

Toba catastrophe theory

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Within the last three to five million years, after human and other [ape](#) lineages diverged from the [hominid](#) stem-line, the human line produced a variety of species.

According to the Toba catastrophe theory a massive volcanic eruption severely reduced the human population. This may have occurred around 70–75,000 years ago when the [Toba caldera](#) in [Indonesia](#) underwent an eruption of category 8 (or "mega-colossal") on the [Volcanic Explosivity Index](#). This released energy equivalent to about one [gigaton](#) of [TNT](#), which is three thousand times greater than the [1980 eruption of Mount St. Helens](#). According to Ambrose, this reduced the average global temperature by 5 degrees Celsius for several years and may have triggered an ice age.

Ambrose postulates that this massive [environmental](#) change created [population bottlenecks](#) in the various species that existed at the time; this in turn accelerated differentiation of the isolated human populations, eventually leading to the extinction of all the other human species except for the two branches that became [Neanderthals](#) and modern humans.

Some [geological](#) evidence and computed models support the plausibility of the Toba catastrophe theory. The Greenland ice core data displays an abrupt change around this time, but in the corresponding Antarctic data the change is not easily discernible. Ashes from this eruption of Lake Toba, located near the equator, should easily spread all over the world.

Genetic evidence suggests that all humans alive today, despite their apparent variety, are descended from a very small population, perhaps between 1,000 and 10,000 breeding pairs.^{[3][4]}

Using the average rates of genetic mutation, some geneticists have estimated that this population lived at a time coinciding with the Toba event. These estimates do not contradict the consensus estimates that [Y-chromosomal Adam](#) lived some 60,000 years ago, and that [Mitochondrial Eve](#) is estimated to have lived 140,000 years ago, because Toba is not conjectured to be an extreme bottleneck event, where the population was reduced to one breeding pair.

Gene analysis of some genes shows divergence anywhere from 2 million to 60,000 years ago, but this does not contradict the Toba theory, again because Toba is not conjectured to be a single-pair bottleneck event. The complete picture of gene lineages (including present-day levels of human [genetic variation](#)) allows the theory of a Toba-induced human population bottleneck.^[5]

According to this theory, humans once again fanned out from [Africa](#) after Toba when the climate and other factors permitted. They migrated first to [Arabia](#) and [India](#) and onwards to [Indochina](#) and [Australia](#) (Ambrose, 1998, p. 631), and later to the [Middle East](#) and what would become the [Fertile Crescent](#) following the end of the [Würm glaciation](#) period (70,000–10,000 years bp).

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2. [^ Stanley H. Ambrose \(1998\). "Late Pleistocene human population bottlenecks, volcanic winter, and differentiation of modern humans". *Journal of Human Evolution* 34 \(6\): 623–651. doi:10.1006/jhev.1998.0219.](#)
3. [^ Ambrose, Stanley H. \(2005\). *Volcanic Winter, and Differentiation of Modern Humans*. Bradshaw Foundation. Retrieved on 2006-04-08.](#)
4. [^ *When humans faced extinction*. BBC \(2003-06-09\). Retrieved on 2007-01-05.](#)
5. [^ *Late Pleistocene human population bottlenecks, volcanic winter, and differentiation of modern humans* by Stanley H. Ambrose](#)
6. [^ *Dawkins, Richard* \(2004\). "The Grasshopper's Tale", *The Ancestor's Tale, A Pilgrimage to the Dawn of Life*. Boston: Houghton Mifflin Company, 416. ISBN 0-618-00583-8.](#)