

# Neanderthal ancestry identifies oldest modern human genome

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Lateral view of the mostly-complete skull of Zlatý kůň. Credit: Martin Frouz

Ancient DNA from Neandertals and early modern humans has recently shown that the groups likely interbred somewhere in the Near East after modern humans left Africa some 50,000 years ago. As a result, all

people outside Africa carry around 2% to 3% Neandertal DNA. In modern human genomes, those Neandertal DNA segments became increasingly shorter over time and their length can be used to estimate when an individual lived. Archaeological data published last year furthermore suggests that modern humans were already present in southeastern Europe 47-43,000 years ago, but due to a scarcity of fairly complete human fossils and the lack of genomic DNA, there is little understanding of who these early human colonists were—or of their relationships to ancient and present-day human groups.

In a new study published in *Nature Ecology & Evolution*, an international team of researchers reports what is likely the oldest reconstructed modern [human](#) genome to date. First discovered in Czechia, the woman known to researchers as Zlatý kůň (golden horse in Czech) displayed longer stretches of Neanderthal DNA than the 45,000-year-old Ust'-Ishim individual from Siberia, the so-far oldest modern human genome. Analysis suggests that she was part of a population that formed before the populations that gave rise to present-day Europeans and Asians split apart.

A recent anthropological study based on the shape of Zlatý kůň's skull showed similarities with people who lived in Europe before the Last Glacial Maximum—at least 30,000 years ago—but [radiocarbon dating](#) produced sporadic results, some as recent as 15,000 years ago. It wasn't until Jaroslav Brábek from the Faculty of Science, Prague and Petr Velemínský of Prague's National Museum collaborated with the genetics laboratories of the Max Planck Institute for the Science of Human History that a clearer picture came into view.



Initial attempts to date Zlatý kůň based on the shape of her skull suggested she was at least 30,000 years old. Researchers now believe she lived more than 45,000 years ago. Credit: Martin Frouz

"We found evidence of cow DNA contamination in the analyzed bone, which suggests that a bovine-based glue used in the past to consolidate the skull was returning radiocarbon dates younger than the fossil's true age," says Cosimo Posth, co-lead author of the study. Posth was formerly a research group leader at the Max Planck Institute for the Science of Human History and is currently Professor of Archaeo- and Palaeogenetics at the University of Tübingen.

However, it was the Neanderthal DNA that led the team to their major conclusions about the age of the fossil. Zlatý kůň carried about the same amount Neanderthal DNA in her genome, as Ust Ishim or other [modern humans](#) outside Africa, but the segments with Neanderthal ancestry were on average much longer.

"The results of our DNA analysis show that Zlatý kůň lived closer in time to the admixture event with Neanderthals," says Kay Prüfer, co-lead author of the study.





Micro-sampling the petrous bone of Zlatý kůň from the base of the skull in the clean room at the Max Planck Institute for the Science of Human History, Jena. Credit: Cosimo Posth

The scientists were able to estimate that Zlatý kůň lived approximately 2,000 years after the last admixture. Based on these findings, the team argues that Zlatý kůň represents the oldest human genome to date, roughly the same age as—if not a few hundred years older than—Ust'-Ishim.

"It is quite intriguing that the earliest modern humans in Europe ultimately didn't succeed! Just as with Ust'-Ishim and the so far oldest

European skull from Oase 1, Zlatý kůň shows no genetic continuity with modern humans that lived in Europe after 40,000 years ago," says Johannes Krause, senior author of the study and director at the Max Planck Institute for Evolutionary Anthropology.

One possible explanation for the discontinuity is the Campanian Ignimbrite volcanic eruption roughly 39,000 years ago, which severely affected climate in the northern hemisphere and may have reduced the survival chances of Neanderthals and early modern humans in large parts of Ice Age Europe.

As advances in ancient DNA reveal more about the story of our species, future genetic studies of other early European individuals will help to reconstruct the history and decline of the first modern humans to expand out of Africa and into Eurasia before the formation of modern-day non-African populations.

**More information:** A genome sequence from a modern human skull over 45,000 years old from Zlatý kůň in Czechia, *Nature Ecology & Evolution* (2021). [DOI: 10.1038/s41559-021-01443-x](https://doi.org/10.1038/s41559-021-01443-x)

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