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DOE Pulse
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Research Highlights . . .

Energy savings on-line

Coupling decades of research on energy efficiency with the interactivity of the web, scientists in the Environmental Energy Technologies Division at the DOE's Lawrence Berkeley National Laboratory have created the Home Energy Saver Website to help homeowners save hundreds of dollars per year on their energy bills. Just enter a zip code, and the Energy Advisor displays energy usage and costs for a typical home in the area. Answer questions about a specific house, and the Advisor returns customized energy-saving suggestions. Other features include links to hundreds of internet sites with practical information about designs, products, utilities, and service providers, plus e-mail access to experts.

[Allan Chen, 510/486-4210, A_Chen@lbl.gov]

Mountain retail stores showcase solar energy

A retail development owner who wants to set an example is helping make possible a new showcase for energy efficient buildings in the Colorado high country. Ground will be broken this spring in Silverthorne on the BigHorn Home Improvement Center, which was designed with assistance from the Center for Buildings and Thermal Systems at DOE's National Renewable Energy Laboratory. A photovoltaic-integrated standing-seam metal roof, a transpired solar collector (solar wall), daylighting, energy efficient windows and lighting, radiant heating and extra insulation throughout the development are expected to cut the center's annual energy bill by about 25% compared to a building designed to just meet federal energy codes.

[Patrick Summers, 303/275-4050, patrick_summers@nrel.gov]

Los Alamos researchers see things in a different light

Scientists at DOE's Los Alamos National Laboratory have refined an analytical imaging process called Mesoscale Chemical Imaging that integrates several different types of microscopic spectroscopy. The Los Alamos team has successfully integrated micro X-ray fluorescence spectroscopy and electron microscopy with infrared and Raman spectroscopy. For years researchers have used these four analytical techniques separately to provide insights into elemental and molecular nature. The analysis technique can detect the physical deterioration of certain metals, polymers and other materials used in nuclear weapons or in stored nuclear materials long before any visible signs of deterioration might appear.

[Kay Roybal, 505/665-0582, k_roybal@lanl.gov]

Promising approach to "tabletop fusion"

Researchers at DOE's Lawrence Livermore National Laboratory are exploring a promising approach to "tabletop" fusion. They generate fusion neutrons by hitting tiny clusters of deuterium (heavy hydrogen) gas with short, intense pulses from a small-scale laser. The superheated clusters explode, driving deuterium nuclei together with enough energy to fuse. Unlike DOE inertial confinement fusion programs, which produce far more neutrons at higher efficiency using very large lasers, this is not a path to generating large amounts of fusion energy but might someday lead to compact neutron sources for materials research and for radiography, said Todd Ditmire, Livermore physicist.

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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).

DOE labs cooperate on new collider

You can almost feel the anticipation in the air these days at DOE's Brookhaven National Laboratory. In a few short weeks, the world's newest scientific facility will come to life, capping years of preparation by hundreds of physicists and engineers around the world. Soon, exploration of the universe's most basic ingredients—and possibly the discovery of a new form of matter—will begin.

The $600-million ring-shaped Relativistic Heavy Ion Collider, or RHIC, has been one of DOE's largest construction projects for nearly a decade. At 2.4 miles around, and with thousands of scientists eagerly awaiting the data it will produce, RHIC is quite literally the biggest thing happening in nuclear physics today.

DOE researchers are crucial to RHIC's success, making up almost a quarter of the thousand-member RHIC community. Nearly 250 of them, from seven DOE laboratories, are working together with university scientists and colleagues from 15 other nations to build four giant experiments around the RHIC ring.

Beginning later this spring, RHIC will collide beams of speeding gold ions at nearly the speed of light, creating hot, dense matter that has not been seen since the universe's first few moments. It's the world's smallest, and fastest, demolition derby.

Brookhaven, of course, has the lead role in building and maintaining RHIC and the systems that support it. Several of BNL's accelerators have been linked to form a "warm-up track" that will accelerate atomic nuclei called ions and inject them into the giant RHIC ring. The ring contains a two-lane "racetrack" of 1,740 superconducting magnets through which the ions will travel in opposite directions before colliding.

Even as Brookhaven has built RHIC, scientists from Argonne, Brookhaven, Lawrence Berkeley, Lawrence Livermore, Los Alamos and Oak Ridge national laboratories and the Ames Laboratory have been working hard to create RHIC's four experiments.

The experiments—called PHENIX, STAR, BRAHMS and PHOBOS—form the "eyes" that will let scientists see what's going on inside RHIC collisions. Each time RHIC's atomic "demolition derby" occurs, thousands of particles will fly out. The experiments will capture and analyze these particles using some of the most advanced particle detection, electronics and computing technology available.

DOE labs have designed and built many of the complex systems for each experiment. LBNL, for example, built the centerpiece detector of the STAR experiment, called the Time Projection Chamber. LANL has a lead role in the muon arm, a major component of the PHENIX experiment.

Also on PHENIX, LLNL designed engineered the giant steel magnets that form the core of this 3,000-ton device, while ORNL has designed and built a major fraction of the experiment's readout electronics and Ames Lab has developed its particle-selection trigger. ANL scientists are working on several of the main detectors for the PHOBOS experiment and the Electromagnetic Calorimeter detector for STAR. BNL physicists lead the construction management of PHENIX, form the backbone of the BRAHMS experiment collaboration, and are well represented on the other two experiments.

With RHIC poised to start up soon, all of these systems will soon begin working in concert to explore the universe within the atom.

Submitted by DOE's Brookhaven National Laboratory

SLAC and Cal Tech share teacher's glory

Emlyn Hughes

Emlyn Hughes may be at Cal Tech now, but the DOE's Stanford Linear Accelerator Center is equally delighted at Hughes' accomplishment. The 1999 Richard P. Feynman Prize for excellence in teaching was awarded to Hughes by the California Institute of Technology.

The Feynman award is given annually at Caltech to "a professor who demonstrates in the broadest sense unusual ability, creativity, and innovation in undergraduate or graduate classroom and laboratory teaching."

The Committee's citation on Hughes' teaching for this year's award reads:

> For his outstanding ability to teach the mysterious nature of quantum mechanics to a broad audience as evidenced by the overwhelmingly positive student feedback from Physics 2, a core course in sophmore Physics. By combining a clear pedagogic style with an entertaining delivery, complete with frequent anecdotes on physics and life, Hughes brings a Feynman-like quality to the teaching of this difficult subject.

Hughes joined SLAC as a research associate in 1988. In 1992, he received the Panofsky Fellowship and remained at SLAC until 1995 when he joined the faculty at Caltech. At SLAC, Hughes was the spokesperson of the polarized helium-3 fixed target experiments in End Station A (E142 and E154) and is a co-spokesperson on the upcoming End Station A experiment, E158.

Emlyn is only the second physics professor at Caltech to receive the award. The first was Tom Tombrello, who is currently the chairman of the Caltech physics department.

SLAC and Cal Tech both offer congratulations to the winner in recognition of his outstanding skill and look forward to many inspired students coming to SLAC for research in the future.

Submitted by DOE's Stanford Linear Accelerator Center