LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Jan. 22-25, 2013.

FRONTLINE TECHNOLOGY WORTH ITS SALT

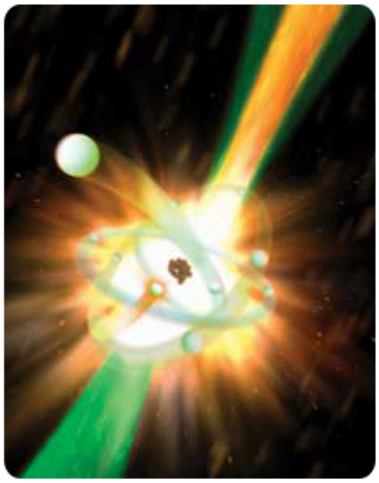
Imagine a world where water from the oceans could be turned into fresh drinking water.

Lawrence Livermore scientists could be on the way to this realization. While investigating a new carbon aerogel and using it as capacitors for energy storage, Livermore's Michael Stadermann and Ted Baumann realized that it was promising for water desalination.

Aerogels, a special class of ultra-low-density materials, have a complicated, cross-linked internal structure that gives them the highest internal surface area per gram of any known material. The new carbon aerogel has the electrical properties of traditional aerogels but has much larger pores. The porosity makes them a perfect candidate as a filter for saltwater. It also is mechanically robust and can be machined and fabricated into different sizes and shapes.

To read more, go to *Frontline*.

photonics.com WELL READ



A powerful X-ray laser pulse from SLAC National Accelerator Laboratory's Linac Coherent Light Source comes up from the lower-left corner (green) and hits a neon atom (center). ***Illustration by Gregory M. Stewart/SLAC***

Lawrence Livermore scientists and international collaborators in 2012 created the shortest, purest X-ray laser pulses ever achieved, fulfilling a 45-year-old prediction and ultimately opening the door to new medicines, devices and materials.

This finding turned out to be one of the top-read biophotonics stories on Photonics.com in 2012.

In the research, the scientists aimed radiation from the Linac Coherent Light Source (LCLS), located at the Stanford Linear Accelerator Center (SLAC), at a cell containing neon gas, setting off an avalanche of X-ray emissions to create a new "atomic X-ray laser."

"X-rays give us a penetrating view into the world of atoms and molecules," said physicist Nina Rohringer, a former LLNL postdoc, now a group leader at Max Planck Society's Advanced Study Group. She collaborated with researchers from SLAC, LLNL and Colorado State University.

To read more, go to Photonics.com.

Lab Manager MAGAZINE
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LECTURES ON THE EDGE

Scientists test a new polymerase chain reaction (PCR) instrument that can process biological samples in less than three minutes.

Lawrence Livermore's popular lecture series, "Science on Saturday," which opens the door to cutting edge science, returns Saturday, Jan. 26, and runs through Feb. 23.

"Detecting Pathogen DNA," by LLNL scientist Reg Beer and teacher Erin McKay kicks off the series. In addition to Beer's and McKay's presentation, this year's talks cover a range of current topics including the Lab's technologies used on NASA's NuSTAR Mission -- the next-generation medical diagnostic devices; and biofuels -- the new energy from ancient life.

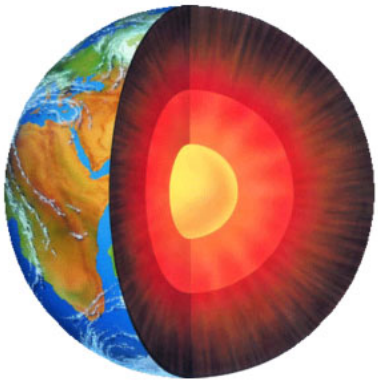
The free lectures will be held in the Bankhead Theater, located at 2400 First St. in Livermore. Two presentations are offered at 9:30 and 11:15 a.m.

Each lecture highlights cutting-edge Lawrence Livermore National Laboratory science presented by leading Lab researchers who are joined by master high school science teachers.

To read more, go to *Lab Manager*.

ASTROBIOLOGY
MAGAZINE

SCIENCE AT THE CORE



An artist's conception of Earth's inner and outer core.

An international collaboration including researchers from Lawrence Livermore National Laboratory has discovered that Earth's core formed under more oxidizing conditions than previously proposed.

Using a series of laser-heated diamond anvil cell experiments at high pressure and temperatures, the team demonstrated that the depletion of siderophile (also known as "iron loving") elements can be produced by core formation under more oxidizing conditions than earlier predictions.

"We found that planet accretion (growth) under oxidizing conditions is similar to that of the most common meteorites," LLNL geophysicist Rick Ryerson said.

To read more, go to *Astrobiology Magazine*.

This new view of spiral galaxy IC 342, also known as Caldwell 5, includes data from NASA's Nuclear Spectroscopic Telescope Array, or NuSTAR.

NASA's Nuclear Spectroscopic Telescope Array, or NuSTAR, set its X-ray eyes on a spiral galaxy and caught the brilliant glow of two black holes lurking inside.

The new image was released earlier this month along with NuSTAR's view of the supernova remnant Cassiopeia A.

The Laboratory has a pivotal role in NuSTAR. LLNL scientists worked on both the design and testing of the X-ray optics that fly on the telescope.

NuSTAR is the first orbiting telescope with the ability to focus high-energy X-ray light and can view objects in considerably greater detail than previous missions operating at similar wavelengths.

To read more, go to *Science Daily*.

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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