

**Office of the President****TO MEMBERS OF THE COMMITTEE ON OVERSIGHT OF THE DEPARTMENT OF ENERGY LABORATORIES:****DISCUSSION ITEM***For Meeting of January 22, 2014***NUCLEAR SCIENCE AND SECURITY CONSORTIUM, BERKELEY CAMPUS, AND OTHER RESEARCH HIGHLIGHTS FROM THE DEPARTMENT OF ENERGY LABORATORIES**

Program highlights from the three UC-affiliated Department of Energy (DOE) National Laboratories will be presented:

- Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab)
- Lawrence Livermore National Laboratory (LLNL)
- Los Alamos National Laboratory (LANL)

***UC Berkeley Nuclear Science and Security Consortium***

UC Berkeley Professor and Chair of Nuclear Engineering Karl Van Bibber will discuss the Nuclear Science and Security Consortium (NSSC or Consortium).

In June 2011, the National Nuclear Security Administration (NNSA) awarded a five-year \$25 million funded program to UC Berkeley to lead the multi-institution NSSC in support of the nation's nuclear non-proliferation mission through the training and education of experts in the nuclear security field. The Consortium brings together more than 100 researchers from UC Berkeley, UC Davis, UC Irvine, the UC Institute on Global Conflict and Cooperation in San Diego, Michigan State University, the University of Nevada – Las Vegas, and Washington University in St. Louis. Researchers and students participating in the Consortium collaborate with LANL, LLNL, and LBNL. The NSSC provides adjunct teaching appointments for National Laboratory staff and is working to establish more joint UC-Laboratory faculty positions. UC Berkeley hosted its first-ever NSSC summer school this past August. All three UC-affiliated Laboratories participated in the program, teaching, speaking, and presenting research. The program also featured tours of both LBNL and LLNL. It should be noted that UC Berkeley was well-positioned for leadership of the NSSC as a result of previous work funded by the UC Laboratory Fee Research Program. The Fee funded research established the Berkeley Nuclear Research Center, the predecessor and nucleating agent for the NSSC. For additional information about the NSSC, see: <http://nssc.berkeley.edu>.

*Lawrence Berkeley National Laboratory*

High-performance, long life-cycle lithium-sulfur battery could find use in mobile applications, and, eventually, electric vehicles with 300-mile range

Researchers with LBNL have demonstrated, in a laboratory setting, a lithium-sulfur battery that has more than twice the specific energy of lithium-ion batteries. The lithium-sulfur battery also lasts for more than 1,500 cycles of charge-discharge with minimal decay of the battery's capacity, the longest cycle life reported so far for any lithium-sulfur battery. Demand for high-performance energy storage for electric vehicles capable of matching the range and power of the combustion engine encourages LBNL scientists to develop new battery chemistries that could deliver more power and energy than current lithium-ion batteries.

For more information, please visit: <http://newscenter.lbl.gov/news-releases/2013/11/19/holistic-cell-design-by-berkeley-lab-scientists-leads-to-high-performance-long-cycle-life-lithium-sulfur-battery/>

New LBNL studies show methane emissions in California and the United States are 1.5 times greater than expected

Current official inventories of methane emissions – a potent greenhouse gas released from landfills, livestock ranches, and oil and gas facilities – may be underestimated both nationally and in California by a factor of about 1.5, according to a new research study performed by LBNL. The Laboratory's work strongly suggests that methane emissions from oil and gas production may account for a significant portion of the underestimated emissions both in California and nationwide.

At the same time, another study from LBNL shows that California is on track to meet its State-mandated targets for reducing greenhouse gas emissions for 2020, but it will not be able to meet its 2050 target without bold new technologies and policies. That's the conclusion of the California Greenhouse Gas Inventory Spreadsheet, a new model developed by LBNL to look at the effectiveness of existing policies and technologies in reducing emissions.

For more information on the LBNL methane report, please visit: <http://newscenter.lbl.gov/news-releases/2013/11/04/new-ideas-needed-to-meet-california%E2%80%99s-2050-greenhouse-gas-targets/>

For more information on the LBNL report on California emissions, please visit: <http://newscenter.lbl.gov/news-releases/2013/11/25/studies-find-methane-emissions-in-california-and-u-s-1-5-times-greater-than-expected/>

*Lawrence Livermore National Laboratory*

Gordon Bell prize for a Sequoia simulation

A [record-setting computer simulation](#) run on LLNL's Sequoia supercomputer was awarded the prestigious Gordon Bell Prize in the "peak performance category." The fluid dynamics [simulation](#) of the collapse of bubbles in a liquid employed 13 trillion cells – making it the largest simulation ever in fluid dynamics – and achieved a remarkable computational speed equivalent to 73 percent of Sequoia's theoretical peak speed. The work was conducted by researchers from LLNL, ETH Zurich, IBM Research, and the Technical University of Munich. The vastly improved performance of the new simulation paves the way for research on a wide range of applications: from avoiding damage on turbine and propeller components to potential applications related to human health.

Artificial retina makes "invention of the year" lists

*Time* magazine named the Argus II retinal prosthesis—widely referred to as a "bionic eye" – as one of the [25 best inventions of 2013](#). The Argus II, which is marketed by Second Sight Medical Products, Inc., was also named the [top innovation of the year](#) by *Popular Science*. This year, the technology became the first-ever retinal prosthesis approved in the U.S. by the Food and Drug Administration for blind persons with a serious eye disease called "end-stage retinitis pigmentosa." The implant stimulates the retina's remaining cells, which transmit the visual information along the optic nerve to the brain, creating the perception of a light pattern. This technology was developed by a collaboration of researchers from five Department of Energy National Laboratories, four universities, and private industry. The LLNL team contributed three major components to the artificial retina: the thin-film electrode array that contains the neural electrodes; the biocompatible electronics package that contains the electronics for stimulating the retina; and an ocular surgical tool to enable the insertion, attachment, and re-insertion of the thin-film electrode array.

*Los Alamos National Laboratory*

Advance in bottle scanning could enhance airport security and benefit passengers

Los Alamos scientists have advanced a Magnetic Resonance Imaging (MRI) technology that may provide a breakthrough for screening liquids at airport security stations. They have added low-power X-ray data to the mix, and as a result have unlocked a new detection technology. Funded in part by the Department of Homeland Security's Science and Technology Directorate, the new system is named MagRay. The goal is to quickly and accurately distinguish between liquids that appear identical visually.

"We're looking for where a liquid lies in a sort of three-dimensional space of MRI, proton content, and X-ray density," said Larry Schultz, MagRay engineer. "With those measures we find that benign liquids and threat liquids separate real nicely in this space, so we can detect them quickly with a very high level of confidence."

The MagRay team has been invited by Physics Today to publish its most current results in the magazine's section for university students.

<http://www.lanl.gov/newsroom/news-releases/2013/November/11.25-magray-screening.php>, includes a link to a new video on MagRay.

#### New HIV global vaccine shows promise in monkeys

The considerable diversity of HIV worldwide represents a critical challenge for designing an effective HIV vaccine. Now, it appears that a vaccine bioinformatically optimized for immunologic coverage of global HIV diversity, called a mosaic vaccine and designed by Bette Korber and her team at Los Alamos National Laboratory, may confer protection from infection.

“This is the first time the mosaic antigen inserts were used in a challenge study. In a challenge study, vaccine-elicited protection from infection is tested, versus testing a vaccine for its ability to stimulate good immune responses,” Korber said.

These vaccines are specifically designed to present the most common forms of parts of the virus that can be recognized by the immune system. This new insight regarding a mosaic vaccine's ability to protect from infection is the result of work by a scientific team led by Beth Israel Deaconess Medical Center, and including Los Alamos researchers. The study, which was conducted in monkeys, is newly published in the journal [\*Cell\*](#).

<http://www.lanl.gov/newsroom/news-releases/2013/October/10.30-hiv-vaccine-design-shows-promise-in-monkeys.php>

Meanwhile, another Los Alamos team is investigating the complex relationships between the spread of the HIV virus in a population (epidemiology) and the actual, rapid evolution of the virus (phylogenetics) within each patient's body. That work has been published in [\*Epidemics\*](#).

<http://www.lanl.gov/newsroom/news-releases/2013/November/11.19-hiv-virus-spread-and-evolution.php>

#### ***Additional Resources***

LBNL: <http://www.lbl.gov>

LLNL: <https://www.llnl.gov/>

LANL: <http://www.lanl.gov/index.php>

UC Laboratory Management web page: <http://www.ucop.edu/laboratory-management/index.html>