

Paleoclimates and Human Evolution, a research conference convened at the Smithsonian's Conservation and Research Center, November 17-20, 2005

Implications of Climate History for Hominin Evolution

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Climate change during the period of hominin evolution (the past 6 million years) included progressive cooling/drying, an overall increase in the amplitude of oscillation, and alternating intervals of high and low climate variability. In eastern Africa, where well-dated hominin fossils and archeological sites are most abundant, early humans also encountered substantial landscape alterations caused by episodic tectonic and eruptive events. The resulting complexity in the environmental milieu of early hominin evolution means that hypotheses linking paleoenvironmental and evolutionary change must be very specific as to *how* environmental change affected evolutionary processes and the subsequent *pattern of correlation* (the association between environmental and evolutionary change) expected to be found in the geologic record.

Key hypotheses concerning adaptive evolution are as follows: Novel adaptations emerged in hominins and contemporaneous mammals (1) in relatively stable habitats, (2) during progressive shifts in environment (e.g., greater aridity), or (3) in response to significant variability in adaptive conditions. Hypotheses regarding species turnover are as follows: Speciation and extinction occurred (4) in a concentrated "turnover pulse" forced by climate change, (5) in a broader interval of major climate change, or (6) over a long period in a gradually changing mosaic of habitats.

Since all hypotheses regarding environmental effects on evolution depend on temporal correlation, a real challenge is to match the sampling of fossil and archeological remains (from which one determines evolutionary change) to the temporal scale of Pliocene and Pleistocene climate dynamics. Since climate change is just one of many factors that shape evolution, it is equally important to assess *which* hominin behaviors and anatomical features make sense as evolutionary responses to changes in climate and habitat. These issues help define some of the goals of our conference.