ANL's Doug Sisterson—"not just a nerdy scientist", page 2.

DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

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Research Highlights . . .

IR devices reduces assembly-line trauma

A rapid infrared heating device developed at DOE's Oak Ridge National Laboratory for fabricating steering wheel assemblies is reducing repetitive stress injuries in one type of automotive manufacturing. The "polymer boot heater" eases the installation of the protective boot, or polymer bellows, which is used in automotive rack-and-pinion steering assemblies. The heater expands the leading part of the polymer boot so it can be easily mounted onto a metal housing. According to one General Motors official, "The polymer boot heater has virtually eliminated the force needed to install the boot. This reduction in force has resulted in the elimination of our ergonomics problem."

[Carolyn Krause, 423/574-7183, krausech@ornl.gov]

Most distant radio galaxy identified

An astronomer from DOE's Lawrence Livermore National Laboratory reported discovery of the most distant known radio galaxy. The galaxy, which may include a super-massive black hole, is located nearly 11 billion light years from Earth in the southern constellation Hydra. Its discovery was made possible by several newly available tools including deep radio surveys, large optical telescopes and infrared detectors. Livermore's Wil van Breugel announced the finding to the American Astronomical Society representing a team from University of California campuses at Berkeley and Davis, Leiden University and the National Radio Astronomy Observatory in New Mexico.

[Steve Wampler, 925/423-3107, wampler1@llnl.gov]

Natural gas vans help clear the air

A first-of-its-kind test of natural gas vans may yield data that will help confirm the performance and benefits of alternative fuel vehicles. DOE's National Renewable Energy Laboratory (NREL) has agreed to collect one year's data on fueling, maintenance, emissions and overall performance of 10 natural gas vans operated by SuperShuttle in Denver, Colo. The performance of the alternative fuel vans will be compared with that of the gasoline-only vans already in their fleet. NREL's cooperative research and development agreement with the Gas Research Institute aims to demonstrate and promote alternative transportation technology that can improve air quality and enhance domestic energy security.

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One-Ångstrom Microscope achieves resolution milestone

Christian Kisielowski, Michael O'Keefe, and their colleagues at the DOE's Lawrence Berkeley National Laboratory have used the One-Ångstrom Microscope at the National Center for Electron Microscopy to make unprecedented images of carbon atoms in a diamond lattice, only 0.89 angstrom apart. And in a first for electron microscopy, the OÅM has resolved nitrogen atoms near massive gallium atoms in gallium nitride, in columns spaced only 1.13 angstroms apart. Says Kiesielowski, "Images of light elements such as carbon, nitrogen, and oxygen in solids at atomic resolution—achieved by a technique that can be a routine tool—is a very big step forward."

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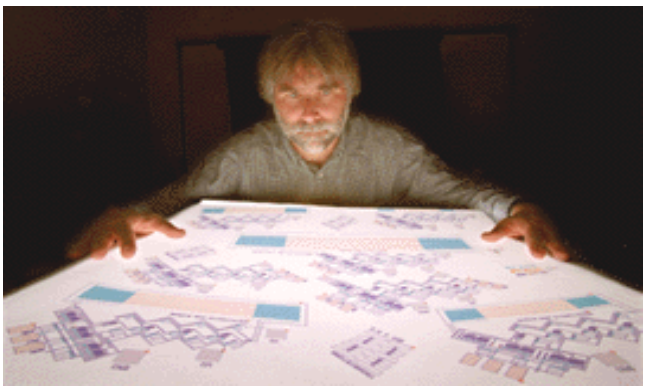
DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***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).

Sandia's tiny acoustic wave sensors part of 'chem lab on a chip'

Minute acoustic wave chemical sensors being developed at DOE's Sandia National Laboratories will in the next two years be part of a hand-held chemical detection system—commonly called "chem lab on a chip—and other integrated microsensor systems.

The microsensors, each about the size of a grain of rice, are similar to a "canary in a mine." Like the canary, the sensors will be able to detect the presence of chemicals in the environment. But unlike the bird, they won't sicken or die when exposed to the chemicals: They will simply alert people to the potential hazard.

Chem lab on a chip, formally called "Chemlab," is a Sandia initiative to build a hand-held "chemistry laboratory" the size of a palm-top computer. The acoustic wave sensor is one piece of equipment in that laboratory.



Steve Casalnuovo shows a large computer printout of the design of an acoustic wave sensor

"What's important here is that the chemical sensing transducer and microelectronics are integrated onto a single substrate," says Steve Casalnuovo, who for the past three years has led a team of engineers and scientists developing the integrated sensor. "Monolithic integration has a lot of advantages but the principal one for us is the small size of the resulting devices."

An array of as many as four or five miniature sensors—each about two millimeters by 0.5 millimeters, by 0.5 millimeters and sensitive to different chemicals—could be built on a chip the size of a shirt button. Because of their size, they may eventually be used as mobile chemical detecting units carried by robotic vehicles to chemical spills, or worn by troops on a battlefield.

Casalnuovo says team members are investigating new types of acoustic wave devices that will provide more sensitive chemical detection, and foresee the time when they could sound a warning that a certain chemical is in the vicinity.

Submitted by DOE's Sandia National Laboratory

Problem solving, science and fun

"I'm a kid that never grew up," says Doug Sisterson, a meteorologist at DOE's Argonne National Laboratory.

And it's this trait that helps Sisterson communicate with students when he visits schools to teach science.

Sisterson manages the Southern Great Plains Cloud and Radiation Testbed Site for DOE's Atmospheric Radiation Measurement program and is operations coordinator for the Atmospheric Boundary Layer Experiment facility operated by Argonne. As if that weren't enough to keep him busy, he also visits about 20 schools each year, kindergarten through high school.

In today's world, education no longer means memorizing and regurgitating dates, facts and figures. Students need to learn problem solving and critical thinking to deal with the vast amounts of information available to them, especially through the Internet.

Sisterson tries to teach students skills to make them think like a scientist—make them hungry to learn, to ask questions, to think differently. "Giving them the tools for problem solving and critical thinking, that's fun."

A typical Sisterson class starts out with him cracking a horse whip, much to the surprise of the students. He then asks them, "What makes that sound?"

"The kids are fascinated," Sisterson says. They begin tossing out ideas. Finally, Sisterson tells them the sound is created because the end of the whip is moving faster than the speed of sound. In essence, it's a mini sonic boom. This helps him launch into a discussion about the science of thunder and lightning.

Sharing his love of science with students helps keep his job fresh, Sisterson says. He enjoys finding ways to communicate science to students in language they'll understand. "It's a little bit science and little bit entertainment," he says. "I try to make them see I'm not just a nerdy scientist."

Submitted by DOE's Argonne National Laboratory