LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 29-Nov. 2, 2012

THE HILL

ENERGY USE BLOWING IN THE WIND

Wind power is on the rise.

Wind power posted the greatest gain in domestic energy consumption in 2011 as overall energy use dropped, according to an analysis by the Laboratory.

Energy consumption from wind power rose 27 percent in 2011 to 1.17 quadrillion BTU (British Thermal Units), up from 0.92 in 2010.

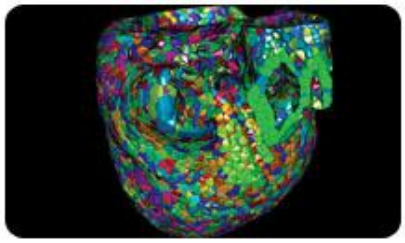
Energy consumption from wind could rise in 2012 as well, as newly installed electrical capacity increased 40 percent in the third quarter compared with 2011, the American Wind Energy Association (AWEA) announced recently.

"Wind energy jumped significantly because, as in previous years, many new wind farms came online," said A.J. Simon, an LLNL energy systems analyst. "This is the result of sustained investment in wind power."

To read more, go to *The Hill*.

NBC

PUMPING UP HEART RESEARCH



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

Sequoia, currently the world's most powerful supercomputer, was built for the upkeep of nuclear weapons. But researchers have put it to work on a groundbreaking simulation of the human heart.

The Laboratory, already well-known for work in high-performance computing, has commandeered the Sequoia supercomputer for the heart simulation during what is known as its "shakedown period," when it's being set up and tested but isn't quite ready for its intended purpose. LLNL and other organizations were given time-share access to the computer to do approved non-classified research.

Supercomputing is a competitive field, but for the moment Sequoia is the fastest on Earth. With more than 1.5 million computing cores producing 20 quintillion operations per second, it allows the researchers to simulate the heart at a far greater fidelity than ever before.

LLNL computational scientist Art Mirin describes the project: "Our heart code work has been a great opportunity to demonstrate Sequoia's power with an application that most people consider important to society, in this case, cardiac modeling." So it's not just about digitizing the heart, but also about humanizing the computer."

To read more, go to NBC news.

Los Angeles Times | SOLDIERS TO SUIT UP

The highly breathable membranes have pores made of a few nanometer-wide vertically aligned carbon nanotubes.

Laboratory scientists are working on a high-tech fabric for the military made out of tiny carbon nanotubes -- hollow structures that stay breathable in hot weather yet are small enough to block out pathogens.

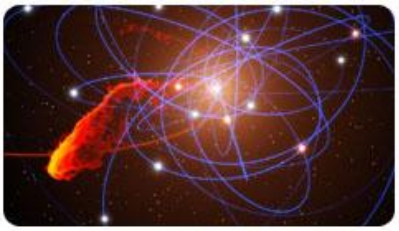
The team is planning to add a special coating that will block out even the smallest toxins, such as anthrax spores and other chemical and biological warfare agents.

In the case of chemical agents, which are much smaller in size, the membrane pores need to react to block the threat. The suit would block the threat and then shed, similar to how a snake sheds its skin.

To read an interview with the Lab's Francesco Fornasiero, a chemical engineer who is in charge of the project, go to the *Los Angeles Times*.

THE DAILY GALAXY

CLOSE ENCOUNTERS OF THE HUNGRY KIND



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.***

A black hole in the Milky Way is patiently waiting to chew up an approaching cloud of dust and gas known as G2.

A Laboratory supercomputer simulation suggests that some of G2 will survive, although its surviving mass will be torn apart, leaving it with a different shape and questionable fate.

"There's too much dynamical friction that it experiences through hydrodynamic instabilities and tidal stretching from the black hole," LLNL physicist Peter Anninos said. "So a lot of its kinetic energy and angular momentum will be dissipated away and it will just sort of break up into some sort of incoherent structure. Much of it will join the rest of the hot accretion disk around the black hole, or just fall and get captured by the black hole"

The black hole is known as Sgr A*. "Sgr" is the abbreviation for Sagittarius, the constellation near the center of the Milky Way. Most galaxies have a black hole at their center, some thousands of times bigger than this one. "While this one is 3-to-4 million times as big as our sun, it has been relatively quiet," according to astrophysicist Stephen Murray also of LLNL. "It's not getting fed very much."

To read more go to *The Daily Galaxy*.

the Atlantic HARNESSING THE POWER OF THE SUN

The preamplifiers of the National Ignition Facility.

Creating the same energy that powers the sun and the stars is a big goal.

But Ed Moses, head of the National Ignition Facility, is leading the effort to create a miniature sun on Earth by creating fusion in the laboratory. When the hydrogen target is hit with the 192 lasers and fusion ignition is created, it's enough energy to power the Earth.

Moses recently participated in a discussion about NIF at *The Atlantic*'s Big Science Summit.

"This is a situation where you have a need, which is clean fuel," Moses said. "You have the technologies and you have a system that mitigates the complications of the technologies. The question is can you show that the performance on the NIF can be done. We are on the verge of doing that."

To see more of the interview, go to *The Atlantic*.

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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