



**FNAL's
Gaston
Gutierrez**



Research Highlights . . .

Muon tomography detects, identifies concealed materials

A technology developed at DOE's [Los Alamos National Laboratory](#) that safely and accurately detects bare, shielded, and masked nuclear threat materials is being licensed commercially. Decision Sciences Corporation received an exclusive worldwide license to commercialize muon tomography. Muon tomography uses naturally occurring cosmic-ray muons, a type of subatomic particle, to detect and identify concealed nuclear threat materials based on their atomic number and density. Unlike other imaging and detection techniques, such as X-rays, muon tomography cannot be fooled by threat materials that have been shielded because the dense shielding material is itself detected.

[Nancy W. Ambrosiano, 505/667-0471, nwa@lanl.gov]

'Leading edge' solar projects underway

The Center for [Revolutionary Solar Photoconversion](#) (CRSP) is launching 12 novel solar research projects totaling more than \$1.1 million in its inaugural round of R&D funding. CRSP—led by the [National Renewable Energy Laboratory](#)—is the newest research center of the [Colorado Renewable Energy Collaboratory](#). The center concentrates on ways to directly convert the sun's energy to clean, low-cost electricity and fuels. The [12 CRSP projects](#) "represent the leading edge of research into both new ways to generate electricity and liquid and gaseous fuels directly from the sun and improving our approaches toward these goals," NREL Senior Research Fellow and CRSP Scientific Director Arthur Nozik said.

[George Douglas, 303/275-4096, george_douglas@nrel.gov]

Why coat sapphires with sunscreen?

Zinc oxide—the same metal powder used in sunscreen—may one day help expand computer memory, protect valuable alloys from corrosion and build better sensors. [EMSL](#) users from [Pacific Northwest National Laboratory](#) and the [University of Idaho](#) compared thin films of zinc oxide grown along two facets, or planes, of the aluminum oxide crystal commonly known as sapphire. Although sapphire atoms on the planes are identical, they align differently. The researchers found that arrangement of the sapphire atoms influences the structure of zinc oxide thin films grown on the planes. Because thin film function depends on structure, this knowledge is important for tailoring thin films to do specific jobs. The team's work appeared in the October issue of [Thin Solid Films](#)

[Judith Graybeal, 509/375-4351,, graybeal@pnl.gov]

NETL sheds new light on unique class of CO₂ capture materials

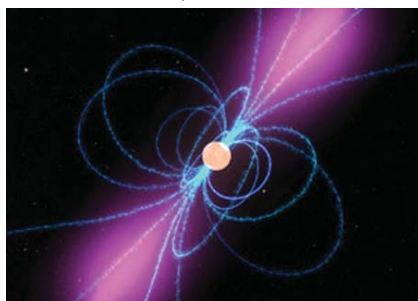
Scientists at DOE's [National Energy Technology Laboratory](#) have developed an experimental technique that provides a better evaluation of storage capacity for a new CO₂ capture material, a nickel-based metal-organic framework. The researchers were able to show, for the first time, that structural changes are responsible for the high CO₂-capture capacity of the framework. Furthermore, the measurements provided evidence for a particularly strong interaction between CO₂ and the pore of the capture framework. The technique relies on an optical phenomenon called attenuated total reflectance, and when used with infrared light, is capable of probing the near surface of porous solids.

[Linda Morton, 304/285-4543, Linda.morton@netl.doe.gov]

DOE Pulse highlights work being done at the [Department of Energy's](#) national laboratories. [DOE's laboratories](#) house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. *DOE Pulse* (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Pulsar observation opens new window on stellar evolution

About three times a second, a 10,000-year-old stellar corpse sweeps a beam of gamma-rays toward Earth. This object, known as a pulsar, is the first one known to “blink” only in gamma rays, and was discovered by the Large Area Telescope (LAT) onboard the Fermi Gamma-ray Space Telescope, a collaboration between NASA, DOE and international partners.



Clouds of charged particles move along the pulsar's magnetic field lines (blue) and create a lighthouse-like beam of gamma rays (purple) in this illustration. (Image courtesy of NASA.)

emits 1,000 times the energy of our sun.

A pulsar is a rapidly spinning neutron star, the crushed core left behind when a massive sun explodes. Although most pulsars are known to emit at radio wavelengths, some of these objects also beam energy in other forms, including visible light and X-rays.

Unlike previously discovered pulsars, the newly-observed pulsar appears to blink only in gamma-ray energies, offering researchers a new way to study the stars in our universe.

The LAT sees about one gamma ray each minute from the gamma-ray-only pulsar. That's enough for scientists to piece together the pulsar's pulsing period, its rotation period, and the rate at which it's slowing down. These measurements are also vital to understanding the dynamics of a pulsar's behavior and can be used to estimate the pulsar's age. From the slowing period, researchers have determined that the pulsar is actually powering all the activity in the nebula where it resides.

"This observation shows the power of the LAT," says Peter Michelson, principal investigator for the LAT. "It is so sensitive that we can now discover new types of objects just by observing their gamma-ray emissions."

These results appear in the Oct. 16 edition of *Science Express*.

Submitted by DOE's *SLAC National Accelerator Laboratory*

TURNING STUDENTS INTO TOP-NOTCH PHYSICISTS

Students of Gaston Gutierrez never forget him.

Two of his former students, Florencia Canelli and Juan Estrada, still apply the lessons that they learned from their mentor several years ago on the DZero collider experiment at the Department of Energy's **Fermi National Accelerator Laboratory**.



Gaston Gutierrez

"Juan and I worked very closely with Gaston. Even now, when faced with a difficult problem, we try to imagine how Gaston would solve it," said Canelli, now a physicist with a joint appointment between Fermilab and the University of Chicago.

As a result of his contributions to the **DZero experiment** and his dedication to mentoring young scientists, Fermilab's Gutierrez received the 2009 Edward A. Bouchet Award from the American Physical Society.

When Gutierrez joined the DZero collaboration in 1997, his first project was to build the central fiber tracker, one of four major parts at the heart of the DZero particle detector. When he wasn't constructing the tracker, he developed a new analysis technique to measure the mass of the **top quark**.

"I like to work on both construction and analysis," Gutierrez said. "Ideally you build it, and then you use it."

Canelli and Estrada were both graduate students at the University of Rochester when they started working with Gutierrez at Fermilab. With their home institution 650 miles away, Gutierrez took them under his wing and collaborated with their advisor, Tom Ferbel. "Florencia and Juan both have strong careers now," said Ferbel. "A lot of that was triggered by their work with Gaston."

Both Canelli and Estrada have won awards for their research on the mass of the top quark, attesting to the positive impact that Gutierrez had on their developing careers.

"Working with Gaston is the best thing that ever happened to me," said Estrada. "I'm not a student any more, but I still like to work with him because I know that everything will come out perfectly."

Submitted by DOE's *Fermi National Accelerator Laboratory*