

In the previous essay in this series on evolution and Christian faith, I summarized the theological data that establish the Catholic Church's teachings on the origins of the human race. A believer seeking to be faithful to the Catholic tradition and to divine revelation would need to take these theological data into account as he or she strives to respond to concerns raised by theologians who question the historicity of Adam and Eve.

In this essay, I will summarize the data that ground the scientific explanation of the origins of our species, *Homo sapiens*. Basically, I will outline the evidence for what

biologists call the Out-of-Africa model of human origins. In the next essay in this series, I will propose a theological narrative, an exercise of both faith and reason, that synthesizes the theological and scientific data into a coherent whole.

In 1950, when Pope Pius XII published his encyclical *Humani generis*, scientists thought that the human race had evolved independently from different non-human populations that existed in different regions in the world before the appearance of *Homo sapiens*. These archaic non-human populations were members of the species, *Homo erectus*.

According to this Multi-Regional Model of human origins, native Africans evolved from archaic non-humans in Africa, native Europeans evolved from archaic non-humans in Europe, native Asians evolved from archaic non-humans in Asia, and native Australians evolved from archaic non-humans in Australasia. Though there was some interbreeding between these evolving human populations over the course of history, according to this explanation of human origins, the peoples of Africa, Europe, Asia, and Australasia evolved into modern human beings relatively independently.

From a theological perspective, according to this multi-regional model of human origins, it is hard to see how every human being who ever lived could have shared a common fallen human nature that would eventually be assumed and redeemed by Christ. For example, if the historic event of the fall had taken place in Africa, how could this event have affected the human natures of the individuals who evolved

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independently in Australia, by propagation and not by imitation? It is not clear.

Therefore, as we saw in the previous essay, it is not surprising that Pope Pius XII taught that, "it is in no way apparent how [polygenism] can be reconciled with that which the sources of revealed truth and the documents of the Teaching Authority of the Church propose with regard to original sin, which proceeds from a sin actually committed by an individual Adam and which, through generation, is passed on to all and is in everyone as his own" (*Humani generis*, no. 37).

By 2014, the science changed dramatically. Today there is robust evidence from both the fossil record and genetic data that anatomically modern humans—creatures that looked like us—evolved in Africa between 200,000 and 150,000 years ago, and they migrated out of Africa about 60,000 years ago.<sup>1</sup>

According to this Out-of-Africa Model, anatomically modern humans initially evolved in Southern Africa and later spread to other regions of Africa beginning about 100,000 years ago with the ancestors of the modern day hunter-gatherers called the KhoeSan. Several tens of thousands of years later, a small group of humans exited northeastern

Africa and continued this expansion throughout Europe, Asia, Oceania, and eventually the Americas.

Notably, anatomically modern humans lived alongside human-like non-human bipedal species, creatures called *archaic hominins* by scientists, including the Neanderthals and the Denisovans, who have since gone extinct. There is strong evidence that these species interbred with our own such that 1% to 4% of the DNA of human beings living today who are not of African descent is of Neanderthal origin, and between 3% to 5% of the DNA of Melanesians and Aboriginal Australians is from the Denisovans.

How many original human beings were there? Studies suggest that the effective ancestral population size for anatomically modern humans in Africa is about 10,000 breeding individuals. In other words, one would need to posit the existence of 10,000 original humans to properly account for the genetic diversity that we see among the seven billion human beings living today.

Note that it is unlikely that these original humans lived in the same community, because without agriculture—which only appeared about 14,000 years ago—they would not have been able to find enough food to support a single tribe larger than several hundred members.

At this point, however, I need to make a critically important distinction between anatomically modern humans—bipeds that looked like us—and behaviorally modern humans—bipeds that not only looked like us but also behaved like us as well. Though anatomically modern humans evolved around 200,000 to 150,000 years ago, behaviorally modern humans did not appear until much later.

This critical transformation from anatomically modern to behaviorally modern human beings—called the *Great Leap Forward* by evolutionary biologist Jared Diamond—demonstrated by a rich archeological record of painting, engraving, carving, bodily decoration, and music, has been linked to the appearance of language and symbolic thought.<sup>2</sup> The earliest archaeological

evidence for such modern behavior is artifacts found in Blombos Cave in modern-day South Africa dating to about 75,000 years ago. Interestingly, there is also data that suggests that all

human languages are derived from a single proto-language that dates to about 100,000 years ago in central and southern Africa, though this claim is controversial.<sup>3</sup>

Biologically, this transformation from anatomically modern to behaviorally modern human beings is attributed to the evolution of brain structures that would have facilitated the use of language.<sup>4</sup> Geneticists have calculated that it would have taken at most ten genetic mutations to explain the appearance of these capacities. Recent studies

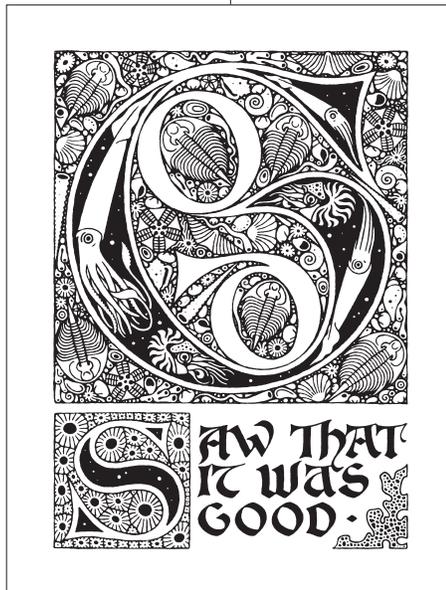
have uncovered uniquely human versions of genes involved in primate brain function associated with the use of language, including CNTAP2, ASPM, and MCPH1. Moreover, there are data that suggest that the human versions of these brain-associated genes have played an important role in human evolution because they bear the marks of strong natural selection in our species.

Finally, why is this transformation from anatomically modern to behaviorally modern humans so important for our discussion of the historicity of Adam and Eve? It is critically important because, philosophically, this transformation can be understood to be archeological evidence for the appearance of the rational soul in human evolution. Theologically, this transformation would be a sign of the arrival on the stage of world history of the *imago Dei*, the creature made in the image and likeness of God with intellect and will. T&E

<sup>1</sup> Brenna M. Henn, L.L. Cavalli-Sforza, and Marcus W. Feldman, "The great human expansion," *Proceedings of the National Academy of Sciences USA* 109 (2012): 17758-17764.

more notes »

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<sup>4</sup> Mehmet Somel, Xiling Liu, and Philipp Khaitovich, "Human brain evolution: transcripts, metabolites, and their regulators," *Nat Rev Neurosci* 14 (2013): 112-127.

<sup>3</sup> Quentin D. Atkinson, "Phonemic Diversity Supports a Serial Founder Effect Model of Language Expansion from Africa," *Science* 332 (2011): 346-349.

<sup>2</sup> Ian Tattersall, "Human evolution and cognition," *Theory Biosci* 219 (2010): 193-201.