Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

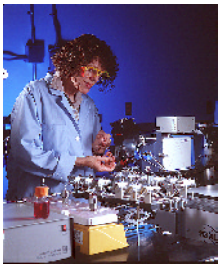
# Sharing the Excitement of Science and Technology

Breakthroughs for the Northwest

Richland, Washington

February 2002

## A dream come true for proteomics research



When researchers at Pacific Northwest National Laboratory talk about their DREAMS, they're talking about a new method for analyzing proteins that has shown to obtain nearly twice the information about proteins in a single experiment than its conventional counterparts. DREAMS—short for Dynamic Range Enhancement Applied to Mass Spectrometry—is a powerful new mass spectrometry technique that analyzes a greater number of proteins and increases speed and accuracy of the analysis, providing a more thorough understanding of an organism.

PNNL scientists designed DREAMS to automatically filter signals from proteins that exist in large numbers from those that appear in fewer numbers. By isolating the low-level proteins often missed using other methods, DREAMS can help unlock clues to important cellular processes such as disease development.

## In this issue


- New tool improves protein analysis
- R&D forecast 2002
- Byproducts turned into profitable products
- Technology Merit Awards recognize PNNL
- Cracking the secret of cracks in reactor core components
- Biologist honored in memorial display


## R&D predicted to continue growing, but slowly

The *R&D Technology Forecast* reports that growth in R&D is expected across all technology sectors in 2002, however, increases in R&D funding are expected to be smaller in the years ahead than they were in the previous decade.

Every year, Battelle, which operates Pacific Northwest National Laboratory, and *R&D* magazine jointly issue the *R&D Technology Forecast*. The 2002 edition predicts that federal support of R&D is expected to increase 4.7 percent to $75.5 billion, with all agencies improving over their 2001 figures. On the other hand, industrial R&D is expected to increase only 3.2 percent in 2002, its slowest growth in nearly 10 years. The entire report, which documents sources of R&D funding and where it is being spent, is available at **http://www.rdmag.com/features/0201fore23.asp**. To request a copy, call 1-888-375-PNNL or e-mail pamela.harrington@pnl.gov.

## Corn processing byproducts—from trash to treasure

Scientists at Pacific Northwest National Laboratory have developed new processes that can turn nearly 14 billion pounds of low-value byproduct fiber generated by the U.S. corn milling industry into higher value products—opening new markets for food processors and reducing the nation's dependency on fossil fuels.

Through a Cooperative Research and Development Agreement between PNNL, Archer Daniels Midland and the National Corn Growers Association, PNNL and ADM are developing processes that separate corn fiber into basic components—lipids, carbohydrates and proteins. While fiber byproducts were previously used for animal feed, the new process is proving that they can be a valuable resource for producing consumer products, building blocks for industrial chemicals and fuel ethanol.

Separating lipids from the hull allows recovery of small amounts of sterols with high-value applications in Vitamin E supplements, cosmetics and shampoo. The carbohydrates can be processed into sugars that are chemically converted to propylene glycol and ethylene glycol, compounds used in industrial and consumer products including plastics, polyesters and antifreeze. With the new process, the fiber also yields substantial portions of glucose—at a lower cost than any other recovery method. Glucose is used to produce fuel ethanol that could replace petroleum-derived fuels and chemicals.

# Two technologies win Environmental Business Journal awards

The Environmental Business Journal honored Pacific Northwest National Laboratory with two of its 2001 Technology Merit Awards announced in January. Specifically, the awards recognized a system that uses saliva samples to test for exposure to contaminants and an innovative process for environmental cleanup.

Researchers at PNNL have developed a non-invasive monitoring technology that may allow saliva rather than blood samples to be analyzed to determine if a person has been exposed to harmful chemicals or trace metals. The technology, which initially is being developed to detect lead exposures, is designed to be portable so that sample collection and analysis can be performed onsite. Using the researchers' mathematical models, it is possible to estimate how much lead is in the body based upon a single saliva analysis. A patent is pending on this technology. Future plans include developing the monitor to detect a broad range of chemical exposures for high-risk populations. For more, see **http://www.biomolecular.org/cellsignaling/highlights/microfluidics.html**.

At the Marine Sciences Laboratory in Sequim, Wash., researchers are investigating mycoremediation—a process of conditioning higher fungi that results in proprietary strains that are adapted to remediate particular contaminants. Potential applications include cleaning up fecal coliform bacteria, petroleum products and organophosphates. A patent is pending on the method used to culture, select and condition natural fungus species to be more efficient at breaking down certain contaminants, and the Laboratory is pursuing opportunities to commercialize the process.

# First-of-its-kind looks at cracks in core components of reactors

Pacific Northwest National Laboratory scientists are dispelling many of the traditionally held beliefs about why cracks occur in the stainless steel core components of commercial nuclear reactors. The scientists' first-of-a-kind, high resolution examinations provide new insights into how cracks develop and spread.

Cracks in nuclear reactor components are a serious concern to the nuclear power industry because they can impact safety as well as reactor performance. "When materials crack, the leading edge of the crack is often buried deep inside the material and no one has ever been able to look inside at the point where the degradation occurs," said Steve Bruemmer, a PNNL scientist working on the project. "Now we can do it with great precision, allowing us to make a quantum leap in our understanding of corrosion and cracking mechanisms in a wide range of materials."

Bruemmer and his colleagues developed tools and techniques in Laboratory radiation facilities to study the cracking phenomenon at the near-atomic scale. A fundamental understanding of the cracking process is an important first step in developing computer simulations of how cracks advance and in designing corrosion resistant alloys.

# Memorial display honors late biologist

A dedicated ecologist whose research involved studying elk on the U.S. Department of Energy's Hanford Site was honored in February as part of a memorial display at Washington State University Tri-Cities. The display, "A Chronicle of Elk in the Columbia Basin: The Rattlesnake Hills Herd," was a tribute to Lester Eberhardt, a Pacific Northwest National Laboratory researcher who died in a plane crash in June 1992 while conducting wildlife research.

Featured among the items on display was a collection of antlers shed by a single bull elk named Melvin who was studied by PNNL researchers for more than 17 years. Other items included photographs, a historical record of Melvin and his herd, and the radiotelemetry equipment used in studying the herd. Part of the area where the Rattlesnake Hills Herd lives is now officially known as the Fitzner-Eberhardt Arid Lands Ecology Reserve. Richard E. Fitzner, another PNNL ecologist, also died in the 1992 plane crash.

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*This publication is available online at http://www.pnl.gov/sharingscience*

RL-P00-007 Feb. 21, 2002