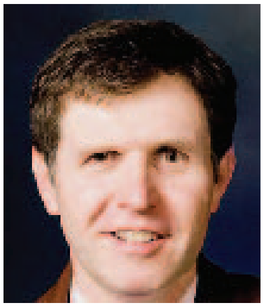

LANL's Malcolm Andrews

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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 237 June 18, 2007

Research Highlights . . .

Improved radiation detectors

Scientists at Brookhaven Lab, funded by DOE's National Nuclear Security Administration, have devised ways to improve the performance of radiation detectors, such as those used by law enforcement agencies. The improved sensors work at room temperature, making them more practical and cost-effective than existing detectors with similar performance, which must be kept very cold using expensive liquid nitrogen. They will also be able to detect more minute quantities of radiation, detect radioactive materials more quickly or from greater distances, better identify the radiation source, and distinguish illicit sources, such as "dirty bombs," from common, naturally occurring radioactive materials.

[Karen McNulty Walsh, 631/344-8350, kmcnulty@bnl.gov]

Launch of Fermilab neutrino experiment

SciBooNE, a small neutrino experiment at DOE's Fermi National Accelerator Laboratory, began taking data in early June, nearly two weeks ahead of schedule. Even without all pieces of the particle detector in place, the experiment already recorded its first neutrino on May 30. The data gathered from this experiment will help scientists understand more about how neutrinos react with matter and will be crucial to the analysis of data gathered by large-scale neutrino experiments, including the T2K experiment in Japan. The SciBooNE collaboration includes about 70 scientists from Italy, Japan, Spain, the United Kingdom and the United States.

[Rhianna Wisniewski, 630/840-6733, rhianna@fnal.gov]

Screening crops for ethanol production

Analytical chemist Emily Smith at DOE's Ames Laboratory is using Raman imaging to help identify plants stocks particularly suited for production of cellulosic ethanol. The technique allows comparison of chemical composition with cellular structure within plant cells, allowing researchers to identify plant stocks low in lignin, a compound which interferes with enzymatic conversion of polysaccharides to ethanol. Because the technique requires only very small samples, Smith can study plant growth over time, without damaging the plant, to see if lignin content changes during the growing cycle. The technique could ultimately be used in the field to check crop conditions for optimal harvest, similar to the way vintners check the sugar content of their grapes for peak wine flavor.

[Kerry Gibson, 515/294-1405, kgibson@ameslab.gov]

Flexible electronics for sensors, artificial muscles

Flexible electronic structures with the potential to bend, expand and manipulate electronic devices are being developed by researchers at DOE's Argonne National Laboratory and the University of Illinois at Urbana-Champaign. These flexible structures could find useful applications as electronic devices that can be integrated into artificial muscles or biological tissues. The flexible electronics are also important for energy technology as flexible and accurate sensors for hydrogen. The concept focuses on forming single-crystalline semiconductor nanoribbons in stretchable geometrical configurations with emphasis on the materials and surface chemistries used in their fabrication and the mechanics of their response to applied strains.

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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).

Data-intensive computing laying foundation for biological breakthrough

Biological breakthroughs critical to solving society's most challenging problems require new and innovative tools and a "different way" to analyze the enormous amounts of data being generated.

Finding a different way is the goal of the Data-Intensive Computing for Complex Biological Systems (Biopilot) project — a joint research effort between the Pacific Northwest National Laboratory and Oak Ridge National Laboratory that is funded by the DOE's Office of Advanced Scientific Computing Research. The two national laboratories, both of which are world leaders in computing and computational sciences, are teaming to support areas of biological research in urgent need of data-intensive computing capabilities.

Recent advances in high-throughput technologies, including mass spectrometry and DNA sequencing, as well as large-scale simulations made possible by an exponential increase in computer power, have generated an explosion of data.

"Conventional analysis software isn't able to efficiently deal with such massive data set, however, so we need to do things in a different way," said Project Lead T.P. Straatsma, a senior scientist and Laboratory Fellow at PNNL.

The multiyear, multimillion-dollar effort is aimed at developing innovative and robust software solutions to address a number of key, large-scale, data-intensive computational problems in biology, and to make these large-scale computational capabilities available to the biology community.

"To really understand biological systems, with its complex networks and pathways, the different components of the biology must be integrated to gain a coherent understanding of the system," Straatsma said. "The more different types of data you can integrate, the deeper are the insights into the biology of the system being studied. Our goal is to create an integrated suite of highly flexible, very adaptable computational tools for large-scale data sets that will be used to address specific challenges facing DOE and our society."

Researchers in the Biopilot project are focusing on three areas: Peptide protein identification and quantification algorithms for mass-spectrometry proteomics, massively parallel solutions for high throughput comparative genomics, and large-scale integration of molecular and network modeling and simulation with bioinformatics approaches.

Submitted by DOE's Pacific Northwest National Laboratory

Los Alamos researcher mixes it up with the best of them


Malcolm Andrews

Los Alamos National Laboratory scientist Malcolm Andrews is the kind of guy who lives for turbulence. As a mechanical engineer and mathematician, Andrews is one of the world's leading experts on Rayleigh-Taylor mixing and turbulent fluid flow processes. These processes are critical scientific aspects to the quality of predictions used in the nation's nuclear weapons stockpile reliability assessment programs and to national security as a whole.

Andrew's expertise was recognized in 2006 when he was named one of eight recipients of the Department of Energy's E.O. Lawrence Award for pioneering contributions in the area of fluid instabilities and turbulent mixing, with expertise spanning the realms of theory, numerical simulation, and experiment. The award honors exceptional contributions by mid-career scientists involved in research and development that support DOE's mission to advance national, economic and energy security.

Born in the United Kingdom, Andrews was educated at Oxford and Imperial College in London. After receiving his doctoral degree, Andrews headed for Princeton University's Department of Mechanical and Aerospace Engineering. There, he lectured in Mechanical Engineering while serving as a member of professional research staff at the Princeton University Engine Laboratory. Andrews moved to Texas A&M University in 1991, where he rose to the rank of Full Professor. Having worked with Los Alamos for almost eighteen years, Andrews joined the Laboratory officially in 2005 as a Los Alamos National Security Fellow.

At Los Alamos, Andrews as helped develop a world-class capability for buoyancy-driven mixing research and is today one of the leading individuals to bridge theory, computation and experiment in the field.

"Being at Los Alamos," says Andrews, "has given me an opportunity to work among world-class researchers on projects of real consequence to the nation's security. As a turbulence scientist, I enjoy mixing it up, so to speak, with the theorists, modelers, and experimentalists."

Submitted by DOE's Los Alamos National Laboratory