LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Feb. 13-17, 2012

NATIONAL GEOGRAPHIC

CLEANING UP COAL THROUGH COOPERATION

China's largest coal-mining firm, Shenhua Group, is implementing a national pilot project in carbon capture and storage technology. ***Photograph by Wu Hong, European Press photo Agency***

If the United States is going to keep a hand in developing technologies to reduce greenhouse gases from coal-fired electricity, it will have to cooperate with China.

The answer may be in controlling greenhouse gas emissions is to make carbon capture and storage (CCS) work at power plants, because fast-developing nations rely on cheap, abundant and carbon-intensive coal to fuel their growing needs for electricity

But carbon capture alone won't protect the atmosphere, unless sequestration of the carbon dioxide is part of the solution. That's where the Laboratory comes in.

"We will never get to substantial CO2 reductions until the United States and China work together," says Julio Friedmann, carbon management program leader at the Laboratory. Friedmann is conducting a study of whether the low costs reported at a Huaneng's post-combustion carbon capture plant outside Shanghai could be applied to Duke Energy's largest power plant, its Gibson facility in Owensville, Ind.

To read more, go to *National Geographic*.

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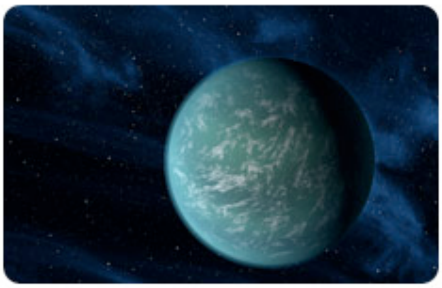
SQUEEZING OUT A DISCOVERY



An artist's conception of planet Kepler-22b, which orbits in a star's habitable zone -- the region around a star where liquid water, a requirement for life on Earth, could persist. ***Image courtesy of NASA.***

Phase changes in liquid magmas at pressures and temperatures deep inside Earth-like planets may be a factor in planet formation, according to Laboratory scientists.

In the same way graphite can transform into diamonds under high pressure, liquid magmas may undergo a similar transition to become denser material.

Using high-powered lasers, LLNL scientists discovered molten magnesium silicate undergoes a phase change, abruptly transforming into a more dense liquid with increasing pressure. This may indicate that phase changes played an important role during Earth's formation and that extra-solar 'Super-Earth' planets are structured differently from Earth.

To read more, go to *UPI*.

nature

IT'S HOT, HOT HOT

The white colored rock (approximately 100 feet high) shows the drop in the water level of Lake Mead as a result of the 10-year drought along the Colorado River. ***Photo courtesy of Guy DeMeo , U.S. Geological Survey.***

Extreme summer temperatures are already occurring more frequently in the United States, and will become normal by mid-century if the world continues on a business-as-usual schedule of emitting greenhouse gases.

By analyzing observations and results obtained from climate models, a study led by Phil Duffy of the Laboratory showed that previously rare high summertime (June, July and August) temperatures are already occurring more frequently in some regions of the 48 contiguous United States.

According to Duffy, the observed increase in the frequency of previously rare summertime temperatures is more consistent with the consequences of increasing greenhouse gas concentrations than with the effects of natural climate variability such as El Niños or La Niñas.

As for the future, the analysis showed that by mid-century, summertime mean temperatures that historically occurred only 5 percent of the time are projected to occur at least 70 percent of the time everywhere in the 48 state region.

To read more, go to *Nature*.

Carolyn Mac Kenzie

Health physics is a field that concentrates on using radiation safely. That can include everything from inspecting nuclear weapons test sites to recovering unused medical equipment in developing countries.

As a health physicist at the Laboratory, Carolyn Mac Kenzie holds a job that most people have never heard of. Yet it is one she sees as increasingly important in the 21st century.

Part of Mac Kenzie's job is to track orphan sources of radiation.

"An orphan source is a large radiation source that is missing or not accounted for," she said. "I do my homework before I go into a country and try to figure out what I think could be there. Then I strategically try to figure out where they might be and then actually go and search for them."

To hear the full interview, go to *KRCB*.

San Francisco Chronicle

THEY MAY NOT BE SO WILD

Adult Chinook salmon returning to a northwest U.S. hatchery. ***Photo courtesy of the National Oceanic and Atmospheric Administration.***

Wild chinook salmon are so outnumbered by hatchery-raised fish in the Mokelumne River that scientists fear they would die out if left to their own devices.

Only about 10 percent of the fall-run chinook that spawn in the river are naturally born fish, according to a recent genetic study.

The study identified hatchery fish using a novel technique developed at the Laboratory that detects traces of a hatchery diet preserved in the ear bones of adult fish. It was the first time biologists were able to quantify the percentage of farmed fish, most of which are unmarked and therefore undetectable in population surveys.

The count of wild fish, which experts believe would be just as bad in other California rivers, means there are not enough native chinook to sustain a natural population in the river.

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