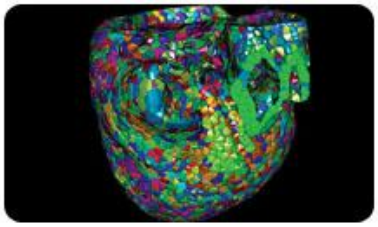
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 22-26, 2012

Popular Mechanics OPEN HEART SIMULATION



The Cardioid code developed by a team of Livermore and IBM scientists divides the heart into a large number of manageable pieces, or subdomains.

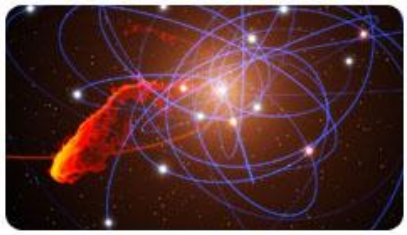
The biggest supercomputer in the world is diving down to the microscopic scale to simulate a human heart at the cellular level and predict how it would respond to particular drugs.

Lawrence Livermore's Sequoia, the most powerful supercomputer in the world, was built to model nuclear weapons explosions. But before the machine goes fully classified, scientists are using its incredible power to build a human heart simulation.

Using a highly scalable code called Cardioid, Lab scientists working with IBM modeled the electrical signals traveling from cell to cell, triggering them to contract. In theory, everything from drugs to pacemakers could be tested on Cardioid before being tested on humans.

To read more, go to *Popular Mechanics*.

Astronomy SNACK TIME IN SPACE



Simulations of the dust and gas cloud G2 on its orbit around the Milky Way central black hole SgrA*. *Photo courtesy of M. Schartmann and L. Calcada/ European Southern Observatory and Max-Planck-Institut fur Extraterrestrische Physik.*

Get ready for a fascinating eating experience in the center of our galaxy, involving a black hole that may devour much of an approaching cloud of dust and gas known as G2.

A supercomputer simulation prepared by two Lawrence Livermore physicists and a former postdoc suggests that some of G2 will survive, although its surviving mass will be torn apart, leaving it with a different shape and questionable fate.

The findings are the work of Lab computational physicist Peter Anninos and astrophysicist Stephen Murray, along with their former postdoc Chris Fragile, now an associate professor at the College of Charleston in South Carolina, and his student, Julia Wilson.

They came up with six simulations, using the Cosmos++ computer code developed by Anninos and Fragile, which required more than 50,000 computing hours on 3,000 processors on the Palmetto supercomputer at Clemson University's Tech Center in Anderson, S.C.

To read more, go to *Astronomy*.

Bruce Buchholz loads a sample in the accelerator.

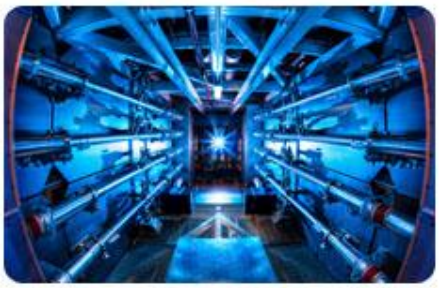
Using Cold War era data from above-ground nuclear tests, Livermore researcher Bruce Buchholz is helping to identify the thousands of John and Jane Does around the world.

And he's looking to the teeth to identify the birthdate of the deceased victims in cold cases.

Buchholz can conduct radiocarbon analysis of enamel from teeth, which gives a more precise birthdate.

Using the Laboratory's Center for Accelerator Mass Spectrometry, Buchholz determined that the radioactive carbon-14 produced by above-ground nuclear testing in the 1950s and 1960s remains in the dental enamel, the hardest substance in the body. The radiocarbon analysis shows that dating teeth with the carbon-14 method estimates the birthdate within one to two years.

To see more, go to KPIX.



The preamplifiers of the National Ignition Facility are the first step in increasing the energy of laser beams as they make their way toward the target chamber.

The National Ignition Facility (NIF) is designed to conduct quality control tests for nuclear warheads.

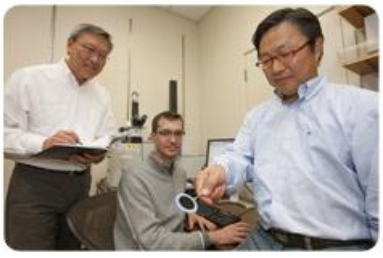
The primary intent is research but a spinoff may be the creation of fusion power for peaceful uses.

Former Lab and NIF Director George Miller describes the 192-laser beam facility as using a technology similar to what kids do with a lens.

"You can focus sunlight onto a leaf and you can start a fire," Miller said. "What we're doing here is concentrating the energy of the sun onto a very small spot and you raise the temperature significantly."

To see more, go to the History Channel.

nano werk SHEDS LIKE A SNAKE



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.

Scientists at Lawrence Livermore have developed a new material geared for military uniforms that uses carbon nanotubes to repel chemical and biological agents.

The material is designed to change with the environment, transitioning from a breathable state to a protective state, by using small-size carbon nanotube membranes that block biological agents.

Francesco Fornasiero, principal investigator, explains that the uniform will be like a "smart second skin" able to adapt from a highly breathable state to a protective one needed in response to a possible environmental threat. In the case of a chemical release, the suit would block the threat and then shed, similar to how a snake sheds its skin.

The project is funded by DTRA (Defense Threat Reduction Agency). Uniforms with the second skin material could be available to the military in 10 years.

To read more, go to *Nano Werk*.

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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