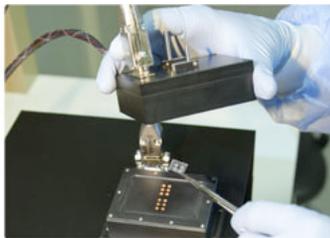


LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 3-7, 2011.



THREE IS THE MAGIC NUMBER



A researcher loads a sample into Lawrence Livermore National Laboratory's new fast polymerase chain reaction (PCR) instrument.

Imagine going to your doctor's office because you feel sick. The doctor takes your pulse, blood pressure, and then takes a nasal or throat swab and inserts it into a mysterious black box. Bam! In less than three minutes, the pathogen that is making you sick has been identified.

Sounds far-fetched? Actually, this scenario is closer to becoming a reality thanks to work by Reginald Beer and his team of scientists and engineers at the Laboratory. They have developed a sub-three-minute amplification of nucleic acids (DNA and RNA) via polymerase chain reaction (PCR).

Beer came up with the idea after waiting 24 to 48 hours for lab results to learn whether his sick child could be treated with antibiotics for an illness. "I was sitting in the pediatrician's office with my daughter several years ago, and it struck me."

PCR is an indispensable technique in medical and biological research laboratories around the world. It allows researchers and clinicians to produce millions of copies from a single piece of DNA or RNA for use in genome sequencing, gene analysis, inheritable disease diagnosis, paternity testing, forensic identification and the detection of infectious diseases.

To hear an interview with Beer, go [here](#).

ASTRONOMY

TO GO WHERE NO MAN HAS GONE BEFORE



To send a spacecraft to stars beyond our solar system, the space program is going to need something stronger than jet propulsion. That something could be nuclear fusion power.

Rather than releasing the energy of atoms by splitting them apart into lighter nuclei, as in fission, fusion melds atomic nuclei together. Fusion is the same energy that powers the sun.

One way to create this clean, limitless power source is through lasers, and the National Ignition Facility at LLNL is on its way to doing just that. The laser system delivers petawatts of energy in the form of pulses that are capable of creating, for scant moments, the temperatures and pressures needed for nuclear fusion in small pellets of deuterium–tritium fuel.

NIF hopes to demonstrate fusion ignition in 2012.

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

The
New York
Times

GOING EXTREME TO CURB CLIMATE CHANGE



A panel of scientists, former government officials and national security experts is recommending that the government begin researching a radical fix to climate change: directly manipulating the Earth's climate to lower the temperature.

Jane Long, an associate director at large at the Laboratory and the panel's co-chair, said that by spewing greenhouse gases into the atmosphere, human activity was already engaged in climate modification. "We are doing it accidentally, but the Earth doesn't know that," she said, adding, "Going forward in ignorance is not an option."

The report says that extreme engineering techniques, such as scattering particles in the air to mimic the cooling effect of volcanoes or stationing orbiting mirrors in space to reflect sunlight, should never be needed. But in its report, the panel said it is time to begin researching and testing such ideas in case "the climate system reaches a 'tipping point' and swift remedial action is required."

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



CLIMATE GAME TOUCHDOWN



Seokho Hong and his sister Inyoung Hong were the first and second place winners, respectively, of the Tracy High School contest based on the Lab's climate simulation tool.

How are climate change and energy demands linked? What energy options are available to our nation and the world?

These are only a few of the questions Tracy High School students explored during a recent school contest based on LLNL's climate simulation learning tool found on the Web.

"The goal is to have students gain a better understanding of how climate change and mankind's energy demands are connected," said Tracy High science teacher Dean Reese.

Reese participated in the Lab Science Education Program's Teacher Research Academy and in the DOE-funded Academies Creating Teacher Scientists program. He came up with the idea of

using the climate contest as a follow-up to his classroom project that analyzed the CO2 trapped in mustard plant leaves found near Tracy. The project was funded through a gift from Lawrence Livermore National Security, LLC, the contract manager the Laboratory.

To read more, link to the [news story](#).

LaserFocusWorld

OPENING A NEW PLASMATIC ERA



Instrument used to measure scattered nuclei is pictured during installation at the Omega Laser Facility.

In a unique recent experiment, researchers used the Omega Laser Facility at the University of Rochester to make precise measurements of a fundamental nuclear process -- the elastic scattering of neutrons off heavy forms of hydrogen.

This is the first time a fundamental nuclear physics experiment has been achieved using a high-energy-density laser facility. Researchers from the Laboratory, the Massachusetts Institute of Technology's Plasma Science and Fusion Center, and the Laboratory for Laser Energetics at the University of Rochester collaborated on the project.

Researchers typically probe nuclear reactions using conventional accelerators. In the new work, the research team created a hot, dense plasma, in which electrons are stripped off of their parent atoms to create an interpenetrating gas, or "soup," of positive and negative charges. The plasma state comprises stars, fluorescent lights, lightning, and, in fact, 99 percent of the visible universe. It is often referred to as the fourth state of matter, after solids, liquids and gases.

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

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](#).

The Livermore Lab Report [archive](#) is available on the Web.