2008 FLC Awards

Awards for Excellence in Technology Transfer

Helical Fiber Amplifier

Department of Defense – U.S. Navy
Naval Research Laboratory

Department of Energy
Sandia National Laboratories

Dr. Jeffrey Koplow (left) and Dr. Dahv Kliner. Not pictured: Dr. Lew Goldberg

Physicists affiliated with the Naval Research Laboratory (NRL) and Sandia National Laboratories (Sandia) have developed and commercialized a patented laser component that revolutionizes the potential applications of fiber lasers. The NRL/Sandia team discovered that coiling laser fibers in precise dimensions will filter out undesirable light modes, thereby making high-power fiber lasers possible. Their inventive solution resolved the power limitations of fiber lasers that had stymied the industry since these lasers were first developed in 1963, while preserving high beam-quality output. The groundbreaking discovery now allows production of high-power fiber lasers that are more cost-effective, rugged, and compact than other types of lasers.

Following patent approval in 2002, the team initiated transfer of its helical fiber amplifier (also called a mode-filtering fiber amplifier) to several commercial laser manufacturers: Nufern of East Granby, Connecticut; LIEKKI Corporation of Lohja, Finland; and IMRA America, Inc., of Ann Arbor, Michigan. By 2006, all three companies had received patent licenses allowing use of the innovative technology in their laser-based product lines. Over time, the technology transfer involved a changing list of collaborative partners and agreements as the inventors moved on to other research institutions. Despite the complexities involved, the outcome has been impressive, with new products already on the market and vast potential markets awaiting the new award-winning technology.

The collaboration between Department of Defense and Department of Energy researchers to develop the NRL and Sandia-patented technology will significantly affect industries like telecommunications, materials processing, and remote sensing by enabling lasers with higher power capability, superior performance features, lower maintenance costs, and smaller size. Applications range across the private and public sectors from real-time contaminant sensing and precision circuitry manufacture to secure high-bandwidth communications. Helical fiber amplifiers are already changing the worldwide fiber laser industry, shaping multibillion dollar market shares and creating new-product possibilities.

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Antibody Profiling Identification

Left to right: Debby Bruhn, Gregory Lancaster, Elizabeth Taylor, Dr. William Apel, Gordon Lassahn, Lawrence Cook, Dr. Vicki Thompson, Heather Silverman, Karen Delezene-Briggs, Joni Barnes. Not pictured: Dr. John Snyder.

In the popular TV series CSI: Crime Scene Investigation, the investigators receive DNA test results in minutes and by the end of a one-hour show, arrest their suspect. Real-life forensics testing takes longer—sometimes months longer. If the crime being investigated is perpetrated by a serial criminal, this means not only wasted time, but additional victims. Today, a new technology can quickly screen forensic samples and reduce the number of samples requiring more extensive DNA testing—Antibody Profiling Identification (AbP ID™).

First identified in 1988, these particular antibodies are called Individual Specific Autoantibodies (ISAs), and they perform a "housekeeping" role in the body by removing dead and diseased cells. Because they are directed against an individual's own tissues, ISAs are unique to each person—and are as individual as a fingerprint. These individual-specific autoantibodies are present throughout life, and their production isn't changed by illness, medication, or food or drug intake. Humans are born with a full complement of ISAs; however, newborns have the same ISA pattern as their mothers. Humans develop their own unique ISA pattern by the age of two, and after this age, even though body chemistry changes, the ISA profile does not.

Developed by researchers at Idaho National Laboratory (INL), AbP ID™ is a powerful new forensic tool that uses a special class of antibodies found in all body fluids, including blood, saliva, urine, perspiration, tears and semen. Coupled with Image ID™, INL's proprietary digital imaging software, this technology provides a low-cost, easy-to-use, accurate, and fast method to identify suspects through forensic evidence and build a searchable database. Although the chemistry behind AbP ID™ is complicated, the test procedure itself is not. At a fraction of the cost of a DNA test, an assay can be prepared in about two hours by someone with a high school education and the most basic lab equipment. This makes AbP ID™ perfect for preliminary screening of forensic samples, ensuring that only the most likely candidates undergo more expensive, time-consuming DNA testing.

DNA testing costs from $200 to $1,200 or more per assay and, because it requires specialized equipment and highly trained personnel, is only performed at large forensic labs or private DNA testing labs. DNA testing also takes a minimum of 48 hours to complete, but can take weeks, depending on the type of test, and sometimes months, depending on the backlog of cases at the lab. At a projected price that is much lower than the least expensive DNA test, AbP ID™ brings high-level forensic screening capability to law enforcement agencies of all sizes, regardless of geographic location or financial limitations.

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Dielectric Wall Accelerator for Proton Therapy

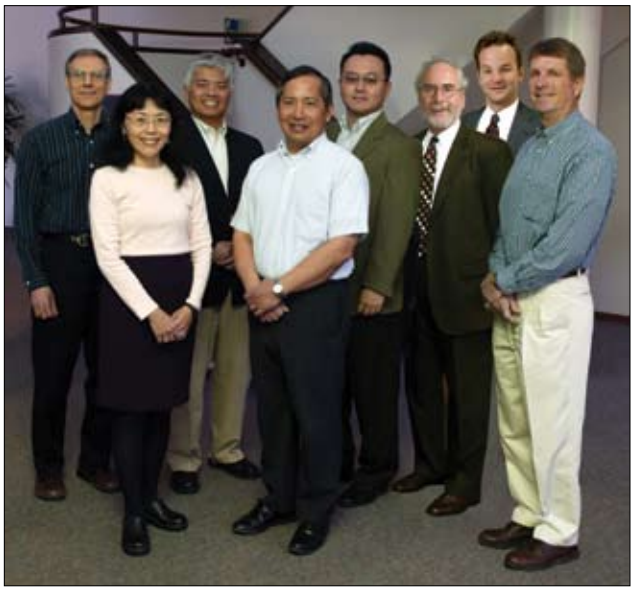
Department of Energy
Lawrence Livermore National Laboratory

More than half of the roughly one million people diagnosed with cancer each year will be treated using radiotherapy. Conventional radiotherapy kills cancer cells using X-rays that deliver high energies to the tissues they travel through, from the point they enter the body until they leave it. A more advanced form of radiation therapy uses proton beams that deposit almost all of their energy on the target, enabling doctors to hit tumors with more effective radiation doses than is possible with conventional radiation.

Despite its usefulness, proton therapy remains available at only 25 cancer centers worldwide due to the substantial size and cost of implementing the technology. The Dielectric Wall Accelerator (DWA)—the technology behind a proton therapy system that is expected to fit in standard radiation oncology clinics and cost significantly less than conventional proton therapy systems—intends to overcome these hurdles and make proton therapy more widely available. An offshoot of defense-related research at Lawrence Livermore National Laboratory (LLNL), the DWA accelerates protons to the required energies for cancer treatment without using bending magnets or other techniques that take up space and generate unwanted radiation.

In 2005, the DWA research team, jointly funded by LLNL and the University of California (UC) Davis Health System, achieved component feasibility for a compact proton accelerator that uses the DWA. Efforts to commercialize the technology failed, however, because the project lacked a working prototype. In early 2006, both parties took the unusual step of investing $1.5 million each toward development of a prototype. Because of the DWA, LLNL created a strategic technology maturation fund for technologies that provide a demonstrable spin back to a LLNL program or that can make significant contributions to an important national problem—in this case, cancer therapy.

The team then looked for a commercial partner that could integrate the DWA into a proton therapy system. TomoTherapy, Inc. was one of the companies that expressed interest. It officially submitted a commercialization plan in June 2006, and by February 2007 a license and a Cooperative Research and Development Agreement were executed. The successful transfer of the DWA technology is serving as a model for future endeavors. LLNL and UC Davis are now collaborating on more than a dozen projects that promise breakthroughs in the detection, treatment, and prevention of cancer.



Left to right: Dr. George Caporaso, Dr. Yu-Jiuan Chen, Genaro Mempin, Dr. Steve Sampayan, James Tak, Dr. Dennis Matthews, Tod Stoltz and Dr. Roger Werne

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Fission Meter™

Front row, from left: Dr. Daniel Dietrich, Catherine Elizondo, Dr. Manoj Prasad, Dr. Tim Twomey and Dr. Daniel Upp
Back row, from left: Dr. Mark Rowland, Ray Pierce, Dr. Neal Snyderman, Pedro Castro
Not pictured: Dr. Ray Alvarez, Doug Howard, Dr. Phillip Kerr

International terrorist activity during the last several years has created a worldwide demand for detectors that can identify fission material—an essential ingredient in nuclear explosives. To meet this demand, Lawrence Livermore National Laboratory (LLNL) developed an advanced neutron source identification system for the interdiction of fissionable material.

The ORTEC Fission Meter™ is the first portable neutron detector that can distinguish between a fissile and a non-fissile neutron source in real time. This detector provides "proof positive" identification of fissile neutron sources such as uranium-233, uranium-235, and plutonium-239, and is a valuable companion to the ORTEC Detective family of portable radiation identifiers.

The advanced technology consists of a low-cost digital data acquisition unit that collects data at a high rate and in real time processes large volumes of data directly into information that a first responder can use to differentiate fissile from non-fissile materials.

Entering into a partnership to transfer this technology was AMETEK, a leading global manufacturer of electronic instruments and electromechanical devices. AMETEK's Advanced Measurement Technology ORTEC Division was granted nonexclusive rights to commercialize the Fission Meter™ technology in August 2005. The nonexclusive license grants the use of three patents (pending) and a copyright. The Fission Meter's™ field-of-use limitation requires that the technology be developed specifically for handheld portable background radiation and neutron source characterization for first-responder search applications.

The Fission Meter™ is being marketed commercially for the federal government, first responders, state and local entities, and foreign governments. As one of the world's leaders in manufacturing radiation detectors and portal monitors, ORTEC has worked with U.S. government agencies, national laboratories, foreign government entities, and private industries, and is a current LLNL licensee for other homeland security technologies.

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Greg Failla, Chief Executive Officer of Transpire, Inc., has plenty of reasons to be proud of what the company has accomplished in the past six years. In 2002, Radion Technologies (later reincorporated as Transpire, Inc.) was founded by Failla and two former Los Alamos National Laboratory (LANL) scientists, Drs. John McGhee and Todd Wareing. Drs. McGhee and Wareing launched the startup company while on an entrepreneurial leave of absence from LANL, where they worked as scientists. They were joined soon after by Dr. Allen Barnett, who previously worked as a shielding engineer in the U.S. Navy's Naval Nuclear Propulsion Program.

Through a licensing agreement with LANL, the company built on core technology that originated at the laboratory to develop a complete radiation transport software product, Attila, that can predict how radiation behaves in a broad range of applications faster and more accurately than just about anything else.

Since the first official release of Attila in January 2004, interest has grown rapidly. Attila is now being used in over seven countries for applications as diverse as radiation shielding, radiotherapy, medical imaging, fusion research, homeland security, spacecraft design and reactor analysis. In addition, the company has received numerous Small Business Innovation Research grants, including two from the National Cancer Institute for medical imaging and radiotherapy, which total almost $2 million.

Left to right: Gregory Failla, Dr. Allen Barnett, John Davies, Dr. John McGhee, Dr. Todd Wareing

In 2007, Transpire generated close to $1 million in revenue from software and training alone, and anticipates exceeding this in 2008. Because of these revenues and the large number of grants, Transpire will be able to broaden the software for additional markets. The software has recently been added to the short list of validated codes for International Thermonuclear Experimental Reactor (ITER) neutronics analyses. ITER is a joint international research and development project that aims to demonstrate the scientific and technical feasibility of fusion power and involves partners from all over the world. The company also has a multi-year project with Pacific Northwest National Laboratory to develop a scenario analysis tool to detect radiological threats at U.S. ports of entry. The software has been licensed by leading healthcare companies involved in both radiotherapy and medical imaging. Additionally, Transpire has active collaborations with the University of Texas M.D. Anderson Cancer Center for radiotherapy and Baylor College of Medicine for medical imaging.

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High-Definition Laser Scanners for Surveying

Department of Energy
Los Alamos National Laboratory

LANL Hi-Def Laser Scanner Team

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When Los Alamos National Laboratory (LANL) scientist Dr. James Lunsford received a patent for his Offset Stabilizer for Comparator Output, he never imagined it would become a crucial component in a line of high-definition surveying (HDS) laser scanners produced by Leica Geosystems, a world-class manufacturer of precision measuring instrumentation.

Dr. Lunsford developed his technology to satisfy the need for more precise time-interval measurement increases "as we probe ultrafast processes in the physical and biological worlds." It contributes the ability to maintain the high accuracy of 6 millimeters at a distance of 50 meters (1.5 mm for extracted targets) during a survey, reducing or eliminating the need for costly return visits to a site. It also contributes to more accurate, complete as-builts for retrofit design projects, which translates into better, more cost-effective retrofit designs. This sub-microsecond interval timing ensures that each interval is absolutely equal to other intervals. Such accurate measurements from period to period are required in instrumentation used in the national security programs at LANL.

In 1997, Cyra Technology licensed Dr. Lunsford's technology for integration with its Cyrax 3-D imaging system to produce more accurate as-built drawings of existing structures (plants, buildings, etc.). Acquired by Leica Geosystems in 2001, Cyra was renamed Leica Geosystems HDS in 2004.

In 2003, Leica introduced the HDS3000 laser scanner, an improved version of the Cyrax 3-D system, with increased speed and accuracy, to the market. In 2006 and 2007, Leica introduced ScanStation and ScanStation 2. ScanStation 2 is on the order of 1000 percent faster in many situations. While the laser in the HDS3000 and ScanStation was limited to 4000 points per second at peak, ScanStation 2 runs at 50,000 points per second at peak, with its speed and accuracy directly attributable to the LANL patented technology.

Second-Generation High Temperature Superconducting Wire

Department of Energy
Los Alamos National Laboratory

Second-generation (2G) high temperature superconducting (HTS) wire is a revolution in the electric power industry. Using a patented deposition method developed at Los Alamos National Laboratory (LANL) in collaboration with industry partner SuperPower Inc., the 2G HTS wire can carry 200 times more current than traditional copper wires. Compared to other HTS wire, the LANL 2G HTS wire is faster to produce, inexpensive, and can be manufactured in kilometer lengths.

SuperPower Inc., a wholly owned subsidiary of Intermagnetics General Corporation, develops state-of-the-art 2G HTS wire and electric power components such as underground transmission and distribution cables, transformers and fault current limiters, all used to transmit electricity. LANL and SuperPower began collaborating in 2000 when the first Cooperative Research and Development Agreement (CRADA), originally with Intermagnetics, was executed for the development of an earlier version of the coated conductor technology. With the formation of SuperPower, Intermagnetics made a commitment to invest significant resources in the scale-up of 2G conductors. That CRADA remains an ongoing collaboration, which has had multiple modifications, and is now focused on lowering the cost of 2G HTS wire and simplifying the wire architecture.

As one of only a handful of companies working on 2G HTS wire development, SuperPower, based in Schenectady, New York, is targeting the $18-billion electric power industry. The company began manufacturing the wire in 2006. Using first-generation HTS wire, SuperPower has already implemented its first commercial in-grid demonstration of the technology in Albany County, New York, connecting two power substations by running a 350-meter superconducting wire. Additionally, SuperPower has manufactured enough 2G HTS wire to replace a 30-meter section of the 350 meters in Albany County that was slated to be energized by the end of 2007. Through the CRADA and new license agreements, the LANL continues to work with SuperPower on improvements to transfer the latest research that will enable the broader commercial viability of the material.

Left to right: Dr. Quanxi Jia, Dr. Paul Arendt, and Dr. Steve Foltyn
Not pictured: Dr. Venkat Selvamanickam, Dr. Xuming Xiong, Dr. Yimin Chen

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Coal Chemistry Module

Dr. Chris Guenther and Dr. Madhava Syamlal

Researchers at the National Energy Technology Laboratory (NETL) developed the Coal Chemistry Module (CCM) software as a means to incorporate coal chemical reactions into physics-based models of multiphase reactors to solve scale-up problems for advanced power plants using coal gasification, such as integrated gasification combined cycle (IGCC) plants. Advanced power plant technologies combine the technology of multiphase reactors with high-temperature chemical reactions for processing fossil fuels.

With industry partners, NETL is leading the way to a new generation of simulation software capable of integrated solutions to this technology challenge. The effort has resulted in the development of CCM, which has been incorporated in the NETL open-source multiphase flow code MFIX (Multiphase Flow with Interphase eXchanges). Code MFIX was the winner of a 2007 R&D 100 Award and has been used in collaborative projects with end users. Technology transfer of CCM is being done under a Cooperative Research and Development Agreement (CRADA) with FLUENT, a well-known fluid dynamics code. These developments have had a positive impact on not only the primary target, the fossil fuel industry, but also coal conversion R&D at universities and national labs.

Researchers at NETL and design engineers at Southern Company and Kellogg Brown & Root (KBR) are using the CCM as part of an overall MFIX simulation of the transport gasifier at the Power Systems Development Facility in Wilsonville, Alabama. The transport gasifier is a promising process for use in high-efficiency, low-emission IGCC systems. The simulations convincingly showed gasifier developers that the model does not merely reproduce what is already known, but provides insight into unobserved phenomena, which they could later verify experimentally. Also, CCM was used with MFIX to predict the expected gasifier behavior almost a year before certain design modifications were completed. KBR design engineers are using similar simulations to help with the design of a commercial-scale Clean Coal Power Initiative (CCPI) transport gasifier at Orlando, Florida.

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High-Temperature Sorbent to Control Mercury in Gasification Processes

Department of Energy
National Energy Technology Laboratory

In this project, researchers at the National Energy Technology Laboratory (NETL) developed a novel technology to remove mercury in gasification-based electric power generation systems, and transferred the technology to Johnson Matthey Corporation (JM) for commercialization. The technology was developed by in-house research at NETL. The technology transfer activities included licensing a patent on a technique to remove the pollutant mercury in gasification-based power generators and a Cooperative Research and Development Agreement (CRADA) between NETL and JM. JM not only wished to pursue this mercury removal technology, but also realized the future importance of coal gasification as a means to produce power, hydrogen, and chemicals. NETL's idea for mercury removal was licensed to JM under the CRADA. The potential market for the technology is significant. Additionally, when the technology is implemented, the American public will benefit because low-cost electric rates would continue and ambient air would be free of mercury.

Over 50% of U.S. electric power comes from coal. A major concern for power generation systems that use coal as an energy source is air emissions from the plant. Although certain gaseous emissions are currently regulated, the emergence of new regulations governing mercury by the Environmental Protection Agency (EPA) will have a direct impact on coal-using facilities, both conventional steam generating systems as well as advanced power systems such as integrated gasification combined cycle (IGCC) systems.

Gasification is an important strategy for increasing the utilization of abundant domestic coal reserves and is a key to the improved power generation thermal efficiency of IGCC. The Department of Energy envisions increased use of gasification in the U.S. during the next several decades, particularly for its adaptability to remove carbon dioxide, a greenhouse gas. As such, the gasification-based technology strives to approach a near-zero emissions goal with respect to pollutants. Mercury is a pollutant that must be addressed by gas cleaning and conditioning. With the EPA's March 2005 Clean Air mercury rule and many states promulgating their own regulations, the need exists for a low-cost mercury removal technique that can be applied to gasification-based processes (e.g., IGCC) and conventional coal-burning plants. Thermal efficiency considerations and completeness of removal are two concerns that are alleviated when elevated temperature removals of mercury are conducted in a gasification system.

Henry Pennline and Dr. Evan Granite

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High-Performance Lanthanum Manganese Oxide-Enabled, High-Temperature Superconducting Tape

Department of Energy
Oak Ridge National Laboratory

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The SuperPower/ORNL High-Performance Lanthanum Manganese Oxide-Enabled, High-Temperature Superconducting Tape (LMOe-HTS) is a robust, high-current second-generation superconducting wire. The technology was developed by means of a Cooperative Research and Development Agreement between Oak Ridge National Laboratory (ORNL) and SuperPower, Inc., of Schenectady, New York.

The Department of Energy (DOE) has funded three different Superconductivity Partnerships for Industry (SPI) projects to demonstrate the use of HTS power cables for electric transmission and distribution.

The LMOe-HTS has the unique combination of strength, flexibility, throughput, and low cost needed for power-grid applications, including coils and motors. It can be fabricated at high throughput rates using reel-to-reel processes. The key to its success, as well as the key improvement from previous technology, is the development and use of an epitaxial $LaMnO_3$ (LMO) buffer layer, which can be deposited at high rates homogenously in long lengths. The use of this buffer enables fabrication of the complete substrate for growth of superconductors at very high throughput rates. The buffer layer also enables formation of very high performance superconducting films.

SuperPower licensed this technology from ORNL (via UT-Battelle, LLC, the management and operations contractor for ORNL, under contract to DOE) under an exclusive, field-of-use license agreement, for the purpose of incorporating LMO into its superconducting wires, tapes, and cables to improve performance. Sumitomo Electric Industries of Osaka, Japan, in partnership with SuperPower, has used LMOe-HTS wire to construct a 30-meter cable that was slated to be installed in the national grid in Albany, New York, in 2007. It is the world's first second-generation HTS device. Two other demonstration projects are planned in Long Island, New York, and Columbus, Ohio. The LMOe-HTS won an R&D 100 Award in 2007.

Energy Expert

From left: Robert Pratt, Bob Silva, Michael Brambley, Patrick O.Neill, David Chassin, Paul Bursch, Teresa Carlon, Sarah Benjamin, David Hunt, Srinivas Katipamula, Shirley Schultz, Krishnan Gowri

Energy Expert is the commercial name given to the newly adapted version of Pacific Northwest National Laboratory's (PNNL) Whole Building Energy Diagnostician (WBE). The technology was originally designed as a stand-alone software tool for monitoring a building's energy use. More specifically, the WBE is a software tool that monitors energy use in whole or major building systems.

The technology uses trend data to automatically detect and provide alerts for anomalies in energy consumption, as well as supporting information on causes. The technology automatically creates a model of energy use as data are accumulated. The model is then used to predict future energy use and alerts building operations staff to variances between actual measured consumption and the expected measurements.

NorthWrite, Inc. realized the commercial potential of the software, but needed it reconfigured to operate as a Web-based technology. NorthWrite approached PNNL to help them make the adjustments. Using funds from the Federal Energy Management Program, a team from PNNL and NorthWrite enhanced the tool to increase its flexibility and usability by converting it to a Web-based application. These enhancements eliminated the need for costly equipment and additional software, making the tool less expensive and easier to maintain.

The WBE is the computation engine behind NorthWrite's user interface in the software tool called the Energy Expert. Energy Expert is now the centerpiece in NorthWrite's energy business development efforts. It is offered as part of a suite of diagnostic tools called WorkSite™.

In the past, building operations managers could only track a building's energy consumption through monthly utility bills. With the WBE in Energy Expert, they can identify unexpected changes in energy usage on a consistent basis and at a moment's notice. This ability to continuously monitor energy usage means expensive fluctuations in energy performance can be addressed sooner, resulting in greater energy efficiency and lower energy costs.

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Reflector Compact Fluorescent Lamps Market Transformation Project

Department of Energy
Pacific Northwest National Laboratory

From left: Jeff McCullough, Kathi Ruiz, Linda Sandahl, Marc Ledbetter, Terri Gilbride, Terry Shoemaker

Recessed downlights are among today's most popular lighting fixtures, with an estimated 350 million installed in U.S. homes. The vast majority of these fixtures are fitted with incandescent reflector lamps (R-lamps), which typically draw 65 to 100 watts of power per lamp. Of the estimated 120 to 140 million R-lamps sold in the U.S. each year, roughly half are for residential use. Why are they so popular? Recessed "cans" are relatively inexpensive compared to other types of installed lighting fixtures for the home, and they provide an unobtrusive, directed source of light for kitchens, hallways, and living rooms.

Many incandescent R-lamps can be replaced with reflector compact fluorescent lamps (R-CFLs), which provide similar light output while using just one-third of the energy. In non-airtight cans, screw-in CFLs can replace incandescent lamps for immediate energy savings. However, until recently, few R-CFLs were available in consumer markets. Further, when higher wattage R-CFLs are used in an insulated ceiling-rated airtight (ICAT) recessed can, an additional challenge arises: heat generated by the lamp and ballast can be trapped inside the fixture, and excessive heat can cause lower light output as well as shorter lamp and fixture life spans.

To address the heat challenge, Pacific Northwest National Laboratory's (PNNL) Technology Procurement Program implemented a market transformation project to develop R-CFLs specifically designed for use in ICAT recessed can fixtures that also meet other minimum performance criteria, including minimum light output and size restrictions (to ensure they fit in standard residential recessed cans).

Commercial buildings, such as restaurants, hotels, and multifamily housing facilities, are also sometimes equipped with recessed can fixtures. Apartment buildings and hotels, for example, often use recessed cans in common areas, many of which remain lit for extended hours. Energy use in these applications is reduced significantly by using R-CFLs instead of incandescent reflectors.

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Titanium Metal Injection Molding

Department of Energy
Pacific Northwest National Laboratory

From left: Dr. Scott Weil, Dr. Eric Lund, Eric Nyberg, Kevin Simmons

Titanium has the strength of steel but is 43% lighter, is twice as strong as aluminum, and is more corrosion-resistant than stainless steel. This super-metal is able to withstand attack by acids, salts, chlorine, and sea water, and is highly resistant to metal fatigue. It is the only metal known to display osseointegration, the ability to form a direct structural and functional connection with living bone.

Praxair and Pacific Northwest National Laboratory (PNNL) joined forces in 2006, each bringing a missing piece to the titanium manufacturing puzzle. Praxair, a global Fortune 300 supplier of atmospheric, process, and specialty gases, interested in opening new markets for its gases, brought its knowledge of industry, contacts in the manufacturing world, and financial support to the licensing agreement. PNNL, committed to developing a new titanium manufacturing process with more than $100,000 of internal funds invested, brought its titanium metal injection molding (Ti MIM) process. The Ti MIM process—a quantum leap forward in titanium metallurgy—overcomes barriers of impurity intrusion to enable the cost-effective production of titanium parts that is finally on par with steel and stainless steel manufacturing.

The Ti MIM technology allows small, precision, detailed components to be produced more cost effectively than machining. Machining takes more time to produce a single part and in the process wastes expensive materials, both of which drive up cost. Ti MIM technology allows many parts to be molded at once with very little waste, resulting in significant costs savings. Additionally, the process allows shapes and angles to be molded into parts that would be difficult or impossible to machine. The technology relies on a unique binder that evaporates out of the part quickly and completely without bloating, distorting, or leaving behind residual impurities. The binder makes it possible to produce high-quality titanium parts by powder injection molding, which offers lower cost, higher precision, and faster output than previous titanium parts production methods and can benefit the medical, aviation, transportation, and chemical processing industries currently using titanium components. Applied in a manufacturing process, Ti MIM cuts raw materials requirements and manufacturing time significantly, providing U.S. industries and individuals with all of the benefits of titanium at a fraction of current costs.

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ElectroNeedle™ Biomedical Sensor Array

Department of Energy
Sandia National Laboratories

From left to right: Dr. Brent Burdick, Dr. Kent Schubert, Dr. Chris Apblett, Kerry Kampschmidt, Dr. Paul Smith, Dr. Steve Casalnuovo, Dr. Stanley Kravitz, and Craig Wingate. Not pictured: Dr. Colin Buckley, Jeb Flemming, Dr. David Ingersoll, and Carrie Schmidt.

The ElectroNeedle™ Biomedical Sensor Array is a device that, when pressed against the skin, provides rapid, on-demand, multiplexed, point-of-care biomedical assays for medical diagnosis in emergency, battlefield, and remote settings where time constraints or distance make it impractical to send the patient's samples to a conventional laboratory for analysis. It will also eliminate delays experienced by many patients and physicians when waiting for diagnostic test results. Finally, it will enable a new dimension in home healthcare, where patients can be routinely monitored and the results transmitted to a physician.

By combining electrochemical measurement techniques with well-defined recognition chemistries and an easy-to-use sensor, it is possible to detect a range of biologically important species, including carbohydrates, electrolytes, lipids, enzymes, toxins, proteins, viruses, and bacteria in a patient's blood or cellular fluid. This technology provides a painless and rapid measurement without having to extract fluids for later analysis.

The significance of ElectroNeedle™ technology has been recognized by both the commercial sector and the medical community. Two new biotechnology companies—New Mexico Biotech, Inc., and Life BioScience, Inc.—have been formed in Albuquerque explicitly to commercialize ElectroNeedle™. One company has already licensed the intellectual property (IP) portfolio that became available during 2006, and negotiations are underway with the second. Sandia National Laboratories (SNL) will provide ongoing research into the technology and technical guidance to the licensing organizations. The licensee(s) are expected to develop the commercial product, pursue FDA approval for the product, and provide funding to SNL for continued research and development.

When this technology is fully commercialized, it will revolutionize healthcare worldwide. Not only will it help Department of Defense personnel on the battlefield and provide faster, more accurate healthcare to U.S. citizens and other members of the developed world, it will also provide vast improvements to healthcare in developing nations.

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Secure Sensor and Seal Technologies for Global Nuclear Nonproliferation

Department of Energy
Sandia National Laboratories

From left to right: Dr. Brent Burdick, Barry Schoeneman and Steve Blankenau

Sandia National Laboratories (SNL) transferred the technology for the T-1A optical seal, an active radio frequency-based (RF) device that is used to monitor high-value assets, and its technological successor, the Secure Sensor Platform (SSP). The T-1A seal makes it highly difficult to remove material or containers without breaking the seal on the fiber-optic loop. When the seal is broken, the T-1A transmits the event by RF and an associated monitoring system collects the information for storage and review. These seals are intended for long-term use without maintenance, up to five years on one battery. The device electronics are housed in a plastic case about the size of two decks of cards and can monitor a fiber-optic loop up to 50 meters in length. The T-1A provides periodic state-of-health communications as well as immediate event notification. The device is also capable of message authentication and has active and passive tamper-indicating features.

SNL initiated the partnership by proposing that Canberra Albuquerque commercialize the T-1A and collaborate on development of the SSP. The innovative and creative technology transfer event was to combine a license agreement for the current T-1A sensor with a Cooperative Research and Development Agreement (CRADA) to jointly develop the next-generation SSP sensor. Not only was the current T-1A product brought to market successfully through the licensing of SNL intellectual property, but the CRADA will provide a streamlined commercial launch of the SSP sensor. The transfer for the SSP has been funded entirely by Canberra. The production of the T-1A units is funded primarily by Canberra, with some minimal funding provided by the Department of Energy's Savannah River Site as the domestic customer for the seal. All technology transfer efforts and associated costs in terms of negotiating and executing the CRADA and license agreement were assumed by the Strategic Relationships Center at SNL.

A direct benefit of the T-1A is the extension of the periods between physical taking of inventory. The first increase was from one to two years, and recently the interval was extended to three years. Additionally, daily manual administrative checks have been eliminated because the seals automatically "report in" several times a day. As well as reducing administrative overhead, the T-1A seals enhance security and confidence. People lose confidence in mechanical seals as soon as they are applied because they are not monitored directly and continuously. Active seals—such as the T-1A and the SSP—renew confidence in their security each time they report their status. Also, the two-person rule has been eliminated for material monitored by an active seal system. An additional benefit is the reduction of the radiation dose received by security personnel, who do not need to be physically present with the stored material as frequently.

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David Goldheim

Department of Energy
Sandia National Laboratories

Outstanding Technology Transfer Professional Award

David L. Goldheim joined Sandia National Laboratories' Technology Transfer Office as its director in 1999. His significant contributions include leadership, inventiveness, and tenacity in developing and shepherding innovative programs that support Sandia's business development and strategic intellectual property (IP) management efforts. During his tenure, the partnering processes at Sandia have matured, as well as expanded into new and innovative areas.

Mr. Goldheim's model of strategic IP management emphasizes identifying existing IP and not-yet-market-ready technical capabilities; then, with the capabilities and the existing IP bundled, using an inventive set of tools to bring the technology from the lab to the marketplace. This strategy requires trust and support among the research institutions to identify a lead lab negotiator and a royalty distribution approach, as well as business savvy to represent the interests of multiple parties.

Intellectual property professionals recognize the value of this model. Members of Sandia's team took the bundling concept outside the walls of the lab in 2006 and received a Licensing Executives Society "Deals of Distinction" award, which recognizes transactions involving the licensing and transfer of intellectual property. Sandia, Los Alamos National Laboratory, the University of New Mexico's Science & Technology Corp., New Mexico State University, New Mexico Institute of Mining and Technology, the MIND Institute, and the National Center for Genome Resources forged an inter-institutional agreement that improves access to technology and eases the complexity of negotiating license agreements by forming a contract that allows the bundling of patents and identifies one organization as responsible for negotiations.

Other examples of Sandia's use of innovative mechanisms include the Business Intelligence/ Market Research team, Equity and Royal Sharing programs, Technology Maturation Fund, Mission-Centric Venturing, Entrepreneur-in-Residence, Sandia Science & Technology Park, Shared Vision program, business development, business intelligence, and market research.

Mr. Goldheim's qualifications as a technology transfer professional are indisputable. He demonstrates business acumen and specific skills in technology transfer in his capacity as Sandia's lead representative in establishing and maintaining strategic relationships that support the laboratories' crucial national security missions.