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

power? What would be the effect of several thousand windmills on the capital outlays of a utility company—an expense which helps determine the company's rate base and hence its rate of return on investment? Should a federation of windmill owners be allowed to bargain collectively with a local utility on rate matters, outside the jurisdiction of government regulators? Can the utility be compelled to transmit power that the windmill owners wish to sell to third parties?

"Wind power is one of the most readily adaptable alternative technologies," Lodge argues. Before it can prosper, however, state and federal regulatory systems may have to be changed to reflect a new and different view of energy production and its control.

Fooling With Mother Nature

"Plant Growth Regulators" by Louis G. Nickell, in *Chemical and Engineering News* (Oct. 9, 1978), 1155 16th St. N.W., Washington, D.C. 20036.

The use of herbicides to increase crop yields by controlling weed growth has had a major impact on modern agriculture. Now, another family of agrochemicals—the so-called plant growth regulators—promises even more startling results.

Plant growth regulators, writes Nickell, vice president of research and development for Velsicol Chemical Co., are organic compounds (either natural or synthetic) which alter the life processes or structure of a plant so as to increase yields, improve quality, or ease harvesting. The first significant commercial use of a plant growth regulator came during the 1940s when naphthalene acetic acid was applied, as it still is, to prevent the preharvest drop of apples.

Today, plant regulators are used to promote rooting, speed up or delay flowering, induce or prevent leaf and/or fruit drop, control plant size, prevent postharvest spoilage, change the timing of crop maturity, and increase resistance to pests, air pollution, and extreme temperatures. A shortage of fruit pickers, for example, has led U.S. chemical companies and the Florida State Citrus Commission to develop compounds that loosen citrus fruit to speed harvesting.

How these plant-regulating chemicals work is still not thoroughly understood, but some are known to alter cell development and to synthesize enzymes. Results are sometimes spectacular. As little as 2 ounces per acre of the hormone gibberllin (which makes stalks grow longer) increases the yield of sugar cane by more than 5 tons per acre and the output of sugar by 0.2 to 0.5 tons per acre. About half the wheat grown in West Germany is treated with Cycocel, a product made by American Cyanamid that reduces stem length and gives the plants greater resistance to heavy winds and rain. A few grams per acre of another compound known as *dinoseb* boosts corn yields 5 to 10 percent.

The real value of growth regulators, says Nickell, may not be their ability to help increase gross crop volume so much as their ability to control the internal metabolism of a plant to produce more sugar, protein, or oil, and to prevent losses caused by failure to reach maturity.