LOS ALAMOS NATIONAL LABORATORY

CURRENTS

February 2009

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Los Alamos
NATIONAL LABORATORY
EST. 1943

My View

Thumbs up on FY08 performance

Thanks to all of you, last year was a remarkable one for the Laboratory. Despite budget uncertainties and constraints, we achieved outstanding performance in mission delivery and made significant breakthroughs in national security science tools. At the same time, we boosted operational performance, especially in safety, security, and environment.

Our performance earned the highest recognition from the National Nuclear Security Administration (NNSA), namely, a year's extension of the Los Alamos National Security, LLC contract—until September 30, 2014. Clearly, we're on the right course.

More than a year ago, we negotiated with NNSA our performance objectives and measures in mission, science, operations, business, and management. The Lab's annual self-assessment, facilitated by the Contractor Assurance Office, provided NNSA key input on how we were doing in all of these areas. We also held monthly meetings with the Los Alamos Site Office to review our performance and identify customer concerns, which we then worked to resolve. These meetings were orchestrated by the Prime Contract Management Office and led by the deputy director. Through this transparent process, we strengthened our partnership with the Site Office and improved integration across the many Laboratory organizations that needed to work in concert to meet the performance targets on which we were evaluated.

What I find so remarkable is the balance and breadth of our collective accomplishments over the past year. These ranged from Roadrunner, the world's fastest supercomputer, to the First Production Unit for the W76-1 and the second axis of DARHT, the world's most powerful X-ray machine. We also reduced lost-time accidents by more than 30 percent, produced seven W88 pits, increased our number of peer-reviewed publications by nearly two-thirds, shipped more transuranic waste than the previous two years combined, reduced serious security incidents by more than half, recovered more than 2,250 excess radioactive sources from sites around the world, and achieved our first audit without a finding by the New Mexico Environment Department.

I could go on and on, but I think you get the idea.

We still have significant opportunities for improvement, but through our joint efforts, we'll make the Laboratory an even better place to work, with continued outstanding levels of performance.

—Roland Knapp,
Contractor Assurance Officer

Sandra Valdez

About the cover: MagViz project leader Michelle Espy with the control panel for the MagViz liquid detection and analysis system, demonstrated in the Albuquerque International Sunport during the month of December 2008. See page 4 for story. Photo by Richard Robinson

Lab student Aguilar takes top honors at AISES conference

Joseph Aguilar, a graduate student research assistant in Ecology and Air Quality, earned first place for "Master's level poster in Indigenous Studies" at the 30th annual National American Indian Science and Engineering Society (AISES) Conference. Aguilar won the Indigenous Studies award at the conference last fall in Anaheim, California.

Now attending the University of New Mexico, where he is pursuing a master's degree in archaeology, Aguilar competed against 20 graduate students.

His poster, The Archaeology of the Pueblo Revolt at Tunyo, San Ildefonso Pueblo, New Mexico, in conjunction with his thesis research, focused on refuge site archaeology at the mesa-top refuge of Tunyo (Black Mesa) at the Tewa Pueblo of San Ildefonso during Don Diego DeVargas's reconquest of New Mexico.

Hecker awarded National Materials Advancement Award

Former Laboratory Director Sig Hecker received the National Materials Advancement Award at a ceremony in Washington, D.C. Hecker, who also is director emeritus, currently codirects the Center for International Security and Cooperation at Stanford University.

The National Materials Advancement Award recognizes individuals who have demonstrated outstanding capabilities and contributions in advancing the multidisciplinary field of materials science and engineering; the effective and economic use of materials in the marketplace and the application of materials developments to national problems and defense; and the development and implementation of national policy that furthers the impact of materials science and engineering on society.

Hecker was Laboratory director from 1986 to 1997 and recently received the 2008 Los Alamos Medal, the Laboratory's top honor.

Lab scientists Burns, Hay named new AAAS Fellows

Laboratory researchers Carol Burns of Nuclear and Radiochemistry and Jeffrey Hay of Physics and Chemistry of Materials are new 2008 Fellows of the American Association for the Advancement of Science. The AAAS is the world's largest general scientific society and publisher of the journal *Science*.

Recognized worldwide as a leader in actinide chemistry, Burns was named a Fellow for her contributions to the field of actinide science and to the understanding of actinide metal-ligand multiple bonds.

Hay was recognized for distinguished contributions in the field of computational and theoretical chemistry, particularly in the area of inorganic chemistry.

Martinez recognized by White House

Jennifer S. Martinez of the Center for Integrated Nanotechnologies has received a prestigious Presidential Early Career Award for Scientists and Engineers. The award, presented to Martinez at the White House, is the highest honor bestowed by the U.S. government on outstanding scientists early in their careers.

Martinez was one of eight researchers funded by the Department of Energy's Office of Science and the National Nuclear Security Administration to be recognized. Martinez is one of 68 researchers supported by nine federal departments and agencies to receive the award.

Richard Robinson

Isaac "Ike" Richardson

Richardson Lab's new deputy director

Isaac "Ike" Richardson is the Laboratory's new deputy director. Richardson succeeds Jan Van Prooyen, who retired.

Richardson spent 31 years in the U.S. Navy, where he attained the rank of rear admiral. He commanded the nuclear-powered aircraft carrier USS *Nimitz* and provided strategic direction of large, complex organizations, such as the Navy's aircraft carrier program. He also provided oversight of storage and compliance programs for prepositioned U.S. nuclear weapons assigned to NATO throughout Europe.

Richardson joined Bechtel in 2003. Most recently, he oversaw Bechtel's civil infrastructure projects in Qatar, where he guided development of the $11 billion New Doha International Airport, and headed Bechtel's aviation business line.

Richardson has a master's degree in aeronautical systems from the University of West Florida, a master's degree in strategy and policy from the Naval War College, and a bachelor's degree in engineering from Vanderbilt University.

Andrei Matlashov of Applied Modern Physics places bottles of shampoo, water, and other liquids on a conveyor belt for analysis by the MagViz machine at Albuquerque International Sunport.

Coming to an airport near you

scientists develop machine to ID liquids

Air travelers at Albuquerque International Sunport were just a few feet away from a remarkable new security device in December, if only they had peeked around the corner into the old Gate D area. The area, no longer in use for airline service, was transformed briefly into a security device test bed for a Los Alamos demonstration for the Department of Homeland Security and the media, plus a little "tire kicking" by the Transportation Safety Administration.

The object of their attention was MagViz, an innovation originally intended to take pictures of the brain using a new, ultra-low-field magnetic resonance imaging (MRI) system. Instead of the powerful magnet used in a traditional medical MRI, the Los Alamos device uses an ultra-low-field magnet similar in strength to the magnetic pull of the Earth—about 46 microteslas. By contrast, hospital MRI machines create a magnetic field 10,000 to 100,000 times Earth's magnetic field.

To make sense of the faint signals from the new machine's low field, the technology relies on sophisticated detectors called superconducting quantum interference devices, or SQUIDs. Whereas a hospital MRI detects spin with a sensor akin to a radio antenna, tuned to a specific set of frequencies, SQUIDs can pick up the oscillation of hydrogen or other atoms at any frequency.

Linked to a computer database, MagViz can now reliably identify some 50 liquids by their chemical fingerprints. And that's only the beginning. "That's one of the beauties of this technology," project leader Michelle Espy said. "We can add different threats as we become aware of them."

If MagViz finds a chemical designated as a threat, the machine will mark the container with a red dot on the screen. Harmless substances get a green dot, and if the machine can't identify the liquid, a yellow dot appears, indicating that further inspection is needed. As new threats emerge, "we just put them in the database and set the gate," Espy said.

In MagViz's current incarnation, the entire process takes a minute, from applying the magnet to producing the image. The Homeland Security Advanced Research Project Agency at the U.S. Department of Homeland Security Science and Technology Directorate, which is supporting this project with a $5 million grant, hopes the final version eventually will be able to scan bags at a speed similar to the current security checkpoint X-ray machines.

Former project leader Robert Kraus hopes that MagViz will be helpful to security by reducing the chance that dangerous substances can make it onto airplanes, while simultaneously allowing passengers the convenience of traveling with liquids as they did before 2006. And the team is aiming for a system that allows travelers to leave everything in their bags, decreasing time spent waiting in security lines.

The project came to life about two years ago, as an interdisciplinary team of Los Alamos researchers and students coaxed fuzzy brain images from the low-field prototype. In the process of developing the brain scanner, then-project-leader Kraus and his team seized upon the idea that a versatile, low-field MRI might have applications beyond medicine. The researchers hypothesized that they might be able to distinguish between different liquids. "Different parts of the brain are all very similar in their chemical makeup," said Espy, and yet the contrast allows doctors to differentiate aspects of the brain.

Starting with commonly available substances, the team found the system to be remarkably discriminating. "If we can tell the difference between V8® juice and Coca-Cola®, which are mostly water," Kraus said, "why can't we tell the difference between shampoo and a threat substance?"

Having liquids on airplanes has been an issue in air travel security since measures were implemented in 2006 to address the threat of terrorists using liquid explosives onboard aircraft. Today, the "3-1-1 rule," which requires that all carry-on liquids be kept in 3-ounce bottles in a single one-quart, zip-top bag, remains a frustration to weary travelers. A solution might well be at hand.

—Nancy Ambrosiano and John C. Cannon

A team effort

Those involved in the development of MagViz came from science and engineering divisions across the Lab, including the following:

- Laboratory Directed Research and Development
- Applied Modern Physics
- Mechanical Design Engineering
- Accelerator and Beam Science
- Radio Frequency Engineering
- Dynamic and Energetic Materials
- Space Instrumentation Systems
- Applied Engineering Technology
- Safeguard Science and Technology
- Instrumentation and Controls
- National High Magnetic Field Laboratory

Photos by Richard Robinson

The screen of the MagViz unit displays each tray of liquid or gel items, with the target materials highlighted by color according to potential risk.

LANL Star helps shape tomorrow's workforce

program deemed national best practice

When Mary Anne With talks about the future of the Laboratory's workforce, she speaks from experience. With runs the Laboratory's Postdoc Program Office, which is the primary pipeline for new technical staff members at the Lab.

About 325 postdocs work at the Laboratory, and many of them matriculate into fulltime technical staff positions. "I enjoy helping our postdocs. They're our future," said With. "I'm honored to be associated with such talented individuals from around the world."

Her work earned With a 2006 Distinguished Performance Award and a LANL Star award from the Women's Diversity Working Group.

"Mary Anne consistently demonstrates the very highest standards of professionalism, dedication, and creativity in her exceptional oversight of the broad repertoire of Laboratory postdoc programs," said Dave Foster of the Education and Postdoc Program Office.

With was instrumental in creating the Los Alamos Postdoctoral Association, which works to bring Lab postdocs together to discuss issues of concern and to raise the visibility of the Postdoc Program.

The Lab's postdoctoral program has been recognized by the Department of Energy as being "a national best practice."

She also assisted Sandia National Laboratories in starting its Truman Postdoc Fellowship program, and offered advice to Lawrence Livermore National Laboratory's Fellowship program and Argonne National Laboratory's Postdoctoral Fellow program.

Two years ago, With helped plan and coordinate the first national laboratory postdoc forum and meeting at University of California, Berkeley. The forum, she explained, was designed to enhance the effectiveness of postdoc programs nationally by improving communications and sharing information between national labs.

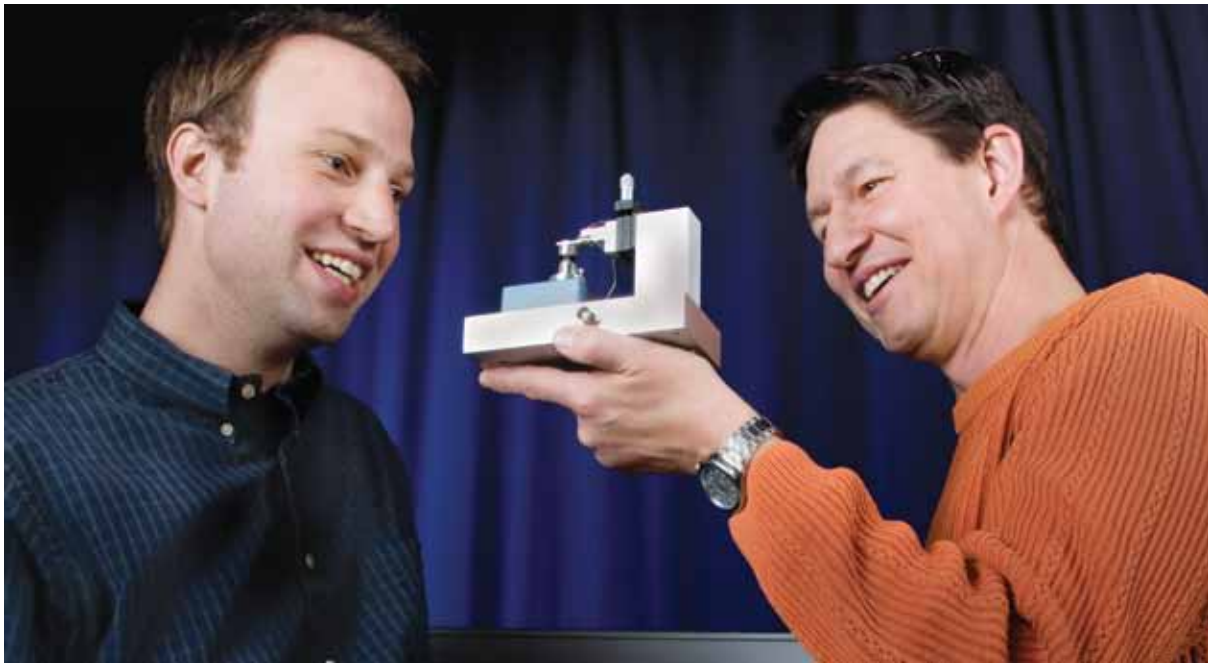
With also helped create a national task force under the auspices of the National Postdoc Association "to enhance the postdoc experience."

Said With, "The day I wake up and don't feel I can make further change for postdocs and the program overall, I'll think about moving on to another challenge."

—Steve Sandoval

Sandra Valdez

Mary Anne With talks to postdocs at a Los Alamos Postdoc Association communications committee meeting in the Otowi Building.



Richard Robinson

Adam Farrow, left, and Franz Freibert of Nuclear Materials Science discuss resonant ultrasound spectroscopy and its application in measuring elastic properties of plutonium.

A new-generation plutonium scientist

With an enthusiasm for understanding the physics of plutonium and a hard-earned appreciation of the complexities of working in a plutonium facility, Franz Freibert is guiding a new generation of scientists studying the mysterious metal.

"Stockpile stewardship is not dead," said Freibert, leader of the materials physics and dynamic testing team in Nuclear Materials Science (MST-16). "A younger generation is bringing new life to it."

Freibert, who earned his doctorate in physics from Florida State University, is part of that new wave.

He began his career studying polymer physics at the University of Southern Mississippi and was a graduate research assistant working on high superconducting systems at the National High Magnetic Field Laboratory in Florida before coming to Los Alamos, where he progressed from postdoctoral researcher in 1996 to principal investigator for the accelerated aging of plutonium (AAP) project in 1999.

As principal investigator, Freibert brought all AAP project plutonium operations into compliance for myriad Department of Energy and Los Alamos regulations. He also developed and integrated casting, machining, and metallurgical processes and performed individual research on the aging effects of plutonium.

Succeeding in that position "really prepared Franz for the role he plays today, which, in effect, is the Technical Area 55 subject matter expert and experimental coordinator for dynamic plutonium experiments," said Rollin Lakis, MST-16 group leader.

Freibert is both a first-line manager and a glovebox worker, responsible for managing a large workflow through a large, complex facility. It's a role appreciated by his newer colleagues, who often call on Freibert to share his background knowledge as they are starting out in the weapons program.

He's also playing a pivotal role in integrating and strengthening the Laboratory's internal plutonium experiments as a means to improving efficiencies and making well-conceived efforts in plutonium science.

In managing the complexities and integration challenges of his workplace, "Franz brings all these little different pieces together," Lakis said. "And in total, the small- and large-scale experiments he supports increase our understanding of plutonium behavior and plays an important role in the national security mission of our Laboratory."

—Editor's note: This is an excerpt from an article by Karen Kippen that was published in the November 2008 issue of MST e-News (http://int.lanl.gov/orgs/mst/mst_enews.shtml).

Lab technology may transform performance apparel

a new way to stay dry

Could plasma technology create comfortable outdoor wear that outperforms GORE-TEX®? A former Plasma Physics technical staff member, with the backing of financial investors, has staked his career on it.

Gary Selwyn, founder, chief technical officer, and chairman of the early-stage Lab spinoff APJeT, aims to give GORE-TEX a run for its money in the outdoor performance apparel market using technology that originated at the Laboratory.

In 1995, Selwyn developed the Atmospheric Pressure Plasma Jet (APPJ®) as one of the Laboratory's first Homeland Security projects for decontamination of areas affected by chemical and biological weapons. An R&D 100 Award-winning technology in 1999, APPJ was transferred in 2002 to APJeT, a company in a license agreement with Los Alamos National Security, LLC.

Gary Selwyn conducts product quality assurance on dual-functional, plasma-treated fabric at APJeT's Santa Fe laboratory.

LeRoy N. Sanchez

Today, APJeT uses its proprietary atmospheric pressure plasma technology to apply to fibers a nanometer-thin polymeric film that enables fabric to repel water and stains without changing its feel or appearance. By combining electrical power with a selected gas, the ionization process that occurs in the plasma produces active, gas-phase chemicals that bond to the surface of the fabric, producing unique properties.

"We use atmospheric plasma to chemically modify textiles, such as polyester, to make them wick water better than cotton by bonding atomic oxygen to the surface," he said. "It breathes well, feels great against the body, and with a different plasma, we make the outer surface rain resistant, all properties essential for outdoor performance clothing."

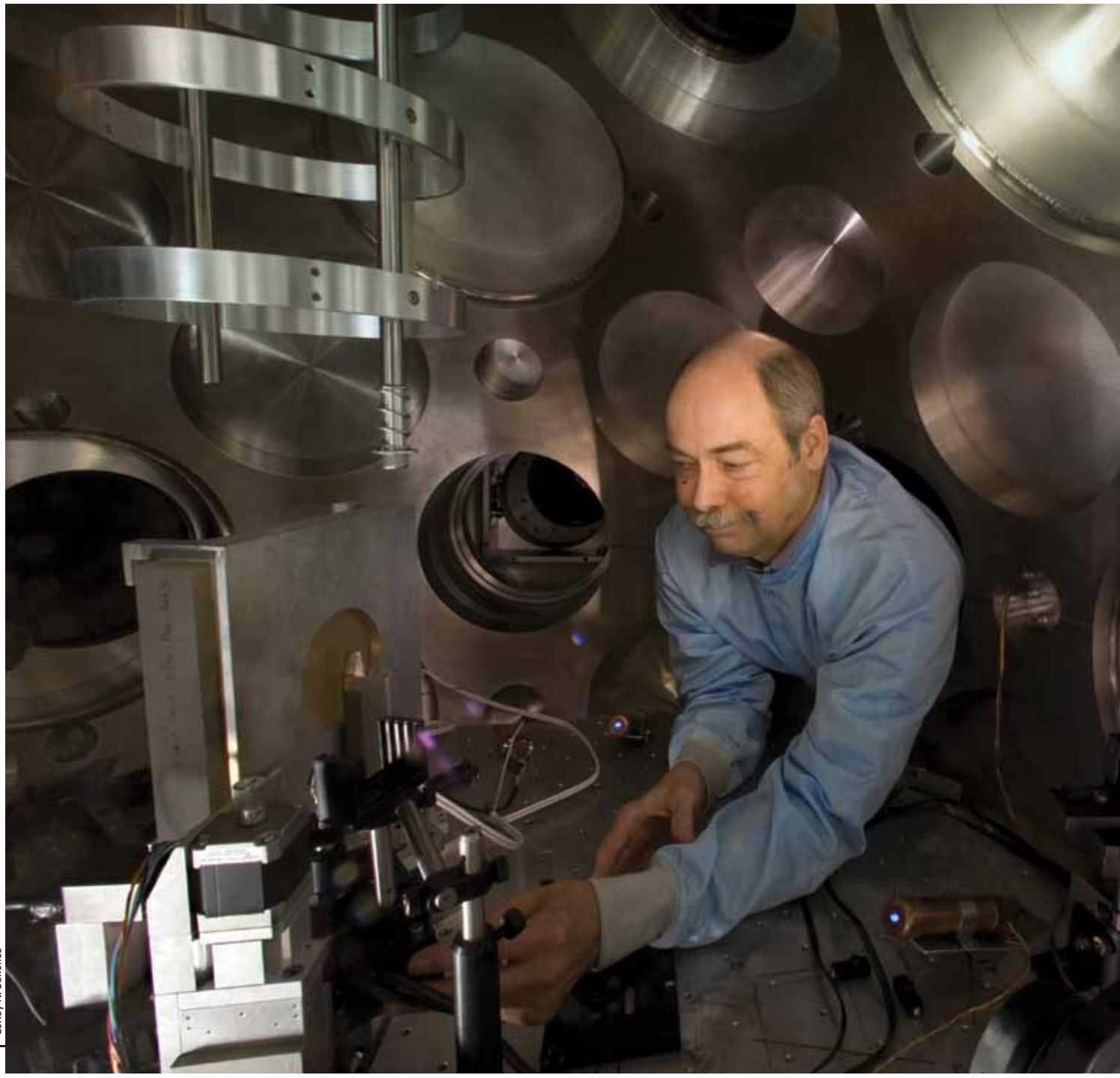
APJeT's dual-functional finish, trade named AP-TeX®, is about to go to market.

"A big part of our current challenge has been selecting this one use for the technology and putting all of our energy and resources into that," Selwyn said. Future applications of APPJ may include depositing thin films for architectural glass, semiconductors, flooring, and solar panels.

The possibility of such broad application of plasma technology across various industries is among the factors that make the company ripe for success in the eyes of Alex Padilla, APJeT's director of business development and sales.

"What makes APJeT a potential success is the demonstrated support of the investment community, an overwhelming response by the textile industry to the APJeT solution, and the technical strength of the company's founder."

—Mig Owens



LeRoy N. Sanchez

Creating and studying extreme matter

Tom Hurry of Plasma Physics leans into the TA-North experimental chamber to adjust the target positioner and particle beam diagnostics before an experiment at the Trident Laser Facility. Laboratory scientists use Trident, which is located at Technical Area 35, to create and study extreme states of matter, such as plasma, by shining a brief, intense pulse of light onto a solid target, which heats a small volume of material into a million-degree microplasma. The round cylindrical objects behind Hurry are porthole covers of the chamber.

Notebook

First atomic bombs, Lab's early history featured on Weather Channel

The Laboratory's early history in the run-up to the Trinity test and the first atomic bombs dropped on Japan in 1945 are the focus of a documentary that aired recently on the Weather Channel. The 41-minute documentary, "Nagasaki," is part of the Weather Channel's *When Weather Changed History* series.

Most of the historical footage in the documentary, including video and still photographs, were provided to the Weather Channel by the Laboratory.

To watch the documentary, go to *http://www.weather.com/multimedia/videoplayer.html?collection=257* and click on "Full Episode: Nagasaki."

Lab announces selection of Venture Acceleration Fund recipients

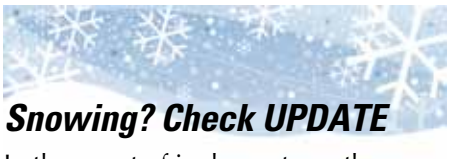
The Laboratory has selected Retriever Technology, Elemetric Instruments, Star Cryoelectronics, and Veezyon as recipients of awards from the LANS Venture Acceleration Fund. Los Alamos National Security, LLC supports the fund through donations from its earnings, with the goal of helping further develop Northern New Mexico for the good of the region and the good of the Laboratory. To read a Laboratory news release, go to *http://www.lanl.gov/news/index.php/fuseaction/nr.subject*.

Environmental Management System audit

The Laboratory will undergo its three-year recertification audit of the Environmental Management System beginning in March. Go to *http://int.lanl.gov/environment/waste/lanl_only/recycle/docs/090108_envirogram.pdf* for information on employee responsibilities.

Safety concerns now can be submitted electronically

Do you have a safety concern or suggestion but prefer anonymity? Employees can phone 5-7233 (5-SAFE) and request to remain anonymous, or, as requested by the Worker Safety and Security Team, employees now can send safety concerns electronically without identifying themselves. Go to *http://int.lanl.gov/safety/safety_help.php* to submit your concern.



Snowing? Check UPDATE

In the event of inclement weather, Laboratory workers should call the Laboratory's UPDATE phone line at 667-6622 or toll free at 1-877-723-4101 for information about the Lab's operating status.

Fiscal Year 2009 Personal Property Inventory Campaign

A statistical sample inventory of controlled property is scheduled to begin the week of February 2 with a target completion date of May 15. Go to the Asset Management Property Web site at *http://asm.lanl.gov/property* for inventory details, including the status of the inventory campaign by associate directorate.

The Hartford Web site for employees

The Hartford is the Laboratory's insurance carrier for life, disability, and accidental death and dismemberment insurance coverages. Employees are reminded that the Hartford's Web site (*https://www.thehartfordatwork.com/thaw/*) is a convenient one-stop resource for checking the status of claims or medical underwriting and for setting up direct deposit for claim payments.

February service anniversaries

Find the February service anniversaries online at *http://www.lanl.gov/news/currents/2009/feb/anniversaries.shtml*.

In Memoriam

- Dugald Pinyan, 82, died June 18, 2008
- Paul Giles, 89, died July 22, 2008
- Tressa McDaniel, 103, died November 26, 2008
- J.L. "Robbie" Robinson, 91, died December 3, 2008
- Merle Eugene Bunker, 85, died December 4, 2008
- Carol Trask Beaulieu, 64, died January 4

Meeting our new commitments

A new year traditionally brings a host of resolutions, goals, and commitments. This holds true at the Laboratory, which recently introduced several new commitments for 2009.

Each of the 84 commitments for 2009 is directly tied to one of the Laboratory's 12 institutional goals, which range from safety and security to environmental stewardship, information security, and improved business practices.

The 2009 commitments are listed on the Our Goals Web site at *http://www.lanl.gov/goals/*. Ninety-seven percent of the 2008 commitments are completed or nearing completion. Check the status of outstanding commitments for each goal by clicking on "Progress" on the Our Goals Web page.

To find out what the commitments are for a particular goal and the progress being made in meeting that goal, as well as to read related news articles, go to the Web site and click on a goal listed on the lower right side. Then click on "Commitments" on the lower left side of the next page to access that goal's commitments and target dates for completion.

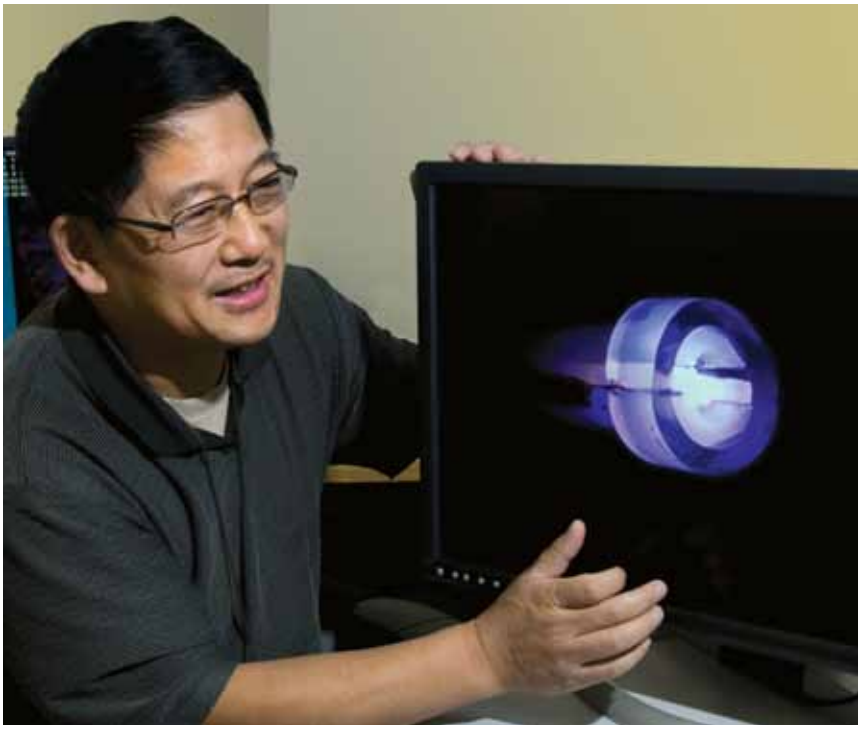
The Strategy, Policy, and Analysis group in the Contractor Assurance Office tracks and summarizes the Laboratory's demonstrable progress in meeting these commitments and notes the progress on the Our Goals site.

Since its inception in February 2008, *Currents* has featured a success story or an accomplishment related to a goal or commitment to help employees better understand how efforts at the Laboratory support the 12 institutional goals and how meeting these goals bolsters the Lab's ability to apply outstanding science, engineering, and technology to national security.

For more information about the Laboratory's goals and commitments, write to *goals@lanl.gov*.

institutional goals …

- Make safety and security integral to every activity we do
- Implement an information security system that reduces risk while providing exemplary service and productivity
- Establish excellence in environmental stewardship
- Assess the safety, reliability, and performance of LANL weapons systems
- Transform the Laboratory and the nation's nuclear weapons stockpile to achieve the 2030 vision, in partnership with the Complex
- Leverage our science and technology advantage to anticipate, counter, and defeat global threats and meet national priorities, including energy security
- Be the premier national security science laboratory and realize our vision for a capabilities-based organization
- Provide efficient, responsive, and secure infrastructure and disciplined operations that effectively support the Laboratory mission and its workforce
- Implement a performance-based management system that drives mission and operational excellence
- Deliver improved business processes, systems, and tools that meet the needs of our employees, reduce the cost of doing business, and improve the Laboratory's mission performance
- Communicate effectively with our employees, customers, community, stakeholders, and the public at large
- Develop employees and create a work environment to achieve employee and Laboratory success



Dixon Wolf

Yixiang Duan shows an image of microplasma used for monitoring blood glucose levels.

New method may end pain of diabetes tests

Thanks to a dedicated team of Los Alamos scientists, diabetes patients soon will be able to monitor their blood sugar levels by testing their breath.

This revolutionary new method may replace the daily finger-pricking by which diabetics test their blood glucose levels.

Millions of people are affected by diabetes, a disease caused by the body's inability to regulate its sugar levels, and which may result in heart failure, blindness, and loss of extremities. To manage diabetes, some patients inject insulin, take medication, or adjust their diet and monitor their blood-sugar levels frequently.

The breath test developed by Yixiang Duan of Chemical Diagnostics and Engineering and his colleagues allows a sample of breath to interact with microplasma formed by ionizing helium or argon gas and analyzing the results. The method has been patented and both the device that generates the microplasma and the spectrometer that interprets the results have been developed, Duan said. The team expects to integrate both pieces of equipment into one hand-held device that eventually will be ready for use in hospitals and in private homes.

Duan holds a bachelor's degree in radiochemistry from Fudan University in China, a master's degree in analytical chemistry from the Chinese Academy of Sciences, and a doctorate in analytical chemistry jointly from Jilin University and Indiana University.

He said he has been interested in diabetes research for the past 10 years. "I noticed early on that diabetes monitoring is a big issue worldwide and that there was no efficient, noninvasive method available for people to use," he said.

Duan, who has been with the Laboratory for 15 years, said he particularly enjoys the wide-ranging research environment at the Laboratory. "It covers everything from chemistry and biology to physics and environment," he said, adding, "This creates a unique research and development environment for cross-disciplinary research."

—Tatjana K. Rosev

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