LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, June 11-15, 2012

San Francisco Chronicle

THREE, TWO, ONE...

An artist's animation of energy escaping a black hole. Image courtesy of NASA Goddard Space Flight Center.

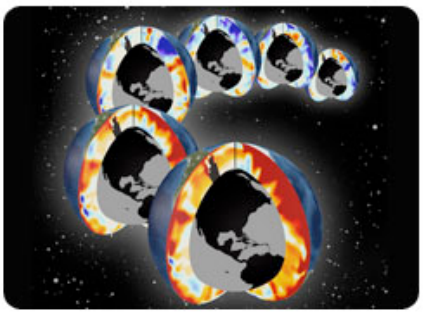
Lift off. The NASA Nuclear Spectroscopic Telescope Array (or NuSTAR), the first focusing, high-energy X-ray NASA satellite that will open the hard X-ray sky for sensitive study for the first time, successfully launched Thursday from Kwajalein Atoll in the Marshall Islands.

The Lab plays a pivotal role in the NASA mission that will eventually allow scientists to observe a new class of objects in space, called extreme objects, which have never been seen. The Laboratory was involved in both the design and testing of the X-ray optics that will fly on NuSTAR.

For Livermore, the predecessor to NuSTAR was a balloon-borne instrument known as HEFT (the High Energy Focusing Telescope) that was funded, in part, by a Laboratory Directed Research and Development investment in 2001. NuSTAR takes HEFT's X-ray focusing abilities and sends them beyond Earth's atmosphere on a satellite. The optics design and the proposed production process for NuSTAR are based on those used to build the HEFT telescopes.

To read more, go to *San Francisco Chronicle*.

DiscoveryNews. NOT BY NATURE ALONE



This image illustrates Pacific and Atlantic ocean zonal average cross sections (surface to 700 meters) of temperature changes for 1955 to 2011Graphic by Timo Bremer/LLNL.

Natural fluctuations alone do not explain warming in the upper layers of the planet's oceans, a new Livermore Lab computer modeling study confirms.

The ingredient necessary to fully account for rising water temperatures in the last 50 years? Humans' greenhouse gas emissions.

While attributing global warming to humans is hardly a new conclusion, this study adds to research intended to differentiate the effects of natural climate cycles, which can occur over decades, from changes caused by human alterations to the environment.

"The bottom line is that this study substantially strengthens the conclusion that most of the observed global ocean warming over the past 50 years is attributable to human activities," said Lab climate scientist Peter Gleckler.

To read more, go to *Discovery*.

YAHOO! NEWS GOING THE DISTANCE

Weapons simulations are pushing the limits of supercomputing. Supercomputers allow the United States to virtually test nuclear weapons without plunging back into the Cold War -- but undetected computing errors can corrupt or even crash such simulations involving the massively networked machines. The problems have enticed researchers to make an automated system for catching computer glitches before they spiral out of control.

The solution involved eliminating a "central brain" server that could not keep up with streaming data from thousands of machines -- researchers organized the supercomputing cluster of machines by "classes" based on whether machines ran similar processes. That clustering tactic makes it possible to quickly detect any supercomputing glitches.

Purdue University and Lawrence Livermore researchers used generic computer code rather than actual classified nuclear weapons software code, but their breakthrough should work out well for supercomputer simulations of nuclear weapons testing.

The team also began fixing the separate problem of "checkpointing." That problem arises because the backup system can't handle the supercomputing scale of 10,000 machines.

To read more, go to *Yahoo News*.

Opthalmoscopic appearance of the retina to show the macula lutea.

Eye diseases such as macular degeneration or glaucoma are typically not discovered until someone is on their way to blindness.

But Livermore Lab-developed adaptive optics technology, which was originally developed to take sharper images of outer space from ground-based telescopes, is opening the door to detecting eye disease in critical early stages.

By taking images of individual cells and layers in the eye, scientists can detect these eye disease earlier and can stop the progression of the disease or even reverse the progression of disease, according to lead Lab researcher Scot Olivier.

Oliver said the exciting part of the project is the ability to help people who are in danger of losing the eyesightTo see the video, go to the American Institute of Physics.

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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