Fermilab physicist "doing what she loves to do." Page 2

DOE Pulse
Science and Technology Highlights from the DOE National Laboratories
Number 34 July 12 , 1999

Research Highlights . . .

Argonne's Ceramicrete recycles n-waste

A patented material developed by DOE's Argonne National Laboratory to stabilize low-level mixed and fission-product wastes may soon find use back in nuclear reactors. A research agreement between Argonne and Eagle Picher Industries of Quapaw, Okla., will use the material, called Ceramicrete, in castable shielding for nuclear reactors; containers for spent nuclear fuel transportation; and storage, biological shielding, medical treatments, and pumpable emergency shielding material for use in nuclear disaster areas. The technology will first be demonstrated on a pilot-plant basis and then later adapted for commercial uses. The project is sponsored by DOE through the United States Industry Coalition in support of the DOE's Initiatives of Proliferation Prevention program.

[Catherine Foster, 630/252-5580, cfoster@anl.gov]

"Green" high-performance cement is hot stuff

Fifteen years of materials chemistry research funded by DOE's Office of Geothermal Technologies has resulted in the development of products that benefit both industry and the environment by scientists at DOE's Brookhaven National Laboratory. One success for use in geothermal wells is a high-efficiency cement, made mainly from recycled fly ash in an environmentally friendly process needing no harsh chemicals. In three years of DOE-funded tests in 5,500-foot-deep, 280ºC wells in Indonesia, this heat and carbon-dioxide resistant cement has performed so well that it is now used commercially in Italy and Japan, and South America may soon follow suit.

[Liz Seubert, 516/344-2346, lseubert@bnl.gov]

New technique allows faster identification of ultratrace metals

A novel extension of inductively coupled plasma-mass spectrometry, an analytical technique pioneered at DOE's Ames Laboratory, is easing the identification of ultratrace metals in biological systems. Developed by senior chemist Sam Houk, the combination of ICP-MS with chromatography allows measurements at part-per-trillion levels and is faster, more sensitive and more selective than conventional schemes. The measurements help scientists better comprehend the effects of both radioactive and nonradioactive elements in biology and environmental sciences. "Since the DOE has radioactive elements in storage, monitoring their binding to proteins and DNA at very low concentrations is of great environmental importance," Houk says.

[Saren Johnston, 515/294-3474, johnstons@ameslab.gov]

One of a kind

Not quite 5 years old, Hall C at DOE's Thomas Jefferson National Accelerator Facility (Jefferson Lab) is performing like a seasoned pro. Lab staff are currently preparing for five experiments that will run concurrently through 1999. This $23 million research hall is unique in the Lab's experimental facilities with its ability to accommodate a variable array of equipment for complex extended investigations. Seven experiments have been completed in the last five years with results published in journals. Chair of the User Group board of directors, Don Geesaman puts it, "Results from Hall C experiments are having a big impact in the field of nuclear physics."

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DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

The "right Bertozzi" wins MacArthur Fellowship

Carolyn Bertozzi, a staff scientist in Lawrence Berkeley National Laboratory's Materials Sciences Division, has been named a MacArthur Fellow for 1999, one of 32 individuals to receive the prestigious award this year.

The John D. and Catherine T. MacArthur Foundation awards the fellowships annually to "the most creative individuals" in all fields of endeavor. One can't apply or even be nominated; selections are based upon the advice of 100 anonymous "talent scouts" who roam the country in search of genius.

Carolyn Bertozzi

Bertozzi, an associate professor of chemistry at the University of California at Berkeley, is in Berkeley Lab's Biomolecular Materials Program. In research cited in the award, Bertozzi engineered markers on cell surfaces to control adhesion to artificial materials. Engineered cancer cells have been tagged for diagnostic probes and targeted drugs, and the technique is being tested for biomedical implants, bioreactors, and biosensors. She and her colleagues have also developed new organic materials for contact lenses and bone implants.

The MacArthur Fellowships carry a no-strings-attached stipend, the amount increasing with age. At only 32 years old, Bertozzi will have to make do with $255,000, which she will use to further chemistry education.

According to a front page story in the San Francisco Chronicle, when Bertozzi heard the MacArthur Foundation was trying to reach her, she thought "they're probably trying to get a hold of me for a quote about my sister," Andrea, a math professor at Duke University, whom Carolyn regards as "the smarter one in the family." When she learned the truth, "My first reaction was they got the wrong Bertozzi."

She credits her colleagues in the Materials Sciences Division for their "focus on collaborative research, across many disciplines. That is a key to encouraging creative thinking-which is what the MacArthur Fellowships are intended to recognize."

Submitted by DOE's Lawrence Berkeley National Laboratory

Faster than a speeding neutrino

Janet Conrad is a whimsical physicist who travels at nearly the speed of light.

One moment she is teaching at Columbia University in New York City. The next moment she is researching neutrinos and working with students at DOE's Fermilab in Batavia, IL. She also raises dahlias, studies photography, and meets up with her husband, a physicist at New Mexico State University.

Conrad describes herself as "self-propelled."

She recently won the prestigious Presidential Early Career Award, the highest honor bestowed by the U.S. government on scientists and engineers beginning their careers. The award comes with a $500,000 research grant, which Conrad has already earmarked: some $40,000 will go to an education project developing connections between physics and medicine; the rest, to purchasing phototubes for the MiniBooNE neutrino experiment at Fermilab's Booster accelerator, for which she is the spokesperson.

When Conrad was in fifth grade, "Star Trek" hooked her on astronomy. But as an undergraduate at Swarthmore, she was mesmerized by a course in quantum mechanics and switched to particle physics.

"Quantum mechanics is a totally different way of thinking than the structured world of mechanics," she explains. "It opens up all sorts of possibilities: If the universe is completely open and goes on forever, then there is some finite probability-very tiny, of course-that a purple unicorn will appear."

From the beginning, she wanted to be an experimentalist, not a theorist.

"I like to build things," she says. "I really enjoy having something there when I'm finished."

Last year, Conrad gave the plenary talk at the world-famous International Conference on High-Energy Physics, followed by invited talks at universities in Sweden and Germany. She says she can't imagine life getting any better.

Conrad sums it up: "I'm paid to do what I love to do."

Submitted by DOE's Fermilab