LANL's Brian Rees

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 130 April 14, 2003

Diatomite dilemma: Getting at the oil

Consisting of silica skeletons of microscopic aquatic plants, oil-bearing diatomite is fragile—up to 70 percent empty space—but nearly impermeable. Using ion-beam milling and imaging, Liviu Tomutsa of the Earth Sciences Division and Velimir Radmilovic of the National Center for Electron Microscopy at Lawrence Berkeley National Laboratory have made nanoscale images of diatomite. "As the beam shaves off layers of material a few nanometers thick, it simultaneously makes a stack of 2-D images," says Tomutsa. From these they will build a 3-D picture that reveals the constrictions and connectivity of the pores, factors that affect trapping of liquids.

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What chemicals are in our air?

DOE's Pacific Northwest National Laboratory has created a Chemical Testing Chamber to identify harmful chemicals in the air as well as test the performance of sensors used to detect weapons of mass destruction. The chamber includes a powerful new gas chromatograph-mass spectrometer, which can be used to identify concentrations of any one of thousands of organic chemicals. The facility is different from other chemical testing chambers in that it gives scientists the capability to work with the very low concentrations of semi-volatile chemicals. Semi-volatile chemicals are used to produce pesticides and herbicides, but also can be used in chemical weapons made by terrorists. The chamber is undergoing final performance testing and will be ready for research use later this spring.

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Agriculture for the future

A team of Idaho National Engineering and Environmental Laboratory and Oak Ridge National Laboratory scientists are conducting discussions with agricultural interests to create an R&D roadmap. The roadmap aims to produce feedstock for future biomass refineries. Through new agribusiness, a sustainable supply of biomass would be available to produce clean fuels and chemicals from corn and wheat stalks and the substance that cements cell walls together. The goal of this DOE Office of Biomass project is to move the U.S. towards energy independence, and guide the allocation of limited funds to national labs and universities that can make the project successful. Discussions are being held in Washington, D.C., Chicago, Minneapolis, Boise and Oklahoma City.

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X-rays produce fossil images in stereo

Scientists at DOE's Los Alamos National Laboratory, working with researchers from Conoco-Phillips, have demonstrated the ability to generate elemental X-ray images using micro X-ray fluorescence. The team recently obtained stereoview elemental images of a 650-million-year-old *Marella splendens* fossil from the Burgess shale in Canada (see accompanying image). Researchers exposed the fossil-bearing rock to an X-ray beam and captured the resulting fluorescence, or X-ray emission, in the form of spectral lines, to image the fossil. The stereoview image shows dimensional elemental features that cannot be seen by eye. The process will be useful to a wide array of other difficult material analyses.

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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/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Fighting radiological terrorism with knowledge


Brian Rees

Across the United States, medical and hospital professionals are learning about the effects of nuclear exposure and radiation dispersal devices (RDDs) thanks to the on-camera skills of Los Alamos health physicist Brian Rees.

Radiological Terrorism for Healthcare is an educational video made to inform health professionals of the reasonable precautions that are effective in treating those exposed to RDDs and other sources of nuclear contamination.

Radiological Terrorism for Healthcare

The Tucson, AZ-based *Medfilms* company that produced the tape contacted DOE's Los Alamos National Laboratory in 2002 to see if anyone there could talk about the effects of an RDD, in the logical, down-to-earth terms that would be helpful to nurses and other emergency workers. Rees, already providing similar, live briefings as part of his work with the Laboratory's Health, Safety, and Radiation Protection Division, was an easy choice.

"Medical personnel cover a wide gamut of the population in general, and many of them have the same misconceptions about radiation that the general population has," says Rees. "I wanted to be sure their misconceptions didn't end up harming anybody, either by their actions or inactions."

With that in mind, Rees and the *Medfilms* director, Alan Reeter, developed a video that shows, through the example of a 1987 radiation-exposure incident in Goiania, Brazil, what health-care workers can expect in a radiological accident or deliberate exposure situation. Among the key effects is panic, which brought over 100,000 people to hospital doorways in Goiania, despite the fact that just over one percent of that number actually required hospitalization—still a significant number, four of whom died, but nowhere near as large as the surging crowd that sought treatment and reassurance.

The video, already available to hospitals for several months now, recently won a "Chris" award from the Columbus International Film and Video Festival in Columbus, Ohio, in the Physical Health category.

Submitted by DOE's Los Alamos National Laboratory

Lab, industry center aims for better power transmission

A facility to test a conductor that may lead to the more efficient and reliable transmission of electricity is in operation at DOE's Oak Ridge National Laboratory.

The National Transmission Technology Research Center is a joint effort of ORNL, TVA and the 3M Company. The three have been teaming on a promising replacement conductor for conventional power lines that will be tested at the facility.

The center will enable researchers to address the problem of power outages caused by sagging lines, which are caused by the heat of high current loads. Use of replacement conductors also would help avoid the high cost and environmentally harmful effects of building new towers.

"3M's new composite-core conductor can increase the current-carrying capacity of a transmission line at minimal cost and environmental impact," said John Stovall, technical leader in ORNL's Engineering Science and Technology Division. "Its advantage is using existing structures to increase transmission capacity without the cost of a new transmission line."

The design uses 3M Nextel 650 ceramic fibers, embedded in an aluminum matrix, to make a composite wire that does not stretch as much when heated. An enhancement to the new cables is the addition of zirconium, which makes the aluminum more resistant to deformation at higher temperatures. The aluminum matrix also helps prevent rust in the cable. 3M is working with Nexans and Wire Rope Industries to manufacture the conductor.

"The new conductor's ability to handle greater temperatures will allow more current to be transmitted," Stovall said.

ORNL researchers will test 3M's small, medium and large diameter conductor cables successively in a field experiment at ORNL. The tests will evaluate the overall performance of the conductors to verify predictions of computer models by looking at sag and tension data, such as stress/strain curve and breaking point, and by testing various conductor accessories that attach the conductor to the towers.

Submitted by DOE's Oak Ridge National Laboratory