NREL's Larry Flowers

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Research Highlights . . .

DOE Pulse

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Idaho hosts international research

Fusion safety research at the Idaho National Engineering and Environmental Laboratory is taking on a decidedly international feel. Since being named a "national user facility," the INEEL's Safety and Tritium Applied Research (STAR) facility has been opened up to increased scientific research from around the world. Scientists believe fusion can be an almost infinite source of energy, but learning to safely harness the reaction is a tremendous challenge. That's where the INEEL's STAR facility comes in, because it is designed to host experiments to determine how the fuel in a fusion reactor interacts with other materials used to produce a fusion reaction.

[Teri Ehresman, 208/526-7785, ehr@inel.gov]

Los Alamos and LIBS: Keeping it fair

A team of Los Alamos scientists went to the Olympics last month with their Laser Induced Breakdown Spectroscopy (LIBS) instrument to analyze bobsled runners. Controversies had occurred in previous competitions where certain types of coatings may have been used on runners to circumvent Olympic rules. LIBS works by focusing a laser beam on a runner to form a plasma. Light from the plasma was spectrally analyzed to verify that the runner meets regulations regarding composition. After the women's bobsled team won, an American bobsled team coach told the LIBS team that the compliance and fairness created by LIBS presence helped our team win the gold.

[Shelley Thompson, 505/665-7778, shelley@lanl.gov]

Microarrays for detecting pathogens

An improved method for producing microarrays that detect pathogens such as anthrax or small pox has been developed at DOE's Pacific Northwest National Laboratory and Washington State University. Microarrays are tiny probes placed on a piece of glass or other material. Each probe is sensitive to a specific pathogen. The arrays are flooded with a complex mixture of DNA or RNA from environmental samples and individual probes react if particular pathogens are present. Currently, the sensors are found only in large instruments in a few laboratories around the country. The PNNL-WSU improvements are in printing microarray sensors to speed the detection of pathogens. They are expected to make the technology less expensive and more readily available for routine use by analytical laboratories.

[Greg Koller, 509/372-4864, greg.koller@pnl.gov]

New findings on low-dose radiation and breast cancer

Recent experimental findings by researchers with DOE's Lawrence Berkeley National Laboratory (Berkeley Lab) have shown that exposure to ionizing radiation creates a microenvironment in the tissue that surrounds breast cells which can cause even nonirradiated cells and their progeny to become cancerous. In a study led by Mary Helen Barcellos-Hoff, a cell biologist with Berkeley Lab's Life Sciences Division, exposure to low doses of radiation was shown to cause breast cancer by pathways other than genetic mutations. This opens up possibilities for new and possibly more effective means of treating breast cancer through the repair of damaged tissue rather than individual damaged cells.

[Lynn Yarris, 510/486-5375, lcyarris@lbl.gov]

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).

Berkeley's ALS used to study WTC ground zero air

A collaboration that includes researchers from the DOE national laboratories at Berkeley and Livermore and the University of California at Davis has been using the powerful X-ray beams at Berkeley Lab's Advanced Light Source (ALS) to study the quality of the air quality near "ground zero," the site where the World Trade Center was brought down by terrorists last September 11. In samples of particulate matter collected continuously from early October to mid-December, the collaborative team has found unprecedented high concentrations of very fine particles less than a quarter-millionth of a meter in size, plus abnormally persistent high levels of coarse particles presumably produced by fires that continued to burn underground.

Among many other pollutants, the level of very fine sulfur in the World Trade Center air was higher than in the Kuwaiti oil fields during the fires ignited during the Gulf War of 1991.

Thomas Cahill, UC Davis professor emeritus of physics and atmospheric sciences, led the DELTA collaboration (Detection and Evaluation of Long-range Transport of Aerosols) which used ALS beamline 10.3.1 for X-ray fluorescence studies of samples at very high resolution. When illuminated by X-rays in the right energy range, atomic elements will re-emit X-rays at characteristic energies. ALS light allowed the DELTA collaboration to determine the exact composition of their samples for elements from sodium to uranium in a single 30-second exposure.

"The ALS is from my point of view an ideal machine for our work, with a virtually perfect energy range—not more energy than we need and not less," says Cahill. "The extraordinary brightness of the X-rays combined with the ability to focus the beam to a micron in diameter means we can pour lots of X-rays into a small area quickly, then rapidly move to the next region."

Berkeley Lab's ALS is a synchrotron storage ring designed to accelerate electrons to energies of nearly 2 billion electron volts (GeV) and extract from them the world's brightest beams of soft (low-energy) X-rays and ultraviolet light through use of bending, wiggler, or undulator magnetic devices.

Submitted by DOE's Berkeley Lab

NREL ENGINEER GOES THE DISTANCE

Light that allows a student to read at night at home in his small hut in rural Chile, clean water, a vaccine refrigerator at a health clinic. These are Larry Flowers' rewards.

Larry Flowers

Flowers, a Team Leader at the National Renewable Energy Laboratory, helped form the Lab's Village Power Group in 1994 to bring electricity from renewables to rural areas of the world.

"We need to find a way to bring sustainable solutions to the 2 billion people in the world that do not have electricity," Flowers said.

The Village Power Group is dedicated to matching renewable energy technologies with rural energy needs in the international market. The essential activities include developing applications, testing systems, initiating pilot projects and conducting outreach, training and information activities.

Flowers has worked in a variety of areas centers during his 21 years at NREL—industrial applications, solar thermal and buildings research. But it was his work with the Village Power Group that took him out of the laboratory and into the field.

"I think a person really needs to be out in the field so that you understand the needs and resources of those you are trying to help find solutions," Flower said.

Flowers' attention isn't just overseas. In 1999, he was tapped to lead the Wind Powering America program, a commitment to dramatically increase the use of wind energy in the United States.

For Flowers, his work is just not about providing energy to rural areas or encouraging local governments to purchase wind energy through the Wind Powering America program, it's about thinking outside of the box.

"My advice to others is to use the strength of your calling card, which for me is the Lab, but to let your ideas and resourcefulness not be confined by that calling card."

Submitted by DOE's National Renewable Energy Laboratory