Animals painted 17,000 years ago crowd cave walls in Lascaux, France.
As an undergraduate at the University of London’s Institute of Archaeology, I was taught that archaeology was ultimately about “the mind behind the artifact.” It was about the person who made the ancient object I happened to be studying. That perspective seemed easy enough when I contemplated the simple chipped stones that represent most of human prehistory. The minds responsible for those artifacts, I naively thought, must have been pretty simple. But when my studies advanced to the explosion of cave art, burial relics and complex tools that signaled the appearance of modern humans more than 30,000 years ago, I just could not understand how that new mind had come to be. What could account for the radical cognitive bloom? So I asked an instructor. His cheerful, rhetorical response was quintessentially British: “They became very smart?”
Humanity certainly did become very smart, and we know roughly when and where, because the transition from the utilitarian tools of early humans to the rich splendors of modern humans is clear in the archaeological record. But for a long time, how the modern mind evolved—what it meant to become “very smart”—was a problem too big to tackle.

Not anymore. Although Charles Darwin conclusively demonstrated a century and a half ago that the physical brain had evolved, only recently have we been able to say with certainty that the mind—what the brain does—evolved as well. This evolution is being examined by a new discipline called cognitive archaeology. Wielding the tools of psychology and archaeology, cognitive archaeologists interpret artifacts in terms of what they tell us about the minds that made them, for example, by estimating the mental “age” required to make a stone tool or determining how the symbolic complexity of an artifact indicates a certain level of consciousness. And by applying the concept of evolution to the mind itself, cognitive archaeologists are unpacking the vague concept of becoming very smart, revealing intriguing insights about what went on in our ancestors’ heads throughout human prehistory.

That, in turn, raises some interesting questions about what is going on in our minds now and why.

Representing Reality

Evolution is characterized by change, so an evolutionary investigation into the modern mind begins with a deceptively simple question: What changed in the mind, through time?

Canadian psychologist Merlin Donald presented the first comprehensive attempt at an answer in his trailblazing 1991 book, Origins of the Modern Mind. His model was so influential that it shaped the pursuit of cognitive archaeology, including now annual conferences as well as the Cambridge Archaeological Journal, dedicated in 2000 to cognitive and symbolic archaeology. Cross-disciplinary research has also sprung up; Liane Gabora, assistant professor of psychology and computer science at the University of British Columbia, has been influenced by Donald’s concepts in her investigations of the evolution of cultural innovation and creativity.

Donald proposed that the evolution of the mind was fundamentally about the ways it represented its experiences. His model—supported by a diverse body of archaeological and psychological data—outlines several revolutions in how the mind managed the information stored in the brain, with each change yielding a new level of cognition, a new state of consciousness.

Donald, now chair of cognitive science at Case Western Reserve University, begins his account more than four million years ago, with the minds of our African protohuman ancestors. Based on their limited use of asymmetrical, often found, objects as tools and other evidence, he likens their minds to those of modern chimpanzees. Chimps are excellent at perceiving the immediate significance of events, but they do not retain most of those events in long-term memory, nor do they think abstractly about what the events might mean in the far future. When taught sign language, for example, chimps use it for immediate concerns, like requests for treats. Donald calls this ability “episodic consciousness,” a bubble of short-term, small-space awareness.

The first cognitive revolution took place with the appearance of early humans (early Homo) around two million years ago. Their symmetrical stone tools indicate a fundamentally new mind that possessed the capacity for voluntary representation. The symmetrical shapes were not produced because of a utilitarian need for that symmetry but because the mind was specifically recalling a concept of “this is how we make tools,” and individuals represented that concept, via the tool itself, to peers. Rather than recalling experiences only in an automatic, reactive way, this
mind could proactively select a past experience and convey it to others, by making a tool in the “appropriate” shape and using that tool in the presence of others in society. Furthermore, a group of individuals that hewed to symmetry and used symmetrical tools publicly promulgated the concept of group unity; unity was signaled by the symmetrical “style” of the tool architecture. Communicating intentionally retrieved memories would have required some kind of representational act, and language immediately comes to mind. But Donald suggests a precursor, called mimesis—communication based largely on symbolic gesture and simple vocalizations. According to Donald, culture and tools were complex enough that teaching them to a young hominid required high-fidelity communication of ideas. Because no artifacts showing fully developed symbolism (such as simple drawings) exist from this period, however, Donald is left to conclude that an individual transmitted information with body gestures and prelinguistic vocalizations. Such mimes and sounds might even have been strung together in sequences, acted out and rhythmically organized.

Although we do not yet know just how mimesis arose, it had the profound effect of bursting the bubble of episodic consciousness. It allowed contemplation of the past and future, along with abstraction—the ability to develop a concept that stands for a concrete object or event. As mimitically represented acts became more complex, standardized and abstracted (for example, gestures that no longer resembled the subject they represented, such as fear or anger), a need arose for organizing the clutter of symbols. The first scheme was probably some kind of mental dictionary that told early hominids that mime A meant B, and so on.

A second, more important solution then appeared: lexical invention, which occurred around 300,000 years ago but fully blossomed in modern humans after 150,000 years ago. The heart of lexical invention was the innovation of symbols far richer than the literal metaphors of mimesis, evident in the earliest traces of symbolic artifacts. These examples include the 75,000-year-old drilled shells (probably strung on necklaces) and engraved stones from Blombos Cave in South Africa.

How did lexical invention happen? How did our ancestors increase the richness of their symbols? Donald’s answer is as fascinating as it is counterintuitive. It happened not by clearly defining what symbols meant but by making them “fuzzier”: by allowing a given symbol to take on a different significance depending on its context. A symbol for “snake” could now be used to indicate a winding river or even the characteristics of a person. In this way, language facilitated the communication of ever more intricate thoughts. Speech arose as a subsystem of mimesis, a more efficient way to represent increasingly complex sets of voluntarily recalled memories.

Just as mimesis broke the mind from episodic consciousness, lexical invention expanded the mind from the rather literal world of mimetic consciousness. Mimesis provided a conceptual dictionary; lexical invention provided a conceptual thesaurus.

The linking of ideas through lexical invention
Language spawned a riot of ideas that needed to be organized. Myths, told through cave drawings such as this 15,000-year-old horse surrounded by symbols, from Lascaux, France, were the solution. Had a breathtaking snowball effect, and the resulting complexity, Donald suggests, cried out for organization. That need spawned the development of myths: narratives that integrated and organized the riot of ideas. These probably began as simplistic, morally guiding dramas, populated by gods, villains and heroes, and grew into the elaborate yarns we still tell today. Mythic consciousness integrated memories into specific narratives that were told and retold as cultural models of what the universe was like and what to do about it. Archaeologically, mythical consciousness is evidenced by the appearance of cave art more than 30,000 years ago, which evolved into paintings that depict ancient myths, complete with fantastic creatures, abstract designs, human-animal hybrids, and more. French prehistorian Jean Clottes has recently applied cognitive archaeology to the spectacular cave art of Europe, interpreting some of the depictions as mythical scenes and others as recollections of shamanic voyages in which ancient healers “traveled” to the spirit world to solve problems people were having in the material world, such as poor health.

I think of myths as encyclopedic. The mimetic dictionary indicated that A specifically meant B. The lexical thesaurus expanded meaning by saying that A could mean B or C or D, depending on circumstances. The mythic encyclopedia organized A, B, C and D into narratives that conveyed and cross-referenced the contents of the mind. As that mind became crowded with rich mythic stories representing enormous bodies of knowledge, yet another new system arose to organize and store that knowledge. This solution was technical, not biological. The idea was to off-load some of the brain’s information-management demands to the outside world. Painting narratives on cave walls or cutting notches into tablets of bone—each as a record of some event—had the profound effect of moving memories out-
side the body, onto external memory storage media. Information was no longer limited by what people could physically remember. External memory allowed for the storage and recall of an infinite amount of information.

Human refinement of cave paintings, hieroglyphs, alphabets and more led to what Donald calls theoretical consciousness. These recordings, particularly writing (which first appeared around 6,000 years ago), freed information from context. Unlike oral myths or cave paintings—which could be understood only in their own cultural context—abstracted writing systems allowed information to be understood regardless of its cultural context. Now information could be contemplated in completely abstract terms.

Theoretical consciousness puts a premium on skills that manage information and integrate thought rather than on rote memorization. Intelligence—a property of the mind that resides in the brain—is about innovation, which results from novel associations of ideas found in huge bodies of information. It is astounding to realize today how much information is stored outside the brain, for example, in libraries or on the Internet.

Echoes in Consciousness

Donald's hierarchy of episodic, mimetic, mythic and theoretical consciousness handily explains what changed in the mind across human evolution. Each new step did not steamroll the previous one, however. Rather new consciousnesses were superimposed on the old. We rely almost completely on episodic consciousness when we are intensely engaged in a single task, such as leaping from a diving board or steering a car across an icy road. We invoke the nonvocal communication of mimics when we fold our arms and scowl at a rude child or dance across a stage, conveying joy.

Mythic consciousness continues to shape how we think. In personal letters, long novels and international nuclear-nonproliferation meetings, we use language to tell our stories, negotiate their content to agreeable truths, and proceed with our objectives. And on any given day, theoretical consciousness allows us to contemplate grand problems such as the physics of relativity.

The modern mind switches from one variety of consciousness to another as easily as changing television channels. And we constantly sift through our experiences, combining new ones with representations of old ones retrieved from all manner of biological and external memory stores, to fashion new worlds of meaning and layer on layer of metaphor. For Donald, the hallmark of the modern mind is this constant integration and reintegration of experiences via multiple, innovative means of representing information.

Cognitive Fluidity

But how has the modern mind evolved to forge productive links between ideas? One answer comes from an alternative model of the evolution of consciousness being explored by British cognitive archaeologist Steven Mithen, head of human and environmental science at the University of Reading. For Mithen, the key variable that has structured the evolution of the modern mind is cognitive fluidity—the degree to which different kinds of intelligence communicate with one another. Unlike Donald's model, which focuses on the evolution of modes of representation, Mithen's theory focuses on the well-established observation that the human mind is composed of “modular” domains of intelligence. He explains the mind's evolution as an increasing level of interaction among these domains.

Mithen identifies four main types of intelligence: linguistic (production and comprehension of language), social (managing interpersonal relationships), technical (manipulation of objects), and natural history (understanding cause and effect in the natural world). The modern human mind, Mithen argues, is the only one in which there is free communication among these domains.
By four million years ago, Mithen argues, our African protohuman ancestors possessed a well-developed social intelligence, as expected in groups of large social primates. But by two million years ago—for reasons paleoanthropologists still have not comprehensively explained—a significant change occurred in hominid life. Early humans, including *Homo habilis*, began using stone tools to butcher carcasses scavenged from big-cat kill sites. This activity did not represent cognitive fluidity yet, although it significantly sharpened early hominid technical intelligence (making tools) and natural-history intelligence (finding carcasses). It was also the first sign that creativity and intelligence would be the ace in the hole for the relatively fragile, lightly built *Homo* lineage; from this point on, *Homo* would rely on brains, not brawn.

The early human mind, Mithen maintains, comprised three of the four domains of intelligence that form the modern human mind (the missing one being language). But significantly, they remained isolated from one another. Mithen’s metaphor for the early human mind is that of a cathedral, composed of separate, walled-off compartments, each used for special purposes. In the early human mind, there were no doors connecting the compartments, no communication between the domains of intelligence.

This cognitive isolation lasted for the vast period occupied by middle humans, including *H. erectus*, a species so strange that in my lectures I refer to it as “bizarre.” What is strange is that, although the mind of *H. erectus* drove the body to make sophisticated, symmetrical stone tools that could be fashioned in 15 minutes, *H. erectus* used those tools for more than a million years without ever really innovating a new design. Middle humans were smart, but there is no sign of the continuous technical innovation characteristic of the modern human mind. Many well-defined and dated artifacts show that from about two million years ago to about 300,000 years ago, middle humans thought about making a stone tool (technical intelligence) yet did not simultaneously think about the specific animal they would butcher with that tool (natural-history intelligence). The two intelligences remained compartmentalized. Archaeologist Clive Gamble of Royal Holloway, University of London, has described the society built by these minds as a 15-minute culture, characterized by routinized actions.

The apparent mental stasis of the middle humans is interrupted by a few innovations crafted by one of their late offshoots, the Neandertals, who flourished in Europe and the Near East after 200,000 years ago. Neandertals’ intelligence was largely technical, but they did use a kind of mimetic symbolism, as well as some rudimentary language, and may have even contemplated an afterlife, as suggested by a few burial sites. Still, like *H. erectus*, what is most striking is what Neandertals did not do. For example, the few burial sites do not contain “grave goods” for a voyage into an afterlife, suggesting that Donald’s mythic narratives (ostensibly necessary to sustain such a belief) simply did not exist. Life and death, it seems, were pretty much literal.

Quoting Tufts University philosopher Daniel Dennett, Mithen characterizes the Neandertal mind as “rolling consciousness with swift memory loss.” By about 30,000 years ago that variety of consciousness became extinct, with the Neandertals themselves, who had been replaced by modern humans who emerged from Africa and took over the Neandertals’ geographic range. For Mithen, the most important characteristic of this new wave of humans was a mind capable of cognitive fluidity—opening doors between compartments in the cathedral.

The rich, fluid communication between modules of intelligence began only in the past 200,000
years, and the key that unlocked the doors was language. According to Mithen, early language arose as social groups became larger and more complex. Bits of information about various aspects of life began to slip into what had started as utilitarian spoken communication (perhaps because of Donald’s lexical invention). For example, information from the domain of natural-history activities began to slip into the domain of social activities. The resulting cross-referencing led to vast new realms of thought.

Imagine thinking not just about social, technical and natural-history domains separately but about all of them at the same time—say, about people, objects made by human hands, and lions simultaneously. Only this kind of cognitive fluidity, Mithen asserts, could account for the explosion of rich symbolism associated with modern humans, such as the lion-person figurine found at Hohlenstein-Stadel Cave in Germany, dated to 32,000 years ago [see illustration on opposite page]. For Mithen, the lion-person is a physical manifestation of cognitive fluidity. Numerous excavations show that such rich symbols are glaringly absent until modern humans emerge from Africa after 50,000 years ago.

Because modern humans rely on inventions (rather than on biological adaptations) to survive, innovation is humanity’s ace in the hole, and it is facilitated by cognitive fluidity, rooted in language. Ultimately, integrated thought replaced (or at least complemented) compartmentalized thought, inventing the concepts and tools that have, for better or worse, brought us to where we are today.

One Mind, Two Models?

In the same way that echoes of early and middle human consciousness are heard in the mime-sis and mythic narratives we still use today, Mithen suggests that our modern minds also exhibit artifacts of the ancient isolation of cathedral chambers. Humor, he points out, often arises from an “inappropriate” crossing of domains of intelligence. When Don Knotts, playing the bumbling deputy sheriff Barney Fife, cringes as the door of his precious new car is slammed shut—as though he himself were being hit—we laugh not because the car is being hurt but because Barney is “inappropriately” mixing information from the technical domain (the car) and the social domain (the feeling of pain).

Certain cognitive disorders also appear to be rooted in a lack of fluidity. Autistic persons and savants can be brilliant in a certain domain, such as being able to recite every word of a novel, but they typically have very routinized, channeled ways of thinking and behaving that do not allow for cross-fertilization of ideas.

We have one mind, but cognitive archaeologists currently have two different models for it. For Merlin Donald, the modern mind evolved as novel modes of recalling and representing information evolved. For Steven Mithen, the modern mind evolved as a consequence of communication between previously isolated modules of intelligence. Can these two explanations be reconciled?

According to Donald and Mithen themselves, the answer is both yes and no. The two thinkers have favorably reviewed each other’s work, albeit with provisos. Mithen embraces Donald’s evolutionary approach to the mind but wrote his own 1996 book, *The Prehistory of the Mind*, in part to address what he considers Donald’s incomplete use of the potential of the archaeological record. And Donald has called Mithen’s approach worthwhile, although he suggests that Mithen underestimates the significance of representation. For the moment, the jury is out. Many experts are now fine-tuning models describing the evolution of mind, yet they are all arguably guided by Donald’s and Mithen’s principles.

What is most exciting is that there is no going back now. We know that like the physical brain, the mind evolved, too. Getting closer to our ancestors—closer to the minds that created the artifacts—requires us to apply everything we know about evolution to the study of consciousness itself. Ultimately, cognitive archaeology will be an enormous aid to understanding who we are and why we think the way we do.

(Further Reading)

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