

**SCIENCE & TECHNOLOGY**

to seven years between design and production are commonplace.

With oil imports (\$42 billion a year) worsening the U.S. balance of payments deficit, Tesar recommends a vigorous government-university-industry research and development effort focusing on "robotics"—the creation of mechanical devices which combine microelectronics with sophisticated mechanical engineering. Such devices will soon be in great demand worldwide for the remote inspection and maintenance of nuclear reactors, offshore oil drilling equipment, space surveillance vehicles, microsurgery, artificial limbs, and industrial automation.

The United States must quickly shore up its vanishing technological superiority or risk losing valuable markets to Japan, West Germany, and Russia. The United States, says Tesar, "has rested on its industrial laurels too long."

*From Hominid  
to Homo Sapiens*

"The Evolution of Man" by Sherwood L. Washburn, in *Scientific American* (Sept. 1978), 415 Madison Ave., New York, N.Y. 10017.

The study of human evolution has undergone radical change in the last 30 years, thanks to new fossil finds, improved understanding of radioactive isotope dating, and revelations in plate tectonics (e.g., that the great land masses of Africa and South America were once quite close). And the application of new specialties, such as molecular anthropology and field observation of primate behavior, offer fresh clues to the relationship between man and other living primates and the dating of their evolutionary divergence.

Evidence gained by specialists in molecular taxonomy (measuring the relationships of species by biochemical techniques) suggests that man is



*Field studies of chimpanzees and their use of sticks suggest that, despite his small brain, primitive man might have employed simple tools 4 million years ago.*

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more closely related to the African apes than to other primates, says Washburn, professor of physical anthropology at Berkeley. On the basis of comparisons between their protein chains, some scientists estimate that man and the chimpanzee share more than 99 percent of their genetic material.

Meanwhile, new field studies of chimpanzees and their use of sticks and other simple tools indicate that Peking Man, the first true man (*Homo erectus*), who appeared about 1.5 million years ago, and even the 4-million-year-old hominid *Australopithecus* could well have used simple tools in spite of their small brains.

This further confirms the fossil record which shows, according to Washburn, that the early ancestors of man walked upright at least 3 million years ago and were making tools and hunting animals about 2.5 million years ago, long before they developed large brains.

Molecular biology will ultimately determine more precisely "the relationships between man and the other living primates and the times of their mutual divergence," says Washburn. But troubling questions about the differing rates of evolution still remain. At the moment, scientists tentatively conclude that man and the African apes separated in an evolutionary sense sometime between 5 and 10 million years ago. Until about 40,000 years ago, the process of human evolution remained exceedingly slow. Suddenly it accelerated. Modern man survived while primitive forms of man disappeared. The fossil record is still too sparse to reveal whether these creatures were victims of evolution, hybridization, or physical extermination.

### *The Consumer as Producer*

"The 'Windmill Case': Facing Up to Appropriate Technology" by Terry J. Lodge, in *Environmental Affairs* (vol. 6, no. 4, 1978), Boston College Law School, 885 Centre St., Newton Centre, Mass. 02159.

The introduction of wind-generated electricity—permitting the electricity consumer to be an electricity producer as well—constitutes an interesting challenge to the electric utility industry and poses new questions for utility regulators.

The nature of this challenge, says Lodge, a Toledo, Ohio, urban planner, can be seen in an obscure tariff case before the New York Public Service Commission (the so-called *Windmill Case* of 1977) in which Consolidated Edison Company of New York (Con Ed), one of the nation's largest utilities, challenged the owners of a small, wind-powered electrical generator. The roof-mounted device was capable of producing 2 kilowatts of usable current for the occupants of a cooperatively-owned apartment house in New York City—enough so that surplus power occasionally flowed backward through Con Ed's meter causing a decrease in the overall measure of electricity usage.

The ability of private wind-powered generators to "backfeed" electricity into a power company system raises complex issues, writes Lodge. For example: What is a fair price to set for wind-produced