Story tips from the Department of Energy's Oak Ridge National Laboratory January 2011

EurekAlert

FORENSICS -- The telltale bone

Technology developed more than 100 years ago to wirelessly transmit electricity is being adapted to locate clandestine graves. Oak Ridge National Laboratory's Charles Van Neste and colleagues are transmitting electromagnetic waves to penetrate the ground and set up a resonance in buried bones. "The system consists of a transmitter and a receiver that collects the surface waves and passively integrates them through resonance over time," Van Neste said. He and colleagues Arpad Vass, Marc Wise and Lee Hively have discovered that human bone has a resonance at about 2,000 hertz, a fact they exploit to make this approach effective. This proprietary technology borrows from a method of energy transfer developed by Nikola Tesla early last century. [Contact: Ron Walli, (865) 576-0226; wallira@ornl.gov [1]]

ELECTRICITY -- Eye on the grid

Through a network that consists of hundreds of low-cost monitors that plug into standard 110-volt outlets, GridEye can play a role in ensuring the reliability of the nation's power grids. The system, developed by researchers at Oak Ridge National Laboratory, provides real-time information about dynamic responses to conditions and can provide warnings of impending failures such as the Northeast Blackout of 2003. The monitors, referred to as frequency disturbance recorders, are installed in offices, school buildings and residences. "ORNL's most recent deployment of GridEye sensors focuses on portions of the grid where high penetration of renewables is planned," said Yilu Liu of the Energy and Transportation Science Division. [Contact: Ron Walli, (865) 576-0226; wallira@ornl.gov [1]]

BATTERIES -- Nanoscale mapping

A nanoscale view into the inner workings of lithium-ion batteries could yield critical clues to overall battery performance. Researchers at Oak Ridge National Laboratory's Center for Nanophase Materials Sciences used a method called electrochemical strain microscopy to take an unprecedented look at the kinetics of a lithium-ion battery anode with a resolution below 10 nanometers. The ORNL team isolated and mapped two key electrochemical processes, ionic reaction and transport, which help define how a battery functions. "Understanding the ionic flow is the key to improving existing battery technologies," ORNL's Sergei Kalinin said, noting the technique can be used to examine other energy storage devices such as fuel cells. The researchers published their results in the journal *ACS Nano*. [Contact:

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SUPERCOMPUTING -- Pairing up in a nucleus

We are all familiar with the change water goes through under the influence of falling temperatures, evolving from a disordered liquid to an ordered solid. What we may not know, however, is that such transitions — known as phase transitions — can also be found within the nucleus of a single atom. In this case the ordering is found when nucleons — neutrons (or protons) — pair up to make the nucleus more stable. Physicists from Oak Ridge National Laboratory and the University of Tennessee have offered the first realistic description of phase transition in an atomic nucleus, using ORNL's Jaguar supercomputer to analyze the odd behavior of germanium-72, a medium-mass nucleus with 32 protons and 40 neutrons, as it is heated and rotated. Nuclei typically lose their pairing—and therefore their order—when they are exposed to high heat and rotation. In germanium-72, however, that pairing re-emerges and peaks at a critical temperature—nearly 2 billion degrees Fahrenheit. Any realistic nuclear theory must take this behavior into account. The team's results are documented in the Nov. 19 edition of *Physical Review Letters* (http://link.aps.org/doi/10.1103/PhysRevLett.105.212504 [3]). [Contact: Leo Williams, (865) 574-8891; williamsjl2@ornl.gov [4]]

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