LOS ALAMOS NATIONAL LABORATORY

CURRENTS

August 2008

Milagro retires
Laboratory wins two R&D 100 awards
Stretching the bounds of communications
Innovative technology helps detect hidden threats

Los Alamos
NATIONAL LABORATORY
EST. 1943

My View

Significant changes, new challenges

Whether you favor John McCain or Barack Obama in the coming presidential election, significant changes affecting national and homeland security, defense, energy, and environmental policy are in store with the coming change in the administration. What appears likely from the campaign rhetoric is that there will be new challenges in arms control and treaty verification, nonproliferation, and homeland security areas, with flat or declining nuclear weapons budgets.

Sandra Valdez

The Laboratory has an incredible track record delivering solutions to national security problems in these potential growth areas. Historically, the Lab has contributed in so many ways. A few of the unique contributions that the Laboratory has made include inventing nuclear safeguards technologies that are now in use around the world, developing instrumentation for satellite nuclear explosions monitoring, inventing techniques for passive and active diagnostics for improvised nuclear devices, and developing algorithms and techniques to simulate infrastructure through the National Infrastructure Simulation and Analysis Center.

New challenges, growth in programs where the Laboratory has demonstrated success, scientific and technical excellence—What is daunting about change in this context? The biggest barrier to the Lab's success is learning how to work as a unified organization with a common set of goals and objectives. Opportunities can be lost simply by assuming that customers can wait while we add more and more hurdles to accomplishing our mission. We clearly need to comply with our contract, but we need to focus on effective and efficient execution of the mission at the same time. It cannot be one without the other. We need to be flexible with our workforce while supporting development and growth for personnel.

Change is good. Internal strife is not. Let's spend the next six months planning for transition to include effective and efficient execution of the mission.

—Evelyn Mullen, International and Applied Technology Division leader

About the cover: Researchers paddle about collecting photomultiplier tubes from the water reservoir at the Laboratory's Milagro facility at Fenton Hill. See page 4 for the story. Photo by Sandra Valdez.

Atcher named president of Society of Nuclear Medicine

Robert Atcher of the Bioscience Division is the 2008-2009 president of the Society of Nuclear Medicine, a multidisciplinary international scientific and professional organization of more than 16,000 physicians, technologists, and scientists.

Atcher served as the program manager for the U.S. Department of Health and Human Services and group leader for the former Michelson and Szilard Resources in the Bioscience Division. He also is the University of New Mexico/Los Alamos National Laboratory professor of pharmacy in the College of Pharmacy at UNM.

Richard Robinson

Don Werder, right, shows off his CLES certificate with Laboratory Director Michael Anastasio

Werder named 2007 CLES Technician of the Year

Don Werder of Physical Chemistry and Applied Spectroscopy and Softmatter Nanotechnology and Advanced Spectroscopy recently received the 2007 Chemistry, Life, and Earth Sciences Technician of the Year award.

Werder's achievements include purchasing a transmission electron microscope (TEM), building a controlled environment room for it in record time, and operating the instrument. Werder also developed a class-10,000 clean room for the fabrication of nanocrystal quantum dot-based devices and made numerous research contributions on colloidal nanocrystal quantum dots, as well as collaborating with non-Lab scientists on TEM studies. His work was recently published in the journal *Nanotechnology*.

The award recognizes outstanding technicians in CLES and their contributions to science and programs. Werder received a certificate, silver star, and monetary award at a CLES directoratewide meeting.

Koushiappas wins Heller Postdoctoral Publication Prize

Postdoctoral researcher Savvas Koushiappas of Theoretical Astrophysics and Space Science and Applications is the 14th recipient of the Leon Heller Postdoctoral Publication Prize in Theoretical Physics. His winning paper, "Proper Motion of Gamma Rays from Microhalo Sources," is published in *Physical Review Letters*.

Pinaki Sengupta, a postdoc jointly sponsored by the National High Magnetic Field Laboratory and Condensed Matter Statistical Physics, received honorable mention for his paper, "Field-Induced Supersolid Phase in Spin-One Heisenberg Models," also published in *Physical Review Letters*.

The biennial prize, jointly sponsored by the Laboratory and retired staff member Leon Heller, is awarded for the best article in theoretical physics published or accepted for publication after January 1, 2006. Heller created the prize in 1976 and provides the monetary award.

Koushiappas and Sengupta will be honored at a Physics/Theoretical Division colloquium this fall.

Courtesy photo

David Loaiza

Loaiza appointed White House Fellow

David Loaiza of Nuclear Nonproliferation was appointed by President Bush as a class of 2008-2009 White House Fellow and will participate in the nation's most prestigious fellowship program for leadership development and public service.

"I am honored to have been selected for this fellowship," Loaiza said. "I realize that by being selected as a fellow, someone else was denied the opportunity. I take this responsibility to heart, and I am committed to living up to the expectations of the White House Fellowship."

Loaiza currently serves as an advisor to the Department of Energy's Office of Dismantlement and Transparency and is involved in the formulation of U.S. nonproliferation policy at the national and international level. He is a technical team lead for U.S. delegations monitoring the denuclearization of North Korea. He also provides technical briefs and training to the International Atomic Energy Agency.

White House Fellows are selected by the President's Commission on White House Fellowships.

Sandra Valdez

A diver prepares to retrieve photomultiplier tubes from the depths of the 5-million-gallon water reservoir at the Laboratory's Milagro facility at Fenton Hill.

Milagro retires

decommissioned components to be recycled for new project

Miracles are hard to come by. And this "miracle"—*milagro* in Spanish—is no exception. Tucked away in the heart of the Jemez Mountains, accessible only by an unmarked dirt road, is the Laboratory's very own "Milagro": a facility where, until earlier this year, scientists mapped the galaxy at tera-electron volt (TeV) energies, revealed gamma-ray sources, and discovered possible acceleration sites of cosmic rays.

After seven years, the Milagro experiment ceased operation. Its results have been truly miraculous. By discovering new sources of TeV and charting the Northern Hemisphere, Milagro helped usher in a new era for ground-based gamma-ray astrophysics and inspired further research by demonstrating that many more yet undiscovered sources of gamma rays exist.

"Cosmic and gamma rays are always raining down on the Earth, but most of the time, we don't know from where," said Jim Linnemann, a professor at the Department of Physics and Astronomy at Michigan State University and one of many scientists from around the nation and world who have worked at Milagro.

"Milagro has allowed us to study extreme phenomena in the universe," said Brenda Dingus of Neutron Science and Technology, who has been involved in the project since 1997.

The core of the Milagro experiment was formed by an extensive air shower (EAS) detector that "saw" the universe at high energies. The particles of light, called gamma-ray photons, that Milagro perceived are about 1 trillion times more energetic than visible light. While these photons are similar to ones making up visible light, they behave differently because of their higher energy levels.

Milagro pioneered water-Cherenkov technology to detect these particles. This technique involves placing a series of light-sensitive photomultiplier tubes (PMT) in a large volume

of water, the detector. When a high-energy photon strikes Earth's atmosphere, it causes a particle cascade, which in turn, results in a scatter of secondary particles. When these secondary particles enter the detector, they emit light that is sensed by the PMTs. Scientists are able to deduce the direction of the original particle by recording the location and time each PMT was struck, allowing them to continuously monitor the sky for gamma-ray emission of energies up to about 100 TeV.

Milagro was unique in that it was sensitive over its entire area. Traditionally, EAS arrays had been composed of isolated sets of small detectors, spread over large areas, which were typically active over only 1 percent of the enclosed area and unable to detect gamma rays from astrophysical sources. In addition, Milagro was able to sense photons at ground level because the water covering the tubes was of sufficient depth to convert gamma rays to detectable charged particles.

The Milagro detector, operated by the Laboratory in partnership with the National Science Foundation and the Department of Energy Office of Science, used a central, covered reservoir holding about 5 million gallons of water. The reservoir was outfitted with 728 PMTs arranged in two layers. One hundred seventy-six outrigger water tanks, each outfitted with one tube, surrounded the central reservoir and let scientists identify air showers over a larger area, as well as accurately pinpoint the location of the shower core.

Having fulfilled its mission, Milagro is slowly and carefully being dismantled. In June, the tarp covering the huge pond was lifted from the water by air-blowing fans, allowing researchers and divers to enter the resulting bubble chamber. Workers piloting small dinghies in the near blackness probed the reservoir's depths to cut free and retrieve hundreds of dimly glowing photomultiplier tubes.

Removal of the photomultiplier tubes from the pond has been completed, although PMTs still are being retrieved from the outrigger tanks. The reservoir's vast supply of water, which Dingus said is constantly monitored for cleanliness and purity, is being put to good use. On-site personnel are using the water, dispersed through enormous hoses and sprinklers, to gently dampen the surrounding forest area, rendering it less vulnerable to potential fire hazards. Dingus added that final disposition of the pond is, as yet, unclear.

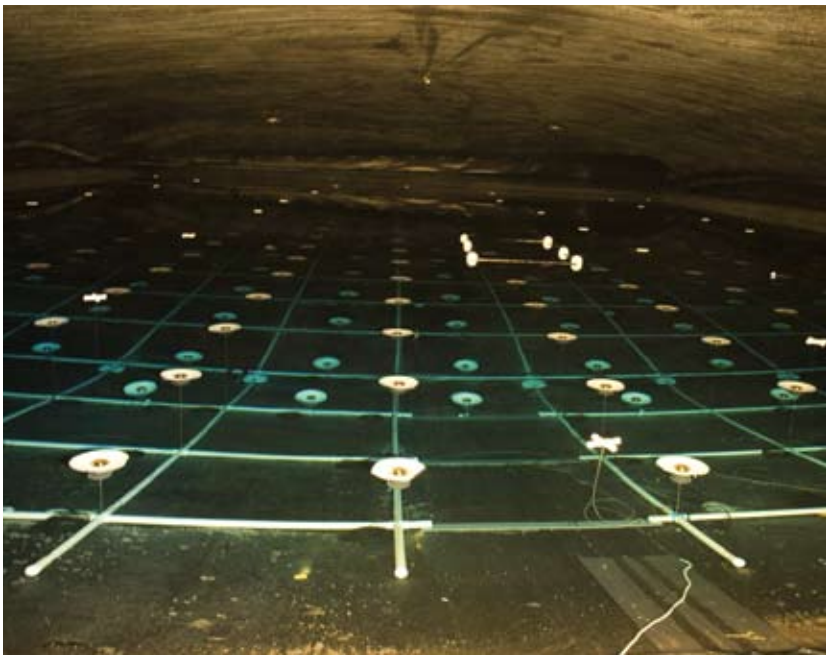
The facility's electronics and data acquisition system currently is being recalibrated and upgraded at the Los Alamos Neutron Science Center. Together with the PMTs and other components salvaged from Milagro, it will be used in a new joint United States–Mexico experiment: the High Altitude Water Cherenkov (HAWC) telescope located at Volcàn Sierra Negra, Mexico, near the site of the Large Millimeter Telescope.

"The first $1 million have just been approved [for HAWC]," Dingus said.

The scientist explained that, at about 13,450 feet above sea level (compared with Milagro's 8,530-foot elevation) and with a larger detector, HAWC will be about 15 times more sensitive than Milagro.

—Tatjana K. Rosev

"Milagro has allowed us to study extreme phenomena in the universe."



LeRoy N. Sanchez

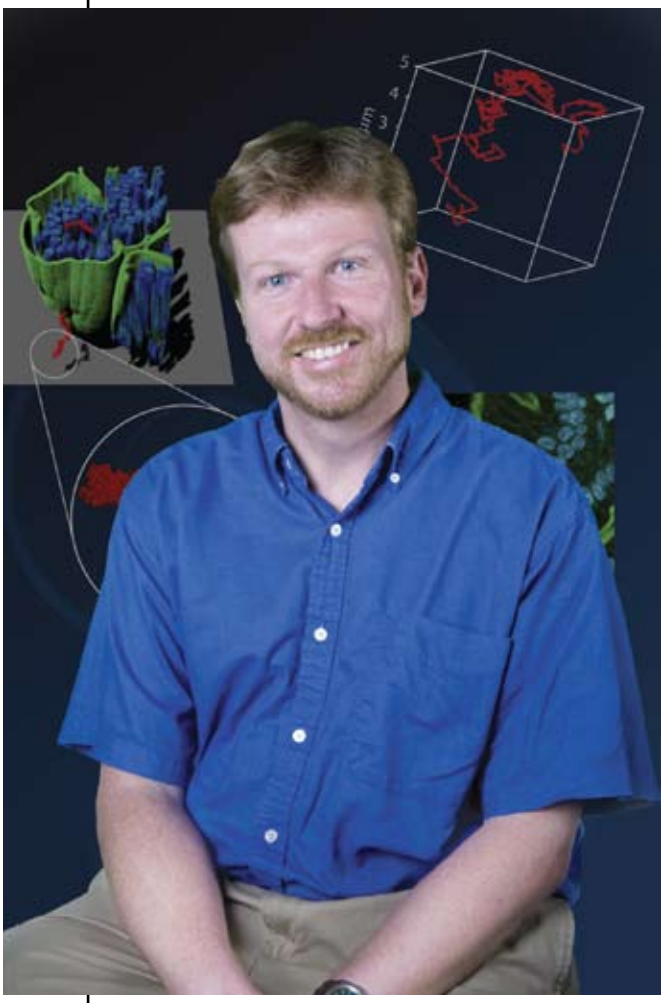
Glowing in the water at Milagro are 728 photomultiplier tubes arranged in two layers.

Laboratory researchers receive two R&D 100 awards

Cutting-edge innovations garnered Los Alamos researchers two of *R&D Magazine's* prestigious R&D 100 Awards. The awards, which will be presented October 16 in Chicago, recognize the top 100 industrial innovations worldwide in 2008. Winning Laboratory projects are the 3-D Tracking Microscope and Laser-Weave® technology.

"Congratulations to our R&D 100 Award-winners for this acknowledgement of scientific excellence," said Laboratory Director Michael Anastasio. "The awards demonstrate that the Laboratory continues to be at the forefront of developing innovative concepts and translating them into practical applications."

This year's awards bring the Laboratory's total to 107 since it began entering the competition in 1978.



Jim Werner

Jim Werner, 3-D Microscope

Jim Werner of the Center for Integrated Nanotechnologies (MPA-CINT), who recently won a coveted R&D 100 award for developing a microscope capable of tracking nanometer-sized objects in three dimensions, is one of the humblest people you'll ever meet.

"I was singled out in the press because I happened to write the application," said Werner, who holds a doctorate in applied physics from Cornell University. "I couldn't have done it without my team."

Werner said Peter Goodwin, Guillaume Lessard, and Nathan Wells, all of MPA-CINT, deserve credit for helping to create the revolutionary new instrument.

The team designed the world's first confocal microscope capable of following the motion of individual molecules, quantum dots, organic fluorophores, single green fluorescent proteins, and other nanometer-sized objects as they zoom through three-dimensional space at rates faster than many intracellular transport processes. The microscope will find primary application in cellular biology, where it will help track the transportation of molecules inside cells, Werner said.

The scientist said that his interest in developing the microscope was sparked by a conference on single molecule biophysics he attended several years ago, where there were a number of interesting reports of two-dimensional single molecule tracking. "It became fairly obvious to me that the technology needed to develop into 3-D," he said.

Werner spent the next five years trying to do just that.

"Peter Goodwin and I went back and forth with methods," he remembered. "We finally came up with a pretty good design and strategy."

The team spent long hours performing simulations, writing software to control the microscope, and building the instrument. Werner said he decompressed by playing soccer, flyfishing, and snowboarding. "I love the outdoors," he said. "That's partly why I love living here in Los Alamos."

Werner said that winning the R&D 100 Award has greatly increased awareness of the technology in the scientific community. The experience also confirmed one of Werner's most closely held axioms.

"I learned a long time ago from Dick Keller (Keller is a Laboratory Fellow and a pioneer of single molecule detection) that scientific discovery is driven by instrument development," he said. "It means so much to all of us that we were able to come up with a successful design."

James Maxwell, Laser-Weave®

James Maxwell of Applied Electromagnetics has been involved in laser and microchemical processing for more than 12 years. Recently, his hard work paid off big: the groundbreaking Laser-Weave technique he pioneered garnered him one of *R&D Magazine's* prestigious R&D 100 Awards, known in the industry as the "Oscars of Invention."

Laser-Weave refers to a process involving hyperbaric laser chemical vapor deposition that allows scientists, engineers, and manufacturers to grow high-strength inorganic fibers into useful shapes and complex patterns, braid or weave strong cables, cloth, or composites with lasers, produce high-value, cost-effective refractory ropes and textiles, and prototype high-aspect ratio micro-electrical mechanical systems.

"To put it simply, we grow things from gases using lasers," said Maxwell, who holds a doctorate in mechanical engineering with a specialty in laser microchemical processing from Rensselaer Polytechnic Institute.

Maxwell's technique lets him grow structures and fibers at astonishing speeds. "Laser-Weave is able to produce 13 centimeters of growth rate along the cable length per second," he said. When laser-woven fibers are braided together, the resulting cloth is exceptionally strong and able to withstand high temperatures and can be employed in a variety of applications, Maxwell explained.

Photos by Sandra Valdez

James Maxwell

"It can be used in anything from the inside of your toaster to exhaust nozzles in rocket engines," he said.

Maxwell said winning an R&D 100 Award will open doors for him in the future. "Already, companies are approaching the Technology Transfer Division looking to license or incorporate this technology," he said.

Maxwell explained that his research is driven by a curiosity of the world around him, the wish to serve his country, and the desire to raise living standards by developing superior products and technologies and making them accessible to the general public.

"I learned a long time ago that engineering and science are what ultimately build wealth in societies," he said. "Innovators help society as a whole, and it's very exciting to be a part of that."

—Tatjana K. Rosev

Leslie Hansen cuddles her dogs, Freya (left) and Sammy, in her backyard, which she has turned into a canine training field."

LeRoy N. Sanchez

Protecting the environment, caring for wildlife

ideal job for animal lover

Leslie Hansen of Environmental Protection considers herself fortunate to have a job that lets her do what she loves best—care for and work with animals while spending as much time as possible outdoors.

"I feel so lucky to live up here," said Hansen, who has been with the Laboratory since 1994. "There's beauty all around me."

Hansen said she's always been interested in animals. After considering zoology as a major, she obtained a bachelor's degree in forest resources, a master's degree in wildlife science, and a doctorate in wildlife management.

A biological resources compliance and monitoring team leader, Hansen helps ensure that the Laboratory is in compliance with the Endangered Species Act. Her team is responsible for implementing the Lab's Threatened and Endangered Species Habitat Management Plan, which identifies the locations of suitable habitats for two federally listed endangered species occasionally found on Lab property: the Mexican spotted owl and Southwestern willow flycatcher. The plan provides guidelines for how to protect those habitats from disturbance and alteration, Hansen said. "We do annual surveys to determine the presence or absence of protected species," she noted.

The team also reviews Laboratory projects to ensure they comply with the management plan. "If a project can't comply, we support the project and the Los Alamos Site Office in consulting with the U.S. Fish and Wildlife Service about identifying and mitigating the project's impacts," she explained.

Hansen's efforts aren't limited to bird life. In addition to investigating Jemez Mountains salamanders, she and her team have done research on elk and deer populations passing through Laboratory territory, which involved outfitting deer with GPS collars for tracking purposes.

In her spare time, Hansen is a trainer with the Los Alamos Dog Obedience Club, training dogs in obedience, agility, and herding. "I've turned my backyard into an agility field," she smiled.

Pointing to a photograph of herself and a white dog, she remembered, "It all began with 'Rat,' a mixed breed I rescued from the streets of Lubbock, Texas."

Hansen owns and trains Sammy, a dog she rescued, and three Munsterlanders, Loki, Yggi, and Freya.

"Training dogs is very relaxing for me," Hansen said. "Dogs have such enthusiasm, such joy in living."

—Tatjana K. Rosev

Stretching the bounds of communication

production value key for videoconferencing specialist

Surging energy prices and shrinking budgets have tightened purse strings for domestic and international travel. But the need to connect with collaborators across the globe is greater than ever, and standing by to help are videoconferencing experts like Roger Salles in Computing, Telecommunications, and Networking Division.

Since he joined the CTN team in 2004, Salles has worked to make videoconferencing as seamless as possible for anyone at the Laboratory who needs to make use of this free service. He and his colleagues develop solutions like desktop videoconferencing to connect sign language interpreters with their clients at the Lab. And Salles engineered a state-of-the-art videoconferencing room, boasting an "immersive" atmosphere with three wall-sized, wrap-around screens. These innovations make Los Alamos a beacon of communication technology.

"We probably have more multipoint conferencing capacity than all of the other DOE sites," Salles said. Other labs often leverage the Los Alamos team's expertise and infrastructure for their own conferencing needs, he added.

Drawing on prior experience developing distance-learning tools at Northern New Mexico College in Española, Salles has focused on trying to transcend the technology and make videoconferences as much like face-to-face meetings as possible.

"To me, it's a show we put on," he said, and "production quality" is paramount. Several months of detailed planning went into the room he designed, down to the angle of the lights and cameras to avoid casting any shadows, the soundproofed walls, and the paint that reflects projected images the way a theater screen does.

Inevitably with technology, things do go wrong, and when they do, CTN staff members "jump into high gear," Salles said. "We rarely experience any outages that the customer can notice." That's a feat, given that between 10 and 20 videoconferences are conducted each week. "We don't know how to say 'no,'" he added. "If it wasn't such a cohesive team, we wouldn't get so much done."

And it's clear Salles doesn't mind supporting an ever-growing client base. His eyes light up when he talks about the myriad connections he's forged between the "smart people" at the Lab and their international cohorts. "It's fascinating to think, 'we have a videoconference with Moscow tomorrow morning.' "

—John C. Cannon

Dixon Wolf

Roger Salles of Computing, Telecommunications, and Networking chats with coworker Diane Hansen in the state-of-the-art videoconferencing room he designed to help Lab staff connect with collaborators and colleagues all over the world.

Notebook

Avoid distractions while driving government-owned vehicles

Employees are reminded not to use hand-held cellular phones or engage in other distracting activities while operating a government-owned vehicle. For other vehicle and pedestrian safety-related requirements, go to *http://policy.lanl.gov/pods/policies.nsf/*.

Mortandad Canyon entrance to close intermittently

The Technical Area 52 entrance to Mortandad Canyon will close intermittently just East of TA-52, Building 1 (Protective Equipment Research and Development Facility) to pedestrian and vehicular traffic as the Water Stewardship Program conducts environmental remediation work through September 30. Access control measures are in place to protect the safety of personnel and minimize disruption of remediation operations.

Catastrophic Leave Program accepting donations

The Catastrophic Leave Program allows employees to donate some of their unused vacation time for use by other employees who do not have sick or paid leave time available but are suddenly faced with a catastrophic medical situation. For additional information, contact Occupational Medicine at 7-7890.

Call 911 for emergency assistance

Call 911 to request emergency fire, police, and ambulance responders on Laboratory property and within Los Alamos County. Provide your name, the nature of the incident, and the location. When calling from a cell phone, provide the city and state from which you are calling. For non-emergency fire or police calls in Los Alamos, dial 662-8222.

Transportation Department launches new traveler information service

New Mexico commuters and interstate travelers have instant access to weather-related road conditions, construction delays, and congestion information by dialing 511. Sponsored by the New Mexico Department of Transportation, the service is part of a growing, nationwide program to provide consistent and reliable traveler information.

Summer Celebration scheduled for August 23

Los Alamos National Security, LLC is sponsoring a Summer Celebration from 11 a.m. to 4 p.m. August 23 at Sullivan Field on Diamond Drive, across from Los Alamos High School. All LANS and contract employees are invited, including employees of KSL Services and SOC Los Alamos. Music, food, and entertainment will be provided.

For more information, go to the Summer Celebration Web page at *http://int.lanl.gov/projects/summercelebration/*.

New performance assessment process

Laboratory senior leaders have agreed on the back-end piece of the new performance management system: performance assessment. As part of the assessment process, employees need to complete a self-evaluation form and turn it in to line managers by August 18. To access the performance management Web site, go to *http://int.lanl.gov/orgs/hr/pmp/*.

Recently issued patents

Read a list of patents issued to the Lab between October 2007 and June 2008, at *http://www.lanl.gov/orgs/tt/intellectual_prop/patents_news.shtml* online.

August service anniversaries

Find the August service anniversaries at *http://www.lanl.gov/news/newsbulletin/anniversaries* online.

In memoriam

- Richard Alan Benson, 65, died June 8
- Felipe M. Lopez, 83, died June 11
- Raymond Allen Gore, 73, died June 17
- Dugald "Dug" Pinyan, 82, died June 18
- Bob Everett Comer, 71, died June 28
- Zelda Geneith, 81, died June 28
- Marie Homan, 53, died July 20

Leverage our science and technology advantage to anticipate, counter, and defeat global threats and meet national priorities, including energy security

Innovative technology helps detect hidden threats in cargo

The United States may soon gain a decided advantage in the fight against those who would try to smuggle weapons of mass destruction into the country, thanks to a Cooperative Research and Development Agreement between the Laboratory and Decision Sciences Corporation (DSC). The agreement between the Lab and DSC to commercialize the Lab's innovative muon tomography (MT) technology has produced devices built under DSC's exclusive license that will give the Department of Homeland Security effective tools for passively scanning cargo and vehicle traffic entering the United States.

The technology allows rapid detection of concealed nuclear and explosive materials while eliminating the radiation exposure that occurs with existing scanning technologies. The Laboratory technology will be integrated with DSC's intelligent reasoning software.

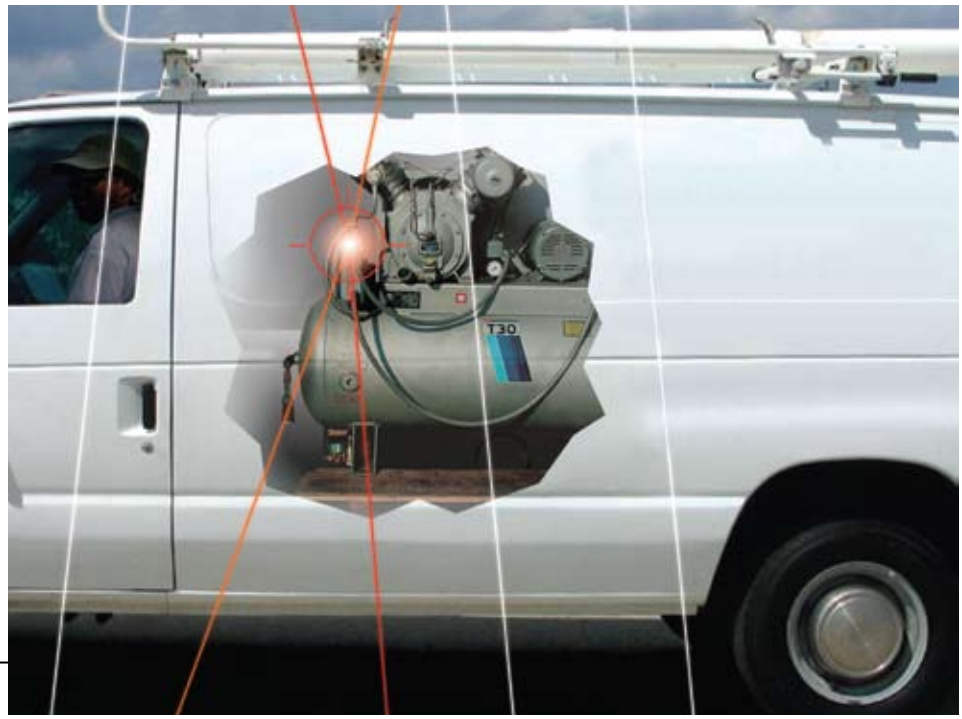
"It has been interesting and exciting to work on a project with Decision Sciences," said Christopher Morris of Subatomic Physics, who pioneered the technology.

Morris' method uses muons—naturally occurring high-energy subatomic particles produced by the interaction of cosmic rays with the Earth's atmosphere—to identify and locate specific materials based on their atomic density.

MT technology allowed Laboratory researchers to develop detectors and algorithms to trace the muons' path. The resulting data are used to produce detailed, 3-D images of complex objects. Because muons can penetrate lead and other materials used to conceal nuclear or other explosive materials, the reliability of inspections using MT is high. DSC and the Laboratory already have demonstrated the effectiveness of the technology using a smaller scanner called the large muon tracker, Morris said. This work is about to be published in the journal *Science and Global Security*.

Full-scale production of DSC's Guardian MT equipment is scheduled for the near future, he said.

—Tatjana K. Rosev



Scanning devices using muon tomography technology detect nuclear weapons or explosives in cargo and vehicle traffic.

Getting the job done

Richard Robinson

Patricia Nelson, left, discusses plans for purchasing ergonomic adjustable dual-surface desks with Debra Lowe of Space Management and Facilities Planning, standing, and Rachel Morse of the Weapons Systems Division Office.

Patricia Nelson of Site Management and Facility Planning usually has a host of things she wants and needs to get done on the job. Foremost among her most demanding recent tasks was reducing the Laboratory's annual expenditures on furniture and related services by $4 million since 2006, furnishing the National Security Sciences Building, benchmarking the Lab Furniture Reuse Program, and saving upwards of $700,000 in 2006 and $1.2 million in 2007 by reusing furniture.

Achieving these goals is a major reason why Nelson was named a 2008 LANL Star by the Women's Diversity Working Group.

Nelson started at the Laboratory in 1982, setting up the first computer-aided design (CAD) system for Space Management. She left the Lab in 1985 to work for Control Data Systems on a team that provided training and support to the Lab's mechanical engineers and drafters, helping them convert to CAD.

Nelson returned to the Lab in 2001 as a team leader for the Facilities Integrated Information Management team and stayed in this position until late 2004, when she transferred to lead the Laboratory's Interior Furnishings team.

Nelson's interest in interior furnishings began in 1982, when the CAD system she set up for Space Management also had an interior design application, which allowed her to create catalogs of chairs, tables, flipper doors, and filing cabinets, for the drawing application. "Furniture was very familiar to me, and I enjoyed the work in the past. I was in need of a change," she recalled.

Nelson credits colleagues and coworkers in helping her achieve success on the job. "I have had many wonderful opportunities over the past 25 years, but it is all the people I have had the opportunity to work with who have helped me succeed," Nelson said, thanking them for their support. "They know who they are."

Nelson said she hopes that being named a "LANL Star" will allow her to mentor and show others that the Lab has many opportunities to offer. "I feel very proud," she said. "My division leader appreciates the work that I do and the causes I support."

—Erika L. Martinez

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