LAWRENCE LIVERMORE REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Feb. 23-March 2, 2009.

NIF project complete; 192 beams fired to target chamber

The National Ignition Facility target chamber.

Just before 2 a.m. last Thursday, control room technicians at the National Ignition Facility fired the first full system shot to the center of the target chamber. It was the first time all 192 beams converged simultaneously in the 10-meter diameter chamber, and it marked the unofficial completion of the NIF construction project.

"This a major milestone for the greater NIF team, for the nation and the world," said Edward Moses, principal associate director of the NIF & Photon Science Directorate. "All data were acquired and looked great."

"Although not required for formal completion of the NIF Project," added Project Director Ralph Patterson, “it is extremely satisfying to wind up the project by firing all beams.”

Livermore to improve wind energy efficiency

Julie Lundquist is the LLNL atmospheric scientist who is heading the wind energy efficiency project.

The Laboratory has signed an agreement with Siemens Energy Inc. to provide high-resolution atmospheric modeling capabilities to improve the efficiency of wind farm sites, turbine design and wind farm operations.

LLNL will provide numerical weather prediction models with resolution as fine as one-kilometer scale to predict power generated by the wind so that wind farms can operate more efficiently while providing more power to hungry grids. Predictive time frames range from an hour ahead to days ahead of time.

Under a $2 million, two-year cooperative research and development agreement, the Livermore team will provide modeling that combines Livermore's atmospheric turbulence modeling capabilities with complex databases of topography and sea surface temperature.

Many U.S. wind parks are yielding up to 20 percent less energy than predicted because of uncertain forecasts. This loss of energy can have complicated financial consequences, such as significant penalties if operators under-produce their forecasts, or no payment for extra power they generate that is more than what was estimated.

More accurate wind predictions will have a positive effect on wind farm operators and owners who can know hours or days ahead of time how wind conditions will affect power generation.

To read more, go to https://publicaffairs.llnl.gov/news/news_releases/2009/NR-09-02-08.html

BBC FOCUSes on NIF

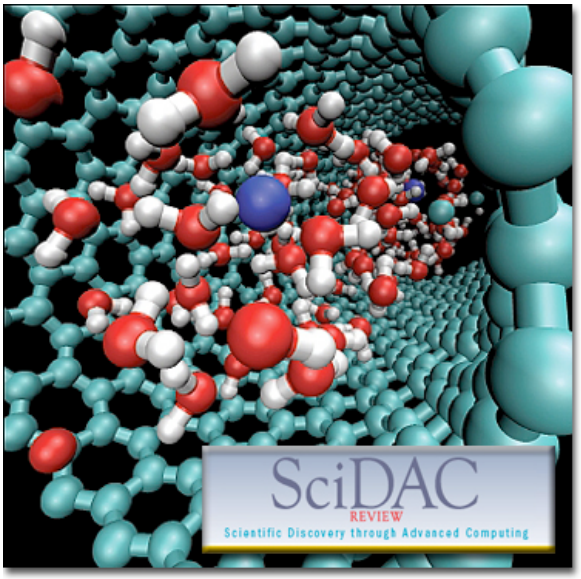
Laser Bay 2, one of NIF's two laser bays, was commissioned on July 31, 2007.

Shooting the world's most powerful laser at a tiny gold target may provide a solution to the energy crisis.

Experiments at the National Ignition Facility, which will be completed at the end of March, will look at recreating the same sort of fusion that is found at the center of stars. It will generate 500 terawatts of power for a fraction of a second, that's 1,000 times more power than the United States produces at any given time.

The *BBC's FOCUS* magazine recently featured an article on NIF. To read more, go to: https://newsline.llnl.gov/_rev02/articles/2009/feb/BBC_Focus2.pdf

Collaboration on water modeling cited as a Top Breakthrough



Simulation of sodium chloride dissolved in water inside a carbon nanotube. Image by Giulia Galli/UC Davis and Eric Schwegler/LLNL

A collaboration between LLNL's Eric Schwegler and colleagues and University of California at Davis Professor Giulia Galli (formerly of the Laboratory) was recently called out as one of the "Breakthroughs in Computational Science" by a Department of Energy's Scientific Discovery through Advanced Computing (SciDAC) panel. The collaboration involves computational simulations of water behavior at interfaces with other materials on the microscopic scale.

The panel was charged with identifying recent breakthroughs in computational science supported by the Office of Advanced Scientific Computing Research (OASCR).

The collaboration between LLNL and UC Davis "explored water at interfaces with graphene, carbon nanotubes, hydrogenated diamond and biocompatible materials such as silicon carbide, looking specifically at how water behaves in confined spaces only a few nanometers in size." The results clarified the microscopic structure of the water-substrate interfaces and identified the role played by electrons in determining the arrangement of water molecules near surfaces.

To read more about the research, go to
http://www.scidacreview.org/0901/html/bt.html#water

Diamonds are a scientist's best friend

LLNL scientist David Bradley, Jon Eggert and Ray Smith of the Physical and Life Sciences Directorate and their colleagues just published results on solid diamond at eight million atmospheres of pressure, which is the highest pressure, solid-state equation of state data ever reported.

The article in *Physical Review Letters* describes how the diamond phase of carbon is stable and strong up to 8 Mbar (1 Mbar equals one million atmospheres). Two-millimeter square diamond samples were illuminated within hohlraums using up to 21 beams of the Omega laser. Applying similar techniques with an optimized 30-nanosecond pulse shape offered by the higher energy National Ignition Facility laser system could potentially ramp-compress a broad range of solids.

The paper was highlighted with a synopsis on the APS Website. To read more, go to **http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.102.075503**.

Latest *Newsline* available

NEWSLINE

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Photo of the week

The greening of the Lab: Alison Terrill is the Laboratory architect who led the effort to win green building certification for Bldg. 264, which has become the first in the Department of Energy complex to achieve the certification under the U.S. Green Building Council's (USGBC) new rating system for existing buildings.

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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