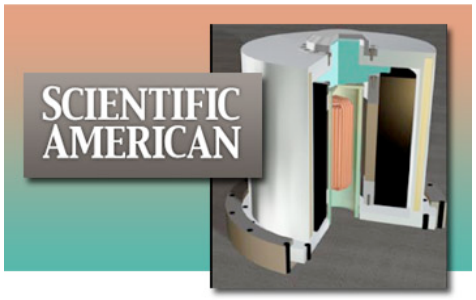
LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory, June 18-25, 2010

A partnership with magnetic attraction



The flywheel battery system

Flywheels are an ancient technology that takes in short bursts of energy and stores them so they can be released at a steady constant flow as needed.

The Laboratory is taking this technology out to industry. LLNL and Arnold Magnetic Technologies are putting together their expertise on magnetic technology and applying it to high-efficiency flywheel energy storage systems. Flywheels are ideal for storing energy from intermittent sources such as solar power installations and wind farms. The use of magnets eliminates the need for petroleum lubricants in flywheels, which traditionally depend on well-oiled conventional bearings in order to operate.

Until recently, flywheels were fairly inefficient because they were made of heavy materials and their bearings required frequent lubrication. Next-generation flywheels are made of lightweight materials and are designed to operate in a vacuum in order to cut down on drag. The use of magnets instead of conventional bearings is another new development.

To read more, go to http://www.scientificamerican.com/article.cfm?id=oil-free-magnetic-lubrication-drive-2010-06

Don't give up on fusion

The National Ignition Facility target chamber

Some researchers believe fusion energy is 20 years away.

But not Laboratory scientists. In fact, they plan on beginning experiments to create fusion (the same energy that powers the sun and stars) in the laboratory later this year.

There are two types of fusion: magnetic and inertial confinement. The latter is where LLNL's National Ignition Facility fits in – where an imploding shell of dense plasma will be used to crush and ignite a fuel target to trigger a fusion reaction.

The next really big milestone is to demonstrate what is termed "net gain," which means getting more energy out of the reaction than what is put in.

To read more, go to http://www.smartplanet.com/people/blog/pure-genius/why-we-shouldnt-give-up-on-nuclear-fusion/3987/?tag=shell;main

Supercomputing flashes on

Hyperion is a next-generation Linux cluster testbed.

A prototype computer system is demonstrating the use of flash memory in supercomputing. The Hyperion Data Intensive Testbed at the Laboratory uses more than 100 terabytes of flash memory.

Hyperion is designed to support the development of new computing capabilities for the next generation of supercomputers as part of the Energy Department's high-performance computing initiatives. Specifically, it will help test the technologies that will be part of Lawrence Livermore's upcoming Sequoia supercomputer.

The Hyperion testbed is an 1,152-node Linux cluster, said Mark Seager, assistant department head for advanced technology at Lawrence Livermore. It was delivered in 2008, but is only now at the point where serious operational testing can begin with the recent addition of the solid-state flash input/output memory.

Flash memory is a key component of the Hyperion system, Seager said. The memory is in the form of 320-gigabyte enterprise MLC ioMemory modules and cards developed by Fusion-io.

To read more, go to http://gcn.com/articles/2010/06/24/lawrence-livermore-hyperion.aspx

Seal of approval for detection array

Two harbor seals engage in rest and relaxation

A tool developed by Laboratory scientists to protect citizens from bioterrorism attacks and outbreaks of novel diseases may aid marine biologists in discovering what's ailing some marine mammals.

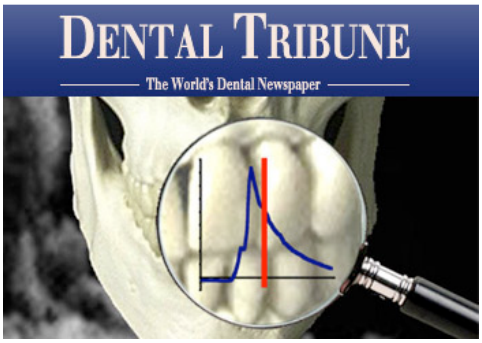
In recent months, about one in six of the adult California sea lions dying at the Marine Mammal Center in Sausalito succumbed to cancer, said Frances Gulland, the center's director of veterinary science.

And in June 2009, about 20 harbor seals in Northern California died from brain lesions, which are often caused by cancer.

Scientists at the Livermore laboratory have teamed up with researchers at the Marine Mammal Center to test how well the lab's new tool for detecting nearly 3,000 known viruses and bacteria can help pinpoint any pathogens behind the alarming rate of cancer showing up in the marine mammals.

To read more, go to http://www.therepublic.com/view/story/SCI-MARINE-MAMMALS_2596483/SCI-MARINE-MAMMALS_2596483/

Taking a bite into forensic science



By using the bomb curve data from above-ground nuclear weapons testing during the Cold War (inset), Lab scientists can determine a victim's birthdate by examining dental enamel.

In a large natural disaster, such as the Haitian earthquake earlier this year, or in an unsolved homicide case, knowing the birthdate of an individual can guide forensic investigators to the correct identity among a large number of possible victims.

Livermore researcher Bruce Buchholz and colleagues at the Karolinska Institute in Swedan are looking at victim's teeth to determine how old they are at the time of death.

Using LLNL'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 radiocarbon analysis showed that dating the teeth with the carbon-14 method would estimate the birthdate within one year.

"Traditional structural re-creation methods used by anthropologists to determine age are often imprecise," Buchholz said. "Radiocarbon dating gives a clear idea of the individual's birthdate."

To read more, go to http://www.dental-tribune.com/articles/content/id/2391/scope/news/region/usa

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NEWSLINE

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Editor's note: The *Livermore Lab Report* will now be distributed on Fridays.

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