The ups and downs of magnetic cycles

On the average, the earth's magnetic field does an about-face, completely flipping direction, every 650,000 years. But the actual frequency of geomagnetic reversals can vary considerably. One exciting development in the last few years was the finding by a number of researchers that the reversal frequency successively increases and decreases every 30 million years [Myr] or so. This is tantalizing because it bolsters the increasingly popular but hotly debated view that the earth and the life it supports are subjected to dramatic changes with clocklike regularity (SN: 10/1/83, p. 212; 5/25/85, p. 324).

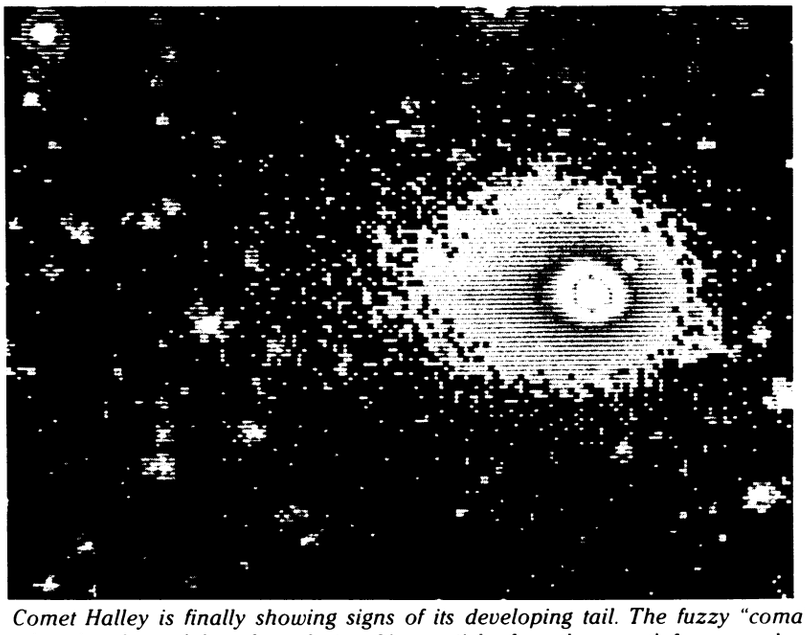
The results of a new paper in the Oct. 3 NATURE, however, should be sobering to those who have subscribed to the 30 Myr geomagnetic cycle. While the paper, by Timothy M. Lutz, a geologist at the University of Pennsylvania in Philadelphia, does not prove that the geomagnetic record is *not* periodic, it does show that a statistical technique used to find this 30 Myr cycle is flawed. The paper also suggests that the periodicities claimed in other geologic records, such as surges of volcanism, impact cratering and biological extinctions, be carefully reexamined.

In his paper, Lutz looks at the statistical procedure used by David M. Raup at the University of Chicago in a NATURE paper published earlier this year. Lutz concludes that the 30 Myr cycle found by Raup was not a real periodicity but rather a subharmonic of a dip in the number of reversals 150 Myr ago which has long been recognized to occur in the 165-Myr-old record. A subharmonic means that one can multiply an integer (in this case, five) times 30 Myr to get 150 Myr. If, however, the time to this dip were shortened from 150 Myr, the 30 Myr cycle would no longer show up as a subharmonic; it would only be evident if it represented a real periodicity. This is exactly the test Lutz applied; he truncated the record by eliminating the most recent reversals so that the time to the dip was shortened. Not only did the 30 Myr cycle disappear, but after his analysis Lutz found no evidence for any other periodicities either.

In the "News and Views" section of the same issue of NATURE, Raup graciously acknowledges his error. Lutz "has shown by an elegant experiment that the 30 Myr signal is predictably sensitive to the length of the time series," he writes. Both he and Lutz also urge that this truncation test be applied to past statistical studies of other geologic phenomena. "Two of the three studies of [biological] extinction used essentially the same statistical techniques that I used with the magnetic data but, as Lutz points out, the extinction and magnetic data are different," Raup continues. "I am happy to report that Lutz's truncation procedure has been applied to the analysis of the extinction data with no effect on its results."

In his recent paper, Lutz also presents a new statistical approach for periodicity hunting, which he believes is conceptually simpler than other methods and which burns up less computer time for moderate-size data sets. Still, he argues that this and the other techniques are simplistic, partially because there is so little geomagnetic data available. Moreover, most of the statistical work in geology, econometrics and other fields has not focused on looking for periodicities. "If we had a really good statistician to work on this," Lutz says, "he might come up with some new ideas." —*S. Weisburd*

Comet Halley begins to show its tail



Caltech

Comet Halley is finally showing signs of its developing tail. The fuzzy "coma" produced as the sun's heat frees dust and ice particles from the comet's frozen nucleus has been visible for months, but the viewing angle from earth has made the tail difficult to identify. The comet has been under scrutiny since it was spotted three years ago on the way to its first rendezvous with the sun since 1910 (SN: 10/30/82, p. 277). This photo was taken on Sept. 25 by James Gibson of Jet Propulsion Laboratory in Pasadena, Calif., using the 60-inch telescope at Palomar Observatory and a red filter to enhance light reflected from the tail's dust.

Hyperactivity: Will it stay or go?

Hyperactive children, it appears, are not always — or even usually — on a one-way street to behavior problems later in life. About two-thirds of a large group of boys diagnosed as hyperactive in childhood have shed all or most of the problems associated with the disorder as they moved into adolescence, according to researchers at the Long Island Jewish-Hillside Medical Center in Glen Oaks, N.Y.

But the rest of the boys in the group still display the symptoms of childhood hyperactivity, as well as a surplus of aggressive and criminal behaviors and drug abuse, report Rachel Gittelman and her colleagues in the October ARCHIVES OF GENERAL PSYCHIATRY.

This suggests that there is a subgroup of "pure" hyperactive children who are most likely to engage in delinquent and antisocial behavior later in life, writes psychiatrist Dennis P. Cantwell of the University of California at Los Angeles in an accompanying editorial. It is unclear, he adds, whether the hyperactivity and other symptoms in these adolescents will persist into adulthood.

The nature of childhood hyperactivity — an overwhelmingly male phenomenon — has been studied and debated for several decades, but few researchers have diagnosed the disorder in a group of children and followed the same youngsters into adolescence. Defining and measuring hyperactivity, or "attention deficit disorder with hyperactivity," as it is now called, has always proved troublesome. Three categories of behavioral signs are sought: inattention (such as difficulty concentrating on or finishing school projects), impulsivity (such as acting before thinking about the consequences of behavior and constantly shifting from one activity to another) and excessive physical activity