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NewsLetter

Week of September 11, 2006 Vol. 7, No. 19

Videogame technology enables new generation of computers

by Kevin Roark

Technology originally developed for the multi-billion dollar video-game industry will be leveraged by the Laboratory and the National Nuclear Security Administration to develop what is hoped will be the world's fastest computer, named Roadrunner.

Los Alamos and NNSA have selected IBM to build the newest supercomputer at the Laboratory, a LINUX-based cluster system that will begin the hunt for the elusive petaflop — a sustained performance of 1,000 trillion calculations per second, or 1,000 teraflops. System hardware for Roadrunner should begin to arrive at Los Alamos' Metropolis Center before the end of September.

The real test will come when Roadrunner begins to utilize IBM's Cell technology — developed for the latest in videogames on the market. "We could not begin to leverage the kind of technological advances that we're seeing without the lucrative videogame market," said John Hopson, the Laboratory's head of Advanced Simulation Computing.

"Game environments, more and more, mimic real life, in real time," said Hopson. "This means their processors are doing many, many calculations also in real time. We thought, why not tap into that research and development, modify it to work a more technologically advanced problem, and bring it here."

"More than ever, it is important that we develop the world's best technology here at home," said Sen. Pete Domenici, R-N.M. "Through the NNSA's stockpile stewardship campaign, NNSA labs have pioneered the high-speed computer architecture that operates on the world's fastest computers. The national laboratories like Los Alamos have led the way in computing and should be challenged to take the next step and breakthrough the petaflop barrier."

"Los Alamos National Laboratory has world-renowned accomplishments in technology and science in support of national security," said DOE Deputy Secretary Clay Sell. "With this procurement, Los Alamos will continue its pioneering role in high-end computing."

"Science-based computer simulations have proven invaluable for the stockpile stewardship program," said Laboratory Director Michael Anastasio. "With this new system, our advanced simulations will be even better, allowing us to provide NNSA with the best technical answers to today's complex national security problems."

Roadrunner could become the next-generation supercomputer for NNSA's stockpile stewardship program, assuring the nuclear deterrent without testing. Officials will watch the development of Roadrunner, decide on future options to expand the machine, and reach for the petaflop.

The IBM Cell system is specifically designed for high-density computing applications. Its unique capabilities focus on graphic-intensive numeric calculations. *Photo courtesy of IBM*

The plan for building the computer calls for the hardware to be delivered in several phases. The first phase, to be completed this year, is a $35 million, 80- to 100-teraflop cluster-based machine that will be delivered using standard technologies, providing the Lab much-needed additional computing capacity.

Pursuing the goal of a sustained petaflop will require a second and final phase, with plans for completion in 2008. This phase would include the addition to the base machine of a large number of advanced computer chips, known as accelerators, enabling a dramatic jump in scientific computing capability and a new world record in supercomputer performance. The entire project is budgeted for $110 million over three years.

The primary role of the new capability will be to provide a major advance in maintaining maximum confidence in the reliability of the nation's existing stockpile of nuclear warheads and to enable a more rapid transformation of the country's nuclear weapons complex.

Laboratory announces 2005 Distinguished Performance Awards

Hats off to the latest group of employees being honored for their exceptional efforts on the job. Four individuals, six small teams and seven large teams are the Los Alamos National Laboratory 2005 Distinguished Performance Award winners.

Individuals or small teams who receive Distinguished Performance Awards must have made an outstanding and unique contribution that had a positive impact on the Laboratory's programmatic efforts or status in the scientific community; required unusual creativity or dedication of the individual or team; and resulted from a level of performance substantially beyond what normally would be expected.

Large teams must have performed scientific, engineering, technical, administrative, and/or management activities at a level far above normal job assignments; completed a project that brought distinction to the Laboratory by resolving a problem that has broad impact and/or resulted in the Lab becoming the recognized expert in the field; worked on a project that involved original and innovative thinking, approaches, and results; and exhibited an exemplary level of skill, teamwork, and dedication well beyond normal expectations that resulted in the successful completion of the project.

A recipient of an individual award receives a plaque and $1,000. Each member of a small team garners a plaque and $500. Large team members receive a plaque, a certificate, and a pin.

Distinguished Performance Award winners are selected by a screening committee. Read about this year's winners, beginning on Page 3.

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For Your Safety

Safe use of handrails encouraged

HR initiative

Miranda Martinez, right, of the Human Resources Service Center (HR-SVSCTR), thanks Mark LeDoux, left, of the Weapons Systems Division (W), and Kenneth Suazo of Surveillance Oversight (W-9) for properly using the handrail in a stairwell at the Otowi Building. Employees observed using handrails safely were given miniature candy bars with a sticker reading "SOS: Safety on Stairs. HR Division thanks you for using the handrails." More than 400 pieces of candy were given out. "We wanted to get the message across that safety is our priority," said Martinez. "If the message was received by ten people, there are ten safer people in the Lab," added Cyndi Archuleta of the HR Service Center, who spearheaded the initiative. "All in all, it was well received. People were appreciative that we took notice of their safety." *Photo by Ed Vigil*

Lisowski joins DOE's Global Nuclear Energy Partnership

by Todd Hanson

Paul Lisowski

Paul Lisowski of the Los Alamos Neutron Science Center is the new deputy director of the Department of Energy's Advanced Nuclear Energy Systems program.

As deputy director, Lisowski will lead the day-to-day operations of DOE's Global Nuclear Energy Partnership, a key element of the President's Advanced Energy Initiative.

"I am excited that Paul will be joining our team," said Dennis Spurgeon of DOE. "He brings a wealth of technical knowledge and expertise, which will be vital as we move forward with building new nuclear power plants under the Global Nuclear Energy Partnership."

At DOE, Lisowski will take the lead on planning and integration of advanced nuclear reactors, fuel processing, and research and development in support of the Global Energy Nuclear Partnership. He also will use his expertise and leadership to expand the use of nuclear power, minimize nuclear waste, demonstrate more proliferation-resistant recycling, develop advanced burner reactors, and establish reliable fuel services.

"Paul has served Los Alamos well, most recently as the leader of LANSCE, one of the Laboratory's flagship facilities. Paul's ability to get the job done, even in the most of difficult of circumstances, is just what GNEP needs," said Terry Wallace, principal associate director for Science Technology and Engineering (PADSTE).

Kurt Schoenberg will succeed Lisowski as acting director of LANSCE, located at Technical Area 53. Schoenberg has been the LANSCE deputy division leader.

Lisowski was LANSCE director for the past five years, where he was responsible for science and technology development, safety, maintenance, and operation of the three national user facilities and the isotope production facility. Prior to that, Lisowski was the national director for the Accelerator Production of Tritium Project, where he led a team that received the 2000 DOE Award for Excellence in Program and Project Management.

"I am pleased to be part of this exciting GNEP initiative," Lisowski said. "I am confident that my past experience with large multi-laboratory and industry teams will greatly contribute to the success of GNEP."

The GNEP seeks to develop expanded use of economical, environmentally clean nuclear energy to meet growing worldwide electricity demand, while virtually eliminating the risk of nuclear proliferation. It would achieve its goal by having nations with secure, advanced nuclear capabilities provide fuel services — fresh fuel and recovery of used fuel — to other nations who agree to employ nuclear energy for power-generation purposes only. The model envisioned by this partnership requires deployment of new and innovative technologies and a partnership among governments and businesses around the world.

Technical staff members from across the Laboratory and in its Civilian Nuclear Programs Office are an integral part of the national GNEP program. Because of the Laboratory's broad scientific expertise, experimental base, and modeling and simulation capabilities, Los Alamos is playing an important role in defining programmatic needs and strategic directions for the program.

For the 2007 fiscal year, areas of significant Laboratory leadership and scientific contributions will include fuels, materials, nonproliferation, and modeling and simulation; as well as key contributions in the areas of separations technologies, geosciences, systems analysis and integration, reactor design, and safety analysis and assessment. These will all be important to GNEP's success. The Laboratory also is planning to start construction of the Materials Test Station, which, when coupled with the LANSCE-Refurbishment project, will provide a unique national capability for testing GNEP fuels and materials.

Los Alamos National Laboratory
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.

NNSA National Nuclear Security Administration

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2005 Distinguished Performance Awards

Individual awards

My Hang Huynh of HE Science and Technology (DE-2)

Robert Kroutil of Biotechnology, Spectroscopy and Isotope Chemistry (B-3)

Frank Pabian of International Research Analysis and technical Development (IAT-1)

Kevin Sanbonmatsu of Theoretical Biology and Biophysics (T-10v)

My Hang Huynh

My Hang Huynh received an individual Distinguished Performance Award for Transcending the Carbon-Carbon Bond Paradigm. Carbon-carbon bond-forming reactions, especially the transition-metal catalysis paradigm that emerged in the last quarter of the 20th century, have played an important role in shaping chemical synthesis. Huynh's breakthrough research on the synthesis of compounds that contain no carbon-carbon bonds and no oxygen has implications for biocompatible coatings on biomedical implants, battery electrodes, catalytics, and sensors for humidity and gases.

This award also recognizes Huynh's exceptional contributions to multidisciplinary research in energetic explosives and nanomaterials. Her explosives work includes the pioneering of green primary explosives that contain no toxic mercury or lead and no unstable poisonous agents. Green explosives are nontoxic to humans, harmless to the environment, and safer to manufacture, handle, and transport.

Further explosives research includes work on a high-temperature, secondary explosive called BPTAP, that is insensitive to spark, friction, and impact and is stable up to 375°C. BPTAP is a suitable replacement for high-temperature explosives currently used to enhance oil extraction from reservoirs deep inside Earth. Huynh also designed and synthesized a variety of metal complexes that allow self-propagation to form extraordinarily lightweight metallic nanofoams with controllable morphologies, pore sizes, and grain sizes not replicated by any other technology. Huynh is internationally recognized for her interdisciplinary research and fundamental contributions to the environmental, economic, and scientific arenas. Huynh also received an R&D 100 Award earlier this year.

Robert Kroutil

Robert Kroutil earned a Distinguished Performance Award for his innovative contribution to the Airborne Spectral Photometric Collection Technology (ASPECT) Emergency Response Project. Operated by the Environmental Protection Agency and the Laboratory, ASPECT deploys chemical and radiological detection equipment, in an aircraft-system platform, to emergency first responders. Kroutil's technical framework and processes compare algorithm performance for crucial emergency operational conditions and provide strategic insight into first-responder criteria for detecting and locating toxic chemical vapors. As the nation's only 24/7 emergency-response chemical and radiological mapping capability, ASPECT significantly enhances U.S. security.

Deployed to incident commanders and first responders during hurricanes Katrina and Rita, ASPECT also provided chemical and radiological mapping and security capability during the last G8 summit in Georgia, the Republican and Democratic national conventions, and the 2005 presidential inauguration. Kroutil's groundbreaking work improved measurement accuracies and lowered instrumentation costs — breakthrough science that ensures continued cutting-edge technology for the EPA, Department of Homeland Security, Federal Emergency Management Agency, and the U.S. Secret Service.

Frank Pabian

Frank Pabian's innovative work in pioneering an amalgamation of unclassified information and commercially available satellite imagery to provide real-time intelligence analyses used by the international community earned him an individual Distinguished Performance Award. This work directly influences U.S. policies on nuclear nonproliferation by providing new insights used in assessments of foreign activities.

Pabian, an internationally recognized intelligence and imagery analyst, exposed Iran's special nuclear material activities and assisted the U.S. government in applying diplomatic and scientific pressure to compel the Iranian regime to end its nuclear program.

His technique used commercial satellite imagery and other Web-based information to review patterns of Iranian tactics and violations and represented a new level of international engagement. The imagery analysis revealed extensive new construction or modifications at five significant sites in Iran and called into question Iran's public statements about the extent and intentions of its nuclear program. This evidence had tremendous impact on the international nonproliferation community. The imagery analysis became a key element in garnering international support for the U.S. position regarding Iran's nuclear program. Pabian is an internationally recognized intelligence analyst and the leading imagery analyst at Los Alamos.

Kevin Sanbonmatsu

Kevin Sanbonmatsu's individual Distinguished Performance Award is for accomplishing simulations of the decoding center of the ribosome. Simulating 2.64 million moving atoms, these representations are larger — by a factor of 6 — than the largest published million-atom computer simulation in biology to date. These first-ever simulations generated the key finding that transfer ribonucleic acid must be flexible in two locations before protein synthesis can occur. The simulations also identified new ribosomal areas in which mutations and protein synthesis-blocking antibiotics could be misread or not accurately understood.

Sanbonmatsu's research has important implications in the rational design of antibiotics such as gentamicin, which is used to treat skin infections, and doxycycline, which is used to treat plague and anthrax. This work has made it possible for other researchers to conduct million-atom simulations of the entire ribosomal function and underscores the Laboratory's success in high-performance biomolecular and ribosomal simulations. Sanbonmatsu's work also led him to establish a landmark computational biology research program at the Lab and to obtain a five-year grant from the National Institutes of Health.

2005 Distinguished Performance Awards

Small team awards

Avian Flu Mitigation Team — Catherine Macken of Theoretical Biology and Biophysics (T-10), Tim Germann of Solid Mechanics, EOS and Material Properties (X-1-SMMP), and Kai Kadau of Explosives and Organic Materials (T-14).

Avian Flu Mitigation

Their work in developing a means to mitigate a national health emergency earned Laboratory scientists Tim Germann, Kai Kadau, and Catherine Macken a small team Distinguished Performance Award. The trio developed an unprecedented large-scale computer simulation model that predicts the possible future course of an avian influenza pandemic. Unchecked, an outbreak of avian flu in America might well strike 151 million people, potentially causing thousands or even millions of deaths.

Using a detailed simulation, the team programmed their computer model to account for the specific ways in which people can transmit disease. This simulation took into account factors that would influence the spread of disease such as limited quantities of antiviral drugs, travel data from the Department of Transportation, and the 5 percent of people assumed not to take prescribed antivirals. The most important factor was the basic reproductive number of the virus, that is, how many people each patient will infect. Computer models serve as virtual laboratories in which researchers can study how infectious diseases might spread and what intervention strategies may lessen the impact of a real outbreak. This work exemplifies the power of such models and could aid policy-makers and health officials as they plan for a possible future pandemic. The research has provided a major new tool that will help the nation prepare for large-scale infectious disease incidents.

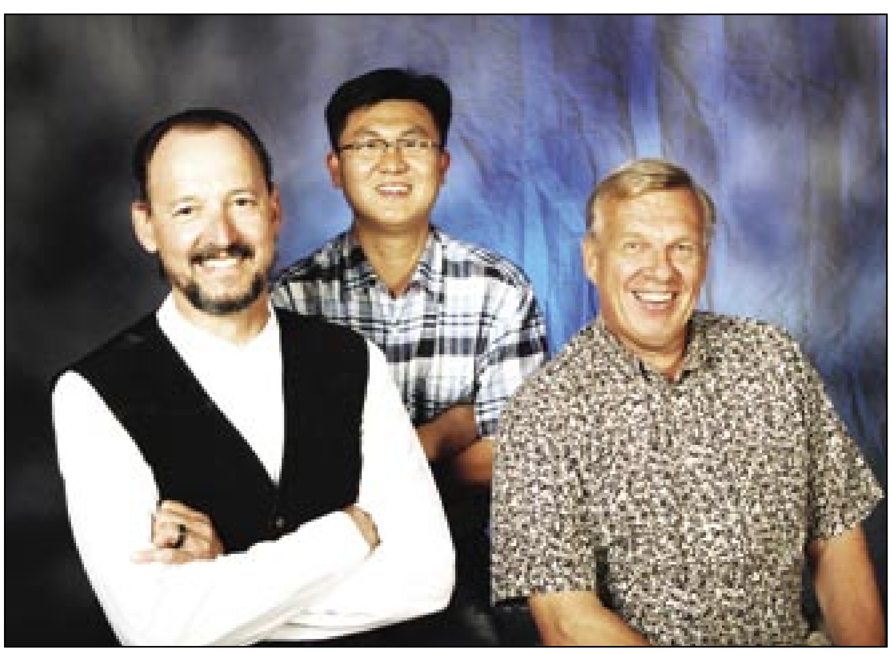
Carbon Dioxide Hydrate Project — Mike Sedillo, Ron Martinez, and Loan Le of Physical Chemistry and Applied Spectroscopy (C-PCS).

Carbon Dioxide Hydrate Project

The Carbon Dioxide Hydrate Project team earned a small team Distinguished Performance Award for its work in the decarbonization of fossil fuels used to produce power. The project focuses on developing commercially viable technology that can capture carbon dioxide at next-generation power plants.

Led by Ron Martinez, teammates Loan Le and Mike Sedillo worked directly with industrial partner, Nexant, to ensure operability and personnel and site safety as they designed and built a large, high-pressure engineering test module that limits carbon-dioxide emissions that are linked to global warming. Beginning with theoretical analysis and working through technology development to actual practice, the team overcame challenges in site preparation, installation, design modifications, and project execution.

The sequestration of the greenhouse gas carbon dioxide has worldwide implications. Next-generation power plant designs use high-pressure techniques to capture carbon dioxide as ice-like gas hydrates; melting the hydrates releases carbon dioxide gas at elevated pressures. Therefore, a process that separates — and reuses — carbon dioxide from multicomponent gas streams at high pressures could significantly minimize carbon dioxide compression costs. The Carbon Dioxide Hydrate Project is the springboard for continued development of the carbon dioxide hydrate concept, which could help limit some causes of global warming.



Plasma Combustion and Applications Team — Louis Rosocha and Yong-Ho Kim of Plasma Physics (P-24), and Graydon Anderson of Physical Chemistry and Applied Spectroscopy (C-PCS).

Plasma Combustion and Applications

Plasma-based techniques that are of key relevance to national energy needs earned Louis Rosocha, Yong-Ho Kim, and Graydon Anderson of the Plasma Combustion and Applications team a small team Distinguished Performance Award. The team researched application of plasmas to enhance combustion, convert coal to more useful fuels, and reduce turbulent drag on aircraft wings. Combustion processes provide propulsion for automobiles, aircraft, and ships. These processes generate electricity, heat homes, water, and commercial buildings.

The team used new technology, based on electric discharge-powered nonthermal plasmas, to pretreat fuels before combustion, thus breaking down fuels to smaller fragments and making them into "free radicals." This "activated" fuel was then mixed with air and combusted, creating very lean-burn combustion modes and reducing nitrous oxide. The method showed great promise in increasing flame speed, stabilizing combustion, and increasing efficiency.

Additionally, Rosocha, Kim, and Anderson developed a plasma-catalyzed coal gasification concept in which plasma turns coal and reactant gases into highly reactive free radicals and excited species that are believed to promote gasification reactions. They used microwave-generated plasma at atmospheric pressure in the hydro-gasification of coal, which will have extremely positive impacts on the Laboratory's Zero Emissions Coal Program.

The team demonstrated that its innovative plasma techniques could maximize the efficiency of varied combustion processes to conserve fuel and reduce pollution. The Plasma Combustion and Applications team contributed significantly to solving the nation's energy dilemma and garnered international recognition for the Laboratory.

2005 Distinguished Performance Awards

Small team awards

Los Alamos/Chevron Strategic Alliance for Advanced Energy Solutions

The Strategic Alliance for Advanced Energy Solutions is the recipient of a small team Distinguished Performance Award for partnering with Chevron Corp. to address critical energy security issues. Team members were John Russell, Otis Peterson, Robb Hermes, Dipen Sinha, and Jacobo Archuleta. The collaboration led to three significant successes: Swept-Frequency Acoustic Interferometery (SFAI), Trapped Annular Pressure (TAP), and Inficomm.

SFAI applies acoustic spectroscopy to several important oil field problems, including diagnostics showing the proportion of oil, gas, sand, and water produced in a well and separation of this stream with noncontact methods and without the use of chemicals; and oil field diagnostics that help locate deposits that are increasingly difficult to find and extract.

The team used TAP to identify a solution for ruptured deep-sea well casings when super-heated oil and gas were extracted in near-freezing water. Each rupture cost approximately $100 million per lost well.

Inficomm technology, developed for defense customers to secure wireless battlefield communications, revolutionized the oil industry's ability to map real-time performance of an entire oil field, predict extraction efficiencies, and prioritize sites for new drilling. Their work also demonstrates the Laboratory's outstanding ability to resolve some of industry's toughest challenges through creative thinking and application of the Lab's expertise across scientific disciplines.

Los Alamos/Chevron Strategic Alliance for Advanced Energy Solutions Team — John Russell, Robb Hermes of Technology Transer (TT-DO), Dipen Sinha of Sensors and Electrochemical Devices (MPA-11), and Jacobo Archuleta of Space Instrumentation Systems (ISR-4). Not pictured is Otis Peterson of TT-DO.

Single-Photon Satellite Ranging and Clock Synchronization

The Single-Photon Satellite Ranging and Clock Synchronization team, composed of Jane (Beth) Nordholt, Nicholas Olivas, and Mike Ulibarri, received a small team Distinguished Performance Award for advancing the Laboratory's Quantum Key Distribution (QKD) Program. The team performed successful experiments that extended satellite laser ranging techniques to show that single photons sent from a satellite could be received on the ground. This programmatic milestone took QKD out of the physics laboratory and developed it for secure satellite communications. The team's work demonstrated, for the first time, that single photons could be sent from a satellite to a ground station and be reliably detected with sub-nanosecond time resolution.

The experiment required that two laser systems and two receiver systems be developed, along with the associated electronics, for all four systems and a master data acquisition system. Each system represented major challenges in optics, timing, synchronization, and data acquisition. The team conducted two all-night, week-long, observation sessions illuminating a satellite with a weak ground-based laser that had less power than a typical laser pointer and tracking the satellite's rapidly changing range with centimeter precision using the single photon signals reflected from the satellite.

The data provides invaluable information on single-photon propagation through the atmosphere, which will allow space-based experiments to be more reliably designed. The team brought credit to Los Alamos and its work is instrumental in maintaining the United States' lead in satellite QKD. In addition, key high-level government agencies recognize the team's seminal work as critical to vital national interests.

Single-Photon Satellite Ranging and Clock Synchronization Team — Mike Ulibarri of Space Data Systems (ISR-3), Nicholas Olivas of Space Instrumentation Systems (ISR-4), and Jane (Beth) Nordholt of Applied Modern Physics (P-21).

Wide-Angle Imaging Lidar Team

A novel and innovative atmospheric remote sensing instrument that can determine the structural and optical properties of dense clouds in the lower layers of the atmosphere earned Lab scientists Anthony Davis, Steven Love, and Igor Polonsky a small team Distinguished Performance Award.

Wide-Angle Imaging Lidar (WAIL) is an active, laser-powered, ground-based device designed primarily to determine the structural and optical properties of dense clouds in the lower layers of the atmosphere, an important step forward for atmospheric scientists. Predicting the radiative heating and cooling of the atmosphere and Earth's surface in the presence of clouds is a huge challenge. Scientists in the Department of Energy's Atmospheric Radiation Measurement Program work to understand the thermal behavior of the atmosphere in the presence of clouds. WAIL is an important step forward for atmospheric scientists and will contribute significantly to this effort. Although clouds are an essential part of the natural water cycle, it is now recognized that anthropogenic emissions of aerosol affect both the radiative properties of clouds and their life cycles, including rain formation. In addition to climate science, WAIL improvements include a redesign for eye-safe operations and correction for multiple surface reflections that affect the precise operation of laser altimeters. The WAIL concept also represents an evolutionary way of developing remote-sensing technologies. Unlike conventional technologies, which start out as largely empirical activities, WAIL began as a theoretical concept and represents a true paradigm shift in the way remote-sensing instruments are designed.

Wide-Angle Imaging Lidar (WAIL) Team — Anthony Davis, Igor Polonsky, and Steven Love of Space and Remote Sensing (ISR-2).

2005 Distinguished Performance Awards

Large team awards

Uranium Nitride (UN) Fuel Fabrication Team — Carolyn Scherer, Gerald Alletzhauser, Deborah Bennett, Stanley Bodenstein, William Crooks, John Dunwoody, Eduardo Garcia, Obie Gillispie, Wendy Hahn, Santiago Jaramillo, Kristy Long, Gregory Long, Carol Lopez, Michael Lopez, Anthony Martinez, Diana Martinez, Charles Montoya, Michael Martinez, and Stewart Voit of PMT-AFCT; Fredrick Hampel of MST-16; Kenneth McClellan of MST-8; and Stephen Wilson.

Uranium Nitride Fuel Fabrication

The Uranium Nitride (UN) Fuel Fabrication team received a large team Distinguished Performance Award for its work producing uranium nitride fuel pellets for NASA and Department of Energy/Naval Reactors. NASA and Naval Reactors were charged with designing and fabricating a space nuclear power system suitable for exploration around Jupiter's icy moons. The fuel pellets were required for use in small nuclear-powered reactors designed to deliver megawatts of power at high temperatures without failure over a 15-year lifetime. The pellets also had to operate with no degradation in density, form, or performance for their required lifetime.

The fabrication effort consisted of project management, feedstock preparation, fuel fabrication, and fuel characterization. The team displayed exceptional project management skills working with the Naval Reactors customers. With limited experience fabricating these fuel pellets, the team accomplished its goals on a very small budget and within a tight schedule. The final product consisted of uranium nitride fuel pellets with fuel densities and dimensions never achieved previously. The team successfully produced the fuel under stringent requirements in the allotted time and secured the success of the reactor system for the Jupiter mission.

Millimeter-Wave Source

Los Alamos' Millimeter-Wave Source Team received a large team Distinguished Performance Award for developing a novel architecture for future high-power millimeter-wave sources.

Millimter-Wave Source Team — Bruce Carlsten, Kip Bishofberger, Lawrence Earley, William Haynes, Frank Krawczyk, Frank Romero, Steven Russell, Evgenya Smirnova, Zhi-Fu Wang of ISR-6; Michael Brockwell of AET-4; Mark Dunham of ISR-DO; Stephen Knox of NN; and Daniel Prono of DHS.

The millimeter wave, the highest radio frequency band, can be employed in remote sensing and other microwave applications. The team performed key proof-of-principle technology experiments and used a grass-roots process to develop new threat-reduction mission concepts. The team's planar ribbon-beam traveling wave tube design resulted in a reduction in size, an improvement in efficiency, a reduction in cost, and an improvement in robustness for many portable applications. Such applications include secure battlefield communications, space-based communications, hand-held active denial (nonlethal personnel control), and autonomous intercept vehicle positioning. Each is essential to threat reduction. As concepts were investigated, the team realized that this source technology could enable new ground-based space surveillance radars, space-based tracking and inspection radars, and terrestrial and space-based spectroscopy missions. The cutting-edge accomplishment achieved by the team represents a major technical achievement that is highly respected in the beam physics and microwave source communities. The team worked efficiently and creatively to complete the demonstration experiments while developing new beam diagnostics and focusing optics simultaneously because no applicable previous research had been done in this area. It developed the scientific foundation for a new generation of high-power millimeter-wave sources, and the team is now recognized worldwide as the leading technology developer in this field.

Proton Radiography Propellant Gun (pRAD Gun) Project Team — Frank Merrill, Camilo Espinoza, Gary Hogan, Julian Lopez, Fesseha Mariam, Christopher Morris, Matthew Murray, Alexander Saunders, Cynthia Schwartz, Terry Thompson, and Dale Tupa of P-25; Frank Abeyta, Mark Byers, Timothy Pierce, and Paulo Rigg of DE-9; Joseph Bainbridge, Robert Lopez, Mark Marr-Lyon, Carlos Martinez, Paul Rightley, and George Trieste Jr. of HX-3; Leo Bitteker of LANSCE-NS; David Clark, Kris Kwiatkowski, Kevin Morley, and Paul Nedrow of P-23; Brian Hollander of P-22; Fred Shelley of AOT-IC; and Dennis Shampine.

Proton Radiography Powder Gun Project

The 29 members of the Proton Radiography Powder Gun team received a large team Distinguished Performance Award for conducting the first-ever gun-driven plate impact experiments using proton radiography as a diagnostic tool. Their work demonstrates the ability to synchronize a propellant gun to an accelerator pulse and obtain real-time direct observations of dynamic material states with unparalleled accuracy. The effort included developing the gun and learning how to design powder charges and projectiles to guarantee timing reliability, followed by fielding the gun in conjunction with the proton accelerator.

The team developed a new fire-control timing system and a means of timing data acquisition to events on the target when the projectile impacted a series of trigger pins. The first experiments demonstrated that synchronization of the shock event and proton beam could be done reliably with a 100% success rate. The team executed a series of plate impact experiments that measured material density in the shocked state with unrivaled accuracies. This independent method for obtaining material state variables could dramatically alter and enhance understanding of equations of state and provide rigorous tests of material models. Detailed measurements using proton radiography coupled with the propellant gun can now probe material failure, including incipient damage formation and evolution, thereby addressing one of the major areas of uncertainty in the Laboratory's predictive science stockpile stewardship campaigns.

Off-Site Source Recovery Project

The Off-Site Source Recovery Project (OSRP) team received a large team Distinguished Performance Award for outstanding performance in the emerging field of radiological threat reduction.

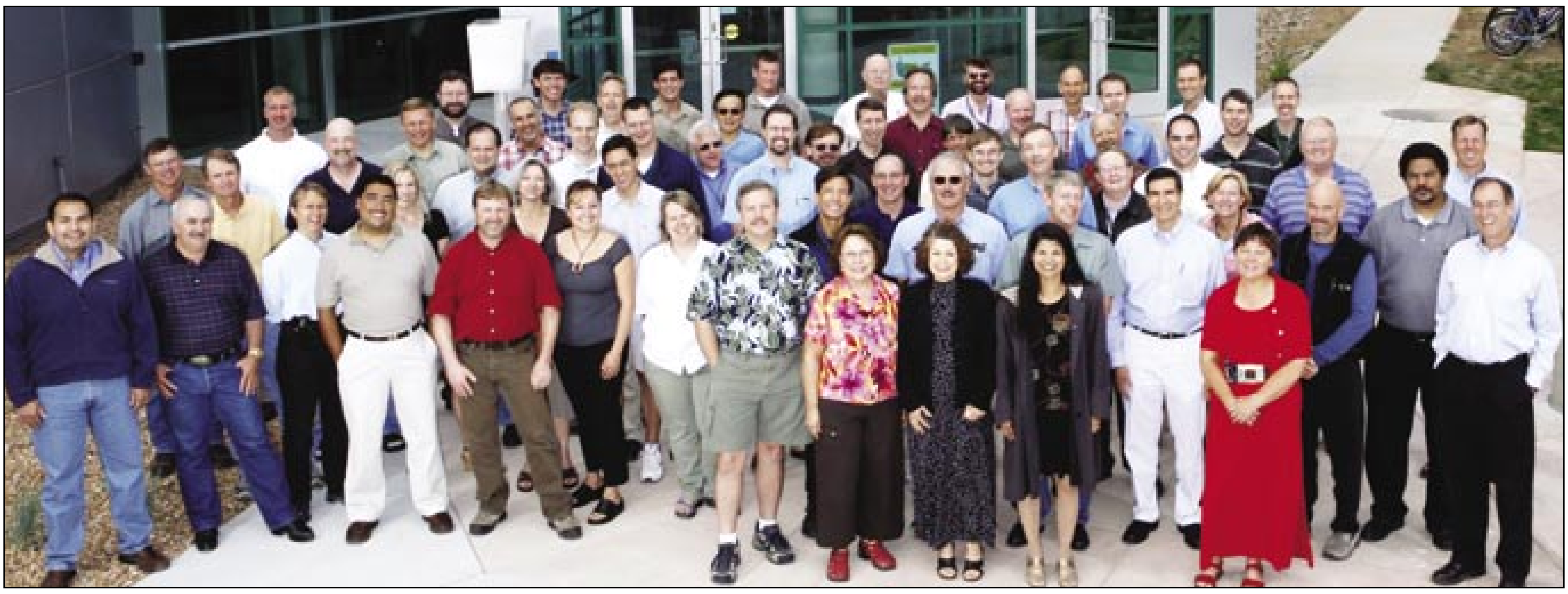
The Laboratory is recognized as the premier U.S. institution to address the potential threat of a radiological dispersal device, or dirty bomb, by aggressively seeking out the most vulnerable radiological sources that are excess and unwanted or orphaned by their owners. The project is part of the U.S. Radiological Threat Reduction Program led by NNSA and managed by the Lab. The team has recovered sources containing radioactive plutonium, americium, cesium, cobalt, and strontium from medical, agricultural, research, and industrial locations in the United States and in other countries, including Sudan and South Africa. By the end of 2005, the team recovered and secured 1,693 radioactive sources from more than 80 sites. Of significance was the team's work to recover some of the most worrisome irradiators in high schools and small colleges across the United States. For example, the team successfully recovered and secured three irradiators that had been orphaned at a high school in Texas. The largest recovery effort took place in November 2005 when the team managed the recovery and disposal of nearly 60,000 curies of DOE-owned cobalt-60 from Atlanta. The team has clearly established its members as radiological material recovery experts, accomplishing their work without a single safety or security violation or incident.

Off-Site Source Recovery Project Team — Cristy Abeyta, Alexander Feldman, Justin Griffin, Lorraine Hauschild, Shelby Leonard, Michael Lindstrom, James Matzke, Michael Pearson, Joseph Tompkins, and Mark Wald-Hopkins of N-2; Jerry McAlpin and Mark Waterman of KMP-FOCI; Leonard Manzanares of RP-1 and Julia Whitworth of NN.

Reliable Replacement Warhead Feasibility Study Project

The Reliable Replacement Warhead (RRW) Feasibility Study Project may potentially change the nature and composition of the U.S. nuclear stockpile over the course of the next few decades. Los Alamos' Reliable Replacement Warhead (RRW) Feasibility Study Project team earned a large team Distinguished Performance Award for its work to develop, manage, and complete a detailed physics baseline design and alternative designs that meet all Project Officer's Group requirements, including Stockpile-to-Target Sequence.

The RRW projects also may transform the manufacturing infrastructure



Reliable Replacement Warhead (RRW) Feasibility Study Project Team — Joseph Martz and Angie Martinez of PADWP; Daniel Abeyta, Bradley Baas, Donald English, Brandon Gabel, Todd Kimbrough, Jeffrey Roybal, and Christopher Scully of W-11; Robert Aikin Jr., John Balog, Robert Hackenberg, and Deniece Korzekwa of MST-6; Mark Anderson, Miles Baron, James Beck, John Becker, Langdon Bennett, Baolian Cheng, Jill Hefele, John Pedicini, Robert Pelak, and Maria Rightley of X-4-AFS; Joysree Aubrey of P-21; Mary Barr, Thomas Farish, Drew Kornreich, and Antonio Villegas of AET-2; Roy Baty, Jobie Gerken, and John Langford of WT-1; Michael Bernardin of X-2; James Betschart, Frederic Bradshaw, and Vj Montanye of CS-PCS; Robert Bishop and Ronald Martinez of W-10; Lawrence Brooks, Terrence Buxton, John Hargreaves, David Hayden, Lavere Hiteman Jr., Dan Knobeloch, Jon Nielsen, Scott Schilling, Cary Skidmore, Dale Talbott, and Daniel Trujillo of W-5; John Budzinski of X-4-TAR; Michael Burkett, Renida Carter, and Nathaniel Morgan of X-4-SS; Damon Burnett of AET-1; Albert Charmatz, Arlen Heger, and Daniel Stinemates of WT-2; Robert Chrien of X-3-MP; Keith Despain, Stephen Kemic, Fred Mortensen, Charles Nakhleh, John Scott, and Jennifer Young of X-2-N2; Seth Gleiman, Kevin Hase, Marcelina Martinez, and John Weigle of WT-6; Thomas Gorman and Gary Wall of X-4-NSI; Michael Haertling of X-DO; Donald Haynes of X-2-PC; Martin Herrera and Peter Sandoval of WT-3; Elizabeth Hogan and Steven Renfro of W-DO; John Hopson Jr. and Jacob Perea of ADWP; Douglas Kautz of WCM-2; Brett Kniss of PM-DO; Gordon Medford of W-3; Brad Meyer and Chad Schmidt of W-7; Jody Niesen and Jacob Tafoya of PF-TDI; Rafael Padilla and Clifford Polston of W-2; David Ponton of W-4; John Purson of IAT-1; James Sowers of AET-3; Keith Thomas of W-6; George Tompkins of D-6; John Vandenkieboom of X-2-AFS; Peggy Sue Volz of WT-8; Robert Weaver of X-2-N1; Gary Gladysz, Edward Nava, David Olivas and Edgar Vaughan.

2005 Distinguished Performance Awards

Large team awards

Spallation Neutron Source (SNS) Radio Frequency (RF) Team — Daniel Rees, David Baca, Gerald Bolme, Joseph Bradley, Audra Espinoza, David Keffeler, Sung Kwon, Michael Lynch, Edward Partridge, Mark Prokop, William Reass, Manuelita Rodriguez, William T. Roybal, Stephen Ruggles, Phillip Torrez, Alex Velasquez, and Karen Young of AOT-RFE; Sean Apgar of ISR-4; Dan Borovina, Roy Przeklasa, and David Warner of W-6; Vaughn Brown of FME-PSE; Phillip Chacon, Thomas Cote, Debora Kerstiens, Pilar Marroquin, Martin Pieck, and John Power of AOT-IC; Jacqueline Gonzales of P-25; Debra Graves of OS-PT; John Harrison of AOT-MDE; Daniel Jones of PP-WEB; Dennis Mack of ASM-PUR; Bobby Quintana and Gabriel Roybal of ISR-2; Amy Regan, Paul Stein and David Thomsom of AET-4; Chris Roybal and John Tapia of P-DO; Matthew Stettler of ISR-3; Paul Tallerico of AOT-DO; and Hamid Shoaee and Marsha Wenzel.

that supports the stockpile, so the project's importance and its visibility are without equal from a strategic viewpoint. The nuclear explosive package was designed to be certifiable without additional underground nuclear testing and to take full advantage of past data from underground tests and current stockpile stewardship tools, such as improved physics models, computer codes, and experimental facilities. The project team designed the warhead to enable improved manufacturing across the Department of Energy nuclear weapons complex. A key activity included a clean-sheet physics weapon design that required characterization of new materials, experimental efforts, and improved modeling and simulation.

This RRW weapon design enabled certification of the design without further underground tests. The result is increased long-term confidence in stockpile reliability, safety, and security, while driving a more responsive weapons infrastructure.

Spallation Neutron Source Radio Frequency

Laboratory scientists who developed the most technologically advanced high-power particle accelerator radio frequency system in the world, received a large team Distinguished Performance Award. The system developed by the Spallation Neutron Source (SNS) Radio Frequency (RF) team became fully operational in August 2005 at the SNS Facility at Oak Ridge National Laboratory in Tennessee, culminating many years of invention, design, development, procurement, testing, integration, and installation by the Lab team.

The SNS RF system has 92 state-of-the-art, high-power, high-efficiency klystron amplifiers; 15 innovative and compact high-efficiency pulsed-power systems; and the first large-scale, fully digital, low-level RF control system. Using a systems-engineering approach, the RF team adopted innovative system architecture to mitigate cost increases, carefully balancing cost, maintainability, and availability to achieve a savings to the project of $15 million in construction and $500,000 per year in operations.

The SNS RF team has been recognized internationally for vendor management, design reviews, and testing practices. The team represents the Laboratory at its best: an interdisciplinary mix of engineers, technicians, and support professionals working together toward a common national goal.

Stealthy Insect Sensor Project

Honeybees are doing more than just making honey. Laboratory scientists studied honeybees and developed a platform to use the bees in detecting explosives. The work also earned the Stealthy Insect Sensor Project team a large team Distinguished Performance Award.

The team achieved its original goal of evaluating the proposed sensor platform and technology and greatly improved understanding of the platform's specificity and detection technology. It studied protein expressions and isolated genetic and physiological differences in individual bee olfaction characteristics. The team studied structural units in the bees' antennae and identified biochemical and molecular mechanisms that could account for differences in the insects' training capabilities and retention capacities. The team also used Pavlovian training techniques that trigger a physical response to the smell of specific explosives.

Stealthy Insect Sensor Project Team — Timothy Haarmann, Priya Dighe, Kirsten McCabe, and Caroline Weldon of B-1; Sara Maurer of EES-6; Rhonda Robinson and Sherri Sherwood of ENV-EAQ; and Robert Wingo of C-CSE.

Creating a controlled environment in which they could accurately determine the bees' capabilities, the team demonstrated that the bees' natural reaction to food — a proboscis extension reflex (PER) in which they stick out their tongues — could be used to record an unambiguous response to scent. The bees responded with a PER when they were exposed to explosive vapors. This paradigm has been tested many times in both laboratory and field settings and is a viable alternative to using dogs or elaborate hardware to detect explosives at low concentrations. The project was so successful that the team turned a $500 thousand seedling project into a $1.8 million Phase 2 project for the Defense Advanced Research Projects Agency.

Text by provided by the
Distinguished Performance Awards Screening Committee

Photos by LeRoy N. Sanchez
of Records Management/Media
Services and Operations (IRM-RMMSO)