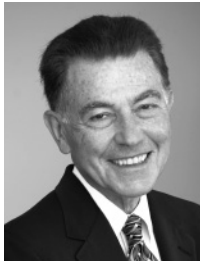


Does evolution explain human nature?



Francisco J. Ayala

Only up to a point.

Evolution explains human origins. We know that humans share recent ancestors with the apes. Our lineage separates from that of the chimpanzees, our closest living relatives, six or seven million years ago. Scientists call members of this lineage “hominins.” The first fossil of a hominin was discovered on the island of Java in 1894, twelve years after the death of Charles Darwin, who had predicted that such remains would eventually be found. That hominin belonged to the species *Homo erectus* and lived more than a million years ago.

Over the past century, thousands of other hominin fossils have been discovered. The oldest of these belong to species quite different from modern humans, classified with exotic names that usually refer to where they were unearthed. *Sahelanthropus tchadensis*, found in Chad in Central Africa, lived between six and seven million years ago. *Australopithecus afarensis*, found in the Afar region of East Africa, lived between three and four million years ago. And *Homo heidelbergensis*, first found in Germany, lived between 500,000 and one million years ago.

For several million years, hominins had a small brain, similar to that of a chimpanzee and weighing about one pound. Brain size started to increase about two million years ago, with the species *Homo habilis*, the first of the hominins to make stone tools. It seems likely that smarter individuals with somewhat larger brains would have been able to make better tools, which was advantageous for hunting, fighting, and so on. As a result, smarter individuals would have left behind more descendants. Gradually, over the last two million years, brain size tripled, reaching about three pounds in the average modern human.

Evolution also allows us to trace the origin and migration of human populations. Modern humans evolved in tropical and subtropical Africa about 150,000 years ago. They colonized much of Africa and parts of Asia and Europe starting about 100,000 years ago, and America about 15,000 years ago. As one would expect from so recent a diaspora (recent, that is, on the evolutionary scale), humans from different parts of the world are genetically quite similar, despite their conspicuous differences in skin color, body configuration, hair, and other traits that help us to distinguish people from different parts of the world.

Over the past decade, evolutionary geneticists have started to decipher the genomes of humans and chimps. Surprisingly, in the genome regions shared by the two species, nearly 99 percent of the DNA is identical. But we also have discovered distinctive human features. Genes active in the development of the brain, for instance, have changed more in the human lineage than in the chimp lineage, and so has the gene called FOXP2, which relates to speech. In fact, researchers have identified 585 genes that have evolved faster in humans than in chimps. But there is still much that we do not know about what makes us so different from apes. Fortunately, we have been searching in earnest only for a decade, and discoveries will continue to accumulate.

Evolutionary neurobiology has made similar advances. We now know a great deal about which parts of the brain have become more differentiated in humans than in apes, and what functions they play in memory, speech, hand articulation, and so on. Much has been learned as well about how light, sound, temperature, resistance, and other impressions are transmitted to the brain by our sense organs. Still, despite all this progress, the field remains in its infancy. Those questions that matter the most to us remain shrouded in mystery: how physical phenomena (the chemical and electric signals by

(continued)

which neurons communicate) become feelings, sensations, concepts, and all the other elements of consciousness, and how the mind, a reality whose properties include free will and self-awareness, emerges from the diversity of these experiences.

Humans also have opened up a new mode of evolution: adaptation by technological manipulation and culture. We have developed the capacity to modify hostile environments according to the needs of our genes. The discovery of fire and the fabrication of clothing and shelter have allowed us to spread from the warm tropical and subtropical regions of the Old World, to which we are biologically adapted, to most of the Earth. Humans did not wait until genes evolved that would provide anatomical protection against cold temperatures by means of fur or hair. Nor have we bided our time in expectation of wings or gills: we have conquered the air and seas with artfully designed contrivances. It is the human brain (or rather, the human mind) that has made humankind the most successful — by most meaningful standards — of living species.

But culture includes much more than adaptation to the environment and much more than science and technology. Culture includes art and literature; history and political organizations; economic and legal systems; philosophy, ethics, and religion. These all-important components of human nature transcend evolutionary biology and every other science. Science has nothing decisive to say about values, whether economic, aesthetic,

or moral; nothing to say about the meaning of life and its purpose; and nothing to say about religious beliefs — except, of course, in those cases when these values and activities transcend their proper scope and make demonstrably false assertions about the natural world.

Science is a way of knowing, but it is not the only way. Evolution tells us much, but certainly not everything, about human experience and the human predicament. In *The Myth of Sisyphus*, Albert Camus asserted that we learn more about ourselves and the world from a relaxed evening gazing at the starry heavens and taking in the scent of grass than from science's reductive ways. This may be literary exaggeration, but there can be no doubt that we learn about human nature by reading Shakespeare's *King Lear*, contemplating the self-portraits of Rembrandt, and listening to Tchaikovsky's *Symphonie Pathétique*. We humans judge our actions toward others according to systems of morality, and we derive meaning and purpose from religious beliefs. Evolution may explain our capacity to hold these principles and beliefs, but it does not explain the principles and beliefs themselves.

Francisco J. Ayala is University Professor and Donald Bren Professor of Biological Sciences at the University of California, Irvine. A former president of the American Association for the Advancement of Science and a winner of the National Medal of Science, he is the author of Darwin's Gift to Science and Religion.

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