

not really his business."

Susan Pearson, the associate chancellor at UMass Amherst, and the administration's chief negotiator with the student union, remembers that when the union first began organizing in 1989, "people expressed fears about the negative effects on the relationships between faculty and students. None of that has materialized." She admits that the relations between union and administration, especially during contract negotiations, is "somewhat strained." The last contract, for example, took two years to nail down. But

Pearson also credits the union for having raised the pay and benefits for graduate employees "in ways that benefit the whole institution."

As the University of Michigan's Dirnbach sees it, "The administration's priorities are just different from those of the graduate employees. Nobody can look out for our interests the way we can."

Adds Miller of UMass Amherst, "We really feel that we're part of a national movement that is going to affect the course of academia. We think it's a great thing for higher education."

JEAN KUMAGAI

DOE Opens WIPP for Nuclear Waste Burial

Before dawn on 26 March, a truck rolled into the Waste Isolation Pilot Plant (WIPP) near Carlsbad, in southeastern New Mexico. The arrival of its radioactive cargo marked the controversial opening of the world's first deep geological repository for nuclear waste.

Dug out 655 meters underground in a salt bed, WIPP is intended for the permanent disposal of radioactive waste generated by the country's nuclear weapons buildup during the cold war. (See PHYSICS TODAY, June 1997, page 50.) Specifically, it's meant for both transuranic waste (items contaminated with radioactive elements of higher atomic number than uranium) and mixed waste (transuranic waste mixed with chemically hazardous materials such as solvents or lead).

Waste earmarked for WIPP is currently stored above ground at 23 sites in 15 states. Most of it is contaminated with plutonium-239, which has a half-life of 24 000 years. Since exploratory drilling began in the mid-1970s, the Department of Energy (DOE) has spent about \$2.5 billion on WIPP, and the total cost, including operating the site for 25 to 35 years, is expected to top \$19 billion.

Wendell Weart, a Sandia National Laboratories geologist who was the

chief WIPP scientist from 1975 to 1995, is "gratified that we, as a nation, finally had the gumption and guts to get on with the job. It's far safer to bury transuranic waste in WIPP than to leave it where it is."

Permit pending

The 26 March shipment, from Los Alamos National Laboratory, contained only radioactive waste, as did the next shipment, on 6 April. (Some eyebrows went up at the news that the first load included nonweapons radioactive waste from building a power supply for the Cassini spacecraft; see PHYSICS TODAY, October 1997, page 91. DOE explained that it couldn't be physically separated from weapons waste.) But to fill WIPP as planned, DOE still needs the go-ahead from New Mexico, which oversees mixed-waste disposal at the site under the federal Resource Conservation and Recovery Act (RCRA).

New Mexico had "encouraged DOE to wait" to open WIPP until after the RCRA permit became final, probably this fall, according to Nathan Wade, a spokesman for the state's environment department. "We think the government is a better environmental actor when it is subject to external regulation." The state permit is supposed to be based on WIPP's being empty, adds Wade, so making early shipments, though legal, "may jeopardize the permit we intend to

issue" because it will provide opportunities for dispute, and "pretty much everything so far has been challenged."

Indeed, legal challenges, combined with changing federal law, have delayed the site's opening by more than a decade. Public opinion remains divided over using WIPP, with polls conducted annually for the past nine years by University of New Mexico political scientist Hank Jenkins-Smith showing that the state's residents are closely split on the issue. Some state and city agencies also question aspects of WIPP. For example, at press time, DOE was still haggling over transport times with the city of Santa Fe, through which many WIPP-bound trucks must pass.

And some critics have vowed to keep fighting WIPP, citing safety as their main concern. For example, although Weart claims that "a room that we fill with waste would be cocooned in solid salt in 100 years," Don Hancock, of the Southwest Research and Information Center, doubts the waste will really be safely enclosed, arguing that salt is more likely to crack than to creep. He also worries about prospectors drilling for oil and gas in the general area, concerns that DOE dismisses.

Hancock and many other WIPP critics say they would agree to deep burial of nuclear waste—just not in WIPP. Says Hancock, "The WIPP site was chosen for political reasons, not technical ones. We hope that the [RCRA] permit will eliminate some of the waste coming to WIPP—prohibiting chemically incompatible, corrosive, explosive, and reactive wastes, for example. We think there are lots of risks beyond what the DOE has considered."

TONI FEDER

Physicist Wins Religion Prize

Ian Barbour, a physicist and theologian at Carleton College, is the 1999 winner of the Templeton Prize for Progress in Religion. Established by global investor John Templeton, the prize goes annually to "a living person who has shown extraordinary originality in advancing humankind's understanding of God and/or spirituality," and carries the world's highest monetary award (designed to beat out the Nobels). This year, it is worth \$1.24 million.

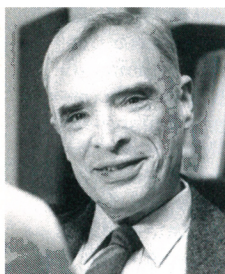
Barbour holds a 1949 PhD from the University of Chicago, and early in his career did research in high-energy physics. But after a few years on the physics faculty at Kalamazoo College, he began gravitating toward ethical

TRANSURANIC WASTE in drums is packed underground at the Waste Isolation Pilot Plant near Carlsbad, New Mexico. Still being excavated, the facility is planned to have a total storage volume of 175 000 cubic meters.



DOE

and philosophical questions, and so decided to go back to school to study religion, earning a theology degree at Yale University in 1956. He then took a joint position in Carleton College's physics and religion departments, becoming emeritus professor of science, technology, and society in 1986.



BARBOUR

Barbour first gained international attention with his 1965 book, *Issues in Science and Religion*. "My concern has been to promote dialog about conceptual and ethical issues, not to merge religion and science," says Barbour. "I moved from having them in watertight compartments to finding fruitful areas of interaction."

"You can do physics without asking wider questions," he continues. "But if you start thinking, particularly in cosmology, it pushes you to ask fundamental questions: Why is there a world at all? Why does it have the structure it does? Religion doesn't necessarily answer the questions that science leaves open, but it can provide a reasonable framework in which to interpret things."

Barbour is also actively involved in discussions of ethical issues related to science and technology, including weapons control and, more recently, environmental issues, genetic engineering, and cloning. "Many scientists find that science raises questions that science itself doesn't answer," he notes.

Barbour plans to give \$1 million of his award to the Center for Theological and Natural Sciences, in Berkeley, California, to be used for academic activities.

The first recipient of the Templeton Prize for Progress in Religion was Mother Teresa, in 1973. Physicists who have previously won the prize are Stanley Jaki (1987), who is also a Benedictine monk, Carl Friedrich von Weizsäcker (1989), and Paul Davies (1995).

TONI FEDER

Synchrotron Gets Green Light in Canada

A synchrotron light source will be built at the University of Saskatchewan in Saskatoon, the Canada Foundation for Innovation (CFI), an independent organization that funds research infrastructure, announced on 31 March.

The Canadian Light Source (CLS) will be the country's costliest scientific undertaking to date. Construction is

expected to total Can\$173 million (US\$114 million), of which Can\$56.4 million will come from the CFI. With the CLS, Canada will lose the dubious distinction of being the only Group of Seven (G-7) country without its own synchrotron light facility.

A third-generation machine, the CLS will produce radiation ranging from infrared wavelengths to hard x rays. Says project leader Dennis Skopik, a University of Saskatchewan physicist, "We had to do double duty with our design work. We built in the hard x-ray capacity for biology and biotechnology—the emerging growth areas for synchrotron studies, and came up with a design that will also serve [members of] the Canadian user community who desire lower energies."

The CLS will also get Can\$49 million worth of existing equipment, chiefly from the university's Saskatchewan Accelerator Laboratory, which will be converted into an injector for the CLS. Three beam lines now in Madison, Wisconsin, and owned by the University of Western Ontario, will be upgraded and transferred to Saskatchewan. The rest of the construction costs will be covered by the University of Saskatchewan, the city of Saskatoon, and other provincial, federal, and pri-

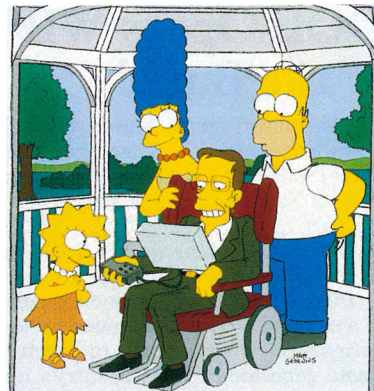
vate-sector sources.

Construction is set to begin this spring, and the first CLS beam lines are scheduled to begin operating in 2003, with all 15 beam lines expected to be running by 2008.

TONI FEDER

IN BRIEF

A character called Stephen Hawking will guest star in the 9 May episode of the animated Fox TV series *The Simpsons*. Dubbed with the real Hawking's synthetic voice, the character will sagely expatiate on the cosmos and the role of intellectuals in society.



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Web Watch

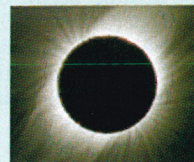
<http://www.lbl.gov/seaborg>

Two years ago, at the age of 84, Manhattan Project member and chemistry Nobel laureate Glenn Seaborg began to create a Web site to chronicle his life's work and, as he put it, "to share the lessons of my experience." The site not only covers the late Seaborg's distinguished career in science and government, but also offers snippets of personal information, such as his reflections on his favorite novel (Sinclair Lewis's *Arrowsmith*) and his wife's recollections of their wedding.



<http://www.eclipse.org.uk>

The millennium's last total eclipse of the Sun will take place on 11 August this year, but it won't be visible from the US. Beginning off the coast of Maine, the path of totality will cross the Atlantic Ocean, clip the southwestern tip of England, cross central Europe, Turkey, Iraq, and Iran, and end in the Bay of Bengal. For more information about the eclipse and its visibility, visit the Rutherford Appleton Laboratory's Solar Eclipse site and the other sites it lists.



<http://www-groups.dcs.st-and.ac.uk/~history>

The eminent Irish mathematician William Rowan Hamilton (1805–65) is only one of the 1350 mathematicians whose biographies appear in the *MacTutor History of Mathematics Archive*. Created by the University of St. Andrews in Scotland, the site also includes topical articles and a compendium of famous curves (famous, that is, to mathematicians), among them the exotically named Kampyle of Eudoxus, Freeth's Nephroid, and the Conchoid of de Sluze.



To suggest topics or sites for Web Watch, please contact ptwww@aip.org by e-mail.

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