

Why are current humans overwhelmingly the descendants of a late migration out of Africa?

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20 July 2025

The original evolution of hominins (modern humans and their evolutionary ancestors since the split with other great apes) took place in Africa about 7 million years ago, based on the fossil record. Beginning about two million years ago, various members of the genus *Homo* migrated out of Africa into Eurasia and, ultimately the rest of the world.

These migrations gave rise to several different populations, including Neanderthals, in Europe and the Middle East and Denisovans in parts of Asia, which have been classified as separate species—*Homo neanderthalensis* and *Homo* (species name not settled), respectively, as opposed to fully modern humans, *Homo sapiens*, who first appeared in Africa about 300,000 years ago.

These older populations eventually disappeared, apparently having been supplanted by the “fully modern” humans in a final migration out of Africa at about 50,000 years ago. A longstanding question has been what happened to the earlier migrants? Why do they appear to have vanished and been replaced by the late arrivals, leaving only one species of humans alive today?

A number of theories have been proposed, generally envisioning various forms of more or less forceful extermination of the older occupants. New research provides a more nuanced explanation.

One explanation is that modern humans were superior in some way—perhaps greater mental capacity and/or more advanced technology—as compared to the older, already resident Eurasian populations. Neanderthals, for example, whose physical remains were first discovered in 1829, had long been caricatured as semi-ape-like, brutish and intellectually limited in part due to a more robust build than modern humans. This supposed superiority of modern humans was extrapolated to support the idea that they caused the extinction of Neanderthals by pushing them into marginal environments and/or direct physical violence. This explanation appeared consistent with 19th century imperialist ideology. However, it was based on speculation, without substantiating evidence.

More recent research has shown that, in fact, Neanderthals had a fairly sophisticated technology (including a recently discovered, industrial-scale fat-rendering facility) and that they were well adapted to the peri-glacial environment of the northern hemisphere during the Pleistocene (ice age). Furthermore, genetic research has shown that current populations in Europe and parts of Asia have small amounts of Neanderthal DNA (1-4 percent). Similarly, some contemporary Asian populations have traces of Denisovan DNA.

Research published last year found traces of modern human DNA, specifically the Y or male sex chromosome, in Neanderthal fossils dating back between 200,000 and 250,000 years ago, apparently the result of an early migration. Another wave of African migrants left a genetic trace between 120,000 and 100,000 years ago. This suggests that there were multiple migrations by modern *H. sapiens* out of Africa during that time span. Nevertheless, these African migrants did not overwhelm the indigenous Eurasian populations the way the more recent migrations did. Why the difference?

Further complicating the issue, the finding of shared DNA brings into question the idea that these three populations—modern humans, Neanderthals, and Denisovans—were separate species. The established definition of a biological species rests on genetic isolation. That is, if members of different populations cannot mate to produce viable, reproductively functional offspring then there is no gene flow between them, and they will evolve in separate directions. This is usually the result of geographic separation resulting in a combination of random genetic drift and evolutionary adaptation to differing environments. Over time these genetic differences become sufficient to prevent successful mating between members of the separate populations.

The fact that modern, non-African human populations carry small amounts of Neanderthal and/or Denisovan DNA demonstrates that full genetic isolation had not taken place and that at least to some extent, these populations “made

love, not war” and were, therefore, members of the same species, at most representing various subspecies. The discovery of a child’s fossil which appears to have a mixture of Neanderthal and modern human characteristics lends weight to the view of cross mating. An example of a Neanderthal/Denisovan hybrid has also been identified.

In addition, recently reported research based on data from Tinsmet Cave in central Israel appears to demonstrate that during some of the Middle Paleolithic, at approximately 110,000 years ago, Neanderthals and *Homo sapiens* lived side by side and shared tools, daily practices and burial customs.

This evidence poses the question of why current human populations are predominantly descended from the latest “out of Africa” migration, with only minor traces of the earlier Eurasian populations among the current inhabitants, rather than the result of a more equal ancestry.

Recently published research, (“Major expansion in the human niche preceded out of Africa dispersal,” *Nature*, 18 June 2025) proposes a new theory as to why the later immigrants from Africa overwhelmed and/or supplanted the pre-existing human populations of Eurasia. This new theory contends that, while hominins originally evolved on the East African savannah millions of years ago and were adapted to that environment, by several thousand years ago *Homo sapiens* in Africa had spread out to other environments, developing a range of knowledge, cultural practices, and technology that permitted them to successfully inhabit a range of settings.

By reviewing a large sample of well-dated archaeological sites from across Africa and evaluating them for their environmental settings, the researchers found that, “the human niche began to expand substantially from 70 ka [thousand years ago] and that this expansion was driven by humans increasing their use of diverse habitat types, from forests to arid deserts.” They concluded that, “humans dispersing out of Africa after 50 ka were equipped with a distinctive ecological flexibility among hominins as they encountered climatically challenging habitats, providing a key mechanism for their adaptive success.” A second wave of ecological expansion is observed starting at approximately 29 ka. By which time, “humans occupied all African regions and ecosystems, with terminal Pleistocene societies engaging with a range of new behaviours, including semi-sedentism, evidence of persistent macroscale social networking and increased territoriality and interpersonal violence.”

A species’ “niche” is the biological and physical environment to which it is adapted. The proposed interpretation contends that by having developed the cultural flexibility to successfully inhabit a variety of environments

in Africa by 70 ka, the modern humans were able to adapt to a wide range of geographic settings when they migrated into Eurasia. The inference is that by contrast Neanderthals and Denisovans were well adapted to only a limited number of relatively narrow ecological niches that had existed during the more stable, earlier portions of the Pleistocene glacial period, which was buffered by the deviation-dampening effect of massive glaciers. This effect causing a condition known as “Pleistocene equability,” which was drawing to a close.

By contrast, the Late Pleistocene (roughly 129,000 to 11,700 years ago) was characterized by dramatic climate fluctuations and significant environmental changes. This period saw alternating cold glacial periods and warmer interstadials, leading to shifts in vegetation, animal distributions, and human populations. Consequently, the newly arrived modern humans, having adapted to various environments in Africa, were more able to inhabit the increasingly variable environment, and therefore, could spread more widely across the Eurasian landscape, resulting in larger populations, overwhelming the indigenous people with sheer numbers.

Whether there were any violent physical confrontations between the resident and immigrant populations is unknown, though this cannot be excluded, but the genetic information suggests at least some degree of friendly interactions. It is significant that, by whatever mechanism fully modern *Homo sapiens* came to overwhelmingly dominate the gene pool of the current human population, this new evidence reaffirms that we are all, ultimately, Africans of relatively recent origin. This understanding is especially important at a time when racism and xenophobia are being employed in the drive for fascism.

Another significant observation is the importance for the scientific study of human origins of the availability of substantial, representative databases. Both in the cited study of modern human migration and a recent study of the origins of social inequality, databases encompassing large numbers of archaeological sites were key to the derivation of new, well documented interpretations. The Trump administration’s vendetta against science in general, including archaeology, will have a devastating impact on future research.



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