LANL researcher's detectors seek water on moon.
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Research Highlights . . .

DOE Pulse
Science and Technology Highlights from the DOE National Laboratories
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New Center Focuses on International Security

DOE's Brookhaven National Laboratory has opened a unique center where scientists will work together to solve technical problems related to international security issues. The center builds upon BNL's existing strengths in the technical aspects of international security, especially nuclear nonproliferation. DOE currently funds $25 million in non-proliferation and national security research at BNL. The center plans to organize workshops for college teachers, summer institutes for students planning to enter the security field, an internship program for academic researchers already involved in the field, and a visitors program for security experts.

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Argonne Protects America's Infrastructure

Assuring the safety, reliability and continuity of telecommunications, energy supply systems and transportation networks is the focus of the new Infrastructure Assurance Center at DOE's Argonne National Laboratory. Argonne created the center in response to a presidential directive calling for "a national effort to assure the security of increasingly vulnerable and interconnected infrastructures." A breakdown in any one critical infrastructure system has the potential to significantly disrupt the economy and national security. "Argonne's expertise in the disciplines required for understanding infrastructure assurance makes the lab well-equipped to address this increasingly important national issue," said Paula Scalingi, director of the center.

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Closing in on CP Violation in B Decays

An asymmetry in the behavior of matter and antimatter that accounts for the– fortunate!– existence of a universe made of matter has so far been observed only in the decays of the K meson, or kaon. At a June 30 seminar at DOE's Fermilab, physicists from the CDF collaboration presented results demonstrating their ability to detect this crucial asymmetry, called CP violation, – if it occurs– in the decays of B mesons created in particle collisions at the Tevatron. The results raise the exciting prospect of observing CP violation in the B system in the high-luminosity environment of Tevatron Collider Run II, starting in the year 2000.

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Piecing Together Magnetic Particles

A unique attempt to alter the tiny particles of a magnetic material is underway at DOE's Ames Laboratory (http://www.external.ameslab.gov) in order to make magnets that retain their power at higher operating temperatures. If successful, the new magnets could become an efficient power source for deep-space probes, cars, electronics, computers and power tools. Bill McCallum and Alan Russell want to alter the structure of neodymium-iron-boron particles to gradually blend two different compositions one at the outer edge to resist demagnetization and another at the core to retain magnetic properties at higher temperatures. NASA hopes to use the magnets as a power source for deep-space probes. More at http://www.external.ameslab.gov/news/release/magnets.html

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

DOE Labs Take on Crime Fighting

Under the "Partnership for a Safer America" announced by Vice President Al Gore in May, the departments of Energy, Justice and the Treasury joined forces to provide law enforcement agencies with cutting-edge crime fighting technologies.

Many of the technologies were on display during a special demonstration at the White House.

Among them were a chemical analyzer from DOE's Lawrence Livermore for use at the crime scene, a Los Alamos DNA analyzer for tracking biological weapons, a system from Pacific Northwest that collects and tracks evidence at complex crime scenes, Oak Ridge technology for image analysis and video enhancement, a Sandia training program for bomb squads and a Brookhaven system to gather evidence of environmental crimes and drug production.

The demonstrated technologies deal with key issues in law enforcement. For example, the Livermore analyzer identifies chemicals to parts-per-billion sensitivity by counting molecules of different weights. Brian Andresen, leader of Livermore's Forensic Science Center, where the system was developed, said portability makes the analyzer "revolutionary" for on-the-scene analysis of criminal activities including clandestine drug production or terrorist chemical releases, and spills and accidents. Instead of waiting days for samples to be shipped to and analyzed by specialized laboratories, law enforcement agents will now be able to identify the substance in question, on the spot, in as little as 15 minutes.

Livermore Lab Director Bruce Tarter noted: "DOE's national labs have made great contributions to the needs of the U.S. through national defense, basic science, energy, biotechnology and other fields....We can play an important role in still another area, law enforcement. Under DOE, we at Lawrence Livermore, like the other national labs, will bring powerful resources to bear on this effort."

Federico Peña, then Energy Secretary, said: "Today we have a message to criminals, 'Beware, because we are going to come after you with technologies you've never seen before.' "

Submitted by DOE's Lawrence Livermore National Laboratory

Livermore's Brian Andresen explains operation of crime scene chemical analyzer developed under DOE support.

Los Alamos Researcher's Detectors Seek Lunar Water

When the Mars Observer failed shortly before it reached orbit around the red planet in 1993, "it felt like someone ripped my heart out," recalls DOE Los Alamos space scientist Bill Feldman.

Feldman had developed a neutron detector for the Mars Observer that would map out water trapped frozen in the Martian soil.

Space exploration, Feldman knew, is a risky business, but the disappointment of seeing years of effort vanish hit hard.

With the Lunar Prospector now circling the moon, Feldman again is charged by the thrill of discovery as plenty of high-quality data return to Earth from the three instruments on the moon orbiter for which he is responsible.

"You never know when you're going to strike paydirt," says Feldman.

Los Alamos' Lunar Prospector instrument package features an alpha particle spectrometer, a gamma ray spectrometer and a neutron spectrometer. The alpha particle spectrometer looks for signs of moon-emitted gases; the gamma ray spectrometer measures elemental signatures from the moon's surface; and the neutron spectrometer is the workhorse for detecting frozen water hidden in the lunar soil.

Feldman's long history with space exploration started shortly after he received his doctorate in physics from Stanford University in 1968. He has worked on outer planet missions such as Pioneer 10 and 11; studied the space between the planets with the International Sun-Earth Explorer and Interplanetary Monitoring Platforms spacecraft; and is a participant in the Ulysses mission to study the sun.

Detectors he designed on a nonproliferation mission, called the Army Background Experiment, have measured the energies of neutrons and gamma rays encountered in orbit for more than three years.

Backup instruments built for ABE are the basis for the neutron and gamma ray spectrometers on Lunar Prospector.

Submitted by DOE's Los Alamos National Laboratory