RELIGION & PHILOSOPHY

Progress and The Apocalypse

"Between Progress and Apocalypse: A Reassessment of Millennialism in American Religious Thought, 1800–1880" by James H. Moorhead, *Journal of American History* (Dec. 1984), Ballantine Hall, Indiana University, Bloomington, Ind. 47405.

Amid the numerous religious revivals of the early 19th century, America's Protestants turned toward a new "postmillennial" theology.

Many earlier Protestants had held that the Apocalypse and Second Coming would be followed by the millennium, a 1,000-year-long earthly paradise. The postmillennialists reversed the order: The millennium would *precede* the Apocalypse. That was an important difference, writes Moorhead, of the Princeton Theological Seminary, one that must be grasped "to understand the world as it appeared to many persons only a few generations ago."

America's pastors and preachers quickly wed postmillennialism to the secular gospel of progress. "Since the Kingdom of God would not arrive by a supernatural destruction of the world," explains Moorhead, "only the labors of believers could bring it about; and if they proved laggard in their task, the millennium would be retarded."

Evangelizing would speed its coming, but Protestant ministers saw "sophisticated technology, greater prosperity, and the flourishing of the arts and sciences" as signs of its approach and worthy of church support.

By the end of the 19th century, the postmillennialist day was done. To conservative Protestants, disturbed by the direction of secular progress, "the postmillennial hope of historical advance seemed fatuous." Among liberal Protestants, millennial beliefs also withered. "What remained was rather like Lewis Carroll's Cheshire cat, [with] faith in moral and social improvement constituting the residual grin."

SCIENCE & TECHNOLOGY

Pole Vaulting

"Polar Flip-Flop" by Subir K. Banerjee, in *The Sciences* (Nov.-Dec. 1984), 2 East 63rd St. New York, N.Y. 10021.

Among the few things that human beings can count on in life besides death and taxes, one of the surest is that the sun will rise in the east and set in the west. Or will it?

According to Banerjee, a University of Minnesota geologist, the Earth's north-south magnetic field has "flipped" at least 25 times during the last five million years, or roughly once every 200,000 years. The most recent turnabout came some 730,000 years ago, so the next "flip" is already long overdue.

The evidence of past polar flip-flops has been around for hundreds of years. As early as 1538, sailors noticed that their compasses went hay-

wire, designating north as south, when placed near certain rocks. No satisfactory explanation of the aberration was forthcoming until 1963. That year, writes Banerjee, two separate research groups, from the U.S. Geological Survey and the Australian National University, concluded that the strange rocks were "'fossil magnets' that . . . recorded the intensity and direction of the global magnetic field prevailing at the time they cooled and hardened."

Scientists believe that the Earth's magnetic field is generated by the movement of molten iron—itself magnetized billions of years ago by the sun or some other celestial body—thousands of miles beneath the planet's surface. As the liquid metal rises, it gradually cools and begins sinking back toward the Earth's core, creating "eddies" some 100 miles in diameter. There may be as many as 50 of them. The rotation of the Earth on its axis makes most (but not all) of the eddies point either north or south. "The net direction of the magnetic field," Banerjee states, "depends simply on which type of eddy is more populous."

This explains why the Earth's magnetic and geographic poles are not identical: Fluctuations in the eddies make the magnetic poles wobble.

Geologists and geophysicists do not know why there are currently more northerly eddies than southerly ones, but the evidence suggests that polar flips are not sudden. Banerjee's own work in Minnesota shows that the magnetic field there is at roughly 40 percent of the peak strength it reached 4,000 years ago.

If a switch occurred tomorrow, it would disrupt everything from missile guidance systems to the migratory habits of birds. But if Banerjee's calculations are correct, mankind will not have to worry about such imponderables for another 2,000 years.

Hairs That Hear

"Crafting Sound from Silence" by Deborah Franklin, in *Science News* (Oct. 20, 1984), 231 West Center St., Marion, Ohio 43306.

Scientists have long known that there is more to the ear than meets the eye, but exploring the recesses of the inner ear is a difficult business. Today, they are finally beginning to understand how mysterious "hair cells" convey sounds to the auditory nerve.

This much is known: Sounds from the outside world stimulate the eardrum, whose vibrations are picked up and converted into hydraulic pressure waves by a bone called the stapes. The waves then travel the length of the cochlea—long, spiral-shaped chambers lined in places with hair cells. They are so named because of the "thin, hairlike appendages, called stereocilia, at their tips," reports Franklin, a *Science News* correspondent. When these extraordinarily sensitive stereocilia are tweaked, they release electrical impulses that signal the hair cell to secrete a chemical that stimulates the auditory nerve.

Humans are born with some 20,000 hair cells in each ear. In a lifetime of normal wear and tear, the hairs thin out and, thus, the hearing