Human DNA and Neanderthal DNA

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Abstract

Among the great advances in 21st-century science has been how much we can learn from DNA data. Historical narratives relying heavily on genomic clues may not always have sufficient causality. When possible, it is ideal to combine the geological past with our emerging genetic profiles. Multidisciplinary perspectives can thereby yield superior hypotheses regarding our ancient past.

For hundreds of years human science has been fascinated with our historical origins. Modern humans are the most successful branch of the primate order evolutionary tree. While still inside Africa our pre-human ancestors shared many genes with multiple other African *Hominidae*. There was no tidy Garden of Eden.

Today's DNA profile also contains significant components from earlier archaic ancestors, primarily Neanderthals in Eurasia, and Denisovans in East Asia.**[1]** Many modern humans retain from 2% to 4% of these older relatives' DNA. Pre-humans had crossed from Africa – most likely on an earlier land bridge about 330,000 years ago – before small numbers of partially-evolved humans first joined them likely 260,000 years ago in shared living space.

The western European group has been studied seriously, while the eastern Denisovan group has so-far provided very little DNA to science. Because of sampling biases, it is possible that there were as many or more global Denisovans than Neanderthals. These two groups are collectively known as the *Neandersovans*.

How, when, and why these various species intermingled is a fascinating window into the prehistoric past, not fully explained by ancestral DNA alone.**[2]** The timing of *gene surges* among our two or three related primate species thereby illuminates our predecessors.

Growing and Shrinking Ice Sheets

The climate timing of our own waves of gene emigration were not random social vectors. These waves had much to do with two opportunities presented by *much lower sea levels during the coldest periods*. Indeed, sea levels were as low as 300 or more feet below today's levels. On the other hand, there have also been periods when sea levels were higher than what we enjoy today, flooding earlier land bridges. Both extremes of sea levels are likely associated with different atmospheric carbon dioxide levels typically from volcanism.

The key to deciphering early relative DNA components can be seen by studying both *causative pressures and opportunities for the wandering curious*. When the ice sheets became very deep conditions in Europe were much more challenging. However, that's precisely when global sea levels were lowest, and critical land bridges emerged. This was not the case in the lands far east of the Mediterranean. East Asian areas have modern humans with higher levels of Neandersovan DNA than northern European areas populated by descendants of the hardy so-called cave men.

However, the additional presence of Denisovan DNA farther east of the Mediterranean, and all the way toward China and the lands between SE Asia and Australia, are also related to low sea levels. Simply put, when the sea levels were several hundred

feet below today's levels, people could explore southward to discover New Guinea and even Australia. Riding on primitive floating platforms became possible after some previous sea gaps became narrow. In other words, expanding prehistoric primate cultures were both opportunistic and environmental, yielding global diversity within our one species. The land bridge from Siberian Asia to Alaska is the most striking global example.

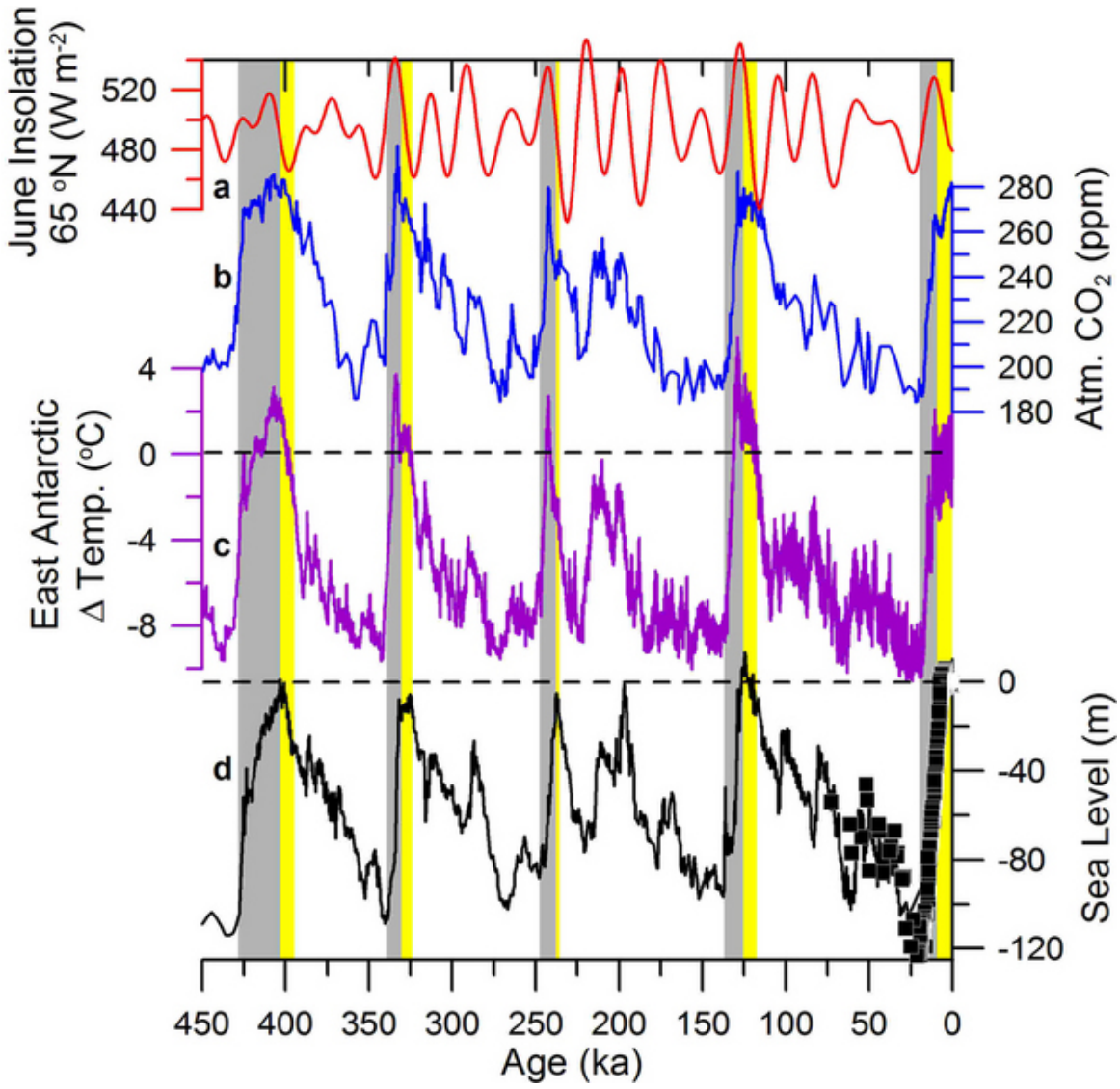
What do we now know about advancing and retreating glacial ice packs, with different opportunities for exploration? The DNA key appears to be how and when sea level opportunities for mass emigration out of the African nursery were presented by climate changes. *Homo sapiens'* clan journeys were not unique, being only the last great movement of superior apes from Africa. In other words, what God supposedly did for Moses in one day took thousands of years for the real migrants.

The last great diversification and extinctions occurred only after significant numbers of sapiens with superior weapons leaving Africa about 170 thousand years ago encountered pre-established Neanderthals and their ancient cousins. That massive gene pool infusion led to absorption of most Neanderthals into our rapidly increasing population. Pure Neanderthals vanished about 40 thousand years ago, last surviving around Gibraltar. Today there is only one modern ape species, *sapiens*, within its *Homo* genus. Fortunately, ghost-like traces of mixed ancestry can now be revealed and decoded by modern DNA technology.

Another climate gene pulse occurred from Africa about 25 thousand years ago, but by then the real Neanderthals were long gone. Even closer to the modern era was an ongoing gene pulse toward the end of the current ice ago, when nearby Asian farmers moved west and displaced the hunter-gatherer clans. This recent era has only led to slight increases in European pre-human DNA.

A recent excellent study of DNA explored the earlier two major gene pulses **[3]** between established European hunter-gatherer populations, and hunter-gatherer African *Hominidae* immigrants.

An important illustration of sea levels and glaciation cycles is here.**[4]** Below is a triple track of CO2 and sea levels **[5]**, with air temperatures mediating the two. Our attention regarding human emergence should go to the lowest CO2 and sea levels recorded about 270 thousand yeas ago, along with the next one about 135 thousand years ago. A third mixing of genes after about 20 thousand years ago was not caused by global sea levels, but by migrations into Europe by nearby Asian farmers.



Note that the coldest recent episode 20,000 years ago saw sea levels about 120 meters, or nearly 400 feet, below today's levels.

At that time there were ample opportunities for the latest mass migration of modern humans out of Africa. It is also important to note that the last archaeological evidence of fully Neanderthal camps (near Gibraltar) was 40 thousand years ago.

We are left with *two important opportunities* for early evolving humans, starting about 250 thousand years ago – and then again about 130 thousand years ago involving much more sophisticated *sapiens* clans. Around 230 thousand years ago sea levels were about 100 *meters* below today's levels. Around 130 thousand years ago levels got down to about 90 *meters* below current levels. The major migration about 130 thousand years ago was more significant for DNA flows among relatively less numerous Neanderthals and modernizing humans with growing brains.

Rapid warming after 16 thousand years ago, with melting ice sheets and rising soil temperatures, would have favored farming Asians over hunter gatherers better adapted to cold climates. By then there were enough modernizing clans to dominate and dilute remnant hunter gatherer humans; and no low-water walking land bridges were necessary.

References

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[3] https://www.science.org/doi/10.1126/science.adi1768

[4] https://www.nature.com/scitable/knowledge/library/ice-sheets-and-sea-level-in-earth-24148940/

[5] https://www.e-education.psu.edu/earth107/node/1496