

# LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Feb. 4-8, 2013.

## CBRNews TOP THIS



2012 was a stellar year for Lawrence Livermore, according to CBRNews.

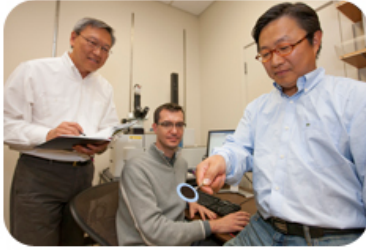
The Dublin, Ireland-based magazine said the Lab had plenty to brag about. Among the achievements:

- Newly discovered element 116 called Livermorium
- New forensic approach developed for identifying human remains
- First ever simulation of early-stage radiation damage
- Plastic developed for detection of neutron emitting special nuclear material
- Novel nanotube fabric developed to repel chemical and biological agents for troops in the field
- LLNL licensed out its DNA microarray system

To read more, go to [CBRNews](#).



**OUTSMARTING THE CHEM, BIO BUGS**



**From left, Kuang Jen Wu and Francesco Fornasiero look on as Sangil Kim holds a piece of the nanotube fabric that repels chemical and biological agents.**

Lawrence Livermore scientists and collaborators are developing a new military uniform material that repels chemical and biological agents using a novel carbon nanotube fabric.

The material will be designed to undergo a rapid transition from a breathable state to a protective state. The highly breathable membranes would have pores made of a few-nanometer-wide vertically aligned carbon nanotubes (CNT) that are surface modified with a chemical warfare agent-responsive functional layer. Response to the threat would be triggered by direct chemical warfare agent attack to the membrane surface, at which time the fabric would switch to a protective state by closing the CNT pore entrance or by shedding the contaminated surface layer.

"The uniform will be like a smart second skin that responds to the environment," said Francesco Fornasiero, LLNL's principal investigator for the Defense Threat Reduction Agency (DTRA) funded project.

To see more, go to [KTVU](http://KTVU.com).



**SCRUB A DUB**



Pulling CO<sub>2</sub> directly from the air is likely to prove too expensive to be practical, especially compared with capturing it when concentrated in the emissions of a power plant.

Many scientists have tried numerous methods in hopes of figuring out ways to reduce the effect of coal-fired plants spewing carbon dioxide into the environment.

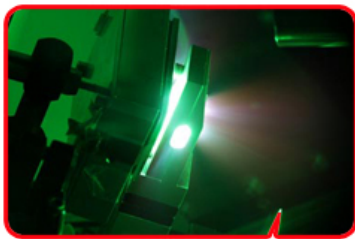
A process called carbon scrubbing, in which gas from a cement plant is run through pulverizing rocks and concrete resulting in a chemical reaction, is expected to capture 80 percent of the carbon dioxide from the gas stream.

But not everyone is convinced that it is cost effective. Julio Friedmann, chief energy technologist at Lawrence Livermore, has no problem with the physics and chemistry of the work. He does have a problem with the economics of it.

"The kinetics of the chemical reaction they're drawing on are very slow," Friedmann said. "There are two ways to get over that: do other things to speed up the process, like heating the rocks, or make the temperature 300 degrees hotter. But that adds cost. Or they can crush the rocks more and make more reactive surface area. But that also ends up meaning much more cost to build a better reactor."

To read more, go to [TomasNet.com](http://TomasNet.com).

**physicsworld.com** CREATING NEUTRONS ON A TABLETOP



**An image of the Trident laser at Los Alamos National Laboratory.**

A new compact high-flux source of energetic neutrons has been built by physicists in Germany and the United States. The laser-based device has the potential to be cheaper and more convenient than the large neutron facilities currently used by physicists and other scientists. The inventors say the source could be housed in university laboratories and also might be used to identify illicit nuclear material.

Neutrons are a valuable tool for scientists in many fields, allowing them to probe the structure and dynamics of a range of materials. Today, the main drawback of neutron science is that intense beams of neutrons must be produced in either nuclear reactors or dedicated accelerator facilities -- making a laser-based tabletop source very attractive.

Laser-driven neutron expert Scott Wilks of Lawrence Livermore points out that non-laser based neutron sources small enough to fit in a suitcase can generate comparable numbers of neutrons, but, he says, over a time interval measured in seconds and at much lower energies. This makes them less effective at imaging very short-lived phenomena. The next step, Wilks added, will be to increase the laser's repetition rate, which, he predicts, "will be no small feat, but, given laser technology's rapid evolution, inevitable."

To read more, go to [Physics World](#).

**Lab Manager** MAGAZINE **SERVICE TO THE NATION**



Lawrence Livermore continued its long tradition of applying innovative science and technology to strengthen the nation's security in 2012.

The Laboratory further developed science and technology capabilities essential to fulfilling its principal missions of sustaining the nation's aging nuclear deterrent without nuclear testing and countering nuclear proliferation and terrorism.

Lawrence Livermore's unique expertise also is contributing to the nation's energy and environmental security and is sharing it with U.S. industry to boost the nation's economic competitiveness.

To read more, go to [Lab Manager](#).

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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. To send input to the *Livermore Lab Report*, send [e-mail](#).