



Friends of the Earth? Nineteenth-century Indian hunters drive a herd of buffalo over a cliff.

1000 A.D. A few centuries later—before Europeans appeared—all known species of the moa, a large native bird, were extinct, as were certain types of geese, ducks, swans, and other bird species. Research at more than 100 large archaeological sites reveals what happened: “Maoris cut up prodigious numbers of moas, cooked them in earth ovens, and discarded the remains. They ate the meat, used the skins for clothing, fashioned bones into fishhooks and jewelry, and blew out the eggs for use as water containers. . . . Maoris must have been slaughtering moas for many generations.”

On all the main islands of Hawaii, Smithsonian paleontologists Storrs Olson and Helen James have identified fossil bird species that disappeared during the Polynesian settlement, which began around 500 A.D. At least 50 species perished before Captain James Cook’s arrival in the 18th century.

In the American Southwest, Spanish explorers arriving during the 16th century found gigantic multistory buildings standing empty in the middle of treeless desert. The vanished builders were known to the Navajo Indians in the region only as “Anasazi” (“the Ancient Ones”). Paleobotanists Julio Betancourt, Thomas Van Devender, and their colleagues have been able to reconstruct what happened, Diamond says. When the pueblos were built in what is now New Mexico’s Chaco Canyon National

Monument shortly after 900 A.D., they were surrounded by piñon-juniper woodland and ponderosa pine forest, which the Anasazi gradually cleared. “As deforestation caused progressively increasing erosion and water runoff, and as irrigation channels gradually dug gullies into the ground, the water table may finally have dropped below the level of the Anasazi fields, making irrigation without pumps impossible.” The Anasazi were forced to abandon Chaco Canyon during the 12th century.

What distinguishes late-20th-century humans from their primitive forebears, Diamond says, is not the innocence of the latter but the former’s scientific understanding of the environment. The Anasazi had the excuse of ignorance; today’s humans do not.

Sunny with a Chance of Meltdown

“The Once and Future Sun” by Ron Cowen, in *Science News* (Mar. 26, 1994), 1719 N St. N.W., Washington, D.C. 20036.

The sun’s extinction may not be one of humankind’s more pressing concerns, but the star that gives us life appears, like today’s baby boomers, to be approaching middle age. At about 4.5 billion years of age, it is more than one-

third of the way through its expected life span.

Like a baby boomer, the sun is going to get fatter, but it's also going to get brighter. The long-term outlook for the sun's earthbound clients is not good. Astrophysicist I.-Juliana Sackmann of the California Institute of Technology and two colleagues recently tried to chart the sun's fate, reports *Science News* writer Cowen. During the next 1.1 billion years or so, its brightness will increase 10 percent. According to a model proposed six years ago by James F. Kasting of Pennsylvania State University, that is likely to trigger a runaway greenhouse effect on Earth, with highly unpleasant consequences: "The planet's oceans will boil away, destroying life as we know it."

Some 6.5 billion years from now, the sun will have more than doubled its present brightness, according to Sackmann, Arnold I. Boothroyd of the University of Toronto, and Kathleen E. Kraemer of Boston University. Having consumed all the hydrogen nuclei at its core, it will start on the hydrogen nuclei in a shell of gas around the core. The energy released will make the core hotter and denser, while the sun's outer envelope will expand and cool, growing redder in color. Over a period of 1.3 billion years, the sun will increase enormously in size, transforming itself into a "red giant," as stars of this type are called, and swallowing Mercury and perhaps Venus.

Eventually the sun will enter a quiescent stage, burning the helium nuclei in its core. After about 100 million years, the helium in a shell of gas just outside the core will ignite. "At about 12.3 billion years of age," Cowen writes, "the sun [will] become a star with two burning shells," one of helium, the other of hydrogen. With its nuclear fuel depleted, the core will contract, drawing in the two gas shells around it. Another series of explosions will trigger "the final phase of expansion and brightening, which will last about 20 million years."

A few million years later, the end will come. "Ejecting its puffy outer layers, the elderly star will lay bare its smoldering, collapsed core, thus becoming a relic known as a white dwarf." Around it, in all likelihood, a lifeless planet Earth will go on revolving forever.

Information Age Auto da Fé

"Discards" by Nicholson Baker, in *The New Yorker* (Apr. 4, 1994), 20 W. 43rd St., New York, N.Y. 10036.

Cheerfully, even gleefully, library administrators all over the United States are bidding adieu to their dusty old card catalogues and plugging in brand new "on-line" catalogues. They only joke about building bonfires out of the old cards, but what they are actually doing with them is every bit as dismaying, writes Baker, a novelist: They are throwing them out.

"On-line catalogues are wonderful things in principle," he concedes. They are also inevitable. Thanks to the boom in academic publishing since the 1960s, some collections are growing by 500 items per day, which makes computerization a necessity. But destroying the old card catalogues seems almost criminal. One reason for preserving them is purely practical. At Harvard University, for example, an outside contractor is transferring the information on five million pre-1980 cards at about 100 different Harvard libraries to the university's on-line catalogue, HOLLIS. Even with the very low official error rate of less than one percent, there will be as many as 50,000 errors. Some of these, Baker points out, will make it difficult, perhaps impossible, for scholars to locate certain books or other items. (Harvard, as it happens, has microfilmed its cards, but most libraries cannot afford such a luxury. Yet they, too, are getting rid of their cards.)

Errors are only the beginning of what Baker thinks is wrong with the conversions. The new data bases "are much harder to browse efficiently, are less rich in cross-references and subject headings, lack local character, do not group related titles and authors together particularly well, and are in many cases stripped of whole classes of specific historical information (e.g., the original price of the book, its acquisition date, its original cataloguing date, its accession number, the original cataloguer's own initials, the record of any copies that have been withdrawn, and whether it was a gift or a purchase)." The hyperefficiency of the on-line systems can also be a curious handicap. Searching one of the best data bases for the works of Peter Illich Tchaikovsky, for example, would not yield