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NNSA Researchers Capture Twelve Awards For Top Industrial Innovations

National Nuclear Security Administration (NNSA) laboratory researchers have captured twelve awards for developing advanced technologies with commercial potential.

The R&D 100 awards program is designed to honor significant commercial promise in products, materials or processes developed by the international research and development community. The R&D Magazine recognizes the world's top 100 scientific and technological advances with various awards.

Teams of researchers from Lawrence Livermore National Laboratory (LLNL) in California, Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL), both in New Mexico, won plaques for being among the top 100 industrial innovations worldwide for 2003. Lawrence Livermore and Los Alamos each won five awards and Sandia won two. The three labs are consistently among the winners every year. This year's R&D 100 awards, often called the "Oscars of

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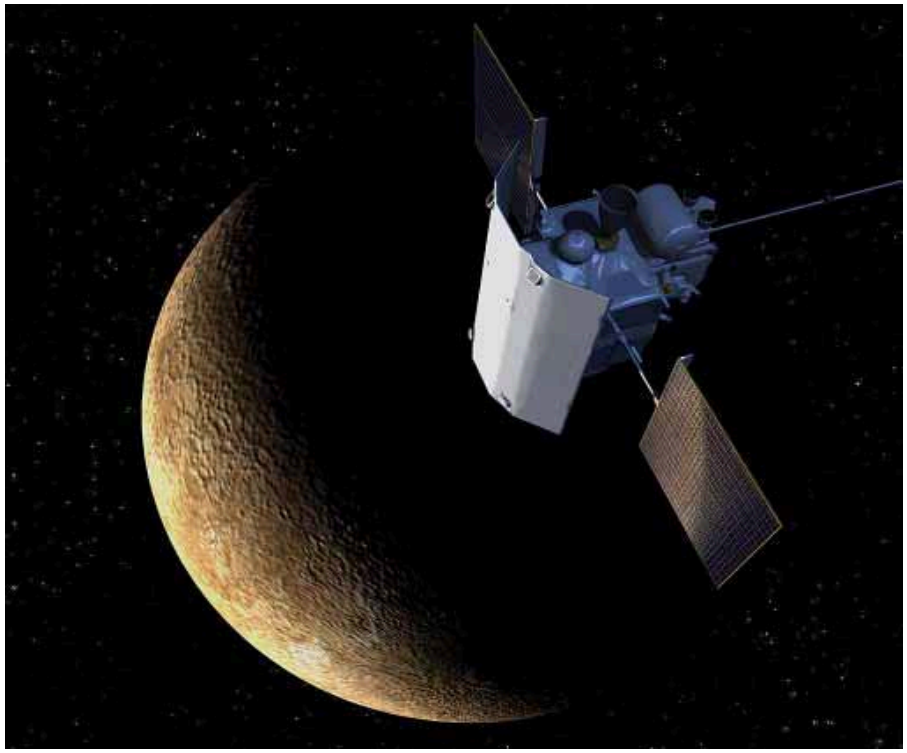

LLNL TECHNOLOGY: LLNL, in collaboration with the U.C. Berkeley and Johns Hopkins Applied Physics Laboratory, designed and built a high-resolution gamma ray detector carried by NASA's Mercury MESSENGER spacecraft. See story page 4.

Spent Nuclear Fuel Returned To The United States From Germany

A shipment of spent nuclear fuel from three research reactors in Germany was completed in August under the Department of Energy's new Global Threat Reduction Initiative (GTRI).

The shipment, the first such shipment since the establishment of the GTRI, contained 126 spent nuclear fuel assemblies of U.S. origin composed of highly-enriched and low-enriched uranium and took place in the framework of the existing Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Acceptance Program. This program, which supports the return of U.S.-origin spent nuclear fuel from foreign research reactors to the United States, was integrated as a key element into the new GTRI.

One of the key missions of the GTRI program is to convert

(continued on page 2)

Spent Nuclear Fuel

(continued from page 1)

reactors worldwide to low-enriched uranium nuclear fuel. The assemblies are stored at DOE's interim management site, the Savannah River Site in South Carolina, until final disposition arrangements are made.

"By accepting this material, particularly highly-enriched uranium that could be used in nuclear weapons if it falls into the hands of terrorist groups, the GTRI plays a key role in removing this material from international civilian commerce," Secretary Abraham said. "This program is vital to our nonproliferation efforts worldwide and I welcome the support of these efforts by Germany, a close partner of the U.S. in the effort to address the threat of proliferation." The initiative, announced by Secretary Abraham in May, supports the Bush Administration's goal of identifying, securing and disposing of nuclear and radioactive materials and equipment around the world that may pose a threat to the United States and its allies.

In the 1950's under the Atoms for Peace program, the U.S. provided reactor fuel to further other countries' research into peaceful uses of atomic energy, with the provision that the resulting spent fuel would be returned to the U.S. Recovering the fuel is now a major nonproliferation effort of the National Nuclear Security Administration.

Savannah River Tritium Facility Wins Secretary's Project Management Award

The Tritium Facility Modernization and Consolidation Project at the Savannah River Site has won the Secretary's Award of Achievement in the fourth annual Secretary's Project Management Awards.

The objective of the $142 million Tritium Facility Modernization and Consolidation project was to relocate, consolidate and modernize tritium gas processing functions from a 50-year old first generation facility to a location within a newer, currently operating second-generation facility. Total project cost was $141.8 million. The complex project was started in May 1998 and is currently 99 percent complete. To date there have been overall cost reductions of $50 million.

Other winners are the Office of Science — Secretary's Excellence in Acquisition Award for the Stanford Positron Electron Asymmetric Ring 3 (SPEAR3) Upgrade Project, Stanford Linear Accelerator Center; and the Secretary's Acquisition Improvement Award for Comparative and Functional Genomics Project Team, Oak Ridge National Laboratory.

Researchers Capture Twelve Awards

(continued from page 1)

Invention," will be presented October 14 during a black-tie dinner at the Navy Pier Convention Center in Chicago.

Winning technologies from the three labs included an automated, podium-sized instrument from Lawrence Livermore that can monitor the air for all three types of biological agents (bacteria, viruses and toxins). It is the second straight year that LLNL researchers have won an R&D 100 award for developing advanced technologies to rapidly detect the airborne release of biological threat agents.

Among the Los Alamos winners is the 10-Gigabit Ethernet which is a network card developed by LANL and Intel Corporation that delivers information electronically at speeds 148,000 times faster than a modem connection and more than 23,000 times faster than a DSL connection. This innovation has the potential to vastly increase the speed of electronic transmissions and data transactions, such as those that take place in commerce, banking, medicine, scientific modeling and simulation and the internet.

Sandia's Cantilever Epitaxy project is another winning project. Colored LEDs are of interest for displays and higher-power lamps like traffic lights. A national initiative is beginning to develop solid-state sources for high-efficiency white lighting. The cantilever epitaxy process of growing LEDs may help meet those needs. The new process creates the potential for longer-lived and better performing LEDs. It also means that LEDs grown on the patterned sapphire/gallium nitride substrates can produce brighter, more efficient, green, blue and white lights than previously accomplished.

For a complete list of the winning technologies, email Al Stotts at astotts@doeal.gov .

Pantex Reaches Plutonium Pit Repackaging Milestone

Pantex recently repacked the 10,000th plutonium pit into a sealed insert container.

Plutonium pits are nuclear components that are removed from weapons and stored at the plant. The repackaging operation inserts the pits into sealed containers more suitable for safe, long-term storage. They are then transported to designated storage locations and maintained with a surveillance and monitoring program.

Pantex has averaged over 200 pit repacks per month since BWXT Pantex assumed the contract in 2001, achieving its repackaging goals for 41 consecutive months. In addition, this process has been constantly improved to increase efficiencies and to reduce personnel radiation exposure per pit / per production technician by approximately 50 percent.

"Everyone who has worked on this program has been dedicated to moving the program forward and improving the process we use so it is safer and more efficient," said Blair Rhodes, Sealed Insert Program manager.

The repackaging program is an important element in the plant's mission to safely and securely maintain the nation's nuclear weapons stockpile. More than 30 employees work on pit repackaging daily, and more than 150 people have contributed to the program's overall success since repackaging began in 1999. The team has been honored for its work by NNSA with a National Security Award.

ANOTHER PANTEX MILESTONE: Members of the Pantex Plant pit repackaging team pose for a group picture. More than 30 employees work on pit repackaging daily, and more than 150 people have contributed to the program's overall success since repackaging began in 1999.

Pantex provides interim storage for the pits until the final pit disposition at the Pit Disassembly and Conversion Facility at the Savannah River Site is complete.

NNSA Managers Win Award For Outstanding Work

Three NNSA managers and two professional staffers were recently awarded the "President's Management Agenda Award" for their outstanding work implementing the President's Management Agenda (PMA). The NNSA awardees included: Associate Administrator for Administration Mike Kane for Human Capital; Director of Planning, Programming, Budgeting and Evaluation Kate Foley for Budget Performance and Integration; and Director of Business Operations Dorsey Hibbits for Competitive Sourcing. Additionally, NNSA professional staffers Ken Sheely and Ken Sprankle were honored. Energy Secretary Spencer Abraham presented the awards at a ceremony at headquarters in Washington, D.C.

Issued in 2001, the PMA seeks to improve the management and performance of the federal government by making it more citizen-centered, results-oriented and market-based. The PMA includes five government-wide initiatives. Departments and agencies are issued quarterly scores by the Office of Management and Budget on their progress in meeting PMA goals. Secretary Abraham is fully committed to make management improvement a hallmark of his administration using the President's Management Agenda as the foundation for making improvements.

In March 2004, DOE/NNSA was recognized at the 2004 Government Performance Summit for its accomplishments in making significant management improvements over the past three years.

Got an article for the NNSA Newsletter?
Submit it for consideration to AStotts@doeal.gov

Mercury MESSENGER Carries Livermore Technology

A team of scientists and engineers from Lawrence Livermore National Laboratory, in collaboration with the University of California at Berkeley and Johns Hopkins Applied Physics Laboratory, designed and built a high-resolution gamma ray detector that will enable NASA's Mercury MESSENGER spacecraft to measure the elemental composition of the crust of Mercury, the solar system's innermost planet.

MESSENGER, an acronym of sorts for MErcury Surface, Space ENvironment, GEochemistry and Ranging, began its journey on August 3 from Cape Canaveral Air Force Station in Florida and will travel approximately eight billion kilometers to reach Mercury's orbit in March 2011.

MESSENGER will conduct an in-depth study of Mercury, the least explored of the planets. Livermore's role was critical in ensuring that the spacecraft's gamma-ray spectrometer could withstand the heat of Mercury.

Livermore researchers led a team that built a rugged, encapsulated germanium gamma-ray detector and mated it with a miniature cryocooler. The miniature cryocooler and a multi-layered thermal shield maintain the germanium detector at a temperature less than 90 degrees Kelvin (-297.67 degrees Fahrenheit), ensuring that the spectrometer functions correctly.

Carrying seven scientific instruments on its compact and durable composite frame, MESSENGER will provide the first images of the entire planet. The mission will also collect detailed information on the composition and structure of Mercury's crust, its geologic history, the nature of its thin atmosphere and active magnetosphere, and the makeup of its core and polar materials.

The detector is based on technology originally developed for Cryo 3, a mobile, handheld mechanically cooled germanium radiation detector with national security applications.

There's A KCP Safety Professional Of The Year (SPY) In Town

Scott Gilmore's actions aren't covert or secretive; in fact, they've made an obvious difference in the Kansas City community as well as at NNSA's Kansas City Plant (KCP).

In recognition of his accomplishments and contributions in the field of safety and health engineering, Gilmore, a staff safety engineer at KCP, recently received the Region V Safety Professional of the Year (SPY) award from the American Society of Safety Engineers.

SCOTT GILMORE

The annual SPY award recognizes the most outstanding safety professional for contributions in the field of safety, health and environmental engineering. Region V consists of 16 chapters throughout Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota and Wisconsin.

As staff safety engineer at KCP, Gilmore has created numerous processes to make a safe culture even safer. Unlike a typical industry, the breadth and depth of site operations and hazards require a comprehensive, complex and integrated safety program to be effective. One of the most challenging programs is electrical safety, to which Gilmore has made many vital contributions.

Gilmore's commitment to safety reaches beyond his office door and into the community. In conjunction with local hospitals and highway patrol units, Gilmore conducts car seat inspections to educate parents on how to transport their babies safely - part of the national "Safe Kids" program.

A lesser noticed but important safety action Gilmore takes is to assist the City of Kansas City workers in labeling storm drains with "drains to stream" - a reminder not to pour chemicals down storm drains. The drains lead to the streams, and hazardous waste can endanger both people and wildlife.

U.S., Russian Lab Directors Advocate Global Expansion Of New Nuclear Energy Technologies

Representatives of seven Department of Energy national laboratories and nine Russian scientific nuclear organizations have developed a joint document that advocates greater global use of nuclear energy.

In addition to providing a virtually limitless supply of secure and reliable energy, increased use of nuclear energy would greatly reduce the risk of nuclear weapon proliferation and nuclear terrorism and reduce the worldwide amount of carbon emissions, the directors said.

C. Paul Robinson, director of NNSA's Sandia National Laboratories, was elected chairman of the seven U.S. representatives.

"These meetings were held to explore alternative research and development paths to meet growing energy needs," he said. "We found considerable common ground on ways to achieve future energy needs, with use of advanced nuclear systems."

NNSA's other two weapons labs were represented by Pete Nanos, director of Los Alamos National Laboratory and Michael Anastasio, director of Lawrence Livermore National Laboratory. Other representatives in the American delegation were Hermann A.Grunder, director, Argonne National Laboratory; Paul Kearns, director, Idaho National Engineering and Environmental Laboratory; Jeffrey Wadsworth, director, Oak Ridge Laboratories, and Leonard K. Peters, director, Pacific Northwest National Laboratory.

NUCLEAR ENERGY ADVOCATES: Sandia Labs Director C. Paul Robinson (center) prepares for a meeting of representatives of seven DOE Labs and nine Russian nuclear science organizations at the International Atomic Energy Agency headquarters in Vienna, Austria. Robinson chaired the group with Evgeny Velikhov (left) of the Kurchatov Institute, Yuri Sokolov (grey jacket), IAEA Deputy Director General, and Tom Sanders (right) of Sandia's Global Nuclear Futures project.

The joint document says the participants believe that of all current or imminently developable energy technologies, only nuclear power is capable of meeting the growing world demand for safe, clean, plentiful and economically viable sources of electricity, fresh water and hydrogen.

The meeting was a follow up to the address by Russian President Putin to the Millennium Summit in September 2000, the Bush-Putin Summit in 2002, and the speech by President Bush at the National Defense University in February 2004. On each of these occasions the idea was advanced that nuclear power should play an appropriate role in the energy mix in the 21st century while providing protection against proliferation.

"The time has come to develop a comprehensive and realistic plan to ensure the development and deployment of nuclear energy," the joint document says. "It must preserve access to nuclear energy sources for all countries of the world, and in parallel, reduce the risks of nuclear arms proliferation, nuclear terrorism and hazardous impacts on environment and population health."

The Russian delegation included representatives from the Kurchatov Institute, the Leypunsky Institute for Physic and Power Engineering, RF Federal Agency on Atomic Energy, the Nuclear Safety Institute, Russian Academy of Sciences, Russian Research Institute of Nonorganic Materials, the Dollejal Research and Development Institute of Power Engineering, and the Research Institute of Nuclear Reactors.

Sandia Labs Supercomputer To Be World's Fastest

Red Storm will be faster, yet smaller and less expensive, than previous supercomputers, say researchers at NNSA's Sandia National Laboratories, where the machine will be assembled. The first quarter of the $90 million, 41.5 teraflops (trillion operations/second) machine should be installed at Sandia by the end of September and fully operational by January, said Bill Camp, Sandia's director of computation, computers, information, and mathematics, who heads the effort to design and assemble the innovative machine.

The main purpose of the machine is work for the U.S. nuclear stockpile: designing new components; virtually testing components under hostile, abnormal and normal conditions; and helping in weapons engineering and weapons physics. The machine is expected to run ten times faster than Sandia's ASCI Red computer system on Sandia's important application codes. (ASCI Red held first place on the top-500 list of the world's supercomputers for three-and-a-half consecutive years.)

Red Storm, an air-cooled supercomputer, is being developed by Sandia and Cray Inc. using mostly off-the-shelf parts.

CALM BEFORE THE STORM: Red Storm, an air-cooled supercomputer, is being developed by Sandia and Cray Inc. using mostly off-the-shelf parts. A unit is pictured here in its initial stage of construction.

Design innovations permit the machine, from concept to assembly, to be completed with unusual rapidity. While manufacturers typically require four to seven years from concept to first product on a new supercomputer, Cray says Red Storm will begin testing at Sandia less than 30 months after conceptual work began.

Because of its uniquely inexpensive design, the machine may become the center of Cray's future supercomputer line, said Camp. "From Cray's point of view, the approach we're pioneering here is so powerful they may want their next supercomputers to follow suit."

The machine has unique characteristics: it is scalable from a single cabinet (96 processors) to approximately 300 cabinets (30,000 processors). In addition, the system was designed with a unique capability to monitor and manage itself. Much of the costs incurred for the machine are non-recurring engineering design costs.

"We couldn't afford a 'Rolls Royce'-an entirely custom-designed machine," said Camp. "The way Red Storm is designed, we don't have to shut down to replace a part. We work around failed components until we decide to fix them-all without shutting down."

Cray was chosen because the company was "forward-looking, flexible, willing to work with us to design a new architecture, and had the lowest cost proposal."

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Livermore "Got Science?" Extravaganza Huge Success

More than 2000 people attended Lawrence Livermore National Laboratory's "Got Science? Discover Science Saturday" extravaganza on July 24. The family-oriented event, designed to share science with the public, included interactive demonstrations on biology, rocketry, lasers, robotics, energy and nuclear fusion. Visitors could generate their own earthquake, make their own DNA jewelry, view sunspots, learn the physics of auto racing and talk with lab scientists about what they do. Entertainment was provided by a rock band comprised of local science teachers, who sang songs with science lyrics and included audience members in musical science demonstrations. Laboratory Director Michael Anastasio lent his own science expertise to the event. "It was great to see so many families come out to see the things we do," said Anastasio. "We reached out to quite a few budding scientists."

GOT SCIENCE?: Zhi Liao leads a group of aspiring young scientists through the dynamics of laser imaging during Lawrence Livermore National Laboratory's recent Saturday science fair, titled "Got Science?".

Los Alamos Helps Map The Evolution Of A Virus

A Los Alamos National Laboratory scientist working with collaborators from the University of Cambridge (England) and the World Health Organization National Influenza Center at Erasmus Medical Center, (Rotterdam, Netherlands) have developed a computer modeling method for mapping the evolution of the influenza virus. The method could soon help medical researchers worldwide develop a better understanding of certain mutations in influenza and other viruses that allow diseases to dodge the human immune system.

In a paper published in the journal Science, the team of scientists describe their work quantifying and visualizing the antigenic and genetic evolution of the influenza A (H3N2) virus from its initial introduction into humans in 1968 up to 2003. The study resulted in a map that shows the virus evolved as a series of 11 closely related virus clusters as it has sought to elude human immunity over the decades.

The mapping method will allow researchers involved in vaccine development and viral surveillance programs for influenza, and potentially for other pathogens such as Hepatitis C and HIV as well, to quantify and visualize the evolution of these viruses. It can assist in monitoring antigenic differences among vaccine and circulating viral strains, and can help in quantifying the effects of vaccination. The approach also offers a route for predicting the relative infection success of emerging virus strains.

According to Los Alamos computational biologist Alan Lapedes, "This collaboration was particularly exciting because it involved close interaction between experts in computation and virology and medicine. Once we had created the map, we tested its reliability by making hundreds of predictions of how well certain strains might match up and then conducting laboratory tests to check the predictions."

Experts estimate that influenza epidemics cause an estimated 500,000 human deaths worldwide each year. Although antibodies provide protective immunity to influenza virus infection, the antigenic structure of proteins that stimulate immune responses changes significantly over time, a process known as antigenic drift, so in most years the influenza vaccine has to be updated to ensure sufficient efficacy against newly emerging variants.

Unique Sandia Labs Facility Celebrates Ten Years of Making The World A Safer Place

Sandia National Laboratories' Cooperative Monitoring Center (CMC) has celebrated its tenth anniversary.

The CMC was established in 1994 after a recognition that technology could be an important element of confidence-building measures or treaties that build trust among nations. The CMC's founders also believed that improving regional security around the world was integral to U.S. national security.

"Everybody now accepts the idea that technical cooperation abroad can be part of achieving our own national security objectives-but then it was a new idea," said Arian Pregenzer, a Sandia senior scientist and CMC founder.

Pregenzer and a group of Sandia scientists proposed to make available to the world - and particularly to Middle Eastern nations engaged in regional conflicts - sharable technologies and information that could become part of such tension-reducing arms control agreements. The CMC initially served as a demonstration facility where experts from around the world came together to learn about such technologies.

"The purpose really was to find ways to share technologies and information to promote regional security and cooperatively reduce the motivations to acquire weapons of mass destruction," said Kent Biringer, Sandia manager of Regional Security and Multilateral Affairs. "At the same time, we recognized that technology is not the solution in and of itself."

Today, the CMC supports U.S. nonproliferation efforts, leads Sandia programs to protect weapons-usable materials around the world, supports the International Atomic Energy Agency's nuclear safeguards work, helps former Soviet nations secure and dismantle nuclear weapons, develops border monitoring technologies, proposes processes to inspect U.S.-destined shipping containers in foreign ports, secures thousands of radiation sources around the world, improves regional security through scientific and technical engagement projects, and leads international efforts to develop standards for protecting potentially dangerous biological pathogens.

Livermore Researchers Develop Hybrid Fuel Tank

Lawrence Livermore National Laboratory (LLNL) researchers have developed a "hybrid" hydrogen fuel storage tank for use in hydrogen-powered vehicles. The tank can hold both compressed hydrogen gas and cryogenic (low temperature) gaseous or liquid hydrogen. The completed tank was installed on a truck provided by the Sunline Transit Agency of Riverside County, Calif. and field tested at the lab before being shipped to Riverside for six months of on-the-road testing by Sunline.

HYDROGEN FUEL RESEARCH: LLNL researchers (from left) Mark McCuller, Jim Fugina, Francisco Espinosa-Loza and Tim Ross discuss the LLNL insulated hydrogen fuel storage system installed in the back of a hydrogen-powered pickup truck.

Funded by the Department of Energy and California's South Coast Air Quality Management District, the tank research focused on overcoming one of the major barriers to practical hydrogen-fueled vehicles: on-board storage. While hydrogen fuel is more efficient and generates less air pollution and greenhouse gas emissions than gasoline or diesel fuel, it's difficult to store in the quantities needed to provide the range and performance of today's fossil fuel-powered cars and trucks.

To solve that problem, the Livermore team developed a safe, compact hydrogen storage tank that combines the around-town energy efficiency of conventional compressed hydrogen gas with the long-distance driving range of cryogenic compressed gaseous or liquid hydrogen.