JLab's Stan Majewski

Page 2

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

Pacific Northwest team unveils largest virus proteome to date

Scientists at DOE's Pacific Northwest National Laboratory and Oregon Health & Science University have discovered a record number of proteins for one of the largest and most complex viruses, the highly infectious and stealthy human cytomegalovirus. Human cytomegalovirus, or HCMV, is a member of the herpesvirus family. HCMV is the leading viral cause of birth defects and is a serious threat to transplant and AIDS patients and others with a compromised immune system. The team discovered 71 proteins in mature HCMV, double the number previously identified. The two institutions identified the viral and host proteins that compose the HCMV virion. The identification of proteins in the HCMV virion may lead to the development of new treatments for these at-risk patients.

[Bill Cannon, 509/375-3732, cannon@pnl.gov]

SLAC, Fermilab achieve 'symmetry'

DOE's Stanford Linear Accelerator Center and Fermilab recently launched their new magazine, *symmetry,* to an audience of physicists, policy leaders and the general public. Exploring the diverse dimensions of particle physics, the magazine emphasizes connections with other sciences, policy and decision-making processes, and popular culture. replaces SLAC's *Beam Line* and Fermilab's *Fermi News,* and is produced by the combined staff of the two labs' communications offices. The magazine is available free through print or electronic subscription and all content is online.

[David Harris, 650/926-8580; harris@symmetrymagazine.org]

Device allows naked eye to see motion of 10 nanometers

A new class of very small handheld devices developed at DOE's Sandia National Laboratories can detect motion a thousand times more subtly than any tool known. "There was nothing in the [optics] literature to predict that this would happen," says Sandia researcher Dustin Carr of his group's device, which reflects a bright light from a very small moving object. The measuring device, still in the laboratory stage, is in effect a kind of accelerometer, about the size of the inexpensive microelectromechanical devices that open automobile air bags. Fabricated by the same processes that mass-produce silicon computer chips, the device has multiple possible uses.

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Research reactor boasts new instruments

Four new instruments installed at DOE's Oak Ridge National Laboratory's High Flux Isotope Reactor this year make the facility an even more attractive destination for researchers around the world. With the additions, the research reactor boasts a total of seven instruments that enable scientists to study magnetic materials, alloys, superconductors and biological materials. The new instruments consist of two diffractometers, one reflectometer and a Spallation Neutron Source test station to screen components that will be used at the $1.4 billion SNS, the Office of Science-funded neutron science facility scheduled for completion in 2006.

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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).

Focus on feathers

Biodegradable silverware, plates, bowls and cups are environmentally correct items that have been around for some time. But for two associate scientists at DOE's Ames Laboratory, the new focus for biodegradables is chicken feathers.

The poultry industry produces approximately 2 to 3 billion pounds of waste feathers annually. Some are ground up and fed to livestock, but a large portion are burned or buried. Now, work being performed by Perminus Mungara and Jay-lin Jane, is aimed at turning waste poultry feathers into biodegradable plastics.

Plates made from biodegradable plastic hold powder (left) made from chicken feathers. This powder is processed into pellets (center and right) for use by manufacturers.

The process involves removing the keratin protein from processed chicken feathers. Keratin protein is then mixed with soy protein and biodegradable polyesters and plasticizers and heated to make a resin that's tough and strong, but also soft and flexible. The resulting feather-based resin can be molded into products that are just as strong as synthetic plastics. In addition, Mungara and Jane, who are also Iowa State University food science and human nutrition researchers, say their resin has potential as a biodegradable mulching film. Current mulching films are petroleum-based and can take hundreds of years to decompose.

The environmentally friendly and cheaper way to dispose of chicken feathers intrigued George Kraus, director of the Ames Laboratory's Biorenewable Resources Consortium. The BRC's mission is to develop and utilize agriculturally derived alternatives to petrochemicals and other nonrenewable fossil resources. So the consortium awarded an $80,000 seed grant to help advance the research.

"The BRC likes to support projects that join teams of scientists to work on novel problems, which certainly was the case with the chicken feathers research," says Kraus, who sees the project's potential economic impact, specifically to Iowa's agricultural economy. The plastics industry currently uses 50 billion pounds of resin annually. Another 30 billion is used for packaging and related applications. "I think there's a lot of potential applications for this research that people haven't even thought of yet," adds Kraus.

Submitted by DOE's Ames Laboratory

Stan Majewski: Life-saving technology developer

Stan Majewski

A glance inside Stan Majewski's laboratory at DOE's Jefferson Lab (JLab) reveals that he's a very busy man. As Detector Group Leader, he's involved in more than a dozen different projects related to JLab detector technology. "There's very little spare time, because mostly I work. And even when I'm away from work, my brain is always working on related things," he says.

There are projects to spot cancers in various organs, including the breast, prostate and brain. Another project aims to image the ailing hearts of emergency room patients, and yet another is focused on imaging target organs in live research animals. But they all have one thing in common: they're based on JLab technology built to research the nucleus of the atom.

Born in Poland, Majewski always knew he'd follow in his father's footsteps to become a physicist, but his current work is a far cry from his intended career track. He says, "I was training to be a theoretician, but I got involved in a hypernuclear experiment at CERN. It was very clear that I was more interested in building the instrumentation than in analyzing the physics results." Majewski came to the U.S. in 1984 to work at Fermilab. He came to JLab in 1991 after a stint at the University of Florida. His work has earned several patent awards and is supported by numerous research grants.

Ever thinking about real-world detector technology applications, Majewski's newest project may one day provide a means of imaging high dose radiation treatments in cancer patients. "Doctors have no instruments now to track the location of the radiation that they've injected into the patient. In these procedures, you're really fighting for these patients' lives. And we want to help in that fight," Majewski explains.

In the meantime, he does try to spend some time away from his many projects. He says, "It's time for the leaves to be removed. And there are many other things that my wife keeps a list of that I should be doing around the house."

Submitted by DOE's Thomas Jefferson National Accelerator Facility