SCIENCE & TECHNOLOGY

Fourth-order Shakespeare monkeys

A GO THIS BABE AND JUDGMENT OF TIMEDIOUS RETCH AND NOT LORD BEATELLOUS WE PLAY MEANS HOLY FOOL MOUR WORK FROM INMOST

Third-order Hemingway monkeys

MOUNT ME SAM WE SNOTLEAKETIFULDN'T MIGH TOON'T MIT BARSOMADE SAM SAY GRID TH ALLY FIRLY WHE SO RUSLOO ST I HOSSITE

Fourth-order Medieval Latin monkeys

FIDENCIA QUI MAGNITRUCCULARE PORES ET NEC RERE NOBILE ET IN EXHORUM ET SUBDITO COD OBEDIENCIA PER INVENIT GREGEM CIBARIA

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By "weighting" a computer-typewriter to account for an author's most commonly used letters, the famous monkey problem can be applied to almost any field of literature. The examples above are based on Hamlet, A Farewell to Arms, *and Roger Bacon's* Secretum Secretorum.

Better-educated fourth-order computers yielded 90 percent words in their letter groups, but Hamlet's soliloquy remained elusive. Unfortunately, the biggest computers today are not capable of simulating correlations of a higher order. Further development of this method of producing masterpieces, Bennet suggests, may best be left to the human brain, with its 10^{10} closely packed neurons and more sophisticated processing procedures.

RESOURCES & ENVIRONMENT

Conservation as a Moral System

"Do Rocks Have Rights?" by Roderick Nash, in *The Center Magazine* (Nov.-Dec. 1977), 2056 Eucalyptus Hill Rd., Santa Barbara, Calif. 93108.

The conservation philosophy of the 1960s and 1970s—which values preservation of natural ecological systems more highly than enhancement of human comfort—has failed to offer the public sufficient justification for abandoning 1,000 years of resource exploitation, writes Nash, a historian at the University of California. Real progress will come, Nash argues, only when conservation is accepted on ethical grounds: because it is *right.*

Most Americans regard the earth, with its animate and inanimate forms, as beyond the scope of ethics: "The rights of animals are dubious; the rights of rocks an absurdity." Yet environmental ethics—an "extended" moral system that encompasses the land and all its life—has been promoted by thinkers from 12th-century ascetic St. Francis of Assisi to Charles Darwin.

That "extended" ethic influenced the American environmental

movement through a young forester named Aldo Leopold (1913–1948), founder of the American profession of wildlife management. In *A Sand County Almanac* (1949), Leopold expounded the notion that man's sense of right and wrong has evolved historically to include larger and larger communities: from self to family, to tribe, nation, race, and all mankind; then on to mammals, all animals and plants, all life. Environmental ethics, which recognizes the rights of nonhuman life and of the nonliving environment, represents the highest level of ethics.

Nash speculates that primitive man may have possessed such an extended ethic but lost it under the pressures of technological development. Today, he adds, thanks to the decline of some natural resources and a growing understanding of ecological reality, we may be groping our way back.

The Future of Oil Shale

"Oil Shale: Prospects on the Upswing . . . Again" by Thomas H. Maugh II, in *Science* (Dec. 9, 1977), 1515 Massachusetts Ave., N.W., Washington, D.C. 20005.

The United States in the 1970s has become reliant on high-priced foreign sources of petroleum. According to Maugh, a *Science* staff writer, this combination of inelastic demand and rising prices has made the development of domestic oil shale economically feasible.

Oil shale—oil locked tightly in solid shale formations—has been touted before as a solution to America's energy crisis, but Maugh believes large-scale domestic production may soon begin in earnest. Techniques for underground conversion of oil shale into crude oil have been improved; federal tax incentives have increased; and as the price of imported oil rises, the relative cost of oil shale conversion becomes less prohibitive.

Deterrents and uncertainties remain, Maugh notes. Shale oil contains high concentrations of nitrogen, sulfur and paraffin; refining is expensive. A slowdown in federal subsidies, a rise in inflation, or a drop in the price of imported oil could doom the prospects for oil shale. But the oil industry is clearly interested. Within a 200-kilometer radius of the juncture of Utah, Colorado, and Wyoming, is the equivalent of 2 trillion barrels of shale oil—50 times the total U.S. petroleum reserves.

Water, Water, Everywhere

"Drinkable, But . . ." by Frances S. Sterrett, in *Environment* (Dec. 1977), P.O. Box 3066, St. Louis, Mo. 63130.

Despite general progress on environmental quality in the United States, researchers have yet to determine the long-term physical effects of the 300-odd organic and inorganic chemicals found in America's local water supplies.

According to Sterrett, a Hofstra University chemist, scientists face two major obstacles: the sheer scope of the necessary research and the