

# Climatic fluctuations drove key events in human evolution

September 21 2011

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Research at the University of Liverpool has found that periods of rapid fluctuation in temperature coincided with the emergence of the first distant relatives of human beings and the appearance and spread of stone tools.

Dr Matt Grove from the School of [Archaeology](#), Classics and Egyptology reconstructed likely responses of [human ancestors](#) to the climate of the past five million years using genetic modelling techniques. When results were mapped against the timeline of human evolution, Dr Grove found that key events coincided with periods of high variability in recorded temperatures.

Dr Grove said: "The study confirmed that a major human [adaptive radiation](#) – a pattern whereby the number of coexisting species increases rapidly before crashing again to near previous levels - coincided with an extended period of climatic fluctuation. Following the onset of high climatic variability around 2.7 million years ago a number of new species appear in the fossil record, with most disappearing by 1.5 million years ago. The first [stone tools](#) appear at around 2.6 million years ago, and doubtless assisted some of these species in responding to the rapidly changing climatic conditions.

"By 1.5 million years ago we are left with a single human ancestor – *Homo erectus*. The key to the survival of *Homo erectus* appears to be its behavioural flexibility – it is the most geographically widespread species of the period, and endures for over one and a half million years. Whilst

other species may have specialized in environments that subsequently disappeared – causing their extinction – *Homo erectus* appears to have been a generalist, able to deal with many climatic and environmental contingencies."

Dr Grove's research is the first to explicitly model 'Variability Selection', an evolutionary process proposed by Professor Rick Potts in the late 1990s, and supports the pervasive influence of this process during human evolution. Variability selection suggests that evolution, when faced with rapid climatic fluctuation, should respond to the range of habitats encountered rather than to each individual habitat in turn; the timeline of variability selection established by Dr Grove suggests that *Homo erectus* could be a product of exactly this process.

Linking climatic fluctuation to the evolutionary process has implications for the current global climate change debate. Dr Grove said: "Though often discussed under the banner term of 'global warming', what we see in many areas of the world today is in fact an increased annual range of temperatures and conditions; this means in particular that third world human populations, many living in what are already marginal environments, will face ever more difficult situations. The current pattern of human-induced climate change is unlike anything we have seen before, and is disproportionately affecting areas whose inhabitants do not have the technology required to deal with it."

The research is published in *The Journal of [Human Evolution](#)* and *The Journal of Archaeological Science*.

Provided by University of Liverpool

Citation: Climatic fluctuations drove key events in human evolution (2011, September 21) retrieved 25 April 2024 from

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