

# NewsLetter

Week of September 10, 2007

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## The life-saving business of radioisotopes

*Some 40 feet beneath the mesa top that rims Los Alamos Canyon, in a heavily shielded room appropriately dubbed "the cave," atoms are being transformed. Energetic protons from an accelerator are sent smashing through a series of targets. When a proton slams into the nucleus of one of the target's constituent atoms, it transforms that ordinary, stable bit of matter into something extraordinary: a radioactive nucleus made specifically to serve society.*

*Radioactive nuclei, also called radioisotopes (or radioactive isotopes), emit energetic particles and/or gamma rays as they decay and become other nuclei. These radiations, while potentially dangerous, nonetheless make radioisotopes uniquely useful.*

### **Uniquely useful**

Home smoke detectors work because they contain americium-241 (the number refers to the radioisotope's mass). Radiation from the radioisotope creates an electric current that weakens when smoke is present and triggers an alarm. Security personnel use the neutrons emitted from californium-252 to inspect airline luggage for hidden explosives, while technicians use the gamma rays from iridium-192 to test the integrity of pipelines. Even polonium-210, the radioisotope that killed former KGB agent Alexander Litvinenko, is used as an anti-static brush to, say, neutralize static electricity on photographic films.

Even more important are the dozens of life-saving radioisotopes used for medical diagnostics and treatments. An estimated 16 million nuclear medicine procedures are performed annually in the United States, primarily to identify cardiovascular disorders, but also to diagnose and treat cancer.

These commercial applications merely hint at the business of radioisotopes, which also is useful for the military, research, and space exploration. Although the private sector conducts most of the commerce, four national laboratories, and in particular Los Alamos, also are players, providing critical radioisotopes that neither industry nor the universities can manufacture.

### **Guaranteed on time**

Radioactive nuclei need to be created, but then the atoms that contain the unstable nuclei must be chemically extracted from the target material, purified, packaged safely, and distributed in compliance with Department of Transportation regulations. This production requires a specialized infrastructure: an accelerator or nuclear reactor, where the radioisotopes are made; hot cells, where the radioactive goods are remotely processed and the isotope product purified; and facilities in which the radioactive and chemical waste streams are handled.

Los Alamos has been producing radioisotopes since the early 1970s, and its biggest success story has been developing a steady supply of strontium-82 for medical purposes. The radioisotope decays to radioactive rubidium-82, a short-lived radioisotope that is used in positron emission tomography (PET) scans to diagnose the condition of a patient's heart.

The Laboratory also produces germanium-68, which is used to calibrate the PET scanners and without which the sophisticated scanners would quickly become less useful.

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**For Your Safety**

## All roads lead to the office

It doesn't matter how an employee gets to work in the morning, as long as he or she gets there safely.

While a great many employees travel to the office in an automobile, there are lots who make the daily trek on foot, by bicycle or motorcycle, or on a bus.

Here are some safety tips for an assortment of travel methods:

- Leave for work early enough so there is no rush. Allow extra time for delays such as highway construction or traffic jams.
- Be ready when the car pool comes around so as not to cause delays, which will tempt the driver to speed.
- Wear seatbelts at all times in a moving automobile.
- When leaving a vehicle at a park-and-ride, stay alert for other traffic in the parking lot. Drivers may be in a hurry and not paying attention to pedestrians.
- When traveling by bicycle or motorcycle, avoid zipping in and out of traffic lanes. Observe all traffic laws just like the larger vehicles. Wear the required safety helmet.
- Get to work with some time to spare, in order to focus on working safely when it's time to tackle the job.

No matter how one travels, safety hazards will be encountered. Plan a safe commute and arrive alive.



## NewsLetter

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Los Alamos National Laboratory is a multidisciplinary research institution engaged in strategic science on behalf of national security. The Laboratory is operated by a team composed of Bechtel National, the University of California, BWX Technologies and Washington Group International for the Department of Energy's National Nuclear Security Administration.

Los Alamos enhances national security by ensuring the safety and reliability of the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction, and solving problems related to energy, environment, infrastructure, health and global security concerns.



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## The life-saving business ...

*continued from Page 1*

Up until 1998, those two radioisotopes and others were made using high-energy protons from the accelerator at what is now the Los Alamos Neutron Science Center (LANSCE). The isotope production station was located at the end of the accelerator beam line, so when the accelerator went down for maintenance, radioisotope production ceased.

The situation changed with the 2004 commissioning of the Isotope Production Facility (IPF).

"The LANSCE accelerator is actually two linear accelerators joined together," said Gene Peterson, the Chemistry (C) Division leader and driving force behind the IPF. "Someone had the foresight to put a 'spigot' where the two join. We can remove protons after the first accelerator stage and send them into the IPF's cave. Our operation is effectively decoupled from the other accelerator and from LANSCE."

The protons taken from the spigot have less energy than those that travel the accelerator's full length. The lower-energy actually allowed for more specific control of the nuclear reactions that create the radioisotopes. The decoupling greatly increased the reliability of Los Alamos products and guaranteed the Lab a stake in the national radioisotope market. The Laboratory's Isotope Production and Distribution Program, under which the radioisotopes are produced, is the first business-like operation at Los Alamos.

### **A national production program**

As soon as they are created, radioactive nuclei begin to decay and disappear. Part of staying in business is maintaining production to ensure a steady supply.

At the national level, the isotope program, administered by the Department of Energy's Office of Nuclear Energy, is responsible for radioisotope production at Los Alamos, Brookhaven, Oak Ridge, and Idaho national laboratories and ensures the supply through the coordination of production schedules. For example, Brookhaven and Los Alamos—the sole producers of strontium-82 in the country—stagger their schedules so one is producing while the other is down for maintenance.

The national program has been remarkably successful, in recent years serving about 170 hospitals and companies worldwide and making about 450 isotope shipments annually.

However, the demand for radioisotopes is steadily increasing, with medical isotopes being one of the fastest growing markets. The increased demand has been a significant strain on the enterprise, especially with respect to the supply of radioisotopes used in research.

In response, DOE recently shifted to a contractor-based system, managed out of the newly created National Isotope Program Office. In addition to contracting with the national laboratories, the national program will be keeping the supplies coming through contracts with reactor facilities at the University of California, Davis, and the University of Missouri, as well as facilities in Russia and South Africa.

"We're trying to establish an integrated production schedule with all the contracted facilities, even those located halfway around the world," said Wolfgang Runde, of Civilian Nuclear Programs (SPO-CNP) and the national program manager. "Plus, we plan to re-invigorate research and development for new radioisotopes, as well as educate the next generation of nuclear physicists, engineers, and chemists. We're investing in the future."

Los Alamos already is working with several partners to make other life-saving radioisotopes, for example, copper-67, widely available to the medical community. A brief human trial during the 1990s showed that copper-67 was effective for treating non-Hodgkin's lymphoma.

At the time of the trial, it was difficult to consistently produce the radioisotope. Laboratory scientists are investigating using a target enriched in zinc-68 to produce the copper isotope. The reaction is ideally suited for the proton energy range available at the IPF.

The zinc target also would produce copper-64, a gamma-ray emitter that can be used for medical imaging applications. Used together, the two copper radioisotopes offer the possibility of simultaneously diagnosing and treating cancer cells.

Los Alamos also is partnering with the New Mexico Center for Isotopes in Medicine at the University of New Mexico to develop a new and improved gallium-68 generator. The positron-emitting gallium-68 is a short-lived radioisotope that can be used for PET imaging of cancerous tissue. The manufactured generator would contain the long-lived radioisotope germanium-68, which decays to the short-lived gallium-68. A hospital or research institution would use the generator as an on-site source of gallium-68.

The gallium radioisotope can be quickly linked to different cancer-targeting agents.

Together with its New Mexico partners, Los Alamos will develop commercial kits that researchers can use to evaluate the gallium-labeled agents in animal studies and experimental models of cancer.

In Runde's opinion, Los Alamos, with its Isotope Production Facility, hot cell facilities, the proposed Materials Test Station, and expertise in nuclear chemistry, radiochemistry, and physics, can be at the forefront of radioisotope research.

"New nuclei will be needed to tackle tomorrow's problems," he said. "We need to start discovering and producing those nuclei today."

**Editor's note:** This article by Jay Schecker of the Science and Technology Based Program Office (STBPO-PO) is excerpted from an article that appeared in the August 2007 edition of the *Laboratory's science publication*, 1663.



**Wolfgang Runde is the new manager of the National Isotope Program, part of which aims to revitalize research into radioisotope products.** Photos by LeRoy N. Sanchez, Records Management, Media Services and Operations

# So...what do you think?

**Q:** The Laboratory encourages employees to exercise regularly to improve or maintain their overall health, and walking is one of the easiest and most convenient ways of doing that. September is Walking Month and the Laboratory's Wellness Center is planning a number of activities to get employees out and walking. Are you taking part in Walking Month? If not, what physical activities do you routinely do to achieve cardiovascular fitness, relieve stress, and/or burn calories?



**Carmen Humphrey of the Communications Office (CGA-CO)**

I am not in a formal walking class, but yes, I do go to the gym three to four times a week, which includes using the treadmill.



**Gloria Salazar of Travel, (CFO-TRVL) and Pat Radosevich of Treasury, Pension, and Tax (CFO-TPT)**

Yes we are taking part. We walk on our breaks, and a half-hour during lunch—about three miles per day.



**Chris Jeffery of Space and Remote Sensing (ISR-2)**

I am not taking part in Walking Month, but I do use the Wellness Center routinely and I sure wish we could finally get a new facility. The Wellness Center is a great resource to maintain overall health.



**It's a festival... and you're invited!**

Come join your Laboratory co-workers for a day of food, fun, and entertainment at the 2007 Fall Festival.

**Saturday, Sept. 29**  
**11 a.m. to 4 p.m.**  
**Sullivan Field**  
 (across from Los Alamos High School)

All Laboratory employees and contractors (KSL, PTLA, etc.) are invited, and each can bring up to five guests.

Planning to attend? Go online to <http://int.lanl.gov/fallfest/> for more information and to register, noting the number of guests you plan to bring. Lab organizers need this information for logistics, including ordering food.

*Editor's note: The Fall Festival, originally scheduled for September 22, was rescheduled for September 29 after the week of August 27 Los Alamos NewsLetter had gone to press.*



## Montoya-Rael is new president of UNM Alumni Association



**Lillian Montoya-Rael**

**C**ommunity Programs Office (CPO) Director **Lillian Montoya-Rael** recently became president of the University of New Mexico Alumni Association.

A member of the association's executive committee, she assumed the presidency of the organization earlier this summer.

Montoya-Rael earned her bachelor's degree from UNM in 1989 and a master's of business administration in 1998 also from UNM.

"With more than 120,000 UNM alumni, it is no surprise that they are making a difference in local communities around the world. Whether it be at a community event or at a board meeting, I continue to be in awe of the number of UNM alumni who are active leaders in New Mexico," said Montoya-Rael. "This is but one reason that I'm honored to represent the UNM alumni."

"The other reason is because I take pride in what the University of New Mexico has become—an outstanding research university," Montoya-Rael continued. "This year with the recent addition of our new president, David Schmidly, we have a terrific opportunity to strengthen the connection among the university, alumni, and the community."

Montoya-Rael has directed the Laboratory's Community Programs Office since August 2004. She also serves on boards and committees of several organizations, including New Mexico First, which she also chairs; Santa Fe Business Incubator; New Mexico Business Roundtable; and United Way of Santa Fe County.

Earlier this year, Montoya-Rael also received the Not-for-Profit Professional of the Year award from United Way of Santa Fe County for her work on behalf of the

Laboratory and its Community Commitment Plan to strengthen Los Alamos National Security, LLC's, and the Laboratory's efforts in regional education, economic development, and community giving.

## Rowe appointed to National Research Council Committee

**C**harlotte Rowe, a seismologist in Geophysics (EES-11), is a new member of the National Research Council's Committee on Seismology and Geodynamics.

Created in 2000, the committee's mission statement has five parts: 1) to foster understanding of the Earth; 2) to review and define basic and applied research activities in seismology, geodesy and geodynamics; 3) to transfer seismological and geophysical knowledge to areas of public welfare and national security; 4) to facilitate the collection, storage and distribution of data; and 5) to monitor geodynamic events and nuclear testing treaties with geophysical technologies.

"I hope that by working with the NRC committee, I'll be able to contribute in a broader way to the advancement of relevant research and meaningful application of the results," she said.

Rowe has been studying geophysics, with a focus on seismology, since earning a bachelor's of science in geology from the New Mexico Institute of Mining and Technology in 1981. From there, she earned her master's of science in geophysics at the University of Alaska, Fairbanks, in 1988. After nine years at the Alaska Earthquake Information Center and Alaska Volcano Observatory, she returned to New Mexico Tech to complete a doctorate in geophysics in 2000.

"I was drawn to geophysics through a life-long fascination with volcanoes," Rowe said. "Seismology always seemed to me the most tangible branch of geophysics. And because it is the most widely used and relied-upon method for monitoring active volcanoes, I focused on it for my degrees."

Rowe joined the Laboratory in 2002 as a postdoctoral research associate in EES-11. She also is an adjunct associate professor for the University of New Mexico Department of Earth and Planetary Sciences and an adjunct associate scientist for the University of Wisconsin Department of Geology and Geophysics, where she had her first postdoctoral appointment before coming to the Laboratory.

## D'Agostino sworn in as undersecretary for nuclear security, NNSA administrator

**T**homas D'Agostino is the third undersecretary for nuclear security and administrator of the National Nuclear Security Administration.

"I applaud the Senate's quick action to confirm Tom D'Agostino as administrator of NNSA," Department of Energy Secretary Samuel Bodman said. "Tom brings institutional knowledge of the weapons complex and firsthand experience in leading our defense programs to his new position. I am pleased to have him on my senior leadership team as we work to further President Bush's energy and national security agenda and advance critical nonproliferation goals."

President George W. Bush nominated D'Agostino on May 17, and he was confirmed by the Senate on August 1. D'Agostino, who joined DOE in 1991, most recently served as NNSA's deputy administrator for defense programs.

"I am honored by the opportunity to serve the President and Secretary Bodman as NNSA administrator," D'Agostino said. "I look forward to fulfilling the President's vision of a smaller stockpile, transforming the country's weapons complex, and continuing to lead the world in combating the spread of nuclear weapons and material around the globe."

D'Agostino has more than 29 years of military service in the United States Navy, retiring with the rank of captain from the U.S. Naval Reserves. He received a bachelor's degree from the U.S. Naval Academy and master's degrees from Johns Hopkins University and the Naval War College.



**Thomas D'Agostino**



## Laboratory employee participates in all-women's international air race

by Cynthia Casados

When Amy Ecclesine of Institutional Quality (QA-IQ) took her first small-airplane ride, the pilot gave her full control of the airplane. She was only 12 years old, but she knew then she wanted to be a pilot. "Don't underestimate 12-year-olds; they make very strong decisions," said Ecclesine.

Ecclesine participated in the annual Air Classic Race, nicknamed the "Powder Puff Derby," an airplane race for female pilots. In June, she flew 2,600 miles in four days with her friend Susan Larson as pilot and Ecclesine as co-pilot. The pair finished seventh among forty-five teams. The race started in Oklahoma City, Oklahoma, and ended in St. John, New Brunswick, Canada.

"I felt I was participating in something important that is not only historical, but also promotes women to achieve their best in the field of aviation, which still is a predominantly male world," said Ecclesine. "If what we've accomplished as a group of female pilots serves as inspiration to any woman to break through her limitations, hooray!"

The Women's Air Derby, which included the famous female pilot Amelia Earhart, dates to 1929. "More than seventy-five years ago, Amelia Earhart took off from the same exact place. It was a sense of repeating history," said Ecclesine.

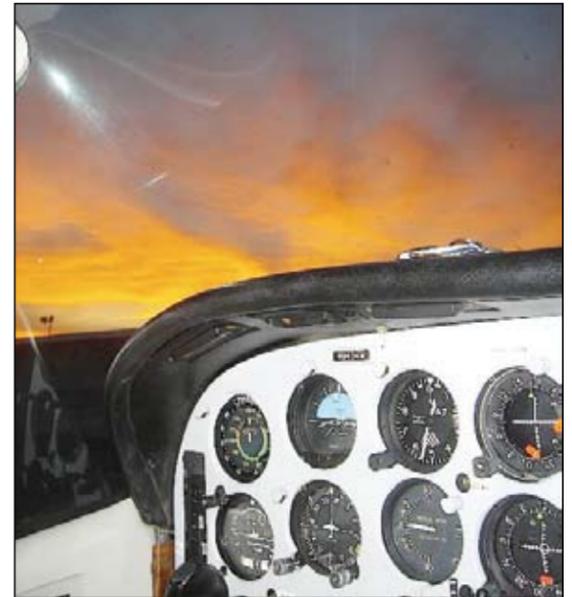
The pair flew in Larson's Cessna 182 Skylane. On the first leg of the race, from Oklahoma City to McCook, Nebraska, the airplane's advanced Global Positioning System failed. Ecclesine had to rely on a hand-held GPS and her navigation skills. "This event shows you can't always rely on your high-tech equipment and plane; you have to know what you're doing and rely on your personal skills," she said.

Ecclesine co-owns a Piper Cherokee and received her license in 2000. Since then, she has flown more than 400 hours. She is a charter member and officer of the Rio Grande Del Norte Chapter of the 99s, an international organization of licensed women pilots. The goal of the organization is to promote fellowship through flight, educate others about aviation through networking and scholarship, and preserve the history of women in aviation.

To learn more about the field of aviation or the Rio Grande 99s, go to <http://www.dpcube.com/>.



Amy Ecclesine



A sunset viewed from the plane, Mikey, on the ground at Bowling Green, Kentucky. Ecclesine and Larson achieved an unprecedented four legs of the race in the first day, sneaking in as the sun set. The rules stated that all flights must be flown by Visual Flight Regulations, meaning the teams had to fly by legal sunrise and be on the ground by legal sunset.



Above is a sectional chart that reflects the mid-air course changes that occurred on the last leg from Bangor, Maine, to St. John, New Brunswick. Of the nine race legs, the last was the most difficult, both weather wise and technically. The plane's Global Positioning System had failed, and the race timing line changed three times while the team was in the air.



Amy Ecclesine, right, stands with Susan Larson, owner of the plane, at the Santa Fe Municipal Airport the morning the team left for Oklahoma City, Oklahoma, to participate in the Air Classic Race, an airplane race for female pilots. Top right photo by LeRoy N. Sanchez, Records Management/Media Services and Operations; remaining photos courtesy of Ecclesine