

# The Rise of Modern Humans

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**Abstract** Human beings are distinguished most strikingly by their unique “symbolic” way of processing information about the world. Although based on a long evolutionary history, the modern human cognitive style is not predicted by that history. It is not the product of a process of incremental refinement but is instead “emergent,” representing an entirely distinct level of complexity. Physically, *Homo sapiens* is very distinctive, its peculiarities clearly resulting from a significant developmental reorganization with numerous skeletal ramifications and quite plausibly others as well. It seems reasonable to suppose that the structural underpinnings of symbolic thought were acquired in this reorganization. Still, the fossil and archaeological records indicate that the first anatomically recognizable members of the species predated the first humans who behaved in a demonstrably symbolic manner. So while the biological potential for symbolic thinking most likely arose in the morphogenetic event that gave rise to *H. sapiens* as a distinctive anatomical entity, this new capacity was evidently exaptive, in the sense that it had to await its “discovery” and expression, clearly through a cultural stimulus that was plausibly the invention of language. One manifestation of symbolic reasoning is the adoption of technological change in response to environmental challenges, in contrast to earlier responses that typically used existing technologies in new ways. As climates changed at the end of the last Ice Age, this new technophile proclivity was expressed in a shift toward agriculture and sedentary lifestyles, precipitating a fundamentally new (and potentially self-destructive) rela-

tionship with Nature. Both of the two most radical and fateful evolutionary innovations in the history of life (symbolic thinking and sedentary lifestyles) were thus very recent occurrences, well within the short tenure of *H. sapiens*.

**Keywords** *Homo sapiens* · Symbolic cognition · Human origins · Upper Paleolithic · Middle Stone Age · Human uniqueness · Exaptation · Emergence

## Introduction

This special issue of *EEO* contains a fascinating series of articles that overview the major players and events in hominid phylogeny and the major themes running through the human evolutionary story, right up to the point when our own species *Homo sapiens* emerged. To conclude the sequence, the reader may refer to the article on human emergence that I published in this journal last year (Tattersall 2009; doi 10.1007/s12052-009-0614x); but for the sake of both completeness and of currency in this issue, the principal points of that article are summarized below and its argument is updated.

## Human Uniqueness

We human beings like to see ourselves and our extraordinary attributes as the culmination of a long process of incremental improvement. And indeed it is true that, in the absence of *any* aspect of the long evolutionary history recounted in the contributions to this special issue, our species would not be the remarkable entity it is today. But as those contributions also show, evidence is mounting that

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*H. sapiens* and its precursors did not simply claw their way steadfastly toward our current eminence. Instead, the transformation of our immediate precursors from a readily recognizable (if rather unusual) variation on the primate theme, to the altogether unprecedented entity we are now, was both recent in geological terms and complex in its unfolding.

Modern *H. sapiens* is an unusual creature in many respects. Most of our many physical peculiarities are in one way or another associated with our upright posture, a feature with a long and complex history that is elegantly summarized by Harcourt-Smith (this volume). Nonetheless, the acquisition that gives us our strong feeling of being somehow qualitatively *different* from the rest of the living world lies not among our physical attributes but in our unprecedented form of cognition. Uniquely among living forms, we human beings live not entirely in the world as Nature presents it to us, but substantially in worlds that we re-create in our heads. We can do this because we are “symbolic” creatures, meaning that we mentally decompose the world around us into a vocabulary of discrete symbols, which we can combine and recombine in our minds to imagine alternate worlds. Significantly, the very first hominids (members of the human zoological family; an alternative adopted elsewhere in this issue is to call them hominins, distinguishing them from their closest living cousins, the great apes, only at the subfamily level) who looked physically identical to us do not appear to have behaved in this distinctive fashion.

### Events in Human Emergence

The first fossil evidence we have of the highly characteristic modern cranial anatomy (showing a globular braincase with a small face retracted beneath its front) comes from Africa, in the form of a fragmentary skull some 195 kiloyears (thousand years) old (McDougall et al. 2005) from southern Ethiopia. More complete is a 160-kiloyear-old cranium, also from Ethiopia (Clark et al. 2003; White et al. 2003). While neither of these specimens is totally “modern” in all respects, both provide evidence that a form substantively resembling modern *H. sapiens* was already in existence in Africa in the period following about 200 kiloyears ago. This paleontological dating is in substantive agreement with molecular estimates for the origin of *H. sapiens* based on DNA divergence observed among modern human populations (e.g., Harpending and Rogers 2000; Behar et al. 2008; Campbell and Tishkoff 2008). A typically modern human skeleton from the Israeli site of Jebel Qafzeh, dated to 93 kiloyears ago, shows that anatomical moderns had spread beyond Africa proper by that time, although both molecular and archaeological observations suggest that this occupation

of the Levant was ephemeral and that the definitive human exodus giving rise to all extant human populations came later, at around 85 kiloyears ago or less (Harpending and Rogers 2000; Tishkoff et al. 2009; Scheinfeldt et al. 2010).

Comparative molecular analyses suggest that over the next 10 kiloyears the descendants of these early emigrants moved eastwards along the southern coast of Asia, reaching China by about 75 kiloyears. Australia may have been colonized (necessarily using boats) by about 60 kiloyears ago. Warming of the climate around 50 kiloyears ago allowed reinvasion of the Levant and the Fertile Crescent region to its north, and by about 40 kiloyears *H. sapiens* was entering Europe and central Asia. By 25,000 years ago, northeastern Eurasia had been occupied, all the way to the Arctic Circle. Perhaps as early as 20 kiloyears ago, humans had entered the New World via a northern route between Siberia and Alaska. Indications are that people had reached Chile by almost 15 kiloyears ago, possibly following the coastline in boats.

Perhaps surprisingly (although the observation is in line with the earlier pattern of episodic cultural innovation out of phase with the appearance of new species), the stone tool assemblages left behind by the earliest anatomical *H. sapiens* are unimpressive at best. The few stone tools reported from the same sediments as the earlier Ethiopian cranium have been described as “unremarkable” (Klein 1999), while those associated with the later one are notably archaic, consisting of some of the latest recorded African hand axes (large, teardrop-shaped bifacial implements that had by that time been made continuously in Africa for almost 1.5 million years), plus some Middle Stone Age elements that were roughly equivalent to the productions of Neanderthals (Clark et al. 2003; Harvati, this volume). Among archaic hominids, and also apparently even among the first anatomical *H. sapiens*, technologies simply did their job, and successive hominid species adapted old tools to new uses as environments fluctuated. This long-standing pattern only ever changed once. And this was very recently, when hominids began to cope with new environments by inventing new technologies. Radical change of this kind is most dramatically evident in the archaeological record left by the *H. sapiens* who arrived in Europe about 40 kiloyears ago and who left an abundant evidence of a restless creative spirit that expressed itself in the relentless pursuit of the new (White 1986, 2003) and in such self-evidently symbolic activities as the creation of powerful art on the walls of caves such as Chauvet, Lascaux, and Altamira. These, too, were the humans who finally nudged the resident Neanderthals into extinction (see Harvati, this volume), and they clearly possessed fully “modern” sensibilities.

But this European evidence is not the earliest intimation we have of a radically new way of doing business—and, by

extension, of processing information about the world. The earliest *H. sapiens* who invaded Europe evidently arrived there with their symbolic capacities fully formed. We see no process of transformation in the archeological or paleontological records. With a very few local and invariably arguable “post-contact” exceptions, the material leavings of the “Middle Paleolithic” Neanderthals in Europe were abruptly replaced by those of the Upper Paleolithic *H. sapiens* who succeeded them. The symbolic ability we see embodied in the European Upper Paleolithic must have evolved elsewhere, before the newcomers arrived.

Significantly, the early anatomical *H. sapiens* who penetrated the Levant by around 100 kiloyears ago seem to have wielded Middle Paleolithic technologies identical to those of the Neanderthals who somehow shared the region with them up to about 45 kiloyears ago (Bar-Yosef 1993); indeed, there is no evidence for any behavioral or cognitive difference between *Homo neanderthalensis* and *H. sapiens* in this period. Just like the earlier Ethiopian anatomically modern forms, these Levantine hominids left no evidence that would lead us to suppose that they processed information symbolically in their minds. Of course, this is not to suggest that they—or the Neanderthals—were not intellectually and behaviorally complex beings; but it does imply that the intelligence they expressed was intuitive rather than symbolic.

The earliest intimations of symbolic thinking come from Africa. The oldest plausibly symbolic object is a pair of geometrically engraved ochre plaques (sadly, without substantive fossil context) from Blombos Cave, close to the continent’s southern tip (Henshilwood et al. 2003). From a Middle Stone Age industrial context, these objects are dated to about 77 kiloyears, and their interpretation as symbolic is reinforced by the subsequent finding at the same site of gastropod shells pierced for stringing (Henshilwood et al. 2004). Body ornamentation has profound symbolic implications in all modern societies, and many believe that it is not unreasonable to infer this for earlier societies, too. The Blombos evidence is supported by similar “beads” found at other African Middle Stone Age sites, including the 82-kiloyear Grotte des Pigeons in Morocco (Bouzouggar et al. 2007), at the other end of the continent. Interestingly, a possible occurrence of similar kind has recently been reported just outside Africa, at the >100-kiloyear Israeli site of Skhūl (Vanhaeren et al. 2006).

Earlier possible proxies for symbolic behaviors are more difficult to interpret. Thus, pigment processing and shellfishing reported from the site of Pinnacle Point on the southern African coast at about 160 kiloyears (Marean et al. 2007) are both arguable as markers for “modern” behavior patterns, especially since both of these economic activities are documented for the almost

certainly nonsymbolic *Homo neanderthalensis* (Stringer et al. 2008). However, one aspect of economic activity at Pinnacle Point (again, sadly in the absence of substantive hominid fossil context) provides evidence of complex planning to a degree that would almost certainly have been beyond the capacity of nonsymbolic hominids. This is the heat treatment of silcrete, which is an indifferent material for stone tool-making until it has been fire-hardened in a very elaborate process that almost certainly does indicate the “elevated cognitive ability” claimed by the excavation team (Brown et al. 2009: 859). This process is well documented at 72-kiloyear levels at Pinnacle Point but is very much more arguably present in earlier levels dated to 164 kiloyears (Brown et al. 2009).

Whichever the case, the evidence appears to point to the emergence of substantively modern *H. sapiens* as a physical entity, followed by the expression of symbolic behavior patterns. Perhaps the most eloquent expression of the latter change was the change in tempo of technological innovation, rather than any individual innovation or category of innovations in itself. Humans began to respond to environmental stimuli by innovation, rather than by mere ingenuity. An exaptive emergence of the modern human behavioral capacity in such a context would have been entirely routine in evolutionary terms, much as ancestral birds possessed feathers long before these structures were used as an indispensable adjunct to flight. It is also notable that, shortly after Blombos times, the southern African region was largely depopulated by prolonged drought; this makes it somewhat improbable that early symbolic expressions in that region were linear precursors to those later documented further north.

## Conclusion

Current evidence thus strongly suggests that the appearance of *H. sapiens* as an anatomically distinct entity, at around 200 kiloyears ago, preceded the first unequivocal expressions of symbolic cognitive processes, perhaps by a long time. The simplest way of explaining this disconnect is through the routine evolutionary phenomenon of exaptation, whereby existing structures are recruited to new purposes. It seems reasonable to suppose that the neural substrate underpinning symbolic cognition was initially acquired in the major developmental reorganization that gave rise to the distinctive modern human anatomy, and that the new potential inherent in the reorganized brain remained unexpressed until it was “discovered” through the action of what was necessarily a cultural stimulus. The best candidate we have for such a stimulus is the invention of language. Language is, after all, the ultimate symbolic activity and one that is inextricably entwined with symbolic

consciousness as we experience it today. It is virtually impossible to envisage one in the absence of the other. What is more, we know that language can be contrived spontaneously by nonlinguistic modern humans, as in the recent creation of a sign language by deaf Nicaraguan schoolchildren (Kegl 2002).

The transition from a nonsymbolic, nonlinguistic cognitive state to a symbolic, linguistic condition is a virtually unimaginable one. Indeed, almost the only reason for believing that it *could* be made is that, inescapably, it *was* made—for this extraordinary switch was a qualitative leap, rather than an additive refinement of a pre-existing system. It was not predicted by anything that preceded it and was not just an improved version of what was there before. Symbolic reasoning is a truly new method of processing information about the surrounding world and, although many like to view it as the outcome of a long process of generation-by-generation fine-tuning, it is much better explained by *emergence*, whereby a chance combination of elements gives rise at once to an entirely new level of complexity (Tattersall 1998).

What is perhaps most counterintuitive is that this cognitive transition took place well *within* the tenure of our species, *H. sapiens*. And since this momentous transition occurred, mankind's history has largely been a matter of discovering how the resulting potential could be used—a process that is abundantly observable today in our rapidly proliferating technologies and art forms. Unfortunately, beyond a few isolated hints, we have no evidence of what exactly transpired in between those first stirrings of the human symbolic spirit in southern Africa and the torrential outpourings of symbolic behaviors by the early modern Europeans some 60 millennia or more later. But we can be reasonably sure that the intervening period saw an unsteady exploration of the possibilities inherent in their new and distinctly non-fine-tuned creativity, as the tiny and scattered early *H. sapiens* populations were buffeted by major climatic and environmental vicissitudes. The most fateful of those explorations took place at the end of the last Ice Age, when a true revolution in lifestyle occurred, with the adoption of settled lifestyles and all of the unintended consequences that came along with them.

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