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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

Jefferson Lab multiplies its research capacity

Thanks to high-tech development work and some creative tuning and tweaking, the $650 million Jefferson Lab in Newport News, Va., can now accelerate beams of electrons to 6 billion electron volts—more energy by half than taxpayers originally paid for. With higher-energy electron beams, researchers using this DOE laboratory can probe deeper than ever into the atom's nucleus to learn how matter itself is put together. "No one can foretell the practical results that could come from this research," says Dr. Hermann Grunder, former director of Jefferson Lab. "But history shows a clear pattern. Fundamental knowledge of matter has led to useful technologies, from medical X-rays and MRIs to transistors and integrated circuits."

[Linda Ware, 757/269-7689, ware@jlab.org]

Precision measurements for Higgs boson's mass

At DOE's Stanford Linear Accelerator Center, physicists from the SLAC Linear Detector (SLD) experiment have produced the world's most precise measurement of a key parameter of the Standard Model, today's dominant theory of particle physics. SLD physicists conclude that a Standard Model Higgs boson should have a mass less than 150 billion electron volts (150 GeV). According to the SLD result, there is only a 5 percent chance it can be any heavier.

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Sandia research aiming at electric hybrid cars

Lithium-ion battery research at DOE's Sandia National Laboratories is playing a key role in an effort aimed at producing hybrid electric cars performing at 80 miles per gallon. Hybrid vehicles combine a gasoline- or diesel-powered engine with an electric motor to increase fuel economy. Sandia is a participant in the Partnership for a New Generation of Vehicles, a research collaboration involving the federal government and the US automotive industry whose goal is to produce by 2004 a "production prototype"—the last stage before a car goes into production—of a full-size electric hybrid sedan with no sacrifice in safety, performance, affordability, or compliance with emission standards.

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Work focuses on improving jet engines

University of Idaho researchers will use the DOE's Idaho National Engineering and Environmental Laboratory's Matched Index of Refraction Flow System to investigate how realistic roughness affects jet engine turbine blades. Instead of relying on a supercomputer or wind tunnel to study flow, they will use baby oil and lasers, simulating the blade's surface with a quartz model. Light passes through the baby oil and quartz without distortion, allowing the researchers to measure flow variations very close to the model's surface. The research, funded by the Air Force Office of Science Research DEPSCoR program, will improve performance and reduce maintenance costs.

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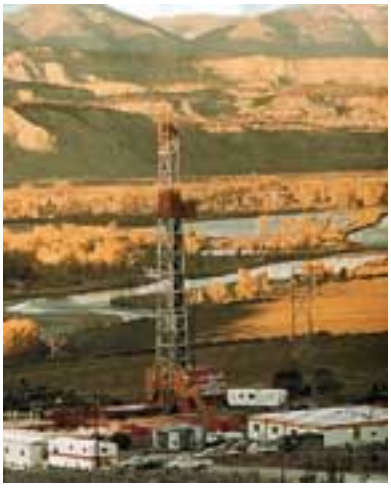
DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***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).

NETL scientists study geologic sequestration of CO_2 in wells

Scientists at DOE's National Energy Technology Laboratory are gearing up for the spring of 2001 when they will join other scientists to "shoot" lots of carbon dioxide into the strata of depleted oil wells.

The NETL scientists—along with scientists from Sandia, Los Alamos, New Mexico Tech, and Strata Oil Production Company—will inject up to 10,000 tons of carbon dioxide into nonproducing wells in the West Pearl Queen oil field near Roswell, New Mexico. But, what would they hope to gain by filling wells with gas?

NETL's scientists have been working on an approach called geologic sequestration to store carbon dioxide in depleted oil and gas formations. Storing carbon dioxide is important because it's one of the greenhouse gases affecting global climate change. And, it's plentiful. An estimated 100 billion tons could be stored, which is an amount that nearly equals all the carbon dioxide expected to be produced by U.S. fossil fuel consumption over the ensuing 18 years.



Test well in Roswell

Chuck Schmidt, NETL's Sequestration product manager, believes that geologic sequestration will work because nature has stored hydrocarbons, such as oil, in the earth for eons. And, NETL scientist Charles Byrer adds that an important key is the integrity of the upper level of the reservoir, the cap rock, to seal in the gas.

At the same time the pilot storage experiment is conducted, the scientists will be eager to evaluate another approach called enhanced oil recovery. By pumping the carbon dioxide into the nonproducing wells, the pressure and mass of the gas is expected to "force" previously unrecoverable oil to the surface. It's sort of like two positive results for the price of one.

NETL's primary focus will be on the geologic sequestration approach. The New Mexico wells will be monitored for three years to determine the potential for long-term storage of carbon dioxide in oil and gas reservoirs. If successful, this approach holds further promise because many of the reservoirs are near sources of carbon dioxide such as power plants, oil refineries, and chemical plants.

Submitted by DOE's National Energy Technology Laboratory

Livermore researcher targets a killer

Christine Hartmann-Siantar

In the early 1990s as she managed her way through graduate school, Christine Hartmann-Siantar watched several relatives succumb to cancer. The process was so painful she dedicated the next decade of her life to improving cancer treatments.

"A whole lot of people died (from cancer) while I was in college," she said. "It's really shaped my career. I decided to use the talents I have to try to help cancer patients the best I can."

Today, Hartmann-Siantar is program leader for the Peregrine Program at the Lawrence Livermore National Laboratory. In early September, the U.S. Food and Drug Administration approved the commercial use of Peregrine to treat cancer patients.

Peregrine—named after the patron saint of cancer patients—is a type of technology that helps doctors direct the appropriate amount of radiation at tumors with minimal damage to surrounding healthy tissue. The treatment calculates the actual dose of radiation by modeling how the radiation is created in a medical accelerator and how it interacts with various tissues and materials in the patient's body.

The Livermore Lab partnered with NOMOS Corporation, a leading supplier of radiation treatment technologies located in Sewickley, PA. NOMOS will produce and market Peregrine systems to the medical community. City of Hope Cancer Center in Duarte, Calif. is scheduled to begin using the treatment later this year.

Hartmann-Siantar said the FDA approval of Peregrine is a final step in a decade-long study of using the Laboratory's extensive databases on nuclear and atomic interactions to find a new treatment for cancer.

"It's not real until it can be used on patients," she said. "Now, nothing stops it from being used (on patients)."

Peregrine is just one of the many medical research projects within the Medical Technology Program at the Livermore Lab.

Submitted by DOE's Lawrence Livermore National Laboratory