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

Sharing the Excitement of Science

Breakthrough Science and Technology for the Northwest

Richland, Washington

May 2001

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Sensor fish join traveling educational display

Two synthetic salmon made the journey from Richland, Wash., to Seattle where they will become a part of the Pacific Science Center's "Wheels on Science" program.

The replicas of rubber-coated fish packed with sensors developed by Pacific Northwest National Laboratory will give children in schools around the state the opportunity to learn about how the sensor fish work and the important data they are collecting. While one fish will be mounted to a display, the other will be available for hands-on investigation.

PNNL scientists developed the sensor fish to collect data about the conditions that salmon encounter as they pass through hydroelectric dams on the Columbia River. With this data, researchers can pinpoint where salmon are being injured in the turbulent environment of the dams. The same information can help engineers design and operate dams in a more "fish friendly" fashion while maximizing power production.

Cutting operating and maintenance costs during an energy crunch

Especially in these days of rising energy costs, organizations are worried that high operations and maintenance expenses will quickly eat away their profits.

Pacific Northwest National Laboratory has developed a system that can help keep equipment running efficiently, improving productivity and greatly reducing costs. The Decision Support for Operations and Maintenance, or DSOM for short, can reduce a facility's life-cycle operations and maintenance costs by 25 to 50 percent.

This intelligent diagnostic operations and maintenance software program integrates input from a network of sensors that monitor the performance of a facility's numerous components. It then diagnoses the data to let operators know in real-time if a system is malfunctioning or running below expectations. DSOM was originally developed for the U.S. Marine Corps and has reduced operations and maintenance expenses at one of its facilities by 33 percent. For a video and more information, see **www.pnl.gov/dsom**.

Biomolecular Networks Initiative launches Web site

Pacific Northwest National Laboratory introduced a new Web site in April to share information about its Biomolecular Networks Initiative. The Web site, **www.biomolecular.org**, describes the Laboratory's multidisciplinary research program, which integrates molecular biology, biochemistry, physics, mathematics and computer science to build an understanding of complex biological systems. The goal of the initiative is to gain new knowledge about the function of proteins and how they work as part of the molecular networks that control the inner workings of living cells. Key to the initiative are collaboration opportunities with industry, academia and other national laboratories.

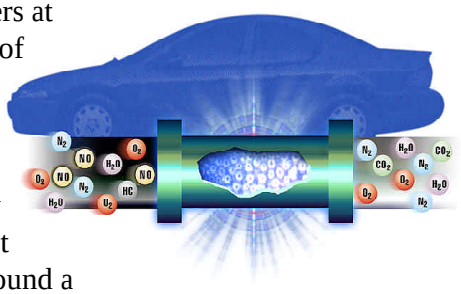
PNNL scientist honored by Health Physics Society

Edmond Hui, a Pacific Northwest National Laboratory scientist whose research focuses on assessing radiation protection and dosimetry, received the 2001 Elda E. Anderson Award from the Health Physics Society. This award recognizes excellence in research or development as well as devotion and significant contributions to the field of health physics. Intended to honor young members of the society, the award is presented annually to a member under 40 years of age.

Hui was honored for his research in radiation dosimetry, microdosimetry and the dosimetry of internally deposited radioactive materials. His research has national and international significance and has helped set new exposure standards widely used at all U.S. Department of Energy facilities. He also developed federal guidelines on methods for dosimetry and radiation protection of unborn babies. Hui worked for the Laboratory from 1989 to 1996 and recently returned as program manager for the Office of Science in the Laboratory's Fundamental Science Division.

Technology reduces NO_xious vehicle emissions

By combining an electrically charged gas with a specialized catalyst, researchers at Pacific Northwest National Laboratory have successfully reduced harmful oxides of nitrogen in a diesel engine by half. Oxides of nitrogen, or NO_x, cause air pollution and contribute to acid rain.



While new light-duty diesel engines already can meet target fuel economy requirements and emit less carbon dioxide than gasoline engines, there is currently no technology that can sufficiently reduce nitrogen oxides in the lean-burn exhaust typical of diesel vehicles. "Our scientists began looking at various materials and found a specialized catalyst that selectively reduces oxides of nitrogen," said Chuck Peden, principal investigator for the project. A patent is pending on a class of zeolite catalyst materials that appear to be the key to NO_x reduction in this novel approach.

Prototype reactor tests conducted on a real diesel engine showed a 50 percent reduction of NO_x. Laboratory results over the past six months, however, show that a greater than 90 percent reduction can be achieved.

Labs joining forces to help develop faster semiconductors

Pacific Northwest National Laboratory, Oak Ridge National Laboratory and Motorola Labs have entered into a cooperative research and development agreement aimed at increasing the speed of future generations of integrated circuits. Together the scientists will pursue new materials that they believe may overcome the fundamental physics problem threatening to limit future semiconductor improvements.

For decades, industry has continued increasing the amount of circuitry, or computing power, on a chip while reducing its size—enabling smaller, faster and better electronic products. However, researchers know that industry eventually will hit a wall that will prevent further size reduction. As the silicon dioxide layer that "gates" the electrons and controls their flow across the transistor gets thinner and thinner with each size reduction, it eventually will become so thin that it no longer provides effective insulation and will not work properly.

ORNL and Motorola Labs have independently been developing new materials with higher dielectric constants to address this problem. PNNL has been evaluating the crystalline samples grown at Motorola. The first phase of the three-year cooperative research agreement will involve transferring the details of ORNL's patented process to Motorola Labs and PNNL. The second phase includes testing and optimizing the technology. For more information, see **www.pnl.gov/news/2001/01-17.htm**.

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RL-P00-007 May 29, 2001