Livermore's Bruce Goodwin

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

Oak Ridge tracks down explosives from the air

Using state-of-the-art equipment, researchers from DOE's Oak Ridge National Laboratory have developed several sophisticated airborne sensor systems that can detect, characterize and digitally map unexploded ordnance—including items buried as deeply as 30 feet into the ground. These helicopter-mounted systems have applications for the military as efforts are under way in the Persian Gulf region to unearth and destroy mines, weapons caches and other dangerous hidden ordnance-related materials.

[Fred Strohl, 865/574-4165; strohlhf@ornl.gov]

Jefferson Lab experiment could lead way to new class of accelerators

DOE's Jefferson Lab recently conducted an experiment with the Continuous Electron Beam Accelerator to determine the feasibility and effectiveness of energy-recovery technology that could lead to a new class of particle accelerators. With minor modifications, Jlab's accelerator became a "novel test bed" for recirculating linacs with energy-recovery capabilities. If results are what scientists hope for, any advances could be applied to future energy-recovery linacs, or ERLs. Existing machines, like Jlab's Free-Electron Laser, could benefit, as well as next-generation devices such as ion colliders and advanced light sources. Energy recovery is the centerpiece of a new operation mode for recirculating linacs, where the high-energy beam returns its energy for further acceleration of a "fresh" batch of electrons.

[Debbie Magaldi, 757/269-5102, magaldi@jlab.org]

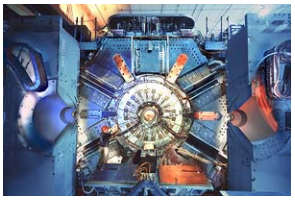
Chem/bio defense for San Francisco International Airport

San Francisco International Airport spokesman Mike McCarron recently praised "the wonderful relationship" with DOE's Sandia National Laboratories that led to the first testing of chemical and biological defense at a major international airport. The research is an outgrowth of work with the Washington Metro, begun in 1997 with Argonne National Laboratory, to characterize chemical detection systems in a subway setting. That sensor system is now entering operation at several Metro stations. The San Francisco airport work began in DOE's Chemical and Biological National Security Program and now continues under the Department of Homeland Security's Science and Technology Directorate.

[Howard Kercheval, 505/844-7842, hckerch@sandia.gov]

New subatomic particle at SLAC

The BaBaR experiment at DOE's Stanford Linear Accelerator Center has identified a



new subatomic particle. The new particle called the Ds (2317), which combines a charm quark with another heavy quark—an anti strange, has unexpected properties that will provide insight into the force that binds the quarks together. The existence of the particle is not a surprise, but its mass is lower than expected, which will send theorists back to the drawing boards. A scientific paper was sent for publication in Physical Review Letters on April 11th 2003.

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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).

New fire fighting technique employs jet engine

Putting out underground coal mine fires may not be rocket science—but it's getting closer. DOE's National Energy Technology Laboratory has joined with the National Institutes of Occupational Safety and Health and COLSOL Energy to test an innovative fire suppression system at CONSOL's Loveridge Mine near Fairview, West Virginia.

A modified jet engine has been used to successfully fight an underground fire that had been burning at the mine for nearly two months. Positioned at the mouth of one of the mineshafts, the jet engine, employing a recirculating water-cooled afterburner, was used to blow water vapor and inert exhaust gases into the mine to smother the fire. By displacing the oxygen in the mine, the technique can shave months off the conventional method of sealing a mine and letting a fire burn itself out. At the Loveridge Mine, it took 10 days of continuously blowing the jet exhaust into the mine to create an inert atmosphere underground.

Mine "inertisation" courtesy of a modified jet engine.

The jet engine system was brought to West Virginia from Australia by a team from the Queensland Mines Rescue Service Ltd. Earlier versions of the technique have been used in other parts of the world, and a similar concept was employed in Kuwait to extinguish oil well fires following the Gulf War a decade ago. This is the first time the technique has been tried in the United States.

A joint team of safety experts from the federal Mine Safety and Health Administration, West Virginia's Office of Miners' Health, Safety and Training, and the United Mine Workers of America joined with CONSOL Energy to monitor the effort and approve the firefighting plan and plans to reenter and restart mine operations. The mine's 300 employees, temporarily laid off when mine operations were idled, hope to return to work soon.

Submitted by DOE's National Energy Technology Laboratory

Livermore's Mr. Plutonium

Bruce Goodwin

With six distinct physical phases, a melting point of only 1184°F, and a density approaching twice that of lead, element number 94 is a truly puzzling substance. It's manmade in reactors, a powerful energy source, and emotionally charged—because it's the stuff that bombs are made of. As Associate Director for Defense and Nuclear Technologies, Bruce Goodwin heads the nuclear weapons program at Lawrence Livermore National Laboratory. And as someone who has designed and tested nuclear weapons, he's also a renowned expert on the behavior in nuclear weapons of the heavy radioactive metal called plutonium.

For his theoretical plutonium work, Goodwin recently received DOE's E.O. Lawrence Award in the national security category. Established in 1959, the award honors the late Ernest Orlando Lawrence, inventor of the cyclotron and namesake for DOE's Lawrence Livermore and Lawrence Berkeley national laboratories.

Goodwin revised equations of state for plutonium under extreme pressures—information essential to the nation's stewardship of aging nuclear weapons without full-scale nuclear testing. "I came up with some theories for the equations of state for plutonium under extreme conditions derived from peculiarities I saw in nuclear test data," Goodwin said. "I was flying in the face of 40 years of research, and even I thought it couldn't be true." But Goodwin's ideas did prove true.

For earlier nuclear design work, Goodwin three times received the "Award of Excellence" for Significant Contribution to the Nuclear Weapons Program from DOE's Office of Military Application. He also has received Aviation Week and Space Technology Magazine Year 2000 "Aerospace Laurels Honor" for significant contributions to the aerospace field.

Submitted by DOE's Lawrence Livermore National Laboratory