

Human evolution, radically reappraised

March 26, 2007

Special to [World Science](#)

Human evolution has been speeding up, a new study contends—so much so, that the latest evolutionary changes largely eclipse those that accompanied modern man’s “origin.”

The study, alongside a few others on which it builds, amounts to a ground-up reappraisal of traditional accounts of human evolution, which widely assumed that humans had reached a pinnacle of evolution and stopped there.

The findings suggest that not only is our evolution continuing: in a sense our “origin” itself can be seen as continuing, according to a geneticist not involved in the work.

Gregory Cochran of the University of Utah in Salt Lake City, Utah, a co-author of the latest study, said the research may force a radical rethinking of the story of modern human evolution. “It turns it upside-down, pretty much,” he said.

The traditional view of humans as a finished evolutionary product started to erode in recent years, scientists said, with a crop of studies suggesting our evolution indeed goes on. But the newest study goes further. It claims the process has actually accelerated.

It also downplays the importance of a much-scrutinized era when humans considered “anatomically modern” emerged in the fossil record, around 200,000 years ago. In the study, this epoch emerges as just part of a vast arc of accelerating change.

“The origin of modern humans was a minor event compared to more recent evolutionary changes,” wrote the authors of the research, to be presented March 30 in Philadelphia at the annual meeting of the American Association of Physical Anthropologists.

The authors are anthropologists John Hawks of the University of Wisconsin-Madison, and Gregory Cochran at the University of Utah, in Salt Lake City.



The proposal is “truly fascinating,” wrote University of Chicago geneticist Bruce Lahn in an email. He wasn’t involved in the work, though he did conduct earlier research finding that evolution may still be ongoing in the brain.

Even before this study and its immediate forerunners, Lahn wrote, scientists had already noted a trend of accelerating change in the evolutionary lineage leading to modern humans from ape-like ancestors. But that phenomenon seemed to have occurred over time spans measured in millions of years; it was far from clear that it has continued in the recent past or today, he added.

Hawks and Cochran, by contrast, argue that the trend “is visible even in the last tens of thousands of years,” Lahn wrote. It “runs counter to the feeling in some quarters that the evolution of the human phenotype [form] has slowed down or even stopped in our recent past.”

If the study is correct, it raises new questions about how to define the “origin” of modern humans, a rather arbitrary decision anyway, Lahn remarked.

The origin is “defined probably more as a matter of convenience rather than reflecting any actual watershed evolutionary event,” he wrote. That is, it’s “useful to say that any past creatures that are within certain levels of similarities to us today should be considered as ‘the same’ as us.”

But if the changes that accompanied this event are only a trifling part of a wider trend, he added, it becomes reasonable to ask whether that further deflates the rationale for calling it an origin.

“In a sense,” he wrote, one could say “the origin is still ongoing.”

Evolution occurs when an individual acquires a beneficial genetic mutation, and it spreads throughout the population because those with it thrive and reproduce more. Ceaseless repetitions of this can change species, or produce new ones. As beneficial genes spread, harmful ones are weeded out; the whole process, called natural selection, propels evolution.

Hawks and Cochran analyzed measurements of skulls from Europe, Jordan, Nubia, South Africa, and China in the past 10,000 years, a period known as the Holocene era. They also studied skulls from the end of the Pleistocene era, which lasted from two million years ago until the Holocene.

“A constellation of features” changed across the board for human ancestors, Hawks and Cochran wrote in their conference presentation. “Holocene changes were similar in pattern and chronologically faster than those at the archaic-modern transition,” the time when so-called modern humans appeared, they wrote. But these changes “themselves were rapid compared to earlier hominid evolution.” Hominids are a family of primates that includes humans and their upright-walking, more ape-like, ancestors and relatives, all extinct.

Hawks and Cochran also examined population growth estimates and past genetic studies to obtain an estimate the rate of production of genes that undergo positive selection—that is, genes that spread because they are beneficial. “Our estimates are consistent with genomic evidence in suggesting that the rate of generation of positively selected genes has increased as much as a hundredfold during the past 40,000 years,” they wrote.

Among the most notable physical changes have been ones affecting the size of the brain case, according to Hawks and Cochran. That conclusion would fit with those of two papers published in the Sept. 9, 2005 issue of the research journal *Science* by Lahn and colleagues. They reported that two genes linked to brain size are rapidly evolving in humans.

A “thing that should probably worry people is that brains have been getting smaller for 20,000 to 30,000 years,” said Cochran. But growth in more advanced brain areas might have compensated for this, he added, speculating that an almost breakneck evolution of higher foreheads in some peoples may reflect this. A study in the Jan. 14 *British Dental Journal* found such a trend visible in England in just the past millennium, an eyeblink in evolutionary time.

Anthropologist Jeffrey McKee of Ohio State University said the Hawks and Cochran study bears out predictions he made in a 2000 book *The Riddled Chain*. Based on computer models, he argued that evolution should speed up as a population grows. This is because population growth creates more opportunities for new mutations; also, the expanded population occupies new environmental niches, which would drive evolution in new directions.

Lahn said he’s not convinced by the notion—also raised by Hawks and Cochran—that the accelerated physical evolution is tied to population growth. “It may be a long way before” anyone can test the truth of this, he wrote.

But other factors could also explain an evolutionary acceleration, according to anthropologist John Kingston of Emory University in Atlanta, Ga. Evolution might speed up because we have changed our own environment, which in turn changes the evolutionary pressures. “We now control our own environment and ecology to some extent,” he said.

Cochran said most likely, a powerful synergy between that and the expanded population explains the “fantastically rapid” recent evolution.

Overall, the findings on accelerated evolution could amount to “a very big change” in traditional thinking for two reasons, according to McKee. First, he said, many researchers had mistakenly assumed population growth would slow down evolution, because new mutations would take too long to spread through a large population.

Second, the findings deal a final blow to a lingering view among anthropologists of evolution as a ladder “with us as the be-all-end-all,” he said. That view went out of fashion in the 1950s but still persists “in the backs of our minds,” he added.

Evidence for changing brain size in the human lineage has been widely presumed to reflect a growth in intelligence. Other changes documented in the fossil record aren’t necessarily so positive.

In the June 2003 issue of the research journal *Current Anthropology*, Helen Leach of the University of Otago, New Zealand wrote that skeletons from some populations in the human lineage point to a progressive shrinkage and weakening, and reduction in tooth size, similar to changes seen in domesticated animals. Humans seem to have domesticated themselves, she argued, causing physical as well as mental changes.

Despite all the alterations, McKee said he believes the notion of an “origin” of modern humans around 200,000 years ago remains useful. “It’s just a threshold point” at which humans take on most of the physical features we recognize, he remarked, and as such, needn’t be discarded.

The new findings just emphasize a ubiquitous truth in evolution, he added: “every species is a transitional species.”

Image; Hominid skulls. Top: Homo erectus dated to 1.75 million years ago; Middle: an early "modern" Homo sapiens dated to 160,000 years ago; Bottom: a contemporary human. (Credits: top, Science magazine; middle, Tim White; bottom, NIH).