



SRNL's Brian B. Looney



Science and Technology Highlights from the DOE National Laboratories

# Research Highlights . . .

## Shell game: Scientists search for a safe, abundant chelator

The detonation of a suitcase-sized nuclear bomb by a terrorist could expose thousands of people to radioactive elements. With no current, effective method to sequester and remove radionuclides from humans in the event of such an incident, researchers at DOE's **Pacific Northwest National Laboratory** are investigating an approach based on a readily available biomaterial called chitosan found in the exoskeletons of many invertebrates, such as crabs and prawns. Chitosan can be chemically modified to enhance its affinity to particular radionuclides. By binding to radionuclides, scientists speculate chitosan might suppress deposition in bones and critical organs like the liver and kidney, and accelerate removal from the body. Current research involves the removal of cobalt from living tissues in laboratory rats.

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## Study to track big-rig performance

A nationwide **truck test** that includes special monitoring equipment on six tractors and nine trailers has been launched by the **National Transportation Research Center**, a joint transportation research facility involving DOE's **Oak Ridge National Laboratory** and the University of Tennessee. During the next 12 months, on-board data acquisition systems will measure each vehicle's performance, including vehicle and engine speed, engine torque and fuel consumption on regular freight runs. Performance data will also take into consideration wind speed, direction, road grade, precipitation and other conditions that vary during long-haul truck runs. One of the areas to be studied is tire performance with the use of new wide-based single tires. Standard dual tires mounted on drive and trailer wheels will also be tested for comparison purposes.

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## NREL, Chevron establish biofuels, hydrogen alliance

DOE's **National Renewable Energy Laboratory** and **Chevron Technology Ventures, LLC (CTV)**, a subsidiary of Chevron Corporation, recently signed a five-year agreement to research and develop new production technology for biofuels and hydrogen. Researchers from NREL and CTV will collaborate on projects aimed at making biofuels such as ethanol and biodiesel, and hydrogen more economical, sustainable and commercially viable. NREL's participation in the alliance upholds DOE's mission to advance the national, economic and energy security of the United States and to promote scientific and technological innovation in support of that mission.

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## NETL providing armor plates to U.S. Army

DOE's **National Energy Technology Laboratory** will provide armor to the U.S. Army, addressing solutions to protect equipment and personnel from improvised explosive devices that are disabling or destroying large ground transports in Iraq. The plates will be used on targets for ballistic testing, and if the results are favorable, NETL will supply a number of full-size prototype plates for field testing. NETL scientists developed the plate-making process for the Department of Defense in the 1990s. NETL researchers participated recently in a meeting at the Army Research Laboratory in Aberdeen, Maryland, and the Army asked NETL to fabricate the cast steel armor.

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## Neutrino experiment for mountains of China

Buried deep in the mountains of southern China, a proposed experiment powered by a series of nuclear reactors and the brains of scientists from two DOE National Laboratories (Berkeley and Brookhaven) and several nations could answer some of the most puzzling questions about one of nature's most elusive particles — the neutrino. Still in the planning stages, the **Daya Bay neutrino experiment** would consist of two miles of underground tunnels and eight identical 100-ton detectors to be run by scientists from the U.S. and China, with additional collaborators from Hong Kong, Taiwan, Russia, and the Czech Republic.

"Neutrinos are very hot right now," said Brookhaven National Laboratory physicist Laurence Littenberg, a Daya Bay collaborator. "It was only in the last decade that we learned they have mass, and there's still so much that we don't know about them."

Uncharged elementary particles produced naturally from the sun and cosmic rays, neutrinos morph, or oscillate, among three flavors — electron, muon, and tau — as they travel through space, people, buildings, and even Earth itself, interacting only rarely. Scientists have characterized two of these oscillations in detail, and are seeking to measure details of the third. The Daya Bay project is poised to measure an important property of this oscillation, possibly helping scientists gain a better understanding of the early history of the universe.

One of the most perplexing questions has to do with the matter that makes up the universe and everything and everyone in it. The Big Bang should have created equal amounts of matter and antimatter, which would have annihilated each other. Yet today, the universe is almost entirely matter. Some scientists believe that this puzzling phenomenon is tied to the properties of neutrinos.

"At the moment, we don't know why the universe is dominated only with matter," said Lawrence Berkeley National Laboratory physicist Kam-Biu Luk, one of two scientific spokesmen for the Daya Bay project. "It's the reason that everyone and everything exists. This is very exciting and important, and I would love to be part of the team that finds out why we are here."

The U.S. and China will share leadership and responsibilities for Daya Bay. "The U.S. and China have been trying to get more and more scientific exchanges between them, and this is another step in that direction," says Randy Johnson, DOE's program director for the Daya Bay project.

The project leaders hope to pass through a series of critical decision steps as quickly as possible to start construction in 2007, with data collection beginning in 2010.

**Submitted by Brookhaven National Laboratory**

## SAVANNAH RIVER'S LOONEY STRESSES NATURAL CLEANUP

The Citizens for Nuclear Technology Awareness, a South Carolina-Georgia based group that provides information about the benefits and risks of nuclear technologies, has honored Savannah River National Laboratory's Dr. Brian B. Looney for his trend-setting work in environmental remediation. CNTA named Dr. Looney its Fred C. Davison Distinguished Scientist of the Year Award recipient for 2006.



**Brian B. Looney**

Dr. Looney is a Senior Advisory Engineer in the Environmental Sciences and Technology Department of SRNL. He is recognized both nationally and internationally for his technical expertise, leadership, and scientific contributions in environmental remediation, site characterization, contaminant geochemistry and modeling. In all elements of his work, Dr. Looney stresses the use of natural forces and processes for environmental cleanup to minimize additional disruption to the environment. He has been a leader in this new scientific direction of green chemistry and environmental sustainability, ideals that are becoming more mainstream.

Dr. Looney works directly with key stakeholders to establish and maintain the integrity of projects by developing innovative, cost-effective, and non-intrusive solutions to complex subsurface science issues, such as the investigation of benzene contamination or the assessment and cleanup of dense non-aqueous phase liquids.

Dr. Looney is a skilled presenter of complex technical material and is frequently requested to present at national conferences, seminars, and meetings to gain support for deployment of innovative technologies. Dr. Looney traveled to Russia to work with Russian scientists applying SRNL-developed environmental technologies to the cleanup of contaminated sites in the former Soviet Union.

Dr. Looney has numerous publications; is active in national technical societies; holds eight patents for environmental technologies; and has received numerous awards. He is the recipient of two R&D 100 Awards for his work in techniques related to bioremediation; one for development and commercialization of In situ Bioremediation of Chlorinated Solvents with Natural Gas and the other for PHOSter™ system for applying phosphorus to accelerate bioremediation.

**Submitted by DOE's Savannah River  
National Laboratory**