LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: April 14-20, 2009.

Cleaning up coal NOW

Clean coal takes the cheapest and most plentiful energy resource and makes it safe for the environment. The PBS program NOW recently took a look at what it will take in the future to ensure coal stays clean.

The Lab's Julio Friedmann, head of the carbon management program, discussed how carbon dioxide could be separated at a coal plant, injected into geological formations thousands of feet underground and stay there.

"There are a lot of formations in Wyoming that can accept large volumes of CO2 for a very long time," he said.

To see the program, go to https://newsline.llnl.gov/_rev02/articles/2009/apr/pbs-now_cleancoal_10apr2009.mov

ABC covers Lab's radiation detection

LLNL and Sandia physicists and technologists close the water shield surrounding the antineutrino sensitive liquid scintillator in the "Tendon Gallery" of a commercial nuclear reactor.

KGO-TV recently featured a story on the Lab's antineutrino detector that can be used to monitor nuclear reactors and nuclear activities.

The Lab's Adam Bernstein is part of a team that has built the detector that is being tested at San Onofre Nuclear Power Plant. Antineutrinos come out of nuclear reactors and interact in the detector.

The detector can be used hundreds of yards or miles away to tell if a nuclear reactor is running and how much fuel it is using.

"It's like wireless technology into the reactor core," Bernstein said.

To watch the program, go to
https://newsline.llnl.gov/_rev02/articles/2009/apr/KGOTV_RadiationDetect0409.mov

Blast from the past

Seeds of some tree species in the Panamanian tropical forest can survive for more than 30 years before germinating.

That is 10 times longer than most field botanists had believed.

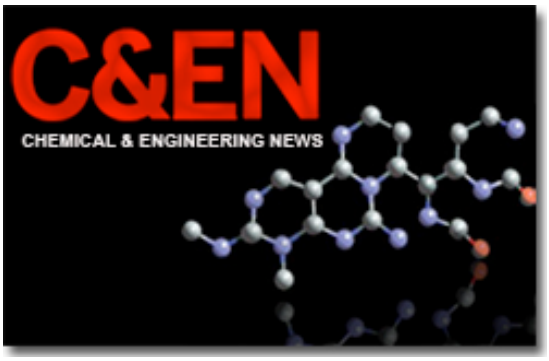
Using the Lab's Center for Accelerator Mass Spectrometry to measure the amount of carbon-14 in seeds of the trees *Croton billbergianus* (Euphorbiaceae), *Trema micrantha* (Celtidaceae) and *Zanthoxylum ekmannii* (Rutaceae), Laboratory scientist Tom Brown and University of Illinois at Urbana-Champaign colleague James Dalling found that seeds survived in the soil for 38, 31 and 18 years, respectively.

Previous demographic studies of pioneer tree species showed that seed persistence (the ability to survive in soil, awaiting favorable conditions for germination) is short, lasting only a few years at most.

The research appears in the April edition of the journal, *The American Naturalist*. It also was featured in *Science Daily*.

To read more, go to http://www.sciencedaily.com/releases/2009/04/090401164045.html

Explosives in slow motion



The formation of nitrogen-rich heterocycles may help slow reactions of some high explosives.

High explosives rich in carbon react far more slowly than those with less carbon — on the order of milliseconds, instead of nanoseconds.

Scientists have believed that the detonation process is slower in the carbon-rich materials because of the formation of graphitic or diamond-like particles. But now, LLNL chemist M. Riad Manaa and colleagues have discovered an entirely different mechanism that may explain the relatively sluggish reaction of carbon-rich explosives.

The group found that nitrogen-rich heterocyclic clusters slow the reaction.

To read more, go to http://pubs.acs.org/cen/email/html/cen_87_i15_8715scic3.html

Sequoia reaches for the sky

The Lab's Sequoia is expected to be the most powerful supercomputer in the world and will be approximately 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 20-petaFLOP (floating operations per second) system will help continue to ensure the safety and reliability of the nation's aging nuclear deterrent.

The system recently was featured in the United Kingdom magazine *PC Pro* as one of the 10 amazing research projects.

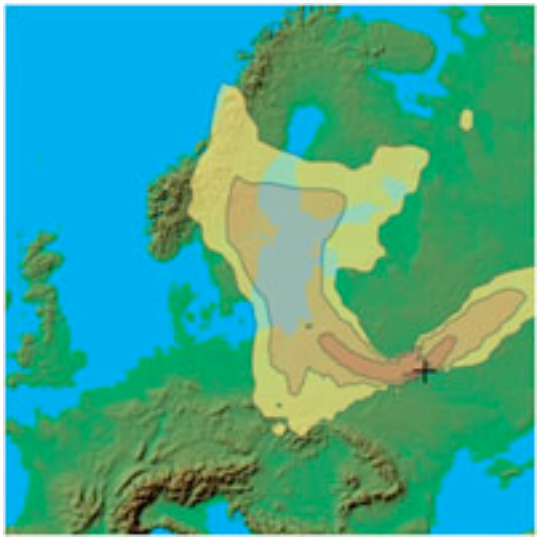
To read more, go to http://www.pcpro.co.uk/features/251206/10-amazing-research-projects.html

Latest *Newsline* available

NEWSLINE

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



Telling model: This image, circa 1986 of the simulated ground-level footprint four days after the Chernobyl reactor accidents, was created by the Lab's National Atmospheric Release Advisory Center (NARAC). Over the next 16 days, NARAC estimated the activity released, modeled the transport and deposition of the material involved, and calculated the dose to people in Europe and around the globe. The center this week is celebrating its 30th anniversary. It first opened during the Three Mile Island nuclear accident in 1979.

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.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The Livermore Lab Report archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2009index.html