

Our Neanderthal Genetic Ancestry

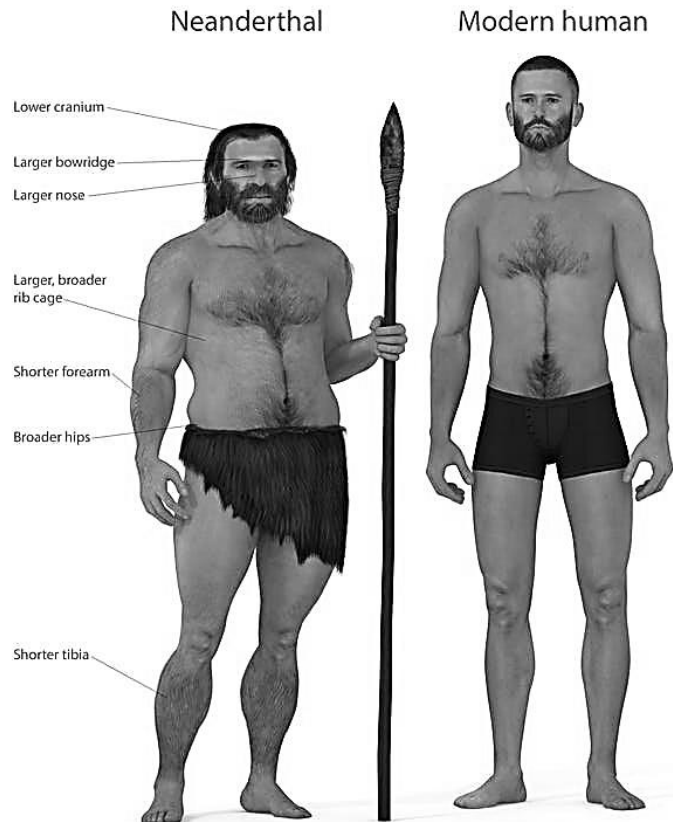
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Who were the Neanderthals and where did they live?



Reconstructed image of a Neanderthal individual (<https://www.newyorker.com/magazine/2011/08/15/sleeping-with-the-enemy>, accessed December 2021)

Neanderthals (more correctly called *Homo sapiens neanderthalensis*, or simply *Homo neanderthalensis*) are our closest relatives, sharing 99% of DNA with us, the anatomically modern humans (*Homo sapiens sapiens*, or simply *Homo sapiens*). Modern humans share 99.9% of DNA with any other individual on the planet and about 98% DNA with the great apes. Neanderthals are named after the Neander Valley in Germany (valley in German is “tal” or “thal”) where their remains were discovered in 1856 and classified as a different hominin species in 1864 (other Neanderthal specimens were discovered as early as 1829 in other European regions but were not properly identified at the time of their finding). The shape of their skull, the more pronounced browridges, and the thicker, stronger bones, were all features that distinguished them from modern humans:



A comparison between a Neanderthal (*Homo sapiens neanderthalensis*) and an anatomically modern human (*Homo sapiens sapiens*). (<https://phys.org/news/2019-01-neanderthals-sprinters-distance-runners-surprisingly.html>, accessed December 2021)

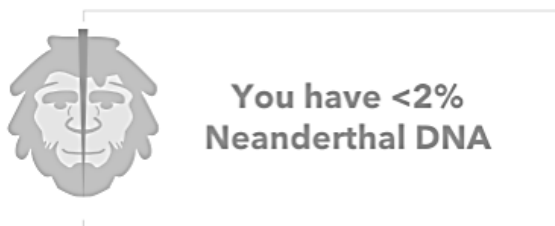
Neanderthals were quite skilled in the creation and use of tools and in their survival lifestyle. For example, they knew how to light and control fire, covered their bodies with animal skin and fur as clothing, lived in shelters, and were hunter-gatherers like our direct ancestors. They lived in Europe as early as 400k years before present time, surviving in harsh and cold environments.ⁱⁱ Originally, scientists believed that Neanderthals' habitats were limited to western Eurasia, but later archaeological findings showed that they expanded all the way to Siberia. About 40,000 years ago, they became extinct, probably because of modern humans, which exited the

African continent and spread throughout the Eurasian continent ca. 100k years ago, thus sharing territory and competing with resources with Neanderthals.

Genetic analysis of Neanderthal remains first produced mitochondrial DNA data, which was considerably different from any mitogenome produced to date from modern humans. Thus, the first conclusion that was derived based on mitochondrial DNA comparison seemed to indicate that the two hominin species did not interbreed.ⁱⁱⁱ However, advances in technology allowed for a complete nuclear genome sequence from a Neanderthal individual starting in 2010, which showed that interbreeding with modern humans occurred and that some of those genetic variants are still present in today's population.^{iv} Several more complete nuclear genomes from Neanderthal individuals have been produced to date.

Which genetic companies provide information about Neanderthal ancestry?

The National Geographic's Genographic Project used to provide information about our shared ancestry with ancient hominids. However, the project was officially "retired" in 2020 and today Neanderthal ancestry is only available as part of the information provided by 23andMe.^v



You inherited a small amount of DNA from your Neanderthal ancestors. Out of the 2,872 variants we tested, we found **267 variants** in your DNA that trace back to the Neanderthals.

All together, your Neanderthal ancestry accounts for less than **~2 percent of your DNA.**

Screenshot from 23andMe website showing the percentage of Neanderthal DNA and number of genetic variants found in my genome (accessed December 2021).

How is this information relevant to me?

Although at first this information might not seem to have immediate genealogical applications, our ancient cousins still played an important role in human history, which cannot be completely dismissed. In fact, a few traits that characterized our own family history (and family health history) can be associated with and potentially be inherited from our Neanderthal ancestors. In their Neanderthal ancestry reports, 23andMe attempts to include them based on the genetic variants that can be linked to what we know about the Neanderthal genome. Here is an example from my own report:

You have Neanderthal DNA that may influence your traits

This report highlights associations between your Neanderthal variants and your traits, but it does not explore how other factors may be involved — such as your many other DNA variants, your environment, or your lifestyle.



You have one variant associated with
having a worse sense of direction.



You have one variant associated with
being less likely to have a fear of heights.

ⁱ Dr. Ugo A. Perego is the owner of the Genetic Genealogy Consultant services (<http://www.geneticgenealogyconsultant.com>), which specializes in helping genealogists with all their DNA needs. He is also a visiting scientist affiliated with the DNA laboratories of Professors Alessandro Achilli and Antonio Torroni at the University of Pavia in Italy, working on human population genetics. He has previously worked for more than a decade as a senior researcher with the Sorenson Molecular Genealogy Foundation and GeneTree.com both based in Utah. Ugo earned a BSc and an MSc in Health Sciences at Brigham Young University (Provo, Utah) and a PhD in Genetic and Biomolecular Sciences at the University of Pavia, Italy. Ugo has contributed numerous lectures and publications on DNA and its applications to population genetics, genealogy, ancestry, forensics, and history. He is currently a full-time biology instructor at the Southeastern Community College in Iowa and an adjunct faculty at the Salt Lake Community College (Utah) and the University of New Haven (Connecticut).

ⁱⁱ <https://humanorigins.si.edu/evidence/human-fossils/species/homo-neanderthalensis> (accessed December 2021).

ⁱⁱⁱ <https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.0020421> (accessed December 2021).

^{iv} <https://humanorigins.si.edu/evidence/genetics/ancient-dna-and-neanderthals/interbreeding> (accessed December 2021).

^v <https://you.23andme.com/reports/neanderthal> available to customers that purchased the 23andMe DNA kit (accessed December 2021).