



BNL's
Peter
Takacs

Page 2

Research Highlights . . .



Science and Technology Highlights from the DOE National Laboratories

Number 274

November 17, 2008

SPEAR springs to life

The Stanford Synchrotron Radiation Lightsource at DOE's [SLAC National Accelerator Laboratory](#) has geared up for a new season of science. After weeks of downtime, the lightsource now boasts a set of upgrades that improve both safety and efficiency, taking it one step closer to its full design potential. SPEAR3, commissioned in 2004, is designed to operate at 500 milliamperes (mA) of current, but a series of required technical upgrades has required that the accelerator be run at 100 mA. Until now, the vacuum systems of SPEAR and the transport line connecting the booster ring and the main storage ring were separate, requiring electron pulses to pass through a series of thin steel windows. After months of hard work, the two vacuum systems are now connected, promising much more efficient operation of the beam.

**[Brad Plummer, 650.926.2282,
brad.plummer@slac.stanford.edu]**

Jaguar upgrade reaches petaflops

The latest upgrade to the [Cray XT Jaguar supercomputer](#) at DOE's [Oak Ridge National Laboratory](#) has increased the system's computing power to a peak 1.64 petaflops, or quadrillion mathematical calculations per second, making Jaguar the world's first petaflop system dedicated to open research. Jaguar has already completed an unprecedented superconductivity calculation that achieved a sustained performance of more than 1.3 petaflops with the upgrade. The upgrade at DOE's Leadership Computing Facility represents a major milestone in a four-year project, begun in 2004 when DOE's Office of Science launched a sustained effort to upgrade supercomputing capabilities for unclassified research in the DOE national lab complex.

**[Mike Bradley, 865.576.9553,
bradleymk@ornl.gov]**

Aiding the search for life on Mars

An instrument at DOE's [Idaho National Laboratory](#) could boost scientists' chances of finding traces of cells in Martian rock. While other methods require extensive sample preparation, INL's "point-and-shoot" laser analysis preserves more of the evidence and reduces contamination risk. The team recently tested its technique on thenardite, a mineral likely present on Mars, and was able to detect biomolecules at concentrations as low as 3 parts per trillion. The study, performed in collaboration with [University of Montana-Missoula](#) researchers, could help mission scientists choose Martian surface samples with the most promise for yielding signs of life.

**[Roberta Kwok, 208.526.2941,
roberta.kwok@inl.gov]**

Sandia aids cleanup of Iraqi nuclear facilities, rad waste

[Sandia](#) scientists are helping train Iraqi scientists and technicians to clean up radioactively contaminated sites and safely dispose of the radioactive wastes as part of the Iraqi Nuclear Facility Dismantlement and Disposal Program. Initiated by the U.S. Department of State, the program focuses on the Al Tuwaitha nuclear complex near Baghdad, which contains major facilities from Saddam Hussein's dictatorship. Sandia provides consultation and hands-on demonstrations to Iraqi professionals from the Iraqi the Ministry of Science and Technology — the owner of the Al Tuwaitha complex — and the Ministry of Environment. Another goal of the program is to help engage Iraqi scientists who were isolated from their counterparts for more than a decade by United Nations sanctions.

**[Michael Padilla, 505.284.5325,
mjpadil@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).

Coalition to promote nanotechnology education

A coalition of 60 industrial, academic, and national lab leaders have harnessed divergent interests with the intent to help students create new inventions, aid national defense, and show a bottom-line profit for industry in the field of nanotechnology. Promises of funds, equipment, or mentoring — on research topics all participants could support — were the result of a first technical workshop sponsored by DOE's [Sandia National Laboratories'](#) National Institute for Nanotechnology Education (NINE), held recently in Albuquerque.

NINE was sparked by warnings in the Rising Above the Gathering Storm report, sponsored jointly by the National Academies of Science and Engineering, that action was needed to attract American students to enter science and engineering and equip them as technical innovators to compete successfully on a global scale.

"NINE is a way for us to anticipate and create the future, rather than just reacting to it," said NINE program manager Regan Stinnett of Sandia.

NINE's somewhat radical approach offers students educational experiences resembling the hands-on, apprenticeship model of the 19th century on research topics such as nanoelectronics, nanosynthesis, nanoenabled chemical processing, and nanoscale characterization. Students would learn their scientific "trade" by working with university, national lab, and business mentors on large, multidisciplinary projects of value to the nation.

The hope is that original output from these students — following their own research interests with unprecedented leverage from NINE — will make money for industry, help national defense, originate innovative technical discoveries and papers, start new businesses, and receive research grant monies, not necessarily in that order.

NINE receives \$7.5 million annually from various sources. Industry participants included Corning, Exxon Mobil, Goodyear, IBM, Intel, Lockheed Martin, and Monsanto. Universities represented included Harvard University, Harvey Mudd College, Massachusetts Institute of Technology, Notre Dame University, Rice University, Rensselaer Polytechnic Institute, University of California at Davis, University of Florida, University of Illinois, University of New Mexico, University of Wisconsin, University of Texas at Austin, as well as New Mexico Highlands University and Purdue University. Also present were representatives from the Semiconductor Research Corporation and the National Science Foundation.

Submitted by DOE's [Sandia National Laboratories](#)

PETER TAKACS: A BROOKHAVEN BUILDER AND FIXER

On October 24, reporters, community members, and employees gathered at DOE's [Brookhaven National Laboratory](#) to play a re-creation of "Tennis for Two," one of the world's first video games, invented 50 years ago in Brookhaven's [Instrumentation Division](#) to entertain Lab visitors. At the anniversary event, people



Peter Takacs

played the re-created game for several hours until suddenly something sparked and the tennis court disappeared from the oscilloscope screen. Peter Takacs, the Brookhaven Instrumentation Division physicist who re-created Tennis for Two, consulted the game's schematic and removed a circuit board from the apparatus. Within 25 minutes, he and his team replaced a burned-out operational amplifier and reinserted the repaired circuit. The tennis court and ball reappeared on screen — much to the delight of the crowd.

Though Takacs has become the expert on the electronics behind Tennis for Two, his true expertise is in [optical metrology](#), using light to measure the surface of x-ray mirrors with nanometer precision. Takacs played a leading role in developing the Long Trace Profiler, an instrument now used worldwide to measure the shape of cylindrical mirrors in synchrotron light sources. The profiler was patented in 1989, and customized versions are used by approximately 15 light sources around the world.

Now, Takacs is eager to develop a new Long Trace Profiler as Brookhaven prepares for the [National Synchrotron Light Source II \(NSLS-II\)](#). Takacs and the Instrumentation Division will collaborate with [Lawrence Berkeley Lab](#) to update calibration standards and instruments for the new facility, which will produce light 10,000 times brighter than Brookhaven's current [NSLS](#).

"Tennis for Two shows how innovative Brookhaven's Instrumentation Division was fifty years ago," Takacs explained. "Today, the division develops unique instrumentation and large detectors for scientists at Brookhaven and around the world. We know the equipment inside and out — we build it and we fix it too."

Submitted by DOE's [Brookhaven National Laboratory](#)