Sandi's Mark Tucker may have answer to anthrax, page 2 .

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

A tale of two poisons

Mystery readers know that arsenic and selenium are two elements that are considered poisonous to the human body in high dosages. Using animal studies, scientists are finding out that there may be a benevolent side to these elements when taken together in specified dose rates. Researchers at the Synchrotron Division of the DOE's Stanford Linear Accelerator Center say that these results can have important human implications in parts of the world where drinking water is contaminated by arsenic.

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Burst bubbles shed light on neutron star

Evidence supporting a theory about neutron stars was reported by DOE's Lawrence Livermore National Lab. Neutron stars have the mass of an ordinary star compressed into a spinning ball about 12 miles across. Livermore astrophysicist Richard Klein and colleagues from the University of California theorized that a neutron star accompanied by a companion star can release energy from bubbles of hot X-rays bursting at the neutron star's surface. They then confirmed key aspects of this "photon bubble" theory by using a NASA satellite to observe the Centaurus X-3 neutron star about 30,000 light-years distant.

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Miniature telesensor has big possibilities

A tiny temperature telesensor developed at DOE's Oak Ridge National Laboratory could have a huge impact as a reliable, inexpensive wireless monitoring device. The sensor, which measures 3-by-3 millimeters, could be particularly useful in industrial, home and medical settings. The device uses wireless spread-spectrum technology, commonly used in advanced 900-megahertz cordless telephones. While wireless sensors offer major benefits, they must be small, inexpensive and rugged to warrant wide-scale adoption. The ORNL telesensor meets those prerequisites not only for medical applications, but for a variety of other uses.

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Pint-sized heat pumps

Researchers at DOE's Pacific Northwest National Laboratory are developing a heat-actuated heat pump small enough to fit within the walls or floor of a home to provide efficient space heating and cooling. Increased efficiency comes from the fabrication of tiny channels within the heat exchanger, where much of the heat pump's work takes place. Smaller channels result in more effective heat transfer due to the intimate contact between the refrigerant and heat exchanger surfaces. The heat pump uses heat, rather than electricity, to provide cooling. Researchers have developed miniaturized versions of the components for a prototype heat pump and expect to have a working system in about two years.

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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).

Chicago Computation Institute takes form

A new computation institute to probe the sciences, humanities and arts has been established by DOE's Argonne National Laboratory and the University of Chicago, two leading research organizations in the Midwest.

Called the Computation Institute, or "CI," its goal is to focus on large-scale projects requiring teamwork between computational sciences and other disciplines.

"Plans call for activity across the physical, biological, and social sciences, as well as humanities and the arts," said Frank Fradin, Argonne's interim director. "Further plans involve analyzing the economic, social, and cultural impact of information technology." Of special interest to the institute, Fradin added, is research requiring computational simulation, modeling, or massive data analysis.

Robert Zimmer, senior associate provost at the university, said, "The Computation Institute will further the leadership position of the University of Chicago and Argonne in research and education in this important and rapidly developing area. We foresee not only exciting applications to science and technology, but the CI will help connect the University's and Argonne's computational work to corporate and public interests."

Ridgway Scott, professor of computer science and mathematics at the University of Chicago, and Rick Stevens, director of mathematics and computer science at Argonne National Laboratory, are the new institute's co-directors.

Other appointments to the institute from among university and Argonne researchers will be made over the next six months.

Part of Argonne's computer science research includes developing a suite of advanced visualization tools that can address the large amounts of data generated by scientific simulations, make use of parallel and distributed rendering, and be integrated into collaborative environments.

Also part of Argonne's computational research is a program in distributed systems, motivated by the tremendous potential of distributed supercomputing systems that couple parallel computers, high-performance workstations, large databases, virtual reality devices, and other resources connected by local or wide area networks. Argonne's mission is the make such systems both usable and broadly accessible for computational science and engineering.

Argonne computer scientists are also working to develop new technologies essential if we are to dramatically increase the productivity of scientists developing applications for parallel supercomputers. The research effort includes integration of parallel programming tools; reuse of parallel program components; development of scientific computing toolkits and portable libraries, and exploration of requirements of future parallel computers.

The Computational Institute is the latest in a broadening series of scientific interactions between the laboratory and the university, and the first joint institutional-level structure. For more information, contact Dave Jacque, Argonne Office of Public Affairs, 630/252-5582, or info@anl.gov.

Submitted by DOE's Argonne National Laboratory

Sandia's foam neutralizes viral, bacterial, nerve agents in minutes

Maher Tadros and Mark Tucker may soon have an option for emergency personnel debating how to respond to a terrorist release of chemical or biological warfare agents. The two researchers from DOE's Sandia National Laboratories have developed a foam that is not harmful to people and begins neutralizing both chemical and biological agents in minutes.

The dilemma faced by response teams is that if they enter a chem/bio scene without knowing what agents are present, they could become victims. If they wait to evaluate, however, more people might die—or worse, an agent could disperse and cause widespread casualties.

"Whatever you do, it's best to act very quickly," says Tadros. "This foam can start neutralizing an agent or combinations of agents right away, even before you know what you're dealing with."

In laboratory tests the foam destroyed simulants of VX, mustard, and soman chemical agents, and killed a simulant of anthrax—the toughest known biological agent. "It has performed superbly for all the agents we have tested it against," Tadros says.

And, adds Tucker, "If you can kill spores, you can kill germinating bacteria and you can deactivate viruses. Spores are the most difficult."

Tadros came to Sandia four years ago after a 21-year career with Lockheed Martin, where he worked mostly in aerospace programs, once earning an Inventor of the Year award. A Distinguished Member of Technical Staff, he was educated at Clarkson and the University of Southern California, earning a PhD in chemistry at the latter.

Tucker, who received a bachelor's degree in engineering at Purdue in 1980, has been at Sandia since 1983. He spent most of the current decade working in environmental remediation projects—particularly bio-remediation—and earned a PhD in environmental engineering from the University of New Mexico in December 1997.

Submitted by DOE's Sandia National Laboratories