ORNL's Joe and Deanna Pickel

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DOE Pulse

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Reducing false alarms in bioaerosol detectors

A Department of Homeland Security-funded project involving a group of researchers at DOE's Sandia National Laboratories is working on determining the causes of false alarms in bioaerosol detectors that guard against bioterrorist strikes in large public spaces. Understandably, managers of such public venues are reluctant to install biodetection systems that could force unnecessary evacuations. The Enhanced Bioaerosol Detection System takes a second look at what is in the air and determines if there is sufficient bioaerosol present for concern. If successful, it could be paired with existing sensors for a more refined and commercially deployable detector system. DOE's Lawrence Livermore, Oak Ridge and Pacific Northwest national labs are also involved in the project.

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

Jefferson Lab's upgrade milestone

A proposed $310-million project that will double the energy of the electron beam at DOE's Jefferson Lab achieved a critical milestone on November 9. DOE approved the project's performance baseline, granting the approval known as Critical Decision 2 or CD-2. It is the third step in a five-step approval process to increase the energy of Jefferson Lab's accelerator, build a fourth experimental hall, and improve the existing experimental halls. The project will provide scientists a one-of-a-kind tool for peering into the nucleus, its protons and neutrons and studying the building blocks of matter, quarks.

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Active capping system for remediation of mixtures of sediment contaminants

Contaminated sediments in salt and fresh water pose a tricky environmental challenge, but a Savannah River National Laboratory team has developed an active capping technology that shows great promise for containing and stabilizing a wide range of contaminants under a broad range of environmental conditions. Traditional remediation methods, such as removal-and-treatment or capping with sand and gravel, have drawbacks. This new approach consists of an active cap that uses a combination of sequestering agents such as apatites, cross-linked biopolymers, and organoclays. It has high potential to treat complex mixtures of metals and organic contaminants by simultaneously reducing contaminant toxicity and bioavailability while creating a barrier that reduces the disturbance of subsurface sediments.

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Ames partners in forensic center of excellence

The Midwest Forensics Resource Center at DOE's Ames Laboratory is a partner in the newly formed Forensic Technology Center of Excellence that will be headquartered at the National Forensic Science Technology Center located at the Young-Rainey STAR center in Largo, Fla. The MFRC will receive approximately $500,000 as a partner in the Forensic Technology Center of Excellence to support two projects, in particular. One project targets the effective use of process-mapping tools for process improvement, while the other seeks to identify, recruit and retain scientific staff for crime laboratories.

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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).

A new kind of magnet for the LHC

Earlier this year members of Lawrence Berkeley National Laboratory's Accelerator and Fusion Research Division (AFRD) and their Brookhaven National Laboratory and Fermi National Accelerator Laboratory collaborators within DOE successfully tested a model superconducting magnet dubbed LRS01 at Brookhaven. The new magnet design is planned for the interaction regions of the Large Hadron Collider at CERN when the LHC is upgraded some years hence. Inside its long supporting structure, LRS01 uses niobium-tin "racetrack" windings instead of the niobium-titanium windings found in today's accelerator magnets (LRS stands for Long Racetrack Shell).

The support structure of the Long Racetrack Shell magnet.

At 3.6 meters LRS01 is the first niobium-tin model of its kind significantly longer than one meter in length, approaching the length of the real magnets that will be needed for the LHC upgrade. Superconducting magnets must be trained to reach their optimum field strengths through repeated deliberate quenchings, or losses of superconductivity.

During the test, the training of LRS01 started above 80 percent of the magnet's estimated maximum current density, and after only five quenchings the current had reached 91 percent of its target. This corresponds to a peak magnetic field of 11 tesla, surpassing the 10-tesla limitation of accelerator-type coils based on niobium-titanium technology.

These and other results are evidence, says Berkeley Lab's Paolo Ferracin, that "the LRS01 magnet is providing key information for the fabrication of long niobium-tin coils and the optimization of shell-based support structures." LRS01's racetrack coils were fabricated at Brookhaven and the supporting shell structure was designed and built by the 18-member Superconducting Magnet Group in Berkeley Lab's AFRD.

Ferracin, who led the AFRD effort, emphasizes "the successful partnership between the labs" and calls the tests "a major milestone in the development of superconducting magnets for the Large Hadron Collider's Interaction Regions, beyond the current design." Berkeley Lab, Brookhaven, and Fermilab are partners in the U.S. LHC Accelerator Research Program.

Submitted by DOE's Lawrence Berkeley National Laboratory

Couple explores polymers at nanoscience center

It's not hard to get Joe and Deanna Pickel talking about polymers. The married researchers bring different sets of experience to the creation of new, innovative materials at the Center for Nanophase Materials Sciences, or CNMS, at DOE's Oak Ridge National Laboratory. Joe Pickel has been working at the center since its inception three years ago. Deanna just joined the Laboratory this summer, arriving from Eastman Chemical Co. headquarters in Kingsport, Tenn., where she worked in specialty plastics.

Joe and Deanna Pickel

Both talk about how new tools and the growing demands of industries such as healthcare and bioenergy are spurring development of new "bio-inspired" polymers mimicking those found in nature. The Pickels are two of a number of experts at ORNL who create and test polymers that could one day offer new solutions for drug delivery, bioenergy and manufacturing.

"We're approaching the ability to create things more like nature does," Deanna Pickel says.

Adds Joe: "I think we're starting to realize that biological systems are the most complex systems out there and by learning how they work at a molecular level and copying them synthetically we could potentially make materials with really new and exciting properties."

For example, he says, nature uses photosynthesis to make energy. "How can we build systems synthetically that will do what nature is doing?"

While the CNMS is primarily oriented around basic research, Deanna Pickel's industrial background lends a new dimension to the polymer program's expertise. The aim is obviously not to develop commercial products for a return on investment, Deanna says, but Eastman's focus on teamwork and safety offer lessons for a national laboratory.

The Pickels are part of larger, multidisciplinary teams at CNMS, where the benefit of this budding teamwork was demonstrated earlier this year. Experts in a variety of synthesis capabilities came together to design the first polymer to be exposed to neutrons in the liquids reflectometer at the Lab's Spallation Neutron Source, located right next door.

Submitted by DOE's Oak Ridge National Laboratory