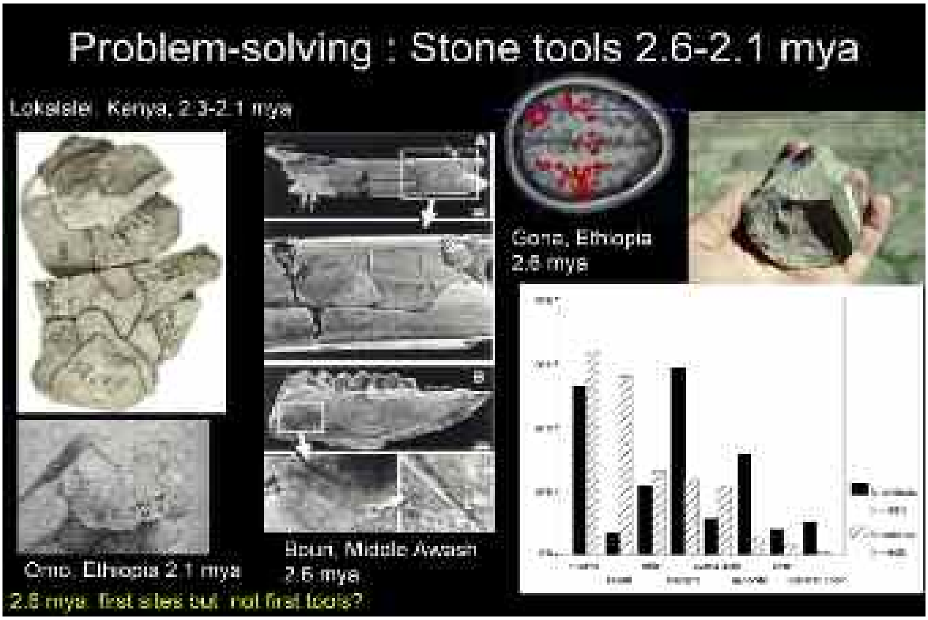

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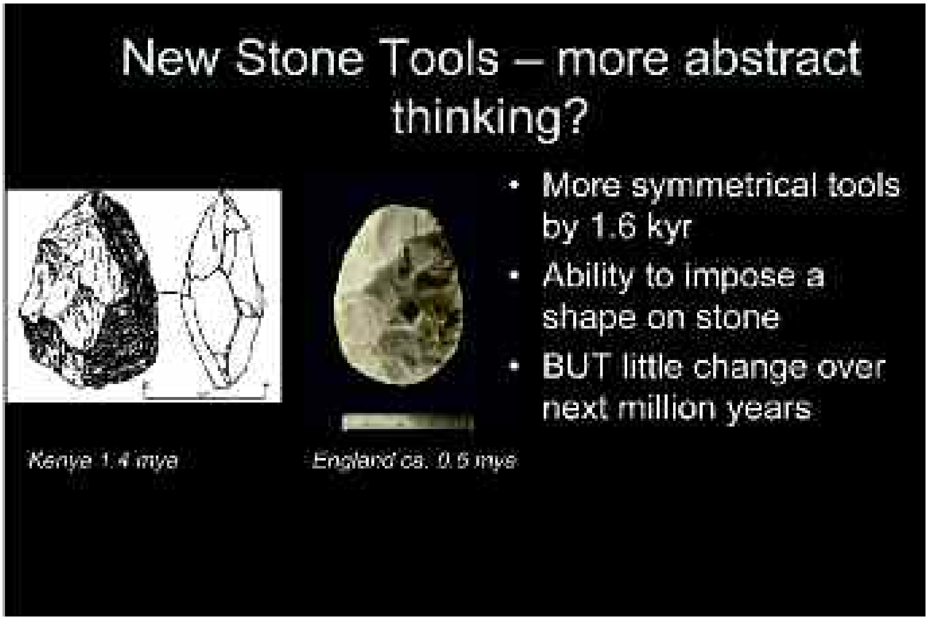


Figure 4.

Figure 5.

Figure 6.

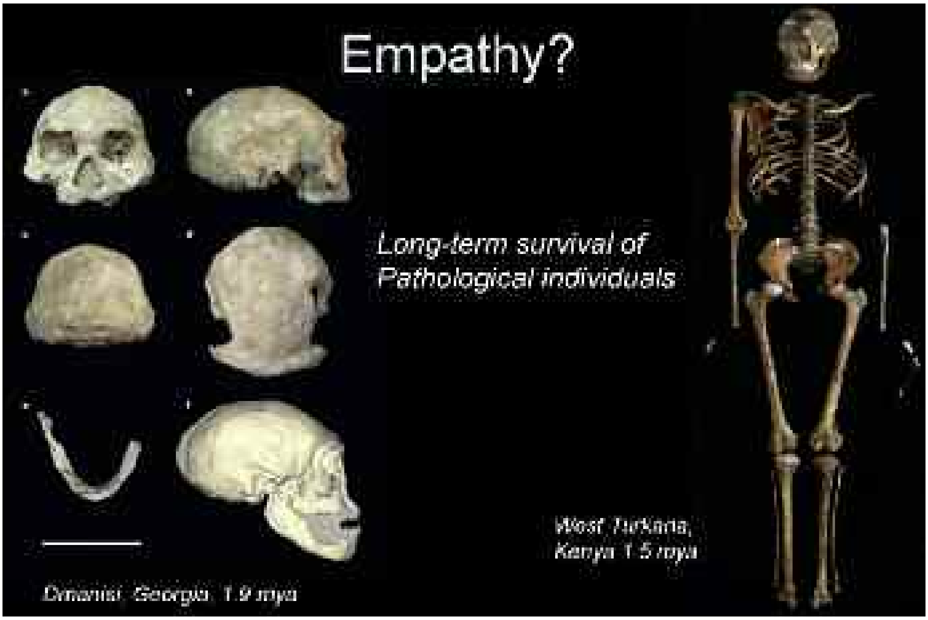


Figure 7.

Figure 8.

Figure 9.

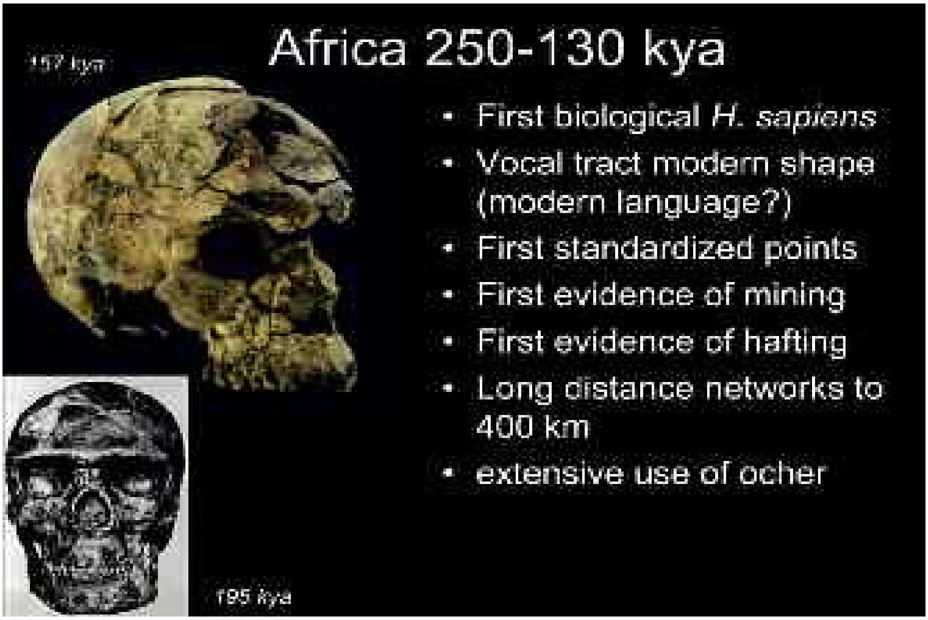


Figure 10.

Figure 11.

Figure 12.

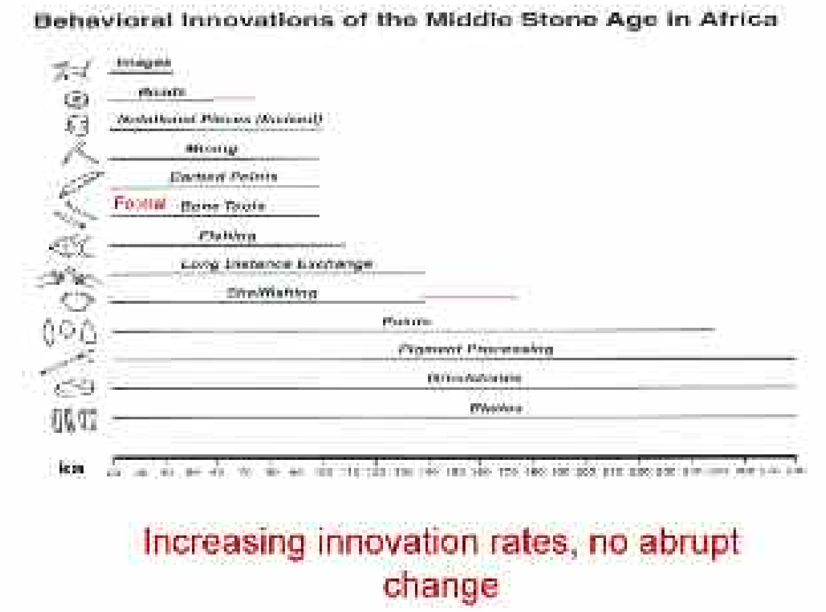


Figure 13.

Figure 14.

Figure 15.

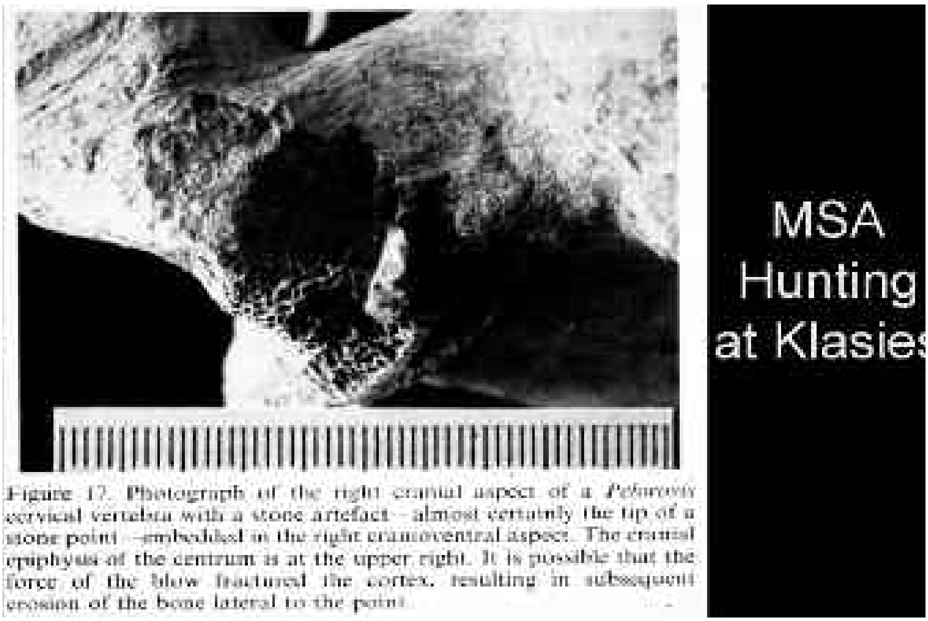
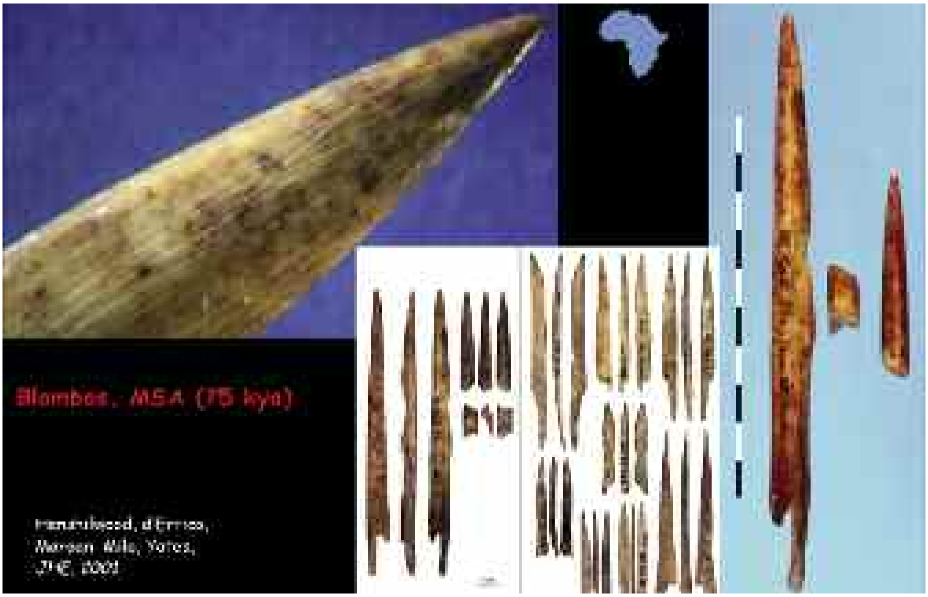


Figure 16.

Figure 17.

Figure 18.



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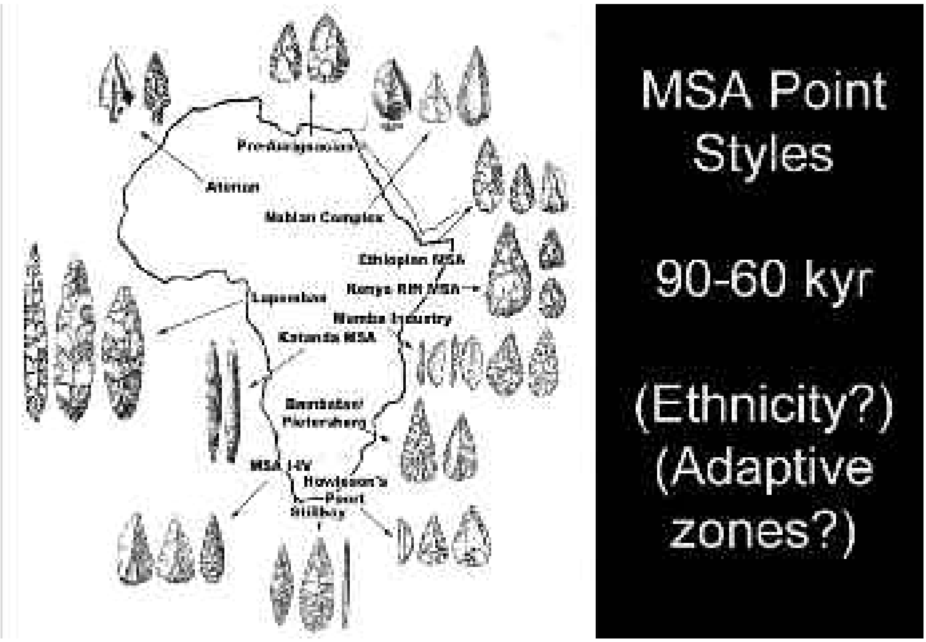

Figure 20.

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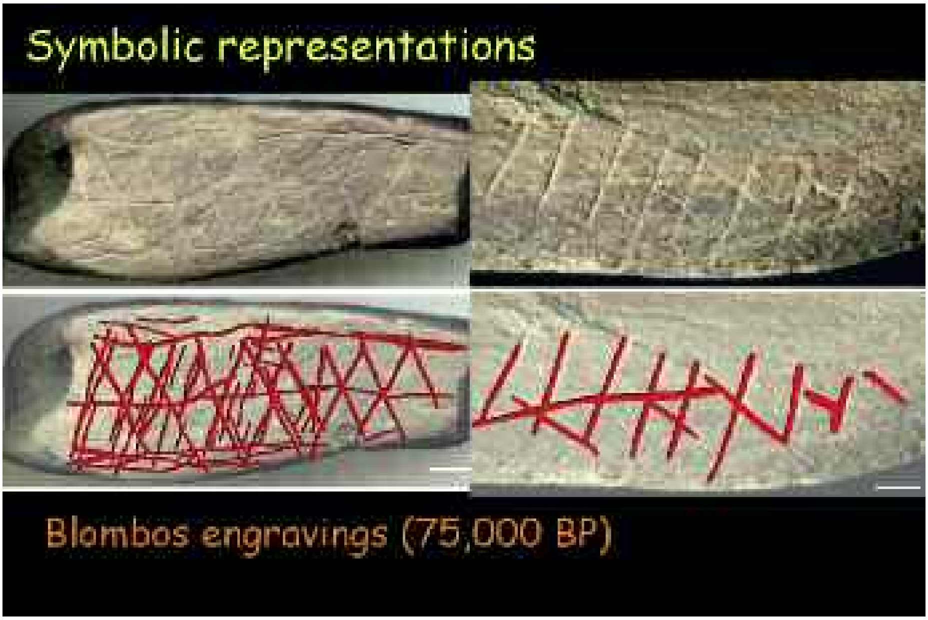

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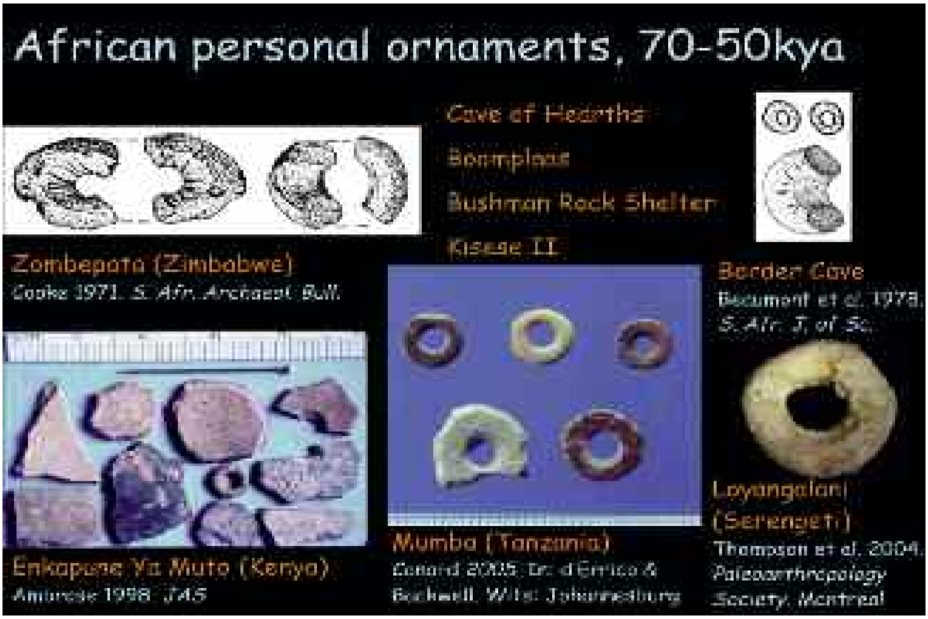

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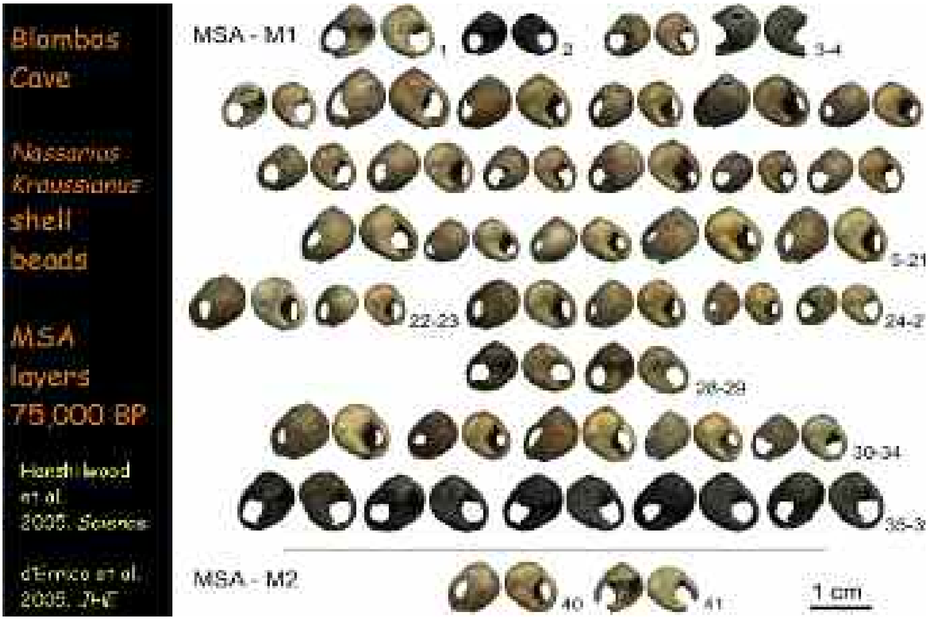

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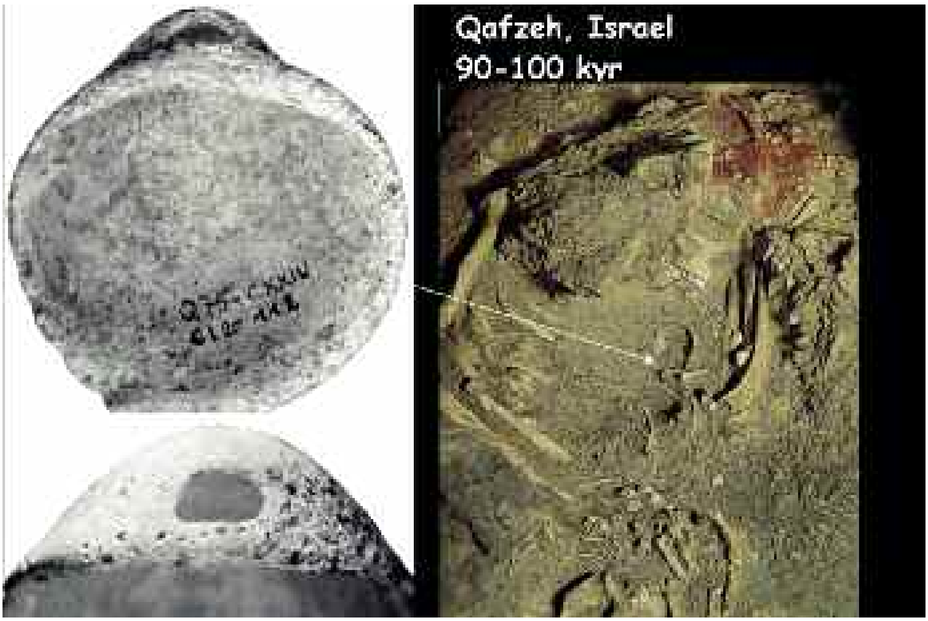

Figure 26.