

Climate changed the size of our bodies and, to some extent, our brains

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Skulls: Left: Amud 1, Neanderthal, 55.000 years ago, $\sim 1750 \text{ cm}^3$, Middle: Cro Magnon, Homo sapiens, 32.000 years ago, $\sim 1570 \text{ cm}^3$, Right: Atapuerca 5, Middle Pleistocene Homo, 430.000 years ago, $\sim 1100 \text{ cm}^3$. Femora: Top: Middle Pleistocene Homo, Trinil, 540.000 years ago, $\sim 50 \text{ kg}$ - Bottom: Neanderthal, La Ferrassie 1, 44.000 years ago, $\sim 90 \text{ kg}$. Credit: Manuel Will

An interdisciplinary team of researchers, led by the Universities of Cambridge and Tübingen, has gathered measurements of body and brain size for over 300 fossils from the genus *Homo* found across the globe. By combining this data with a reconstruction of the world's regional climates over the last million years, they have pinpointed the specific climate experienced by each fossil when it was a living human.

The study reveals that the average [body](#) size of humans has fluctuated significantly over the last million years, with larger bodies evolving in colder regions. Larger size is thought to act as a buffer against colder temperatures: less heat is lost from a body when its mass is large relative to its surface area. The results are published today in the journal *Nature Communications*.

Our species, *Homo sapiens*, emerged around 300,000 years ago in Africa. The genus *Homo* has existed for much longer, and includes the Neanderthals and other extinct, related species such as *Homo habilis* and *Homo erectus*.

A defining trait of the evolution of our genus is a trend of increasing body and brain size; compared to earlier species such as *Homo habilis*, we are 50% heavier and our brains are three times larger. But the drivers behind such changes remain highly debated.

"Our study indicates that climate—particularly temperature—has been the main driver of changes in body size for the past million years," said Professor Andrea Manica, a researcher in the University of Cambridge's Department of Zoology who led the study.

He added: "We can see from people living today that those in warmer climates tend to be smaller, and those living in colder climates tend to be bigger. We now know that the same climatic influences have been at work for the last million years."

The researchers also looked at the effect of environmental factors on brain size in the genus *Homo*, but correlations were generally weak. Brain size tended to be larger when *Homo* was living in habitats with less vegetation, like open steppes and grasslands, but also in ecologically more stable areas. In combination with [archaeological data](#), the results suggest that people living in these habitats hunted large animals as food—a complex task that might have driven the evolution of larger brains.

"We found that different factors determine brain size and body size—they're not under the same evolutionary pressures. The environment has a much greater influence on our [body size](#) than our brain size," said Dr. Manuel Will at the University of Tübingen, Germany, first author of the study.

He added: "There is an indirect environmental influence on brain size in more stable and open areas: the amount of nutrients gained from the environment had to be sufficient to allow for the maintenance and growth of our large and particularly energy-demanding brains."

This research also suggests that non-environmental factors were more important for driving larger brains than [climate](#), prime candidates being the added cognitive challenges of increasingly complex social lives, more diverse diets, and more sophisticated technology.

The researchers say there is good evidence that human body and [brain size](#) continue to evolve. The human physique is still adapting to different temperatures, with on average larger-bodied people living in colder climates today. Brain size in our species appears to have been shrinking since the beginning of the Holocene (around 11,650 years ago). The increasing dependence on technology, such as an outsourcing of complex tasks to computers, may cause brains to shrink even more over the next few thousand years.

"It's fun to speculate about what will happen to body and [brain](#) sizes in the future, but we should be careful not to extrapolate too much based on the last million years because so many factors can change," said Manica.

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