

Neanderthals did not go anywhere

Geneticists discover a link long missing. Partha P. Majumder has the story

A study published in *Science* in the last week of February examined genomic data from three female Neanderthals who lived 1,22,000, 80,000 and 52,000 years ago respectively. The team of scientists found that most of the Neanderthal genome was devoid of human DNA. However, they found an unusual amount of DNA of modern humans on the Neanderthal X chromosome.

Modern humans and Neanderthals shared a common ancestor approximately 6,00,000 years ago. The lineage then split, with Neanderthals evolving in Europe and modern humans in Africa.

Between 1,00,000 and 70,000 years ago, a small group of humans migrated out of Africa and gradually dispersed and expanded in size across West Asia, Asia and Europe. During this time, they encountered another population of human-like beings — the Neanderthals.

Around 40,000 years ago, Neanderthals disappeared. For decades, the prevailing narrative was they had lost to modern humans, either through violence or natural selection. Swedish geneticist Svante Pääbo and his colleagues sequenced the Neander-

thal genome in 2014.

Genome sequences of many humans were already available by then. Comparison of Neanderthal and modern human genomes yielded a startling discovery — current human genomes contain segments of Neanderthal DNA.

This could only have happened through interbreeding between the two groups. Pääbo was awarded the Nobel Prize in Physiology or Medicine in 2022 for “his discoveries concerning the genomes of extinct hominins and human evolution”.

Subsequent studies estimated that 1 to 4 per cent of the genomes of current non-African populations are derived from Neanderthals. To estimate the percentage of Neanderthal DNA among Indians, my colleagues and I from the National Institute of Biomedical Genomics in Kalyani analysed DNA of persons from about 50 ethnic groups in India; roughly eight from each geographical region — north, central, northeast, east, south and west.

We found that Neanderthal ancestry ranged from 1.9 to 2.5 per cent. The highest percentages were found among communities of the Northeast. East and Southeast Asian populations are known to have significantly higher Neanderthal admixture and genetic studies have shown that many Northeast groups share ancestry with populations from southern China and Southeast Asia.

Each human cell contains 23 pairs of chromosomes, which carry genetic information.

Among these are the sex chromosomes — females possess two X chromosomes inherited one each from both parents, whereas males inherit an

X chromosome from the mother and a Y chromosome from the father. The remaining 22 pairs are called autosomal chromosomes, inherited equally from both parents regardless of sex.

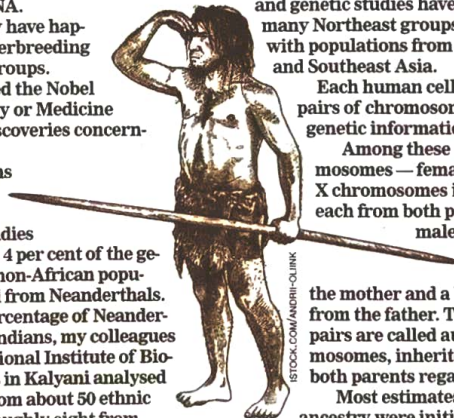
Most estimates of Neanderthal ancestry were initially derived from autosomal chromosomes. Therefore, although it was clearly established that

Homo neanderthalensis and *Homo sapiens* had mated with each other, the directionality of gene flow remained uncertain. In other words, it was still a mystery as to whether matings between modern human males and Neanderthal females occurred as frequently as the opposite. Later, it was discovered that most of the human X chromosome lacks Neanderthal ancestry.

The recent study has now established that the X chromosome of Neanderthals across time had 62 per cent more modern human DNA compared to their autosomal chromosomes. How did this come about? The simplest explanation is that, over a large number of generations, Neanderthal males mated more often with human females than human males mated with Neanderthal females.

Exactly why that happened will perhaps never be explained. It is, however, amazing that such ancient behavioural characteristics can be deciphered by studying DNA.

Humans have always outnumbered Neanderthals. It is possible that Neanderthals did not die out. As a result of interbreeding for a very large number of generations, the Neanderthals became just like some of us.



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