

Evolving to the beat of a different theory

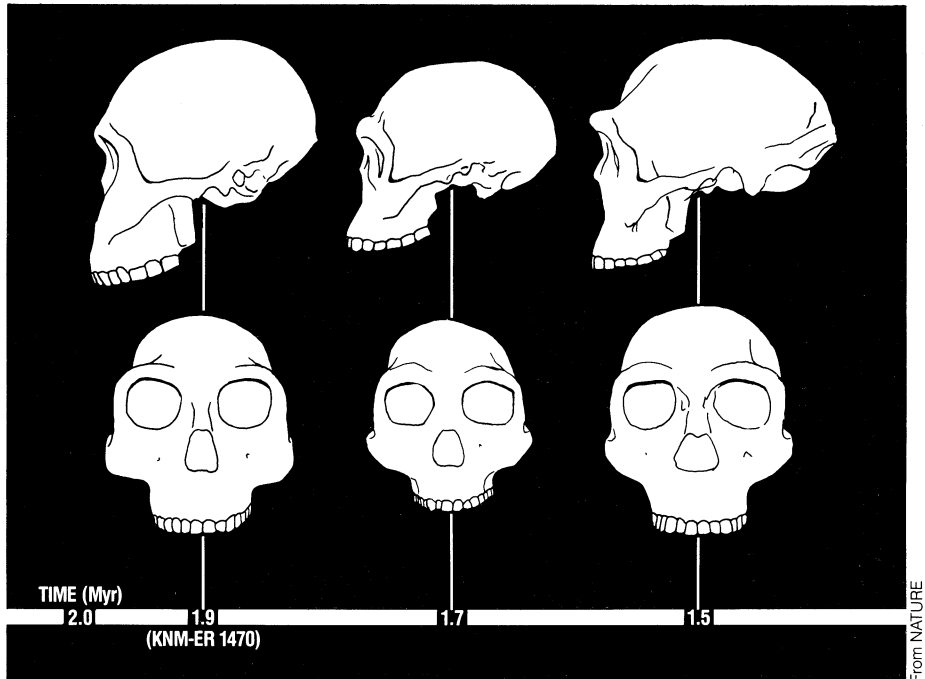
The tempo of human evolution is at the center of a fierce argument based on a frustrating scarcity of data. The theory of punctuated equilibrium, which has recently gained popularity, states that humans and other species evolved over periods of rapid change interspersed with much longer static periods (SN: 7/4/81, p. 12). In the July 9 NATURE, four anthropologists argue against that view and take the more traditional stand—most changes in human evolution have been both gradual and cumulative. "What we think we've done is to confirm Darwin's and Huxley's views on evolution," says principal author John E. Cronin of Harvard University.

In a review of much of the human fossil data, Cronin and collaborators say that apparent cases of punctuated equilibrium in the fossil record are due to erroneous assignment of dates or to incorrect identification of fossils. The specimen labeled KNM-ER 1470, for example, was originally dated as being 2.6 million years old, but later re-dated to 1.8 million years old. This change reduced the minimum time of the species *Homo habilis* and took away a possible example of a species remaining static over the long period of a million years.

As evidence for continuous and gradual change, Cronin and collaborators charted 44 morphological traits among four hominid species and three specimens they consider intermediary. They found a "clear directionality" in the development of a number of the traits. For two of these, body weight and cranial capacity (which reflects brain size), they plotted graphs using estimated values for each of the four species then connected the points with a straight line. "The trends seem to show no jumps or discontinuities. Any impulse to draw a step diagram [the model of punctuated equilibrium] through the points should be resisted while the most parsimonious approach is to interpret the trends with a best-fit line," say Cronin, Noel Boaz of New York University, Christopher B. Stringer of the British Museum and Yoel Rak of Tel Aviv University.

The lifetimes of the hominid species are regarded by these scientists as further evidence for gradual evolutionary change. Each of the species, from *Australopithecus afarensis* to *Homo erectus*, lasted approximately 740,000 years. Punctuated evolution would have produced high variance in the durations of species, since each new form would have been the result of a rapid and random event.

Cronin and collaborators are aiming their challenge primarily at a 1977 paper by Stephen Jay Gould of Harvard University and Niles Eldredge of the American Museum of Natural History in New York.



Fossil to fossil: Did humans evolve with gradual or discontinuous change?

Eldredge told SCIENCE NEWS that human evolution had been described in that paper in a couple of paragraphs but no detailed analysis has been made. He says that questions of evolutionary tempo can be better answered by looking at non-human organisms that have left more complete fossil records. In the case of trilobites, a class of distinct arthropods, for example, there is a clearly "rectangular" pattern of anatomical change. He says that a species remained the same for 5 to 10 million years, giving rise to distinct new species and finally becoming extinct.

Eldredge objects that the recent NATURE paper does not accurately portray the "punctuated equilibrium" point of view. "They have us mixed up with saltationists, who believed there are sudden jumps in anatomical features," he says. "We believe features change rapidly, over thousands of years, which is short in geological time, but not in single-generation jumps."

"Nobody disputes that brain size and body weight get bigger during human evolution," Eldredge says. But he doesn't believe a graph with a straight line connecting only a few points is a serious argument for continuous, gradual change. "When an organism gets a good anatomical idea, it sticks with it for a while," he explains.

Ian Tattersall, a physical anthropologist colleague of Eldredge, argues that Cronin has set up a straw man. "Nobody has gone through the human fossil record and made explicit the cases [of sudden change and extended stasis], but anyone who knows the record can find them," he says. "Where

a pattern is discernable, something happens rapidly or there is not much change for a long time. The few good cases of gradualism occur in time periods where the picture is not clear at all." □

Boring problems threaten LEP, HEP

*"There once was a place called Villars
Where there was more than one star;
They talked about LEP
And the future of HEP,
But decisions were made in the bar."*

The July/August CERN COURIER attributes this limerick to the physicist Hans Boggild. Villars is a town in the Swiss mountains where representatives of the European international physics laboratory CERN gathered to discuss plans for their newest project, the construction of a Large Electron-Positron collider (LEP) in what CERN COURIER called a "Club Méditerranée ambience." The picture is enough to make U.S. physicists cry in their drinks, that is, if they could afford bar prices in a Swiss mountain resort.

If LEP is built, physicists generally (and not only European ones) expect the future of high energy physics (HEP), aka particle physics, to be played out there in the environs of Geneva. LEP will provide collisions of electrons and positrons flying at energies up to 100 billion electron-volts. Out of those collisions are expected to come the things that will test and maybe prove the