Brookhaven Lab's John Dunn

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 210 **May 29, 2006**

Research Highlights . . .

Buckyballs meet gilded cousins

Gold atom clusters with central cavities are the first known metallic equivalents of the famous hollow carbon fullerenes known as buckyballs, a team from DOE's Pacific Northwest National Laboratory, Washington State University and the University of Nebraska report. The fullerene is made up of a sphere of 60 carbon (C) atoms; gold (Au) requires many fewer-16, 17 and 18 atoms, in triangular configurations about 6 angstroms across, roomy enough to cage a smaller atom. Researchers had been spurned in their attempt to find the fullerene's kin in metal because of metal's tendency to compact or flatten. Experiments at the PNNL-based W.R. Wiley Environmental Molecular Sciences Laboratory narrowed in on the likely candidates by eliciting their photoelectron spectra.

[Bill Cannon, 509/375-3732, cannon@pnl.gov]

Space telescope arrives for testing

A pioneering space telescope recently assembled at DOE's Stanford Linear Accelerator Center has taken a continent-sized step in its journey toward launch. The Large Area Telescope arrived safely for pre-launch testing on May 14 at the U.S. Naval Research Laboratory in Washington, D.C., after a 3,000-mile trip from Menlo Park, Calif. LAT is the primary instrument for the Gamma-ray Large Area Space Telescope (GLAST) mission to detect gamma rays, the most energetic particles of light in the universe. Physicists and astronomers expect that this unprecedented look at the gamma-ray sky will reveal vital information about the nature of dark matter, the evolution of stars, and the accelerating powers of supermassive black holes. GLAST is an international collaboration led by NASA and the DOE.

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First Compact Stellarator vessel assembly arrives

On May 9, the first of three vacuum vessel sub-assemblies for the National Compact Stellarator Experiment (NCSX) was delivered to the Princeton Plasma Physics Laboratory. The shipment included a 120-degree segment (one-third) of the vessel with its three largest ports installed. Major Tool and Machine, Inc., of Indianapolis, Indiana is manufacturing the 25,000-pound vessel, which is made of Inconel 625. When completely assembled, it will resemble a twisted doughnut with 84 ports for diagnostic devices. NCSX will begin operation in 2009 to determine the attractiveness of the compact stellarator as the basis for a fusion power reactor.

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Development enables low-cost IC antifuses

Researchers at DOE's Sandia National Laboratories have developed a reliable and easy-to-manufacture class of dielectric films that can enable programmable antifuses on integrated circuits (IC) at less cost. Antifuses are nonvolatile, one-time programmable memories fabricated on ICs that are programmed with applied voltage. "Antifuses have been around a long time," says Paul Smith, who is involved in technology transfer at Sandia. "The new Sandia-developed film—that ultimately is incorporated into computer chips with antifuses—requires lower voltage and less real estate. This makes them more desirable than existing antifuses." Smith hopes to attract outside companies to be Sandia partners who would commercialize the new film technology.

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

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).

NYC assignment reveals metropolitan bioterror mitigation

Isabelle Chumfong of DOE's Sandia National Laboratories gained a new perspective during a recent unique assignment in which she spent six months working with New York City's Department of Health and Mental Hygiene (DOHMH) to develop an in-depth understanding of and contribute to the city's bioterrorism response planning and preparedness efforts.


Isabelle Chumfong

The goal of the collaboration was to develop better strategies for collecting information about the impact of bioterror agent releases in real time for the Department of Homeland Security (DHS), which partially funded her participation, and to improve New York City's response activities.

The Sandia-DOHMH team focused on improving methods and approaches for post-incident environmental air and surface sampling, which typically would be used to confirm and characterize a bioterror event.

"It was really enlightening to be there," she says, because her exposure to the real-world concerns in the public health department put into perspective some of the issues and priorities of end-users of Sandia research.

The preliminary study examined the city's responsive architecture for bioterrorism events and proposed a methodology, based on modeling, for identifying promising sites for environmental sampling. These sites were chosen by analyzing an extensive set of agent release scenarios deemed most likely by New York City law enforcement and emergency management agencies.

Isabelle says she appreciated learning what day-to-day questions key decisionmakers need answered, based on their goals and responsibilities. The concept of sending someone to the city agency came about early last year in a Bay Area meeting of public health, law enforcement, and environmental officials who wanted to better understand the potential hazards of bioterror releases and how to gather information about them in real time. Decisionmakers at DOHMH were eager for assistance, having heard of Sandia's initial modeling of plumes that might be generated from releases of a bioterrorism agent.

Submitted by DOE's Sandia National Laboratories

Building the molecular biology toolbox


John Dunn

Brookhaven Lab biologist John Dunn has been in the right place at the right time throughout the "golden age" of molecular biology, starting with his humble beginnings washing urine bottles at a hospital to earn a few bucks while in high school. There, after unknowingly washing the urine of a kidney tuberculosis patient down the drain and setting off a mild panic about a potential public health crisis, Dunn learned a lot about the TB bacterium and was hooked on microbiology.

While he worked his way through West Chester State, a small teachers college in Pennsylvania, Dunn's lab experience and an influential professor led him to scuttle his initial plan to become a teacher and pursue graduate studies.

"My parents were upset," he says. "They saw teaching as a more stable career."

At Rutgers University, then at the University of Heidelberg as a postdoc, and at Brookhaven since 1972, Dunn has made a string of important contributions to the emerging field of molecular biology, including:

- Discovering how certain proteins tell transcription enzymes which genes to transcribe from DNA to make RNA, the chemical messenger needed to translate genes into proteins
- Setting up the first RNA sequencing lab at Brookhaven
- Sequencing the DNA of the T7 bacteriophage, a virus that infects bacteria — which led to the discovery of many new T7 genes
- Helping develop T7 into a system for the rapid production of proteins and RNAs
- Synthesizing antigen proteins from the bacterium that causes Lyme disease, analyzing their structures, and contributing to the development of a new vaccine
- Developing a way to rapidly assess where regulatory proteins bind to DNA
- Investigating the role of particular genes and chemical alterations of DNA on cancer

"The joy at Brookhaven is the ability to do, do, do and go from one thing to another," Dunn says.

Submitted by DOE's Brookhaven Lab