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

remains the number one cause of death in the United States.)

Litwak, a professor of cardiothoracic surgery at Mount Sinai Medical Center in New York, is careful to note that the machine's makers stood on the shoulders of others. Still, the efforts of Leland C. Clark, head of the biochemistry department at Antioch College's Fels research institute, and physician-investigator Frank Gollan were seminal: Much of their "technical and conceptual" work "is being used today."

The basic task of a heart-lung machine is to oxygenate and circulate the patient's blood while the heart is stopped during surgery. The design that Clark and Gollan pioneered, the "bubble oxygenator," called for exposing the patient's venous blood to oxygen forced under pressure through a porous disk. But the process created bubbles that had to be eliminated before the blood could be returned to the patient's body, a problem that defied solution. A key to Clark and Gollan's success was their decision to pass the oxygenated blood through a chamber containing glass beads coated with a new "defoaming" resin created by Dow Corning Laboratories. The first use of such a machine came in 1953. Only 14 years later, Christiaan Barnard, a U.S.-trained physician in South Africa, performed the first human heart transplant.

A second feature of heart-lung machines is their ability to cool the body and reduce its need (especially the brain's need) for oxygen. Normal body temperature is 37.5° C; most ordinary bypass operations are conducted at a body temperature of 30–32° C, but more serious procedures, such as the replacement of the aortic arch, can require temperatures down to 12° C. Surgeons had resorted, without much success, to ice packs and other techniques; Clark helped pioneer methods that allowed heart-lung machines to pass the blood through a heat exchanger, similar in concept to a car radiator (the first one actually was built by a manufacturer of auto radiators).

For all the tedious labor of research, great passions were at work. Addressing a new generation of heart researchers, Gollan once quoted the 1859 words of Antioch College president Horace Mann: "Be ashamed to die until you have won some victory for humanity."

Arts & Letters

The All-American Con Man

"Being Claude Dukenfield: W. C. Fields and the American Dream" by Paul A. Cantor, in *Perspectives on Political Science* (Spring 2002), 1319 18th St., N.W., Washington, D.C. 20036–1802.

Some people consider William Claude Dukenfield Hollywood's all-time greatest con man. But the man we know as W. C. Fields (1880–1946) would have taken that as a compliment. "He loved to cast a spell over an audience," says Cantor, an English professor at the University of Virginia, but he "took equal delight in exposing his own magic as a fraud." It was this peculiar mix of illusion and disillusion that allowed Fields to make the often difficult transition from his early days as a vaudeville juggler and comedian, through a successful middle period with the Ziegfeld Follies, and, finally, to modest success in the movie business with a string of hits in the 1930s and '40s.

He was, in a sense, the first postmodernist. In Cantor's view, "the construction of identity is the principle that unites Fields the man and Fields the artist." His onscreen persona was "basically the all-American con man, part carnival barker, part patent medicine salesman, part circus showman, part cardsharp, and part stockbroker." This gave his comedy "a distinctly dark side," says Cantor, and may also explain why he never matched the success of Buster Keaton or Charlie Chaplin. Unlike those other comedians, Fields "never developed a truly cinematic imagination," and many of his movies "feel as if they are merely filmed versions of stage plays"—though, to be fair, he never had the creative control that, for instance, Chaplin enjoyed.

Films such as *The Fatal Glass of Beer* (1932) and *The Bank Dick* (1940) still afforded the comedian delicious opportunities to