



Lynne Parker
trains robot
"kids."

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Research Highlights . . .

Dress rehearsal for nuclear weapons detection

A nuclear detection device created by researchers at [DOE's Pacific Northwest National Laboratory](#) recently staged its international debut in Freiburg, Germany, where it proved it could measure short-lived isotopes produced by underground nuclear testing. ARSA, the Automated Radioxenon Sampler/Analyzer, was developed at Pacific Northwest to collect, purify and measure the fission product xenon, a telltale sign of an underground nuclear detonation. In Freiburg, ARSA detected a short-lived radioactive isotope called xenon-135, produced by European nuclear power plants and also emitted during underground nuclear tests. When completely developed in early 2001, ARSA will be licensed to sell to countries attempting to monitor weapons testing.

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Fuel cell breakthrough . . .

Low- or zero-emission high-mileage automobiles powered by fuel cells could be just around the curve with the development of a carbon composite bipolar plate developed at [DOE's Oak Ridge National Laboratory](#). A bipolar plate is a key component of a proton exchange membrane fuel cell, the technology of choice in the automobile industry because of its low-temperature operation and rapid startup. ORNL's plate overcomes significant barriers in the areas of weight, cost, corrosion resistance, conductivity and manufacturing. A fuel cell uses hydrogen to produce electricity with water being the only emission.

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Methane hydrate technology could tap fuel source

Researchers at [DOE's National Energy Technology Laboratory](#) have invented a novel methane hydrate conversion technology that was recently presented at the 2000 spring national meeting of the AIChE. The process involves the photocatalytic conversion of the methane contained within the hydrate molecule to produce methanol and hydrogen. Applications of the technology are for conversion of hydrates in situ, which could provide access to a vast hydrocarbon fuel source, or to remove hydrate plugs in pipelines and wells. The research is reviewed in the April 2000 issue of *Hart Publications' Gas-to-Liquids News*.

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Technology could ease prostate treatment

Millions of older men who suffer from urinary obstruction and associated pain caused by an enlarged prostate gland could benefit from [new treatment technology](#) developed by a senior scientist-physician at [DOE's Sandia National Laboratories](#). Drugs, surgery, and other treatments are effective to varying degrees in controlling and treating the condition known as benign prostatic hyperplasia, but the method developed by Sandia's Dr. Lawrence Larsen should have several advantages over existing ones—it could be done on an outpatient basis, a single treatment should have long-lasting benefits, side effects should be almost nil from the minimally invasive technique, and treatment costs could be lowered.

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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).

A helping hand for Midwest crime labs

In the Midwest, as in most of the United States, crime laboratories struggle with growing caseloads, personnel shortages and a chronic space crunch.

The criminalists who work in these labs have their hands full analyzing evidence as quickly as possible, leaving them no time to develop new equipment and techniques that could enhance the speed and accuracy of their investigations.

That's where [DOE's Ames Laboratory](#) and Iowa State University's Institute for Physical Research and Technology hope to come in.

The two organizations are collaborating on a proposal to establish a regional forensics support and research facility at ISU.

The proposed Midwest Forensics Resource Center would draw on the expertise of faculty and staff members at Ames Laboratory and IPRT, a network of 11 multidisciplinary research and technology-development centers on the Iowa State campus. Ames Laboratory is part of the IPRT network.

The forensics proposal has received \$44,000 in seed funding from IPRT to begin developing the partnerships needed to launch the facility, and organizers are working to identify funding sources for the center. David Baldwin, director of Ames Laboratory's Environmental and Protection Sciences Program and a participant in the proposal, said the forensics center would serve three main purposes. First, it would be an arena for the development of new analytical techniques and tools for forensic investigators as well as providing an outlet for technologies developed at Ames Laboratory and other DOE laboratories.

Second, Iowa State students could work at the facility to gain valuable training prior to graduation, making them more attractive as potential employees. Finally, the center would serve as a regional training facility and resource for local and federal agencies.

The regional aspect of the forensics center will be crucial to its success, Baldwin said.

"We don't want to be a burden to any of the states in the Midwest, especially Iowa," he said. "We don't want to be a drain on resources that might otherwise go to the crime laboratories. The center needs to be a regional laboratory that's funded nationally."

Scientists at Ames Lab and IPRT have already begun laying some of the groundwork for the center through forensics research projects for the FBI, DOE and the Iowa Division of Criminal Investigations.

To find out how the proposed center could best serve crime laboratories, Baldwin and the other organizers have invited forensic investigators from eight Midwestern states and four federal agencies to a meeting at Ames Laboratory on May 26.

The crime-lab representatives will provide input on the types of research, services and training that would be most helpful to their facilities, as well as brainstorming about funding sources for the proposed center.

One of the forensic investigators who plans to attend is Carl Bessman, a criminalist with the [Iowa Division of Criminal Investigations](#). Bessman said the research assistance his crime lab has already received from IPRT and Ames Lab has proven valuable. "Ultimately, applying good science to the casework is our most important responsibility," he said.

Submitted by [DOE's Ames Laboratory](#)

LYNNE PARKER TRAINS HER ROBOT "CHILDREN"



Robots for years have been performing tasks they've been "hard wired" to do. The ability for them to respond to their surroundings, learn and make decisions for themselves remains far out in the future. Lynne Parker, a researcher at [DOE's Oak Ridge National Laboratory](#), is

bringing that future closer to the present.

Parker is developing a computer program called Alliance that is aimed at coordinating the efforts of several robots to do one task. Her "children," autonomously operated vehicles named Ada, Alexandra, Edith and Grace, are sometimes unruly as they learn not to crash into furniture or each other.

"It's always something that's fascinated me," she says, "The whole idea of how you can make machines do what seem to us to be very smart things."

Parker is a pioneer in efforts to develop software that applies different robots with different capabilities toward one task. Doing so requires programs of great complexity. However, researchers now believe that a suite of robots with different "talents" can perform tasks more effectively than one machine.

This type of robotic teamwork could serve DOE very well in cleaning up hazardous waste sites. The multi-robot approach also interests NASA's planners for its interplanetary unmanned missions. Complex missions, Parker says, can be made less complex by spreading the work among several robots.

Through information from on-board sensors and from other robots, the Alliance software helps each robot "learn" and "make decisions."

For her groundbreaking work in robotics, Parker was recently named a Presidential Early Career Award in Science and Technology winner, one of seven from DOE.

Robert Arkin, of the Georgia Institute of Technology College of Computing, has cited her work in his textbook, "Behavior-Based Robotics."

"She's off to a great start in her career," Arkin says.

Submitted by [DOE's Oak Ridge National Laboratory](#)