

**LAWRENCE LIVERMORE**

# REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Feb. 2-Feb. 9, 2009.

## LLNL ups the ante in supercomputers with Sequoia



**Dawn, a BlueGene/P system, is being installed in the Terascale Simulation Facility.**

With a speed of 20 petaflops, Sequoia, to be installed at LLNL, is expected to be the most powerful supercomputer in the world and will be approximately more than 10 times faster than today's most powerful system.

To put this into perspective, if each of the 6.7 billion people on earth had a hand calculator and worked together on a calculation 24 hours per day, 365 days a year, it would take 320 years to do what Sequoia will do in one hour.

The National Nuclear Security Administration (NNSA) last week announced a contract with IBM to bring world-leading supercomputing systems to the Laboratory to help continue to ensure the safety and reliability of the nation's aging nuclear deterrent.

IBM will deliver two systems: Sequoia, a 20-petaflop (quadrillion floating operations per second) system based on future BlueGene technology, to be delivered starting in 2011 and deployed in 2012; and an initial delivery system called Dawn, a 500-teraflop (trillion floating operations per second) BlueGene/P

system, scheduled for delivery in the first quarter of 2009. Dawn will lay the applications foundation for multi-petaflops computing on Sequoia.

To read more, see the *New York Times* story at <http://bits.blogs.nytimes.com/2009/02/03/ibms-sequoia-supercomputer-to-shatter-speed-records/?scp=2&sq=Lawrence%20Livermore&st=cse>

### **Livermore scientists emerge as green gurus**



### **LLNL researchers Julie Lundquist and Ben Santer**

The *San Francisco Chronicle* recently featured an article highlighting 10 Bay Area people who are the brightest lights in the climate change and energy fields. Among the group are Lawrence Livermore's Ben Santer and Julie Lundquist.

Santer has studied the nature and causes of climate change for more than 20 years. He has tried to "untangle the human effects on climate from the background of the many natural influences on climate," such as the sun's radiation, atmospheric volcanic dust and El Ninos and La Ninas. He is the recipient of a MacArthur "genius" grant, and an author of an important government report scheduled for release this year, "Global Climate Change Impacts in the United States."

Atmospheric scientist Lundquist is investigating how wind speed changes with height and how that affects turbulence. Wind turbines thrive on strong, steady winds and minimal turbulence. Some of Lundquist's research uses the Lab's supercomputers to enhance high-resolution forecasting models to increase the world's use of wind energy and reduce the cost of wind power.

To see the *San Francisco Chronicle* story go to <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/02/01/MNPB15EL62.DTL>

## Lab research featured on "Monster Quest"



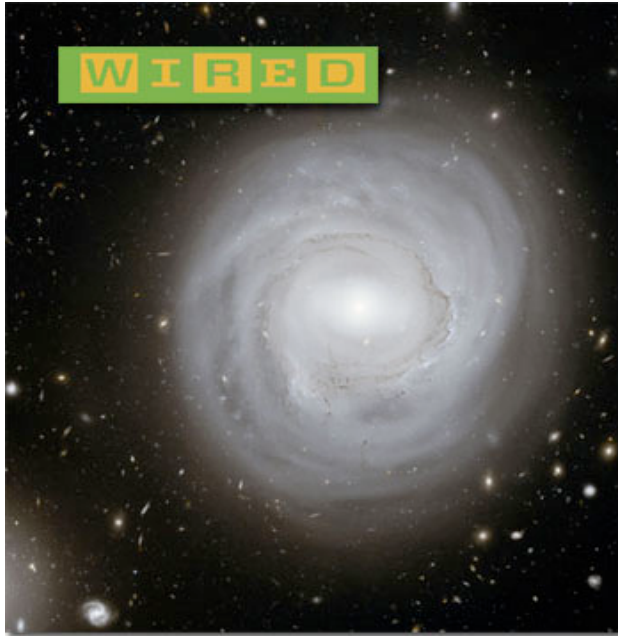
How is the Loch Ness Monster related to LLNL research? That's where the History Channel's "Monster Quest" comes in.

A recent edition of the show features researcher Tom Guilderson of LLNL's Center for Accelerator Mass Spectrometry discussing how a shell found at the bottom of Loch Ness dates back 14,100 years ago. What this points to is that one of history's most infamous creatures, Nessie, could have originated in the sea during the end of the last Ice Age and swam into Loch Ness when the glaciers retreated.

Guilderson used carbon dating, which determines the isotopic composition of substances to determine their age.

To see a portion of the "Monster Quest" episode, go to [https://newslines.llnl.gov/\\_rev02/articles/2009/feb/history\\_lochness\\_03feb2009.mo](https://newslines.llnl.gov/_rev02/articles/2009/feb/history_lochness_03feb2009.mov)  
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## New image opens door to strange galaxy



**An image of the galaxy, dubbed NGC 4921, from 50 separate exposures through a yellow filter and another 30 exposures through a near-infrared filter using the Wide Field Channel of the Advanced Camera for Surveys on Hubble Space Telescope.**

In the search for the expansion of the universe by looking at Cepheid variable stars in a nearby galaxy, LLNL's Kem Cook and colleagues are part of a collaboration that has created the first ever exceptionally deep view of a strange galaxy.

Using images from NASA's Hubble Space Telescope, a new image of the unusual spiral galaxy, dubbed NGC 4921, in the Coma Galaxy Cluster has been created.

Cook has been studying the variable stars in this galaxy since 2007 and used Hubble to obtain initial images. His team was using Hubble to search for Cepheid variable stars in NGC 4921 that could be used to measure the distance to the Coma Cluster and hence the expansion rate of the universe.

Stars are classified as variable if their apparent brightness as seen from Earth changes over time.

The image was featured in *Wired*. To read more, go to <http://blog.wired.com/wiredscience/2009/02/comagalaxy.html>

## **LLNL earns three federal technology transfer awards**



**Carol Bruton, shown checking instrumentation, is one of the co-developers of a technology that filters out silica from geothermal waters.**

Laboratory researchers have earned three awards for Excellence in Technology Transfer from the Federal Laboratory Consortium (FLC). The FLC awards recognize federal laboratory employees who have accomplished outstanding work in transferring federally developed technology to the marketplace.

The "Noninvasive Pneumothorax Detection" connected to a standard PDA -- provides a critical capability currently unavailable to the nation's first responders - the ability to diagnose, rapidly and in the field, a condition in the chest cavity that can cause death in minutes if not treated properly.

"Serial Technology Development and Transfer in Cargo Security" leverages LLNL capabilities in radiation detection and ultrawideband monitoring to provide the ability to monitor maritime cargo containers for smuggled radioactive materials and detect security breaches of containers in transit.

"Silica Mining from Geothermal Waters" involves extracting silica and other valuable minerals from water at geothermal turbine facilities, where the silica clogging in machinery can be a costly problem. This green technology not only enhances geothermal plant efficiency but also provides valuable commodity materials that would otherwise pose a waste-disposal problem.

For more on the technologies, go to  
<https://newsline.llnl.gov/rev02/articles/2009/feb/02.06.09-flc.php>

### Latest *Newsline* available



*Newsline* provides the latest Lab research and operations news. See the most recent issue at <https://newsline.llnl.gov/rev02/index.php>

### Photo of the week



**To the moon: Lab researcher Hui Chen looks through the target chamber of the Callisto laser in the Jupiter laser facility. Named after one of the moons of the planet Jupiter, the laser recently was used to create billions of particles of anti-matter.**

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LLNL is managed by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy's National Nuclear Security Administration.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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