

ogist's lamp," Oz-Salzberger observes. Yet the biblical tales of Saul and David and Gideon and Deborah remain the paradig-

matic stories of political actors. The Bible, she concludes, still has something to teach us about politics and human liberty.

SCIENCE, TECHNOLOGY & ENVIRONMENT

Catching the Wind

"Wind Power for Pennies" by Peter Fairley, in *Technology Review* (July–Aug. 2002), One Main St., 7th fl., Cambridge, Mass. 02142.

Wind power's potential has long been praised by dreamy environmentalists and derided by hardheaded energy experts. Wind-driven generators today produce less than one percent of U.S. electricity. But a new lightweight wind turbine with a radically different design "just may change the fate of wind power," reports Fairley, a writer based in Victoria, British Columbia.

Like "giant fans run in reverse," wind turbines "use airfoils that catch the wind and crank a generator that pumps out electricity," he explains. Many now in use have three-bladed rotors that span 87 yards—almost the length of a football field. "Power production rises exponentially with blade length," but the huge structures must be able "to endure gales and extreme turbulence."

During the 1980s and early 1990s, American companies and the U.S. Department of Energy poured hundreds of millions of dollars into a fruitless quest for lightweight turbines that could withstand those forces. Danish researchers, meanwhile, perfected a "heavy-duty version . . . and it has become the Microsoft Windows of the wind power industry," says Fairley. An 80-turbine, \$245 million "wind farm" is being built off the Danish coast.

To construct a wind farm costs about

\$1 million per megawatt, compared with \$600,000 for a conventional gas-fired power plant. Denmark, which gets 20 percent of its power from wind, has been willing to pay the price, in part because fossil fuels are so costly in Europe. The United States is a different story.

Enter the new lightweight prototype, designed by Wind Turbine of Bellevue, Washington, and erected two years ago at Rocky Flats in Colorado, the Energy Department's proving ground. The turbine has two blades (not three) stretching about 44 yards. There's a radical departure in design: The blades are flexible and hinged, and the rotor is positioned downwind, so the blades don't slam into the tower. (In the Danish design, the blades face the wind, and must be heavy to avoid bending back and hitting the tower.) The result: turbines that will be 40 percent lighter and up to 25 percent cheaper to make. A second prototype, being erected near Lancaster, California, should have blades that span 66 yards—"full commercial size"—by the end of the year.

Staffers at the National Wind Technology Center at Rocky Flats have been skeptical. They've seen a lot of failures, Fairley notes. But "today, despite some minor setbacks, those doubts are fading."

Heartfelt Thanks

"Leland C. Clark and Frank Gollan: Bubble Oxygenators and Perfusion Hypothermia" by Robert S. Litwak, in *Annals of American Thoracic Surgery* (Aug. 2002), Elsevier Science, P.O. Box 945, New York, N.Y. 10159-0945.

Hundreds of thousands of people around the world have a special anniversary to mark next year: the debut in 1953 of the basic heart-lung machine used in open-heart surgery. Every

year, some 750,000 Americans undergo such surgery, from relatively routine bypasses to more complex procedures; without it, virtually all would die. (Even so, heart disease