



SRNL's George Wicks

# Research Highlights . . .



Science and Technology Highlights from the DOE National Laboratories

## Z creates temperatures hotter than the interiors of stars

The **Z machine** at DOE's **Sandia National Laboratories** has produced plasmas that exceed temperatures of 2 billion degrees Kelvin—hotter than the interiors of stars. "At first, we were disbelieving," says project lead Chris Deeney. "We repeated the experiment many times to make sure we had a true result and not an 'Oops!'" The unexpectedly hot output, if its cause were understood and harnessed, could eventually mean that smaller, less costly nuclear fusion plants would produce the same amount of energy as larger plants. The very high radiation output also creates new experimental environments to help validate computer codes responsible for maintaining a reliable nuclear weapons stockpile safely and securely—Z's principal mission.

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

## SLAC, Stanford dedicate new particle astrophysics building

The **Fred Kavli Building**, in which scientists will explore unanswered questions in astrophysics and cosmology, was officially dedicated Friday, March 17 at DOE's **Stanford Linear Accelerator Center**. The state-of-the-art building, made possible through contributions from physicist Fred Kavli and the Kavli Foundation, is the centerpiece of the Kavli Institute for Particle Astrophysics and Cosmology. Activities in the building will champion the increasing convergence of particle physics—the science of the extremely small—and astrophysics—the science of the very large. The 25,000-square-foot building includes a high-tech auditorium, conference rooms, work space for 90 people and stunning views of Stanford University and the bay.

[Neil Calder, 650/926-8707, Neil.Calder@slac.stanford.edu]

## N.C. base tests SensorNet system

Fort Bragg, a military base in North Carolina, could be the model for the nation when it comes to protecting the public through a network that integrates a 911 dispatch system. **SensorNet**, a collection of systems for the detection, identification and assessment of chemical, biological, radiological and nuclear threats developed at DOE's **Oak Ridge National Laboratory**, has been installed as part of a project with the Fort Bragg Directorate of Emergency Services. One of the main objectives at Fort Bragg will be to assess and evaluate chemical, biological, radiological and nuclear sensors along with meteorological sensors, intrusion detectors and access control technologies.

[Ron Walli, 965/576-0226, wallira@ornl.gov]

## New coating protects steel and superalloys

Researchers at DOE's **Pacific Northwest National Laboratory** have developed an economical **ceramic-based coating** that protects steel and superalloys from damage, such as corrosion and oxidation, that commonly occurs in gas, liquid, steam and other hostile environments. The coating consists of a liquid pre-ceramic polymer mixed with aluminum metal-flake powders to form a slurry that can be applied to a metal object by dipping, painting or air-spraying. A low-temperature curing process that uses a commercial Ruthenium-based catalyst enables polymer cross-linking and dries the slurry to a green state. Heating in air, nitrogen or argon at 700 to 900 degrees Celsius creates an aluminum diffusion/reaction layer that becomes an integral part of the steel. The resulting surface won't scratch or chip.

[Judith Graybeal, 509-375-4351, Graybeal@pnl.gov]

**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/](http://www.ornl.gov/news/pulse/)) is distributed every two weeks. For more information, please contact Jeff Sherwood ([jeff.sherwood@hq.doe.gov](mailto:jeff.sherwood@hq.doe.gov), 202-586-5806).

## Stardust arrives for X-ray analysis

They came from outer space. And now, particles of comet dust that traveled from the far reaches of the solar system are traveling the U.S., including a stop at the **Advanced Photon Source** at **Argonne**.

The particles—so tiny that several fit across the width of a human hair—are the first pieces of a comet to have ever been plucked from outer space and returned to Earth. The collection was part of NASA's Stardust mission, which collected dust and carbon-based samples during its closest encounter with **Comet Wild 2**.

Four of those samples recently spent a few days at Argonne, and almost that entire time they were bombarded by the high-precision APS X-ray beams to help determine their chemical makeup.



**George Flynn of SUNY Plattsburgh displays a sample from the Stardust mission, analyzed at the Advanced Photon Source at Argonne.**

"Comets form far out in the solar system," explained researcher George Flynn of **State University of New York Plattsburgh** who is working on the project with researchers from the **University of Chicago**. "They have trapped original parts of the solar system in ice for four and a half billion years. We have material that we think is the original dust that the solar system formed from. And if we want to understand the Earth, we need to understand what it's made of."

Prior to landing at Argonne, the samples were analyzed at the **Advanced Light Source** at **Lawrence Berkeley National Laboratory** and the **National Synchrotron Light Source** at **Brookhaven National Laboratory**. Using the APS, the samples can be studied at much higher energies allowing researchers to detect heavier elements and map the samples at smaller scales.

After the particles are extracted from the aerogel, some will return to Argonne, where researchers will examine individual minerals in the particles at the submicron scale.

Once all research is finished, the samples will be housed at the Johnson Space Center and will remain available for researchers.

*Submitted by DOE's **Argonne National Laboratory***

## SRNL RESEARCHER LAUDED FOR MULTIPLE ACHIEVEMENTS

The Citizens for Nuclear Technology Awareness, a South Carolina-Georgia based group that provides information about the benefits and risks of nuclear technologies, has honored Dr. George Wicks, of DOE's **Savannah River National Laboratory**, for his 30 years of contributions in multiple fields related to materials science, spanning areas that include waste management, environmental remediation, sensor development, material corrosion, hydrogen storage, weapons dismantlement, reactor operations, and hybrid microwave technology. CNTA presented Dr. Wicks their Fred C. Davison Distinguished Scientist of the Year Award.



**George Wicks**

He is best known for his research and leadership in developing and understanding processes, systems, and procedures for immobilizing and disposing of potentially hazardous nuclear waste. Among his early contributions was the development of the first slurry feeding system for vitrification of the Savannah River Site's high-level radioactive waste, an innovation that saved many millions of dollars.

Internationally, he serves on advisory panels for the CEA of France and the European Commission, and is well-known for his work in programs involving the burial of glass samples for testing and analysis to increase understanding of the performance and durability of the glasses used for disposal of nuclear waste. Most recently, he developed and coordinated the first major international in-situ testing program conducted in the U.S. involving burial of simulated nuclear waste systems and participation of seven countries.

In recent years, he has concentrated much of his effort on "dual-use" technologies, which take SRNL's areas of expertise, initially developed over decades of support for the Savannah River Site, and apply them in a variety of new fields. Of particular interest to him is his work to foster collaborations between SRNL and the medical field to apply SRNL technologies to medical uses.

Dr. Wicks has authored or co-authored more than 150 publications, including four books and eight chapters in text or reference books including two encyclopedias, chaired or co-chaired eight international symposia or workshops, and earned 14 patents.

*Submitted by DOE's **Savannah River National Laboratory***