



*Jerry Olson and Sarah Kurtz test the voltage output of their award-winning solar cell. See page 2.*



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## Research Highlights . . .

### INEEL Cashing In on Commercialized Business

International Isotopes Idaho Inc. (I4) has presented to DOE's Idaho National Engineering and Environmental Laboratory (INEEL) a profit-sharing check in the amount of \$19,592 as a result of its successfully spun-off business to produce medical isotopes. Medical isotopes like those produced by I4 are used in diagnosing and treating cancer, and in cardiac imaging, and require a nuclear reactor to create.

*[Scott Hallman, 208/526-4448, t39@inel.gov]*

### Getting to the Roots Of Dental Health

A scientist at DOE's Lawrence Livermore National Laboratory is applying the most sophisticated tools of materials science to understanding the composition and structure of teeth, particularly the porous, bone-like material called dentin. Key to the research is an X-ray microscope that produces high-resolution images of dentin in three dimensions, says the scientist, John Kinney. Working with dental experts at the University of California at San Francisco, Kinney hopes to create a scientifically detailed tooth model that leads to significant advances in dental health, such as more permanent bonds with fillings and crowns.

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### Stalking the Wild Microbe

Tamas Torok and Stanley Goldman of DOE's Lawrence Berkeley National Laboratory Center for Environmental Biotechnology use gene sequencing and biomarkers to characterize microbial communities found in damaged environments such as closed military bases, polluted watersheds, and high-level radioactive waste sites. Because "fewer than five percent of the microbes we find in nature will grow in the lab," Torok says, they imitate nature by growing cultures in cool darkness on soil and rock samples from the damaged site. Some of the microbes in these intricate, invisible communities may be able to help remediate their toxic surroundings.

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### Los Alamos Introduces New Influenza Database

Medical researchers around the world can now tap into the world's most comprehensive collection of genetic information about the influenza virus at DOE's Los Alamos National Laboratory. The new database will help scientists understand how the flu bug mutates and will aid in the development of vaccines. The database contains viral sequence data, results from immunological studies and information on viral protein structures. Researchers can contribute to and access the Los Alamos flu sequence database, allowing them to compare older viral species and strains with those currently in circulation.

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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/](http://www.ornl.gov/news/pulse/)) is distributed every two weeks. For more information, please contact Jeff Sherwood ([jeff.sherwood@hq.doe.gov](mailto:jeff.sherwood@hq.doe.gov), 202-586-5806).

## A Different Nuclear Mission

Old age makes a car a classic. But finding an original owner's manual can command a hefty price. Similarly, finding the original plans, designs or documentation for a 20-year-old nuclear weapon can be a daunting task.

Scientists at DOE's Los Alamos National Laboratory are collaborating with others from across the weapons complex to ensure the current nuclear stockpile works the way the weapons were originally intended. What these scientists have found is that the people who originally designed, built and tested the bombs are retiring.

Further complicated by the nuclear test ban, the new generation of weaponeers must revalidate old test data, review old records and plans, and ensure that the aging process hasn't significantly changed any weapons components without the benefit of validating it by testing a weapon.

When weapons testing ended, so did data analysis and documentation.

There is no formal database or central location for weapons data, engineering data sets or non-nuclear explosive test records. "In some cases, the only formal documentation we might have is a set of viewgraphs that the scientists used to brief their peers or government officials. Final shot reports were more of an oddity than the norm," says Charles Miller, leader of the Nuclear Weapons Archiving Project at Los Alamos.

Between the spotty documentation and the retirement of the older weaponeers, researchers feared they were in danger of losing valuable expertise. How do you certify a nuclear weapon in the absence of nuclear testing? How did you conduct a nuclear test? How did you perform diagnostic experiments? How can you continue to use information from past testing?

The scattering and smattering of old records is not unique to Los Alamos. Other sites in the DOE's nuclear weapon complex such as Pantex, Lawrence Livermore and Sandia have similar archiving projects and cooperatively, the laboratories are working toward appropriate information access across the entire complex.

The archiving project aims to preserve data on past experience in the nuclear weapons program to make it easier to validate expectations of future performance of the stockpile.

Another emphasis is creating easy desktop access to information for designers and engineers. In some divisions of the Lab, online vaults have been created. Researchers can access the secure local area networks and use keywords to search for documents. Associated electronic archives provide nuclear and non-nuclear test data.

The Los Alamos team recently signed a LANL-Xerox CRADA to ensure this information is more readily available for use.

Old data isn't necessarily a bad thing.

"We have better diagnostic tools now. When we input old numbers or review old records many times we can get more out of the data than we did originally," Miller said.

At any time, more than 100 people are recovering records and reviewing the data at Los Alamos. Miller says the project is like a mystery novel.

"We try to follow all the clues and put them into a coherent picture of what happened in the past and what might happen in the future."

*Submitted by DOE's Los Alamos National Laboratory*

## NREL RESEARCHER TAKES SOLAR TECHNOLOGY INTO THE FUTURE

Sarah Kurtz, senior scientist at DOE's National Renewable Energy Laboratory (NREL), is hooked on solar. In addition to her full-time research responsibilities developing cutting-edge solar cell technology, she teaches children about renewable energy at the lab's Visitors Center.

For much of her 13-year career at NREL, Kurtz has worked with Principal Scientist Jerry Olson. Kurtz and her team of researchers assisted Olson in the development of solar cells that now provide as much as 50 percent more power for satellites orbiting Earth.

These cells are based on the two-junction, gallium indium phosphide on gallium arsenide design. TECSTAR Inc., a leading solar-cell manufacturer, recently licensed two U.S. patents covering the technology for space use.

"The future is bright for this technology," said Kurtz. "Production capacity for tandem cells is growing. Companies are showing interest in using these cells in terrestrial systems as well as for satellites."

What does she enjoy most about her work? "I enjoy solving mysteries in the lab and working with other people who are dedicated to developing renewable energy. Right now, we are working on the next generation solar technology, a 3- or 4-junction cell that can achieve even higher efficiencies."

Kurtz shares her expertise with groups of school children at the lab's Visitors Center. "I like talking to the children and getting them excited about solar cells," said Kurtz. "They are the ones who will be running tomorrow's world - hopefully they'll be running it on renewable energy."

Kurtz received her doctorate in Chemical Physics from Harvard University.

*Submitted by DOE's National Renewable Energy Laboratory*