PNNL's Cindy Bruckner-Lea

Page 2

Research Highlights . . .

DOE Pulse

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Painless bone substitute could offer new era for surgeons

Researchers from DOE's Sandia National Laboratories and the University of Illinois are waiting for Food and Drug Administration approval to begin implanting in patients a ceramic material surgeons could use to replace damaged or missing bone. The substance was fitted successfully in a preliminary test in May and could have replaced missing bone in the lower jaw of an elderly woman. The strong, lattice-like structure allows new bone cells and blood vessels to grow through it while it serves as a temporary support structure for the missing bone. The Illinois surgery served only to see if the molded substance would fit; it could not be left in the woman's jaw because of the still-pending FDA approval.

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

Synchrotron X-ray source upgrade on schedule

The Stanford Synchrotron Radiation Laboratory at DOE's Stanford Linear Accelerator Center is working double shifts to construct the next generation synchrotron X-ray radiation source (SPEAR 3) in a record 7 months. It will deliver a brighter, denser beam to see smaller objects than the old machine. The flux density with the bending magnets will increase 100 times, and will increase 10 times with the insertion devices. Currently on schedule, the project aims to begin some operations in January 2004. To build a new machine with only nine months of downtime for users, SSRL spent two years preparing by tearing down everything non-essential and pre-assembling components. To see live images of construction: http://www-ssrl.slac.stanford.edu/talk_display.html

[Neil Calder, 650/926-8707, neil.calder@SLAC.Stanford.EDU]

Making a seismic survey easier, cheaper, better

A unique device developed at DOE's Idaho National Engineering and Environmental Laboratory will make seismic surveying easier, less expensive and improve image resolution. The downhole geophone is a suite of modules that can be deployed more quickly and easily than current commercial modules. The nonclamping design is water coupled, meaning it is directionally responsive to seismic waves transmitted through liquid in the borehole. Therefore, it doesn't have to be clamped to the borehole casing to sense seismic transmissions. The second is a quick-clamp-and-release geophone. Inserted into the borehole, it is hydraulically or pneumatically clamped to the casing, again working much quicker and more efficiently than current models.

[Steve Zollinger, 208-526-9590; gaz@inel.gov]

Jefferson Lab's upgraded Free-Electron Laser produces First Light

DOE's Thomas Jefferson National Laboratory produced First Light with its upgraded Free-Electron Laser on June 17. The machine was upgraded from the earlier, one-kilowatt Infrared Demonstration FEL, which broke power records by delivering 2,100 watts of infrared light during 2001. Now 18 months after the one-kilowatt FEL was dismantled, the upgraded FEL, designed to produce 10 kilowatts of infrared and one kilowatt of ultraviolet light, is undergoing commissioning toward the goal of producing 10 kilowatts by summer's end.

[Debbie Magaldi, 757-269-5102; magaldi@jlab.org]

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).

Wireless test bed open for business

America's only "city-size" wireless communication test facility is now open for business– and it's at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory.

The Bechtel/INEEL Wireless Test Bed offers large-scale, independent, end-to-end testing of wired and wireless next generation communication infrastructure including 3G/4G cellular, land mobile radios and wireless local area network systems.

Cell Tower

The Test Bed's opening is particularly timely since the country has experienced an enormous increase in numbers of users, minutes online and cell phone functions. These increases in usage and capabilities are not without their growing pains, both for commercial vendors and the public. Problems range from interference and service interruption to troubles with network integration and handset interoperability. Bechtel Telecommunications, a unit of Bechtel Corporation, built the Wireless Test Bed in collaboration with the INEEL to create an environment where commercial carriers and equipment manufacturers can address these network deployment issues.

Until now, no facility existed where wireless communications could be tested in a life-size, city-like setting. Laboratory and bench-scale testing, or limited-access to traffic-bearing networks had to suffice for carriers or manufacturers.

The Bechtel/INEEL Wireless Test Bed owes its existence, in part, to INEEL's status as a National Telecommunications Information Administration test station. This allows the test bed to transmit at all– but a few– frequencies. INEEL's site also offers a virtually RF-clean environment.

Over the past several months, the INEEL/Bechtel team of researchers and engineers has constructed three cell towers on the INEEL site and has provisioned them with various radio equipment, test equipment and modeling/simulation tools. And this is on top of the Department of Energy's 20 years of large communications infrastructure investments at INEEL that have resulted in 170 miles of high-speed fiber, radio labs and shops, and two mountaintop radio transmission facilities.

The Test Bed opened for business April 1, and engineers are conducting tests for a major carrier. Anticipated areas for testing include base station equipment, antennas, handsets or the big-hitter for Homeland Security, 911 systems.

Submitted by Idaho National Engineering and Environmental Laboratory

Dr. Cindy Bruckner-Lea, Pacific Northwest National Laboratory

Cindy Bruckner-Lea

When senior scientist Cindy Bruckner-Lea talks BEADS, she is not talking costume jewelry; rather she is discussing a new technology she helped develop that detects biological or chemical threats. The Biodetection Enabling Analyte Delivery System, or BEADS, deploys microanalytical sensors at the point of use, whether in a doctor's office, at a patient's bedside, on the food processing line, in the battlefield, or on-line at a wastewater treatment facility.

BEADS can be used at the front end of sensitive detection systems because it captures contaminants of interest from dirty environmental samples. The technology essentially "washes away" interfering compounds that may be present in a sample. Eliminating the interfering compounds permits better, timelier detection of hazards. "BEADS will be used to remove the need for manual sample preparation and enable rapid, automated biodetection in the environment," explains Bruckner-Lea. "I have been interested in Bioengineering for some time, particularly research involving the interface of chemistry, biology and engineering."

Bruckner-Lea joined DOE's Pacific Northwest National Laboratory in 1992, focusing on bioanalytical sensor systems in support of the Environmental Molecular Sciences Laboratory (EMSL) at PNNL. Her research ranges from basic studies on biomolecular interactions to the integration of micro sensors and fluidic systems for chemical separation and detection. Cindy leads PNNL's biodetection project for DOE's Chemical and Biological National Security Program, a key element in the plan for homeland defense.

In addition to her accomplishments at the Laboratory, Cindy is actively involved as the chair of the Sensor Division for the Electrochemical Society. Cindy enjoys mentoring students and young scientists at PNNL and in the community.

Submitted by DOE's Pacific Northwest National Laboratory