



## Neandertals: Not So Fast

Constance Holden (Special Section, Archaeology, 20 Nov., p. [1456](#)) cites evidence indicating that Neandertal mitochondrial DNA (mtDNA) shows they had been a distinct branch from the human tree for a half-million years (Research News, 11 July 1997, p. [176](#)) and refers to the debate about why, if Neandertals are so similar to us, they became extinct just at the time of their "technological

golden age." Of course, all populations alive at that time are now extinct, so the question is whether the Neandertals became extinct without issue. This is a behavioral matter if we assume that behavior and biology are linked together, rather than being unlinked, as they are between human populations today. This assumption requires that Neandertals were a distinct and separate evolutionary line.

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Holden contends that the mtDNA shows this, but for this interpretation of the ancient mtDNA ([1](#)) to be correct, one must assume that (i) the history of the Neandertal mtDNA lineage segment is a population history, (ii) constantly accumulating mutations are the sole cause of mtDNA evolution, and (iii) the mutation rate of mtDNA is known with sufficient accuracy to date the putative split. Belief in the Eve theory of modern human origins is the most important prerequisite for these assumptions ([2](#)), because it

ties mtDNA history to population history through the explanation that low-mtDNA diversity in humans comes from a recent population-size bottleneck at the beginning of a new species.

But this interpretation is not obviously correct. The mtDNA observations are insufficient to resolve issue of whether they were a separate evolutionary line. For instance, a different reason why we may not find many of their genes is that, if Neandertals made up 25% of the ancestry of all modern humans (3), there is a better-than-50% chance that all their mitochondrial genes would have been lost because of drift (4). This calculation assumes a slow, or phylogenetic, rate of change for mtDNA. If the rate was 100 times faster, as intergenerational studies now suggest (5), Neandertal genes could not have been lost by drift, but then there would have been ample possibility for them to have evolved into the modern genome through mutations (6). Most important, the star-shaped genealogy of the human mtDNA genome reveals a history of selection (6), and post-Neandertal selection in human mtDNA renders all of these phylogenetic interpretations meaningless.

Perhaps we should slow down and consider a more parsimonious explanation for why Neandertals seem so human-like in brain size and anatomy, the speech-related details of the hypoglossal canal, hyoid bone anatomy, burial behavior, hunting prowess, and invention of a true Upper Paleolithic industry in Europe. If it looks like a duck and quacks like a duck....

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## References and Notes

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2. M. H. **Wolpoff**, *Evol. Anthropol.* **7**, 1 (1998). It was recently estimated from anatomical considerations that Neandertals must have made up at least 25% of the ancestry of modern Europeans; if so, their contribution to all modern humans would be much smaller [J. Hawks in *Human Evolution: Abstracts of Papers Presented at the 1997 Cold Spring Harbor Symposium on Human Evolution*, L. Cavalli-Sforza, Ed. (Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 1997), p. 81.]
3. M. Nordborg, *Am. J. Hum. Gen.* **63**,1237 (1998).
4. L. Loewe and S. Scherer, *Trends Ecol. Evol.* **12**, 422 (1997); T. J. Parsons, D. S. Muniec, K. Sullivan *Nature Genet.* **15**, 363 (1997).
5. K. Hunley and A. Merriwether, paper presented at the 1998 meeting of the Human Biology Association, Salt Lake City, Utah, 31 March to 1 April 1998.
6. J. Hey, *Mol. Biol. Evol.* **14**, 177 (1997); C. A. Wise, M. Sraml, S. Easteal, *Genetics* **148**,409 (1998).

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