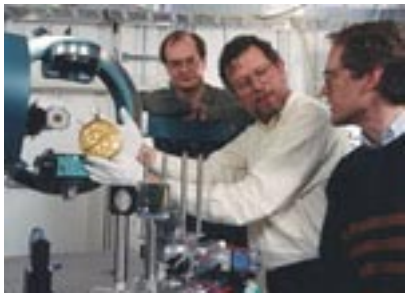

Brother team helps solve riddle.

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Research Highlights . . .

DOE Pulse
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Researchers unravel genome for 'superbug'

DOE researchers in California and university researchers in Texas unraveled the genetic sequence, or genome, of a "superbug" that is a leading cause of hospital-acquired infections. The feat—a day's effort—demonstrates the power of biotechnology to rapidly visualize the biological blueprints of harmful bacteria like Enterococcus faecium, which becoming dangerously resistant to antiobiotics. It is hoped that such work can lead to better diagnoses, treatment and possibly vaccines. The work was a collaboration of DOE's Joint Genome Institute in Walnut Creek, Calif., and University of Texas Health Science Center and Baylor College of Medicine, Houston.

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Secrets of antiferromagnetism revealed

Giant magnetoresistance, vital to advanced computer read-heads and magnetic storage devices, is achieved by "pinning" one ferromagnetic layer to an antiferromagnet, leaving another free to respond to external magnetic fields. The first images demonstrating precise alignment of magnetic domains at the interface of a ferromagnet and an antiferromagnet were made by the PEEM2 photoemission electron microscope at DOE's Advanced Light Source at Lawrence Berkeley National Laboratory. The research also revealed local bias in each domain, without external setting. Collaborators included Joachim Stohr, Frithjof Nolting, Andreas Scholl, Simone Anders, and others from IBM Corporation, Stanford University, Berkeley Lab, and other institutions.

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The ultimate pocket protector: Radiation detection made easy

If you're trying to smuggle nuclear material, getting through Customs is even tougher now thanks to an award-winning, pocket-sized device developed at DOE's Idaho National Engineering and Environmental Laboratory. The dosimeter is the only commercially available instrument that can simultaneously detect two types of radiation-bundles of massless energy called gamma rays and tiny particles called neutrons. Needing only four AA-batteries, the versatile dosimeter provides real-time radiation exposure information in less than ten seconds and sports three alarm options-audible alarm, visual screen display, and a vibration mode. Data stored in a microprocessor can be downloaded for additional analysis or logging.

[Deborah Hill, 208/526-4723, or dahill@inel.gov]

Tolerant storage materials

Scientists at DOE's Los Alamos National Laboratory have demonstrated that certain ceramic materials with structures similar to fluorite crystals hold up well to radiation damage because the materials' atoms shift around to accommodate the defects the radiation causes. Long-term storage of nuclear waste is a continual issue because internal radiation can cause radioactive host materials to swell or crack, making the stored waste unstable and susceptible to leaching. Recent research into better storage materials for high-level radioactive waste has centered on a class of materials that are part of a larger group of ceramics called complex oxides.

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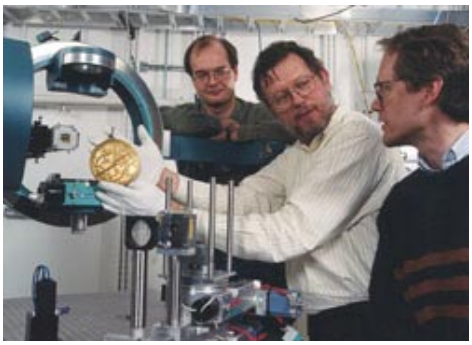
DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions.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

Probing the past with X-rays

Innovative 21st century technology recently transported two brothers back to the 16th century in a quest for truth.



Dean Haffner (left), Bruce Stephenson and Brian Stephenson discuss their experiments.

At issue was the authenticity of two astrolabes, astronomical instruments that predate the invention of the telescope. Both—one owned by the Adler Planetarium, one by Harvard University—were allegedly finished and dated by the same worker on the same date, an unlikely coincidence given the time and care Renaissance craftsmen required to handcraft an astrolabe.

Argonne's 21st century tool, the Advanced Photon Source (APS), produces the nation's most brilliant X-rays for materials, biological and environmental research. The APS can reveal a material's composition, crystal structure and thickness without damaging the material itself.

"Museum curators need to know which astrolabes are genuine, so they aren't deceived by reproductions," says Bruce Stephenson of Chicago's Adler Planetarium.

Stephenson's brother Brian works in Argonne's Materials Science Division and suggested they use the laboratory's APS to solve the mystery scientifically.

The APS's brilliant X-rays would reveal each astrolabe's material composition, crystal structure and thickness profile. The process would not damage the astrolabes, but would allow researchers to determine which was genuine. The Stephenson brothers were joined by Dean Haeffner of the APS. "In this experiment, we were able to merge history with our knowledge of materials science," Haeffner explains.

X-ray fluorescence revealed the Adler astrolabe to be made of a copper-zinc alloy; it is "old brass." The Harvard astrolabe, however, has no zinc and is gold-plated copper rather than brass.

The researchers concluded that the composition and microstructure of the Adler astrolabe is consistent with the metallurgical technology of 1597, the date inscribed on the astrolabe, suggesting that it is the real McCoy—um, make that the real Bos.

Submitted by DOE's Argonne National Laboratory

Sandia brings electricity to areas of Navajo reservation

DOE's Sandia National Laboratories is providing technical support for a new solar power initiative of the Navajo Tribal Utility Authority (NTUA) to bring electricity to the homes of people living in remote areas of the vast reservation.

In a program that is the largest of its type in the country, the NTUA is providing 200 photovoltaic systems for $2 million and installing individual units at private residences to furnish electrical power. Sandia engineers ensure the units are properly installed and working as intended.

Navajo families use photovoltaic cells like these to power their homes.

Each system serves a single home. All 200 systems are to be installed by the end of summer.

Photovoltaics technology converts energy from the sun into electricity, which is stored in batteries for future use in the home.

Jimmie Daniels, NTUA solar program manager, says the utility decided to offer this alternative power source to its customers because the cost of stringing wire over parts of the reservation's rural terrain is prohibitive.

"The only way for many of these people to have electricity is to provide each household its own photovoltaic unit," he says.

Between 10,000 and 30,000 Navajos are estimated to live without electricity throughout the reservation that covers parts of New Mexico, Arizona, and Utah. The systems give some of these people their first opportunity to live in an illuminated world—having access to electric light so children can do homework at night, and to radio, television, and computers to help reduce rural isolation.

The systems have about 600 watts of photovoltaic collectors, which will be able to convert about 3 kilowatt hours per day, on average, in the winter.

That's enough electricity to power a single household for a day, if the family members are conservative in their use of electricity.

Submitted by DOE's Sandia National Laboratories