



Jefferson Lab's Celia Whitlatch



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Research Highlights . . .

Record re-establishes U.S. neutron leadership

The [Spallation Neutron Source](#), the DOE's \$1.4 billion research facility at Oak Ridge National Laboratory, has established a record as the world's most powerful accelerator-based source of neutrons for scientific research. The SNS surpassed the previous record of 160 kilowatts for beam power while operating at 183 kilowatts. As the SNS ramps up toward an eventual 1.4 megawatts of power, the beams will produce up to 10 times more neutrons than any other pulsed neutron source. The field of neutron scattering science is one example of a technological edge lost and regained: Neutron scattering was developed in Oak Ridge in the wake of the Manhattan Project. In the following decades, larger and more powerful neutron sources were built in Europe and Asia. With the SNS, researchers have a U.S.-based resource.

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Well-finding tech locates wells, methane leaks

DOE's [National Energy Technology Laboratory](#) used its SEQUIRE well-finding technology, which recently won an R&D 100 award, to survey Naval Petroleum Reserve No. 3, an oilfield near Casper, Wyoming. Magnetic and methane data were acquired from a helicopter using boom-mounted magnetometers and a sensitive methane and light hydrocarbon detector. NETL modified the flight plan and instrument payload used previously for the 2005 SEQUIRE well-finding survey at nearby Salt Creek Oilfield to improve the detection of wells with weak magnetic signatures. NETL will process the data and provide RMOTC with GIS maps depicting anomalous magnetic features and methane plumes as overlays.

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NREL to evaluate performance of UPS hybrid-electric vans

Researchers with DOE's [National Renewable Energy Laboratory \(NREL\)](#) are collecting and analyzing maintenance, fuel economy and other vehicle performance data from 50 UPS hybrid diesel step delivery vans powered by an electric hybrid propulsion system. Funded by DOE's Advanced Vehicle Testing Activity, NREL is performing a 12-month evaluation of some of these 50 hybrid vans at UPS locations in Dallas and Phoenix. The diesel hybrid delivery vans are expected to improve UPS fleet fuel economy and dramatically decrease vehicle emissions while maintaining the same reliability and overall performance as conventional vehicles. NREL will publish its findings in fall 2008.

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Successful Phoenix pulsed-power shot at BEEF

On August 4, workers from DOE's [Lawrence Livermore National Laboratory](#) at the Big Explosive Experimental Facility at NTS site executed helical hydrodynamic test one, or HHT-1. Part of the Phoenix Project, the shot uses a world-class, pulsed-power system to drive a series of Livermore's isentropic compression experiments that improve knowledge of material properties at extreme pressures. A hydrodynamic test, or hydrotest, is a non-nuclear experiment that shows how materials react to high-explosives detonation, causing solids to flow like fluids. HHT-1 employed an advanced helical generator system. Program manager Scott McAllister said the test data was successfully recorded and the helical generator performed exactly as predicted.

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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).

Caught in the "Net"

Ames material negatively refracts visible light

This time Ames Laboratory physicist Costas Soukoulis has caught a really big "fish." Collaborating with researchers Stefan Linden and Martin Wegener at the University of Karlsruhe in Germany, he has developed a material with a negative refractive index for visible light. With its unique "fishnet" design, the silver-based, mesh-like material moves the rapidly evolving field of metamaterials into the visible region of the electromagnetic spectrum, a significant step forward from existing metamaterials that operate in the microwave or far infrared—but still invisible—regions of the spectrum.



Metamaterial multilayer fishnet structure: Multilayer processing is used to fabricate metamaterials in a net-like structure that produces negative refraction in several directions.

Metamaterials, also known as left-handed materials, are exotic, artificially created materials that refract light, or electromagnetic radiation, at a negative angle, opening a wide range of potential applications. The challenge that Soukoulis and other scientists who work with metamaterials face is to fabricate them so that they refract light at ever-smaller wavelengths. The fishnet design, developed by Soukoulis and produced by nanostructure researchers Linden and Wegener has openings roughly 100 nanometers wide.

"We have fabricated for the first time a negative-index metamaterial with a refractive index of -0.6 at the red end of the visible spectrum, or a wavelength of 780 nanometers," says Soukoulis. "This is the smallest wavelength obtained so far."

While the silver used in the fishnet material is more resistant to energy loss when subjected to electromagnetic radiation than gold used in earlier materials, energy loss is a major limiting factor. The difficulties in manufacturing materials at such a small scale also limit the attempts to harness light at ever-smaller wavelengths.

"For applications to come within reach, several goals need to be achieved," Soukoulis notes. "We need to reduce losses by using crystalline metals and/or by introducing optically amplifying materials, develop three-dimensional rather than planar structures, create isotropic designs, and find ways of mass-producing large-area structures."

Submitted by DOE's Ames Laboratory

JEFFERSON LAB ENGINEER AMONG NATION'S BEST

Celia Whitlatch, a mechanical engineer at the Department of Energy's Jefferson Lab, has been named one of the "best and brightest" engineers in the country by HENAAC.

HENAAC, formerly known as the Hispanic Engineer National Achievement Awards Conference, will honor Whitlatch and 24 other winners on Oct. 12 in San Diego at the 19th Annual HENAAC Conference.

"I love my work," says Whitlatch, "I've done projects from one end of the Jefferson Lab campus to the other." Whitlatch is a 12-year Jefferson Lab veteran and one of two HENAAC honorees in the civil engineering category.

Originally from Chicago, Whitlatch's family moved to Arizona when she was 10. She started her college career at Arizona State University on a pre-med scholarship, but she soon changed her major to mechanical engineering.

"At first I wasn't even sure what it was all about," she recalled, "but I grew to really love it."

Whitlatch is now designing both the process cooling and air conditioning for Jefferson Lab's accelerator recirculation arcs as the Lab prepares to double the energy of its electron beam to 12 GeV. This technically difficult design will increase the capacity of existing process-cooling systems with a very limited space, budget and timeframe.

"I enjoy designing, do a lot of my own designs and manage the implementation of those designs throughout the construction process."

She is also reviewing the mechanical portions of the architect engineers' work on the Lab's proposed new experimental hall, Hall D, and the new extension of the Lab's Central Helium Liquefier.

Before coming to Jefferson Lab, Whitlatch worked on helicopters at McDonnell-Douglas and on 737s and 757s for Boeing. She's also worked at the Palo Verde Nuclear Generating Station in Wintersburg, Ariz. Her first job in the Newport News area was with Navy contractor John J. Mullen Associates Inc., doing pipe design on nuclear submarines.



Celia Whitlatch will receive a HENAAC award in civil engineering in October 2007.

Submitted by DOE's Jefferson Lab