



PERSONAL ADORNMENT with jewelry and body paint may have started far earlier than previously thought. Early indications of such symbol use—believed by many archaeologists to be a key component of modern human behavior—include 75,000-year-old shell beads (left) from Blombos Cave in South Africa.

# The Morning of the Modern Mind

Controversial discoveries suggest that the roots of our vaunted intellect run far deeper than is commonly believed

BY KATE WONG



**CAPE TOWN, SOUTH AFRICA**—Christopher Henshilwood empties a tiny plastic bag and hands me a square of worn blue cardstock to which 19 snail shells no larger than kernels of corn have been affixed in three horizontal rows. To the casual onlooker, they might well appear unremarkable, a handful of discarded mollusk armor, dull and gray with age. In fact, they may be more precious than the glittering contents of any velvet-lined Cartier case.

The shells, discovered in a cave called Blombos located 300 kilometers east of here, are perfectly matched in size, and each bears a hole in the same spot opposite the mouth, notes Henshilwood, an archaeologist at the University of Bergen in Norway. He believes they were collected and perforated by humans nearly 75,000 years ago to create a strand of lustrous, pearl-like beads. If he is correct, these modest shells are humanity's crown jewels—the oldest unequivocal evidence of personal adornment to date and proof that our ancestors were thinking like us far earlier than is widely accepted.

## A Behavioral Big Bang

BY MOST ACCOUNTS, the origin of anatomically modern *Homo sapiens* was a singularly African affair. In 2003 the unveiling of fossils found near the Ethiopian village of Herto revealed that this emergence had occurred by 160,000 years ago. And this past February researchers announced that they had redated *H. sapiens* remains from another Ethiopian site, Omo Kibish, po-

tentially pushing the origin of our species back to 195,000 years ago.

Far less clear is when our kind became modern of mind. For the past two decades, the prevailing view has been that humanity underwent a behavioral revolution around 40,000 years ago. Scholars based this assessment primarily on the well-known cultural remains of Ice Age Europeans. In Europe, the relevant archaeological record is divided into the Middle Paleolithic (prior to around 40,000 years ago) and the Upper Paleolithic (from roughly 40,000 years ago onward), and the difference between the two could not be more striking. Middle Paleolithic people seem to have made mostly the same relatively simple stone tools humans had been producing for tens of thousands of years and not much else. The Upper Paleolithic, in contrast, ushered in a suite of sophisticated practices. Within a geologic blink of an eye, humans from the Rhone Valley to the Russian plain were producing advanced weaponry, forming long-distance trade networks, expressing themselves through art and music, and generally engaging in all manner of activities that archaeologists typically associate with modernity. It was, by all appearances, the ultimate Great Leap Forward.

Perhaps not coincidentally, it is during this Middle to Upper Paleolithic transition that humans of modern appearance had begun staking their claim on Europe, which until this point was strictly Neandertal territory. Although the identity of the makers of the earliest Upper Paleolithic artifacts is not known with certainty, because of a lack of human remains at the sites, they are traditionally assumed to have been anatomically modern *H. sapiens* rather than Neandertals. Some researchers have thus surmised that confrontation between the two populations awakened in the invaders a creative ability that had heretofore lain dormant.

Other specialists argue that the cultural explosion evident in Europe grew out of a shift that occurred somewhat earlier in Africa. Richard G. Klein of Stanford University, for one, contends that the abrupt change from the Middle to the Upper Paleolithic mirrors a transition that took place 5,000 to 10,000 years beforehand in Africa, where the comparative culture periods are termed the Middle and Later Stone Age. The impetus for this change, he theorizes, was not an encounter with another hominid type (for by this time in Africa, *H. sapiens* was free of competition with other human species) but rather a genetic mutation some 50,000 years ago that affected neural processes and thereby unleashed our forebears'



Snail shells were collected from an estuary 20 kilometers away from Blombos Cave and then pierced with a bone awl. Wear marks around the holes indicate that they were strung together to create perhaps a necklace or bracelet.

## Overview/*Evolved Thinking*

- Archaeologists have traditionally envisioned *Homo sapiens* becoming modern of mind quickly and recently—sometime in the past 50,000 years, more than 100,000 years after attaining anatomical modernity.
- New discoveries in Africa indicate that many of the elements of modern human behavior can be traced much farther back in time.
- The finds suggest that our species had a keen intellect at its inception and only exploited that creativity in archaeologically visible ways when it was advantageous to do so—when population size increased, for instance.
- *H. sapiens* may not have been the only hominid to possess such advanced cognition: some artifacts hint that Neandertals were comparably gifted.



# Mapping Modernity

Humans who looked like us had evolved by 195,000 years ago, as evidenced by *Homo sapiens* fossils from the site of Omo Kibish in Ethiopia. But received archaeological wisdom holds that humans did not begin behaving like us until nearly 150,000 years later. That notion stems largely from cultural remains from Europe, where art, ritual, technological advances and other indications of modern thinking flowered spectacularly and suddenly after about 40,000 years ago, around the time that anatomically modern humans

started colonizing Europe. Recent finds, including those from Blombos Cave in South Africa, are revealing that many sophisticated practices emerged long before 40,000 years ago at sites outside of Europe, suggesting that humans were our cognitive equals by the time they attained anatomical modernity, if not earlier. Indeed, the fact that Neandertals appear to have thought symbolically raises the possibility that such capacities were present in the last common ancestor of Neandertals and *H. sapiens*.

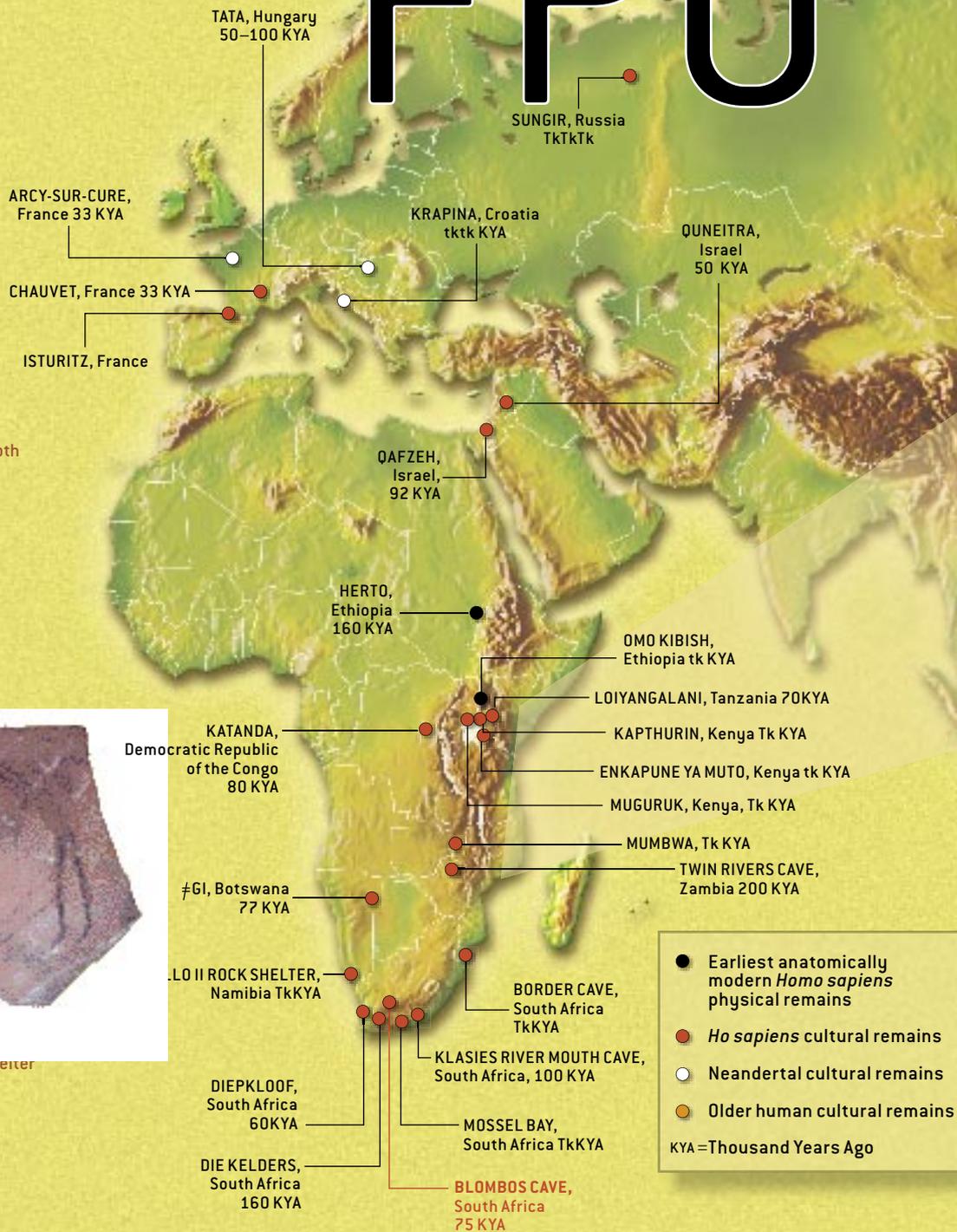


from Arcy-sur-Cure, France. 33,000 years old.



Ochre from Apollo 11 rock shelter in Namibia. Date range TK

# FPO



Ivory water bird from Hohl Fels Cave in region Tk, Germany. Date TK



Scraped, heat-treated red ochre, possibly used in ritual burial act. Qafzeh Cave in Israel. 92,000 years old.



Bone harpoon from Katanda. Democratic Republic of Congo. 80,000 years old



Ostrich eggshell bead from Loiyangalani, Tanzania. Date range tk

LAKE MUNGO, Australia 40-60 KYA

powers of innovation.

Key evidence for this model, Klein says, comes from a site in central Kenya called Enkapune Ya Muto, the “twilight cave,” that places the origin of the Later Stone Age at 45,000 to 50,000 years ago. There Stanley H. Ambrose of the University of Illinois and his colleagues have uncovered obsidian knives, thumbnail-size scrapers and—most notably—tiny disk-shaped beads fashioned from ostrich eggshell in Later Stone Age levels dating some 43,000 years. Strands of similar beads are still exchanged as gifts today among the Khoi-San hunter-gatherers of Botswana. Ambrose posits that the ancient bead makers at Enkapune Ya Muto created them for the same reason: to foster good relationships with other groups as a hedge against hard times. If so, according to Klein, a genetically conferred ability to communicate through symbols—in concert with the cognitive prowess to conceive of better hunting technology and resource use—may have been what enabled our species finally, nearly 150,000 years after it originated, to set forth from its mother continent and conquer the world.

## Seeds of Change

IN RECENT YEARS, however, a small but growing number of archaeologists have eschewed the big bang theories of the origin of culture in favor of a fundamentally different model. Proponents believe that there was no lag between body and brain. Rather, they contend, modern human behavior emerged over a long period in a process more aptly described as evolution than revolution. And some workers believe that cognitive modernity may have evolved in other species, such as the Neandertals, as well.

The notion that our species’ peerless creativity might have primeval roots is not new. As long ago as three 400,000-year-old wooden throwing spears from Schöningen, Germany; that humans were engaging in modern practices long before *H. sapiens* first painted a cave wall in France. A handful of other finds followed— among them a 233,000-year-old putative figurine from the site of Berekhat Ram in Israel; a 65,000-year-old piece of flint incised with concentric arcs from Quneitra, Israel; two 100,000-year-old fragments of notched bone from South Africa’s Klasies River Mouth Cave; and a polished plate of mammoth tooth from Tata in Hungary, dated to between 50,000 and 100,000 years ago. Many archaeologists looked askance at these remains, however, noting that their age was uncertain or that their significance was unclear. Any sign of advanced intellect that did seem legitimately ancient was explained away as a one-off accomplishment, the work of a genius among average Joes.

That position has become harder to defend in the face of the growing body of evidence in Africa that our forebears’ mental metamorphosis began well before the start of the Later Stone Age. In a paper entitled “The Revolution That Wasn’t: A New Interpretation of the Origin of Modern Human Behavior,” published in the *Journal of Human Evolution* in 2000, Sally McBrearty of the University of Connecticut and Alison S. Brooks of George Washington University laid out their case.

Many of the components of modern human behavior said to emerge in lockstep between 40,000 and 50,000 years ago, they argued, are visible tens of thousands of years earlier at Middle Stone Age locales. Moreover, they appear not as a package but piecemeal, at sites far-flung in time and space.

At three sites in Katanda, Democratic Republic of the Congo, Brooks and John Yellen of the Smithsonian Institution have found elaborate barbed harpoons carved from bone that they say date to at least 80,000 years ago, which would place them firmly within the Middle Stone Age. These artifacts exhibit a level of sophistication comparable to that seen in 20,000-year-old harpoons from Europe, not only in terms of the complexity of the weapon design but the choice of raw material: the use of bone and ivory in tool manufacture was not thought to have occurred until the Later Stone Age and Upper Paleolithic. In addition, remains of giant Nile catfish have turned up with some of the Katanda harpoons, suggesting to the excavators that people were going there when the fish were spawning—the kind of seasonal mapping of resources previously thought to characterize only later humans.

Other Middle Stone Age sites, such as  $\neq$  Gi (the  $\neq$  denotes a click sound) in Botswana's Kalahari Desert, which is dated to 77,000 years ago, have yielded butchered animal remains put paid to another oft-made claim, namely, that these ancient people were not as competent at hunting as Later Stone Age folks. The residents at  $\neq$  Gi appear to have regularly pursued such large and dangerous prey as zebra and cape warthog. And sites containing tool assemblages belonging to a variant of Middle Stone Age known as the Herviesons Poort, at in South Africa, Hilary Deacon of the University of Stellenbosch has found indications that more than 60,000 years ago, humans were deliberately burning grassland to encourage the growth of nutritious tubers, which are known to germinate after exposure to fire.

Some discoveries hint that certain alleged aspects of behavioral modernity arose even before the genesis of *H. sapiens*. Last summer McBrearty's excavations at a site near Lake Baringo in Kenya, turned up stone blades—a hallmark of the Upper Paleolithic material cultures—more than 510,000 years old. At a nearby locality, in levels dated to at least 285,000 years ago, her team has uncovered vast quantities of red ochre and grindstones for processing it, signaling to McBrearty that the Middle Stone Age people at Baringo were using the pigment for symbolic purposes—to decorate their bodies, for instance—just as many humans today do. (Baringo is not the only site to furnish startlingly ancient evidence of ochre pro-

cessing—Twin Rivers Cave in Zambia has yielded similar material dating back to more than 200,000 years ago.) And slightly younger tool assemblages from Muguruk, near Lake Victoria, include flakes crafted from obsidian that McBrearty has traced to a volcanic flow 190 kilometers away—compelling evidence that the hominids who made the implements traded with other groups for the exotic raw material.

Critics, however, have dismissed these finds on the basis of uncertainties surrounding, in some cases, the dating and, in others, the intent of the makers. Ochre, for one, may have been used as mastic for attaching blades to wooden handles or as an antimicrobial agent for treating animal hides, skeptics note.



**Blombos ochre, engraved with a stone point, may reflect record keeping or a design aesthetic. The effort required to prepare the substrate and produce the markings suggests a premeditated act, not doodling.**

### Smart for Their Age

IT IS AGAINST this backdrop of long-standing controversy that the discoveries at Blombos have come to light. Henshilwood discovered the archaeological deposits at Blombos cave in 1991 while looking for much younger coastal hunter-gatherer sites to excavate for his Ph.D. Located near the town of Still Bay in South Africa's southern Cape, on a bluff overlooking the Indian Ocean, the cave contained few of the Holocene artifacts he was looking for but appeared rich in Middle Stone Age deposits. As such, it was beyond the scope of his research at the time. In 1997, however, he raised the money to return to Blombos to begin

excavating in earnest. Since then, Henshilwood and his team have unearthed an astonishing assemblage of sophisticated tools and symbolic objects and in so doing have sketched a portrait of a long-ago people who thought like us.

From levels dated by several methods to 75,000 years ago have come an array of advanced implements, including 40 bone tools, several of which are finely worked awls, and hundreds of bifacial points made of silcrete and other difficult-to-shape stones, which the Blombos people could have used to hunt the antelopes and other game that roamed the area. Some of the points are just an inch long, suggesting that they may have been employed as projectiles. And the bones of various species of deep-sea fish—the oldest of which may date back more than 130,000 years—reveal that the Blombos people had the equipment required to harvest creatures in excess of 80 pounds from the ocean.

Hearths for cooking indicate that the cave was a living site, and teeth representing both adults and children reveal that a family group dwelled there. But there are so many of the stone points, and such a range in their quality, that Henshilwood wonders whether the occupants may have also had a workshop in the tiny cave, wherein masters taught youngsters how to make the tools.

They may have passed along other traditions as well. The most spectacular material to emerge from Blombos is that which demonstrates that its occupants thought symbolically. To date, the team has recovered one piece of incised bone, 9 slabs of potentially engraved red ochre (a form of iron ore) and dozens of the tiny beads—all from the same 75,000-year-old deposits that yielded the tools. In addition, sediments dating back to at least 130,000 years ago contain vast quantities of processed ochre, some in crayon form.

Scientists may never know exactly what meaning the enigmatic etchings held for their makers. But it is clear that they were important to them. Painstaking analyses of two of the engraved ochres, led by Francesco d’Errico of the University of Bordeaux in France, reveal that the rust-colored rocks were hand-ground on one side to produce a facet that was then etched repeatedly with a stone point. On the largest ochre, bold lines frame and divide the crosshatched design.

Bead manufacture was likewise labor-intensive. Henshilwood believes the marine tick shells, which belong to the *Nassarius kraussianus* snail, were collected from either of two estuaries located 20 kilometers away from the cave that still exist today. Writing in the January issue of the *Journal of Human Evolution*, Henshilwood, d’Errico and their colleagues report that experimental reconstruction of the process by which the shells were perforated indicates that the precocious jewelers used bone points to punch through the lip of the shell from the inside out—a technique that commonly broke the shells when attempted by team members. Once pierced, the beads appear to have been strung, as evidenced by the wear facets ringing the perforations and traces of red ochre on the shells hint that they may have lain against skin painted with the pigment.

In the case for cognitive sophistication in the Middle Stone Age, “Blombos is the smoking gun,” McBrearty declares. Henshilwood has not convinced everyone of his interpretation, however. Klein, who has studied the Blombos materials, charges that the provenance of the engraved ochres at Blombos is uncertain, saying that they may have come from the overlying Later Stone Age deposits. Doubts have also come from Randall White of New York University, an expert on Upper Paleolithic body ornaments. He suspects that the perforations and apparent wear facets on the *Nassarius* shells are the result of natural processes, not human handiwork.

## Here Today, Gone Tomorrow

IF READ CORRECTLY, however, the remarkable discoveries at Blombos offer weighty evidence that at least one group of humans had attained behavioral modernity long before 50,000 years ago, which may in some ways make previous claims for early behavioral modernity easier to swallow. So, too, may recent finds from sites such as Diepkloof in South Africa’s Western Cape, which has produced pieces of incised ostrich eggshell dated to around 60,000 years ago, and Loiyangalani in Tanzania, where workers have found ostrich eggshell beads estimated to be some 70,000 years old.



BLOMBOS CAVE was a veritable garden of Eden when humans lived there 75,000 years ago, observes discoverer Christopher Henshilwood. Freshwater springs bubbled at the base of the cliff, and the bounty of the sea lay in the backyard. Tasty eland and other antelope roamed the area, and the climate was as mild as it is today. Henshilwood and his team have been digging the cave’s Middle Stone Age deposits since 1997, carefully recording the location of each artifact unearthed. This year marks their ninth excavation season.

Yet it remains the case that most Middle Stone Age sites show few or none of the traits researchers use to identify fully developed cognition in the archaeological record. Several other locales in South Africa, for example, have yielded the sophisticated bifacial points but no evidence of symbolic behavior. Of course, absence of evidence is not evidence of absence, as prehistorians are fond of saying. It is possible the people who lived at these sites did make art and decorate their bodies, but only their stone implements have survived.

Perhaps the pattern evident thus far in the African record—that of ephemeral glimpses of cognitive modernity before the start of the Later Stone Age and ubiquitous indications of it after that—is just an artifact of preservational bias or the relatively small number of African sites excavated so far. Then

again, maybe these fits and starts are exactly what archaeologists should expect to see if anatomically modern *H. sapiens* possessed the capacity for modern human behavior from the get-go but only tapped that potential when it provided an advantage, as many gradualists believe.

The circumstances most likely to elicit advanced cultural behaviors, McBrearty and others hypothesize, were those related to increased population size. The presence of more people put more pressure on resources, forcing our ancestors to devise cleverer ways to obtain food and materials for tool making, she submits. More people also raised the chances of encounters among groups. Beads, body paint and even stylized tool manufacture may have functioned as indicators of an individual's membership and status in a clan, which would have been especially important when laying claim to resources in short supply. Symbolic objects may have also served as a social lubricant during stressful times, as has been argued for the beads from Enkapune Ya Muto.

"You have to make good with groups around you because that's how you're going to get partners," Henshilwood observes. "If a gift exchange system is going on, that's how you're maintaining good relations." Indeed, gift giving may explain why some of the tools at Blombos are so aesthetically refined. A beautiful tool is not going to be a better weapon, he remarks, it is going to function as a symbolic artifact, a keeper of the peace.

Conversely, when the population dwindled, these advanced practices subsided—perhaps because the people who engaged in them died out or because in the absence of competition they simply did not pay off and were therefore forgotten. The Tasmanians provide a recent example of this relationship: when Europeans arrived in the region in the 17th century, they encountered a people whose material culture was simpler than even those of the Middle Paleolithic, consisting of little more than basic stone flake tools. Indeed, from an archaeological standpoint, these remains would have failed nearly all tests of modernity that are commonly applied to prehistoric sites. Yet the record shows that several thousand years ago, the Tasmanians possessed a much more complex tool kit, one that included bone tools, fishing nets, and bows and arrows. It seems that early Tasmanians had all the latest gadgetry before rising sea levels cut the island off from the mainland 10,000 years ago but lost the technology over the course of their small group's separation from the much larger Aboriginal Australian population.

This might be why South African sites between 60,000 and

30,000 years old so rarely seem to bear the modern signature: demographic data suggest that the human population in Africa crashed around 60,000 years ago because of a precipitous drop in temperature. Inferring capacity from what people produced is inherently problematic, White observes. Medieval folks doubtless had the brainpower to go to the moon, he notes. Just because they did not does not mean they were not our cognitive equals. "At any given moment," White reflects, "people don't fulfill their entire potential."

## Symbol-Minded

THE DEBATE OVER when, where and how our ancestors became cognitively modern is complicated by the fact that experts disagree over what constitutes modern human behavior in the first place. In the strictest sense, the term encompasses every facet of culture evident today—from agriculture to the iPod. To winnow the definition into something more useful to archaeologists, many workers employ the list of behavioral traits that distinguish the Middle and Upper Paleolithic in Europe. Others use the material cultures of modern and recent hunter-gatherers as a guide. Ultimately, whether or not a set of remains is deemed evidence of modernity can hinge on the preferred definition of the evaluator.

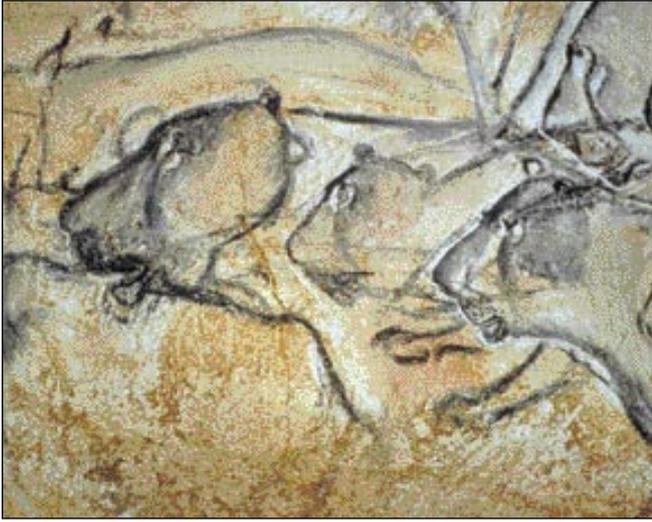
Taking that into consideration, some experts instead advocate focusing on the origin and evolution of arguably the most important characteristic of modern human societies: symbolically organized behavior, including language. "The ability to store symbols externally, outside of the human brain, is the key to everything we do today," Henshilwood asserts. A symbol-based system of communication might not be a perfect

proxy for behavioral modernity in the archaeological record, as the Tasmanian example illustrates, but at least researchers seem to accept it as a defining aspect of the human mind as we know it, if not *the* defining aspect.

It remains to be seen just how far back in time symbolic culture arose. And recent discoveries outside of Africa and Europe are helping to flesh out the story. Controversial evidence from the rockshelters of Malakunanja II and Nauwalabila I in Australia's Northern Territory, for instance, suggests that people had arrived there by 60,000 years ago, possibly earlier. To reach the island continent, emigrants traveling from southeastern Asia would have to have built sturdy watercraft and navigated a minimum of 80 kilometers of open water, depending on the sea level. Scholars agree that any human capable of managing this feat must have possessed full-blown



Tools from Blombos are more sophisticated than those typically found at Middle Stone Age sites. The bone implements include awls worked to a fine point and polished with ochre to achieve a smooth patina.



SYMBOLIC BEHAVIOR may not have originated in Europe, but its early record there is spectacular and rich. Chauvet cave, in the Ardeche region of France, contains the oldest cave paintings in the world. Its pitch-dark galleries showcase a menagerie of Ice Age creatures, including lions (left), exquisitely rendered in ochre 35,000 years ago. Ancient Europeans also had a love of music, as evidenced by this 28,000-year-old bone flute from Isturitz, France.

language. And in Israel's Qafzeh Cave, Erella Hovers of the Hebrew University of Jerusalem and her team have recovered dozens of pieces of red ochre near 92,000-year-old graves of *H. sapiens*. They believe the lumps of pigment were heated in hearths to achieve a specific hue of scarlet and then used in funerary rituals.

Other finds raise the question of whether symbolism is unique to anatomically modern humans. Neandertal sites commonly contain evidence of systematic ochre processing, and toward the end of their reign in Europe, in the early Upper Paleolithic, Neandertals apparently developed their own cultural tradition of manufacturing body ornaments, as evidenced by the discovery of pierced teeth and other objects at sites such as Quinçay and the Grotte du Renne at Arcy-sur-Cure in France [see "Who Were the Neandertals?" by Kate Wong; *SCIENTIFIC AMERICAN*, April 2000]. They also interred their dead. The symbolic nature of this behavior in their case is debated because the burials lack grave goods. But this past April at the annual meeting of the Paleoanthropology Society, Jill Cook of the British Museum reported that digital microscopy of remains from the Krapina rock shelter in Croatia suggests that Neandertals were cleaning the bones of the deceased, possibly in a kind of mortuary ritual, rather than defleshing them for food as previously thought.

Perhaps the ability to think symbolically evolved independently in Neandertals and anatomically modern *H. sapiens*. Or maybe it arose before the two groups set off on separate evolutionary trajectories, in a primeval common ancestor. "I can't prove it, but I bet *H. antecessor* [a European hominid that lived as much as 780,000 years ago] was capable of this," White speculates. If so, archaeologists have a lot of digging to do.

For his part, Henshilwood is betting that the dawn of symbol-driven thinking lies in the Middle Stone Age. As this article was going to press, he and his team were undertaking their ninth field season at Blombos. By the end of that period they will have sifted through a third of the cave's deposits

75,000-year-old, leaving the rest to future archaeologists with as yet unforeseen advances in excavation and dating techniques. "We don't really need to go further in these lands at Blombos," Henshilwood says. "We need to find other sites now that date to this time period." He is confident that they will succeed in that endeavor, having already identified a number of very promising locales in the coastal DeHoop Nature Reserve, about 30 miles west of Blombos.

Sitting in the courtyard of the African Heritage Research Institute pondering the dainty snail shells in my hand, I consider what they might have represented to the Blombos people. In some ways, it is difficult to imagine our ancient ancestors setting aside basic concerns of food, water, predators and shelter to make such baubles. But later, perusing a Cape Town jeweler's offerings—from cross pendants cast in gold to diamond engagement rings—it is harder still to conceive of *Homo sapiens* behaving any other way. The trinkets may have changed somewhat since 75,000 years ago, but the all-important messages they encode are probably still the same.

#### MORE TO EXPLORE

**The Revolution That Wasn't: A New Interpretation of the Origin of Modern Human Behavior.** Sally McBrearty and Alison S. Brooks in *Journal of Human Evolution*, Vol. 39, No. 5, pages 453–563; November 2000.

**The Dawn of Human Culture.** Richard G. Klein, with Blake Edgar. John Wiley and Sons, 2002.

**Emergence of Modern Human Behavior: Middle Stone Age Engravings from South Africa.** Christopher S. Henshilwood et al. in *Science*, Vol. 295, pages 1278–1280; February 15, 2002.

**The Invisible Frontier: A Multiple Species Model for the Origin of Behavioral Modernity.** Francesco d'Errico in *Evolutionary Anthropology*, Vol. 12, No. 4, pages 188–202; August 5, 2003.

**The Origin of Modern Human Behavior: Critique of the Models and Their Test Implications.** Christopher S. Henshilwood and Curtis W. Marean in *Current Anthropology*, Vol. 44, No. 5, pages 627–651; December 2003.

**Nassarius kraussianus Shell Beads from Blombos Cave: Evidence for Symbolic Behavior in the Middle Stone Age.** Francesco d'Errico, Christopher Henshilwood, Marian Vanhaeren and Karen van Niekerk in *Journal of Human Evolution*, Vol. 48, No. 1, pages 3–24; January 2005.