2006 FLC Awards

2006 FLC Awards

May 3, 2006

Minneapolis, Minnesota

Adding value to the federal agencies, laboratories, and their partners to accomplish the rapid integration of research and development resources within the mainstream of the U.S. economy.

Welcome to the 2006 FLC Awards

Thank you for attending the 2006 FLC awards. You will be part of an exciting evening as we salute the people who have made outstanding achievements in technology transfer. This year's theme, "From Innovation to Enterprise," perfectly summarizes the path that this year's award winners have taken. The men and women you will meet tonight represent all facets of the technology transfer process, from the federal scientists who have the vision to develop something unique and innovative, to the professionals who work tirelessly to find the right partner to move the vision forward, and finally the partners who make the vision a reality. Teamwork is at the heart of technology transfer, and the Federal Laboratory Consortium for Technology Transfer strives to encourage this spirit of cooperation among government, industry, and academia. As the technology transfer efforts within the FLC are diverse in their scope and large in number, we present awards in the following areas:

Victor Chavez
Awards Committee Chair

- Awards for Excellence in Technology Transfer—Presented to FLC member laboratories and their partners for successfully transferring federally developed technologies.

- Laboratory Director of the Year—Recognizes directors of FLC member laboratories for their contributions to the overall enhancement of technology transfer for economic development and their support of the FLC and its activities.

- FLC Service Awards—Presented to individuals, inside or outside the FLC, who have provided significant support to the technology transfer process, furthering the FLC's mission.

The FLC awards are a prestigious honor in the technology transfer world, with dozens of federal laboratories submitting nominations each year. These awards have become a great source of pride for both the laboratories and their government agencies.

As you read this booklet, you will be impressed with the experience, expertise, and resources these award winners used to take their technologies from the drawing board to the real world. I am extremely proud and pleased to present the recipients of the 2006 FLC awards.

2006 FLC Awards

Awards for Excellence in Technology Transfer

Vaccines for the Prevention of the Two Major Diseases of Catfish

Department of Agriculture
Agricultural Research Service (ARS)
Mid South Area

A team from the ARS Mid South Area's Aquatic Animal Health Research Unit demonstrated exceptional creativity in the invention and transfer of the first U.S. modified live vaccines that protect channel catfish from enteric septicemia and columnaris. Enteric septicemia and columnaris are the two major diseases of U.S. farm-raised catfish and were reported to be a problem on about 50% of all catfish operations in 2003. The diseases together cost the U.S. catfish industry $50-$70 million annually.

The causative bacteria, *Edwardsiella ictalari* (E. ictaluri) and *Flavobacterium columnare* (F. columnare), respectively, are ubiquitous pathogens that infect all sizes of catfish. No effective control measures were available to the farmer. These pathogens are responsible for severe disease outbreaks throughout the catfish industry every year. Previous studies suggested that killed vaccines against both *E. ictaluri* and *F. columnare* were not effective when administered by immersions (i.e. mass delivered in the field). The team modified both agents with an antibiotic that changed the lipopolysaccharide (a virulence factor of Gram-negative bacteria). The modified bacteria were still able to gain entry into the fish for a proper immune response to develop, but could no longer cause disease. With the creation of the modified live vaccines, the problems associated with killed vaccines (e.g., injection administration of each fish, cost of administration, stress associated with administration, and not providing lifetime protection) were overcome.

The modified live vaccines are administered by bath immersion, a non-stressful and inexpensive process, to large numbers of young fish and provide lifelong protection. Both vaccines were developed under a CRADA with Intervet, Inc., patented, and exclusively licensed to Intervet. The CRADA allowed team members to develop the final freeze-dried formulations in cooperation with Intervet scientists and to cooperatively test the vaccines' safety and effectiveness. These modified live vaccines are possibly a trend setting advancement for the rest of the world in fish vaccinology.

The enteric septicemia vaccine (AQUAVAC-ESC™) was first introduced in 2001.

From left: Dr. Craig Shoemaker, Dr. Joyce Evans, Dr. Phillip H. Klesius

According to Intervet, the total benefit to producers from use of this vaccine alone is almost $2,000 per acre, due to faster growing catfish that yield greater lengths over non-vaccinated catfish. AQUAVAC-COL™, the first efficacious vaccine against columnaris disease in the world, was launched in 2005 and sold out quickly. These vaccines, in combination, provide fish farmers with a cost-effective means of preventing the two most economically serious diseases in commercial pond-raised catfish.

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Department of Agriculture
Agricultural Research Service (ARS)
South Atlantic Area

A Fertilizer for Alleviation of Nickel Deficiencies

Dr. Bruce W. Wood

The existence of real-world nickel deficiency in agricultural crops was discovered by Dr. Bruce W. Wood of the South Atlantic Area's Southeastern Fruit and Tree Nut Research Laboratory. Other scientists had earlier demonstrated that nickel is an essential plant pico-nutrient.

However, nickel was thought not to be of practical concern to farmers or gardeners because of the minute amounts thought to be needed by plants and the abundance of nickel in most soils. Thus, nickel has been largely ignored by agricultural scientists, farmers, and gardeners.

While nickel deficiency naturally occurs in certain soil situations, the most severe forms typically arise due to excessive use of other fertilizer elements, such as zinc, copper, calcium, magnesium, manganese, and iron. The discovery has led to the identification of symptoms for diagnosis of nickel deficiency in crops and the discovery of deficiency in several other crops.

A cooperative interaction was initiated to jointly develop a commercial nickel fertilizer product called Nickel Plus™; and a new company, NIPAN, LLC, was formed. NIPAN, the co-owner of the patent, is negotiating an exclusive license to ARS's interest in the technology for correcting nickel deficiency in plants.

The new Nickel Plus™ associated technology is now being used in eight states, with others likely to follow suit. The technology has cured mouse-ear and little-leaf disorders in pecan and river birch, and is conferring disease resistance in day lilies, having a beneficial impact of millions of dollars. As news of the technology spreads, it is expected that plant producers will discover deficiency-associated problems in a multitude of major and minor crops worldwide, impacting the yields, quality, and profitability of many crops. Additionally, evidence indicates that improving nickel nutrition may also improve environmental quality in that it is likely to reduce the use of fungicides and nitrogen fertilizers for certain crops. The technology not only promises to stimulate increased scientific interest in nickel and to solve challenging crop problems that have heretofore defied solution, but also opens a new frontier for the use of other nickel-associated technologies.

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Electro-Osmotic Pulse (EOP) Control of Moisture in Below-Grade Concrete Structures

Department of Defense
U.S. Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research
Laboratory (ERDC-CERL)

Michael McInerney *Orange Marshall* *Sean Morefield* *Vincent Hock*

Electro-osmotic pulse (EOP) technology has been used to successfully remedy damp basement syndrome in military and government buildings. Through intensive technology development and transfer efforts by the ERDC laboratory, EOP is now becoming available for diversified and far-reaching commercial applications throughout the nation. EOP eliminates moisture in below-grade structures, preventing the occurrence of mold, mildew, bacteria, corrosion, and standing water. It uses the concrete itself as the waterproofing agent by exploiting the fundamental properties of electro-osmosis.

In 2004, a new CRADA was implemented with industry partner Drytronic. The parent company created the spinoff, OsmoTech, to maximize EOP commercialization. The novel inter-relationship between the ERDC, Drytronic and its licensee, OsmoTech, has seen client application potential grow to include projects such as highway construction and tunnels. Complex intellectual property and research decisions have moved between the CRADA partners to optimize the new applications and project opportunities.

EOP is better, faster and 40% less costly to install than conventional moisture control solutions. Combining the EOP technology with up-to-date crack and repair techniques completely resolves the problem of water intrusion, thereby mitigating millions of dollars of impact on federal, residential and business structures.

The ERDC team is planning an aggressive future development of EOP capabilities following the demands made by the Hurricane Katrina disaster.

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Department of Defense
U.S. Army Edgewood Chemical Biological Center

Enzyme-Based Decontamination Technology for Organophosphorus Nerve Agents and Pesticides

Dr. Tu-Chen Cheng *Dr. Vipin Rastogi* *Dr. Joseph DeFrank* *Christopher Penet*

With an increasing need to respond quickly and efficiently to real-world threats such as a deliberate chemical warfare agent attack or accidental release of toxic industrial chemicals, the U.S. Army Edgewood Chemical Biological Center (ECBC) developed a patented technology to neutralize organophosphorus chemical agents and pesticides.

This enzyme-based technology simplifies and improves the process of decontaminating a class of highly toxic chemicals, including nerve agents. Other decontamination methods use corrosive chemicals that are more costly, less efficient, and generate a substantial amount of residual waste. The ECBC technology is nontoxic, noncorrosive, and environmentally safe. It can be applied using existing water-based application systems such as firefighting foams and sprays, and aircraft deicing solutions. In an incident where highly toxic chemicals are released, the enzymes quickly neutralize the chemicals before they can contaminate a wider area.

While initially intended for decontaminating equipment, facilities and large areas, the enzymes could potentially be used in shower systems for decontaminating personnel and casualties.

Having invented this enzyme-based decontamination technology, ECBC needed a commercialization partner to license and enhance the manufacturing process to drive down the unit cost of the material—an important requirement for broad adoption of the technology. Genencor International, Inc., the leading manufacturer of industrial and specialty enzymes in the United States, was contacted to explore the possibility of licensing and manufacturing the technology. Genencor agreed to license the technology and use its state-of-the-art fermentation plants for the manufacturing process.

Genencor met its production milestone and is now successfully producing the licensed enzymatic decontamination technology under the trademark DEFENZ™. This product is being purchased by companies that produce and sell firefighting foams and sprays and other matrices. These companies, in turn, are formulating the enzymes into products for purchase by fire departments, HAZMAT groups, and others in the first responder community. The first commercial decontaminant that incorporates the enzymes (All-Clear™) was introduced into the market by Kidde Fire Fighting, Inc., in August 2005.

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Special Medical Emergency Evacuation Device (SMEED)

Department of Defense
U.S. Army Institute
of Surgical Research

SFC Eric Smeed of the U.S. Army Institute of Surgical Research (USAISR) has developed a patent-protected metal framework that attaches to evacuation litters and holds individual pieces of medical equipment needed for optimal patient transport. The Special Medical Emergency Evacuation Device (SMEED) stabilizes a variety of medical devices, such as ventilators and oxygen cylinders, replacing the traditional method of attaching such equipment directly to the transported patient. Lightweight and adjustable, the 14-inch by 22-inch SMEED adapts for use in any Department of Defense medical vehicle.

SFC Smeed invented the critical care platform specifically to lessen the discomfort of burn victims during medical transport. Enthusiastic responses from those testing his prototype convinced Smeed that the creation had greater lifesaving potential through technology transfer. The Army physical therapist refined his design through several prototypes, while searching for development funding that ultimately came from the U.S. Army Medical Materiel Development Activity. The Army subsequently patented the device and in 2002 awarded a Small Business Innovation Research contract and exclusive license agreement to Impact Instrumentation, Inc. of New Jersey. The company further developed the technology, manufacturing a commercial product now on the market. The U.S. military has purchased hundreds of the company's SMEED platforms, currently used by medical units deployed in Iraq, Afghanistan, and elsewhere.

The commercialization exemplifies the military goal of technology transition, moving a military-designed technology to private industry for development and eventual government purchase for general military use. The SMEED solves critical problems of limited time and space typical in combat and other disaster situations. It eliminates the need to fasten uncomfortable equipment directly to patients and gives health care providers a clear view of any readout monitors on attached medical devices. As patients are transferred from point of injury to various care centers, delicate equipment can be quickly exchanged or added as needed. The SMEED technology expedites the evacuation of wounded soldiers, preserving lives and safeguarding military resources.

SFC Eric Smeed

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Department of Defense
Naval Air Warfare Center
Aircraft Division Lakehurst

Liquid Atomizing Nozzle

Joseph Wolfe

Joseph Wolfe of the Naval Air Warfare Center Aircraft Division (NAWCAD) developed the Liquid Atomizing Nozzle (LAN) as a more environmentally safe method of fire suppression onboard aircraft. Streams of air and liquid combine within a unique mixing chamber and exit the nozzle to form a high-momentum mist with very small droplets. The smaller droplet size increases the surface area of liquid and the high droplet momentum gives greater fire penetration, both providing superior effectiveness against fires.

As a result, smaller amounts of water can extinguish a fire more quickly, making it possible to carry water rather than environmentally harmful chemicals like halon, which is traditionally used in aircraft fire extinguishment systems. Features of the patented nozzle translate into a lightweight, non-clogging, inexpensive technology that does not require the extremely high operating pressures of standard fire suppression systems. It conserves water and minimizes consequential water damage.

Patented in 1996, the LAN technology was transferred in 2001 via a partially exclusive license agreement to the aerospace supply company, International Aero, Inc., of Burlington, Washington.

The resulting commercial product, the Fine Water Mist System, awaits FAA approval for widespread aircraft use. The company, which pays royalties to the Navy, projects multimillion-dollar annual sales and is developing other LAN-based firefighting products for non-aircraft uses. The U.S. Department of Homeland Security recently selected this NAWCAD invention as one of the top five technologies for first responders, out of more than 700 competing entries. Field-testing by civilian firefighters has shown how much more effective the LAN system is than standard fire equipment. Because it disperses liquids so evenly and efficiently, the transferred technology has a long list of other potential applications, such as pharmaceuticals, manufacturing, and waste management.

International Aero and NAWCAD currently are negotiating a Cooperative Research and Development Agreement (CRADA) under which Wolfe would be technical consultant to the company's new spinoff, Fine Water Mist Systems, LLC, for developing new agricultural and decontamination applications.

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Trivalent Chromium Processes

Department of Defense
Naval Air Warfare Center
Aircraft Division Patuxent River

A team from the Naval Air Warfare Center Aircraft Division (NAWCAD) has developed and commercialized an innovative metal surface coating containing trivalent chromium sulfate that protects against corrosive environments. This marks a significant improvement over the widely used traditional, but toxic, hexavalent chromium process. The novel breakthrough chemical solution minimizes the corrosion of aluminum, zinc, and other substrates while it improves the bonding surface for paints.

Easy to apply and price-competitive, these trivalent chromium processes (TCP) also provide chemical and weather resistance to treated surfaces. The technology meets the more demanding EPA and OSHA requirements recently implemented in response to concerns over use of the highly toxic hexavalent chromium. TCP is the first protective chromium-based metal coating to fully meet U.S. military specifications while being both highly effective and environmentally benign. It also is the only non-hexavalent chromium conversion coating that satisfies military specifications for pre- and post-treatment of aluminum surfaces. Initially developed to better protect military aircraft and watercraft, TCP technology has vast market potential in the private sector within the ubiquitous metal-coating industry. Under nonexclusive patent license agreements with several companies,

From left: Craig Matzdorf, James Green, Michael Kane, RDML Jeffrey Wieringa

NAWCAD has successfully transferred this important advance in metal finishing to widespread civilian use.

Currently, four licensees are in various stages of marketing TCP to consumers in the United States, Canada, and Mexico: Luster-On Products, Inc., of Springfield, Massachusetts; Metalast International, Inc., of Minden, Nevada; SurTec International GmbH, of Zwingenberg, Germany; and Henkel Surface Technologies Corp., of Madison Heights, Michigan. Given the extent of metal fabrication and utilization around the world, the market possibilities for TCP applications are immense, affecting our daily lives from the commercial airline industry to home construction.

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Department of Defense
Naval Medical Center San Diego

Treatment of Noise-induced Hearing Loss Through Biologic Mechanisms

From left to right: Tanisha Cater; Lt. Marco Ayala, M.D.; Dr. John Coleman; Cdr. Ben Balough, M.D.; Dr. Ronald Jackson; Cdr. Michael Hoffer; Dr. Jianzhong Liu; Dr. Xianxi Ge; Lt. Matthew Patterson, M.D.; Elizabeth Harper; Gavin Jones, not pictured: Dr. Richard Kopke

It sounds unbelievable and seems impossible. And it has been, until now—an orally administered antioxidant pharmaceutical product that will prevent, reduce and, in some cases, even reverse acute noise-induced hearing loss. This paradigm-changing medical breakthrough came about thanks to the research efforts of Drs. Richard Kopke and Michael Hoffer of the Naval Medical Center San Diego. Drs. Kopke and Hoffer discovered that certain antioxidant compounds are effective in combating the hearing damage that occurs when people are exposed to loud noises such as explosions, airplane engines, industrial equipment, and even loud offices and sports stadiums. This antioxidant-based medical technology has been successfully transferred to the private sector through an exclusive patent licensing agreement with American BioHealth Group (ABG).

ABG has been on the fast track, and one product based on this technology is already available to the public as a nonprescription nutraceutical known as “The Hearing Pill™.”

The antioxidant ingredient in this pill, N-acetylcysteine (NAC), had already been approved by the FDA for human consumption for other uses, which allows the product to be sold to the public. Noise-induced hearing loss is one of the primary causes of disability in both the military and civilian sectors.

An estimated one in four American adults develops permanent hearing loss as a result of their occupational exposure to noise. According to the Centers for Disease Control, hearing loss costs the nation about $56 billion a year. Clearly, an effective treatment for hearing loss such as that of the transferred technology can have far-reaching and extensive benefits to a vast array of citizens and to the nation itself.

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Robust Dimension Reducing Decision Support Tool for Large, Complex Datasets

Department of Defense
Naval Undersea Warfare Center
Division Newport

The Data Extraction & Mining Software Tool, or DEMIST, is a mathematical, probabilistic classification tool that employs intelligent feature and pattern selection algorithms. DEMIST improves classification performance and supports meaningful decision making.

DEMIST has applications in areas such as pattern recognition, credit scoring, insurance ratings, job applicant screening, and enterprise level risk management. Unlike other classification methods, DEMIST is able to handle missing information such as credit applications with answers left blank. DEMIST also predicts its own performance. Additionally, DEMIST not only reduces the number of variables in the decision making process, but it reduces the probability of error in the decision, making the outcome more reliable and consistent with business goals and objectives. Currently, DEMIST is being commercialized by Milkhouse Software, LLC, a small business in Rhode Island, as part of its enterprise level decision support tool. Zoot Enterprises, Inc. of Montana, a company that focuses on consumer credit scoring for financial institutions, has licensed DEMIST to bring improved decision support and increased revenues to financial institutions. DEMIST will help eliminate extending credit to potential non-payees. Anasphere, Inc. has licensed DEMIST to use in its atmospheric chemical analysis and has demonstrated detection capabilities down to very small quantities.

Dr. Robert Lynch

DEMIST was originally developed for classification of sonar targets, but was expanded to other fields, resulting in a product that could potentially benefit all parts of the population.

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Department of Defense
Air Force Research Laboratory
Directed Energy Directorate

Low Emission, High Current Density Field Emission Cold Cathode

Dr. Donald Shiffler

Working at the Air Force Research Laboratory's Directed Energy Directorate, Dr. Donald Shiffler discovered an important, innovative way to make cold cathodes that are far more efficient and easier to manufacture than cold cathodes utilizing previous technologies.

To make these advanced devices, a carbon substrate is covered with commercially available, high-aspect ratio carbon fibers that are coated with cesiated salts using a proprietary treatment process. This cold cathode technology can deliver high electron current densities using very low power, thereby allowing the systems in which they're installed to operate at cool temperatures and be light in weight.

The new cold cathodes solve a nagging, "showstopping" problem for the Air Force, which had been stymied by the lack of an emitter that could be used to proper effect in a high-powered microwave tube.

While this cold cathode innovation has been developed primarily for use in military high power microwave devices, the transfer partners also envision broader uses in the fields of public and private security, health care, and materials characterization. Further possible applications include enhanced x-ray screening systems, which could be developed for use by homeland security as well as private security firms. Substantial improvements in resolution for material characterization are also feasible. Incorporation of the invention into x-ray technology could lead to better and safer radiation treatment for cancer patients, as well as more detailed and accurate mammograms.

The cesiated salt-coated carbon fiber, carbon substrate, cold cathode technology has been transferred to Fiore Industries of Albuquerque, New Mexico, through a licensing agreement. The technology has been further transferred to the private sector through CRADAs with companies that are developing x-ray tubes based on this cold cathode technology. Dr. Shiffler's cold cathode technology has also been directly transferred through consultation and discussion to other federal labs, including DOE's Sandia National Laboratories.

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Attenuating Custom Communications Earpiece System (ACCES®)

Department of Defense
Air Force Research Laboratory
Human Effectiveness Directorate

John Hall

Imagine standing on the flight line at Edwards Air Force Base, trying to communicate with the cockpit of an F/A-22 Raptor while the pilot runs up the blasting engines for preflight checks. What did he say that instrument was reading? "One" or "none?" You have to ask him to repeat the information three times, and your ears are ringing by the time you get back to the hangar. Repeated scenarios such as this drove the Raptor ground crew to think there must be a way to protect their hearing while still allowing clear communication with the cockpit. Now, finally, there is.

The Attenuating Custom Communications Earpiece System (ACCES®), developed by John A. Hall and his team at the Air Force Research Laboratory, Human Effectiveness Directorate, has revolutionized hearing protection and communication in high noise environments.

ACCES® integrates specialized electronics and cabling into a custom-molded earplug that provides 40dB of mean noise reduction while providing clearly intelligible voice communication. Westone Laboratories, the technology transfer partner producing this state-of-the-art device, was recently awarded a General Services Administration (GSA) contract. With this development, ACCES® has achieved all of a program manager's dreams: rapid technology development and delivery, technology transfer and transition, partnering with private industry, improving warfighter effectiveness, and acquisition reform. Augustine Vu, Air Force technology transfer program manager, calls the contract award a "landmark example of technology transfer facilitating transition of products to the warfighter." The Office of the Secretary of Defense applauded the development as a milestone in technology transfer.

Even before gaining the GSA contract, ACCES® had its inaugural commercial use in none other than Spaceship One, the first private craft to fly more than 50 miles above the earth. "Before these plugs, we had problems," said Spaceship One pilot Mike Melville. "When I switched to ACCES®, I had perfect hearing of what was going on from mission control throughout both my flights and had no discomfort at all from the noise of the rocket motor." The ACCES® plugs, he said, were perfect. "I am very, very pleased with how they work."

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Department of Defense
Air Force Research Laboratory
Materials and Manufacturing Directorate

Vascular Viewer™

Front row, from left: Charles Lovett, Dr. Robert Crane
Back row, from left: Byron Edmonds, Walter Johnson

A team from the Air Force Research Laboratory's Materials and Manufacturing Directorate (AFRL/ML) has developed a patent-protected viewing device that reveals blood vessels in the body under a broad range of lighting conditions. The innovative imaging technique originally combined image intensifier tubes and near-infrared light sources to highlight and view veins and arteries. Further technology enhancements have replaced the original binocular tubes with a monocular tube (scope). Medical personnel can use the Air Force invention to access blood vessels more quickly and accurately, even in extreme conditions such as on the battlefield or during trauma care. Through technology transfer, the AFRL/ML invention now is available as a commercial product—the Vascular Viewer™—with impressive potential for saving lives, minimizing patient discomfort, and reducing health care costs.

The Air Force awarded an exclusive license to a spinoff company, InfraRed Imaging Systems (IRIS) of Columbus, Ohio, to develop and market the technology. Two IRIS-developed viewers currently are being tested by U.S. military medic units in Afghanistan and Iraq. Present-day combat often involves massive body trauma, making immediate administration of life-saving fluids critical. Recent events in post-Katrina areas of the Gulf Coast also emphasize the importance of hydrating patients who might have difficult-to-access blood vessels, such as the elderly and small children. Other clinical trials of the imaging technology are underway at several U.S. hospitals. Civilian health care workers are enthusiastic about the technology's potential for reducing technician time and patient pain, both in emergency situations and during standard venipuncture or catheterization procedures. Venipuncture, used to obtain blood samples, is the most common invasive medical procedure in the United States, with more than 1 billion occurring annually. On average, it takes two or three attempts to successfully insert a peripheral intravenous catheter. This type of vascular access is affected by a variety of patient- and technician-related factors.

Changing profiles of the U.S. population suggest that patient groups with conditions complicating vascular access are increasing in numbers—for example, the elderly; those with chronic disorders such as diabetes, cancer, and obesity; or those with darker pigmented skin. The market share for the Vascular Viewer™ is projected to be millions of dollars annually. The health benefits to American soldiers and civilians will be incalculable.

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Silicon Carbide Schottky Diodes

Department of Defense
Air Force Research Laboratory
Propulsion Directorate

Dr. James Scofield

Dr. James Scofield, of the Air Force Research Laboratory Propulsion Directorate (AFRL/PRPE) championed a novel plasma processing technique for fabricating power electronic devices based on the robust semiconductor material, silicon carbide (SiC).

This SiC Schottky diode technology is a high-speed switching device, which previously relied on silicon (Si) technology. This specialized semiconductor device is proven to reduce energy losses from conduction and switching, and for faster switching characteristics in high-speed electronic circuit applications. SiC devices are superior to silicon in virtually every respect.

The SiC Schottky diode is now available in the 300-1200 volt class, enabling the use of its high switching speeds to yield dramatically increased power system efficiency. High voltage power products that previously could not take advantage of the attractive characteristics of a Si Schottky device, can now utilize the SiC Schottky diode. SiC technology enables downscaling of the size and weight of power components.

Dr. Scofield transferred this technology in collaboration with Mississippi State University to incubate SemiSouth Laboratories, under funding from the Ballistic Missile Defense Organization (now known as the Missile Defense Agency). He also implemented a Dual Use Science and Technology agreement with manufacturer Cree, Inc., of Durham, North Carolina. Cree has successfully commercialized the first SiC power device (SiC Schottky diode), and this has led to the first commercially available SiC field effect power transistor offered by a U.S. company.

After commercializing the SiC Schottky diode, Dr. Scofield forged an effort to develop and mature a switching transistor device to complement the diode. SiC was promoted and formulated into a program to develop a junction field effect transistor (JFET) integrating the SiC Schottky diode. As a result, SemiSouth Laboratories released a line of 600-volt power JFET/Schottky diodes in a single package in spring 2004. The commercial name for this technology is Harsh Environment Low Loss Field Effect Transistor (HEL2FET™).

The SiC is now used in electronic power supplies, motor drives, and power conversion equipment throughout the world. The commercial and industrial applications for the SiC JFET and Schottky diode are vast, and will have a tremendous impact on reducing electrical energy consumption for lighting and consumer/industrial electronics, thus substantially reducing dependency on foreign oil.

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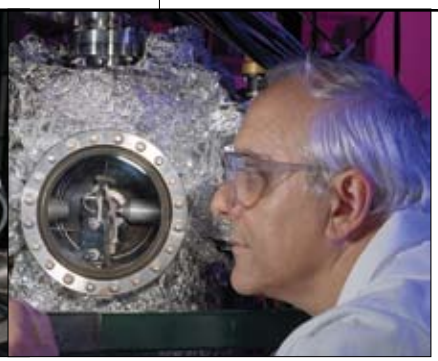
Department of Energy
Argonne National Laboratory

Ultrananocrystalline Diamond (UNCD) Coating Technology for Advanced Multifunctional Devices

Dr. John Carlisle



Dr. Orlando Auciello

The Ultrananocrystalline Diamond™ (UNCD™) coating technology, invented and developed at Argonne National Laboratory (ANL), captures many natural diamond properties in thin-film form and greatly surpasses other diamond film technologies with commercial potential.

UNCD™ films can be used in a broad and diverse range of applications from macro to nanodevices, such as energy-saving ultra-low friction and wear coatings for mechanical pump seals and tools, high-performance microelectromechanical and nanoelectromechanical system (MEMS/NEMS)-based telecommunication devices, the next generation of high-definition flat panel displays, in-vivo biomedical implants, and biosensors. Despite ANL's many interactions with industry, the nature and maturity of the technology made it unsuitable for licensing directly to established companies. Instead, the novel UNCD™ thin-film technology was successfully transferred to an ANL-founded startup company, Advanced Diamond Technologies, Inc. (www.thindiamond.com).

The nominees worked closely with ANL's Office of Technology Transfer, as well as officials from the University of Chicago and the U.S. Department of Energy (DOE), in founding ADT.

The pioneering technology transfer process established by the nominees has been used to create three other ANL startup companies in the past year, and it is being considered as a new model for transferring energy-related and other technologies from DOE laboratories to the private sector.

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ELITE: Easy Livermore Inspection Tester for Explosives

Department of Energy
Lawrence Livermore
National Laboratory

International terrorist activity has increased markedly in recent years, spurring demand by security agencies worldwide for efficient, accurate explosives detection capabilities. To meet this need, Lawrence Livermore National Laboratory (LLNL) perfected a disposable, portable, highly accurate explosives detector. The Easy Livermore Inspection Tester for Explosives (ELITE) is a simple, chemical-based, field useable spot-test to rapidly screen for a broad range of trace explosive materials. The ELITE detection card is highly sensitive to more than 30 explosives, making it one of the most effective detection systems available.

Using colorimetric chemistry, ELITE provides real-time analysis for airport screeners, border patrol officers, security agents, and first responders, including firefighters and law enforcement.

The portable design of the ELITE does not require a fixed power source, thus making it ideal for field use. The detection card has been shown to have a high degree of sensitivity toward most explosives, with few false-negative/positive readings. The card includes a unique swipe material, chemical-containing ampoules, and a separate heat generator. A first responder need only brush a suspect surface with the disposable swipe and break the ampoules to release chemical reagents onto the swipe. If the swipe changes color, explosives are present. The design of the card is uncomplicated, allowing use even in very tumultuous environments.

Front row, from left: Peter Nunes, Catherine Elizondo, J. Del Eckels
Back row, from left: Dr. Randall Simpson, Richard Whipple, Dr. John Reynolds, Raymond Pierce

The ELITE detection technology was developed and tested in LLNL's Forensic Science (FSC) and Energetic Materials Center and was transferred to Field Forensics, a small Florida company that develops tools to serve first responders and lab technicians who require rapid testing results. Field Forensics is manufacturing 500 ELITE cards for DHS and began delivery in October 2005. In autumn 2005, Field Forensics introduced the ELITE detection card and associated technology to a broader audience at an annual security conference attended by many state law enforcement agencies.

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PowerFactoRE

Dr. Harry Martz and Dr. Michael Hamada

Who could imagine that Procter & Gamble (P&G), one of the nation's largest consumer product manufacturing enterprises, would turn to one of the nation's most eminent—and secretive—weapons design labs for help with its diaper production line? But this is precisely what happened. The outcome of this surprising collaboration is known as PowerFactoRE, a comprehensive approach to reducing operating costs and minimizing capital expenditures for manufacturing operations. PowerFactoRE enables manufacturers to predict, prevent, and reduce reliability losses, equipment failures, and repair downtime. Adopted throughout P&G's global manufacturing network, PowerFactoRE has saved more than $1 billion in operating costs since its implementation. In 2003, *R&D Magazine* selected PowerFactoRE for an R&D 100 Award as one of the world's 100 scientific and technological advances to show the greatest commercial potential in the preceding year. In 2004, PowerFactoRE received a Council for Chemical Research Award for government/industry collaboration.

Los Alamos National Laboratory (LANL) weapon engineers were excited by the challenges posed by a huge commercial manufacturing production line—one with hundreds of real-world variables for testing their computational and analytical prowess. And while they came from vastly different worlds, LANL and P&G discovered they spoke a common language—reliability engineering. LANL produces nuclear deterrents that must work perfectly. P&G must maintain high quality to retain its customers. The two signed a Cooperative Research and Development Agreement (CRADA) to conduct reliability modeling using P&G data and LANL expertise.

PowerFactoRE, the product of this CRADA, comprises a unique toolkit of proven reliability engineering methods, statistical and analytical tools, simulation software, customized procedures, and training to help manufacturing line managers understand reliability losses and prevent problems before they occur.

Using PowerFactoRE, P&G has transformed manufacturing efficiencies on its assembly lines producing consumer products ranging from diapers to detergents. P&G has reduced operating failures in more than 200 plants worldwide. Since implementing the system globally, P&G has increased plant productivity up to 44%; cut controllable costs by as much as 33%; improved equipment reliability between 30% and 40%; reduced line changeover time from hours to minutes; and achieved 60% to 70% faster new-product startups. Other manufacturers are realizing the same advantages by licensing the PowerFactoRE toolkit from P&G and its marketing partners, BearingPoint and Zarpac Inc.

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Improved Method to Separate and Recover Oil and Plastic

Department of Energy
National Nuclear Security
Administration - Kansas City Plant

The Kansas City Plant developed a process that uses liquid and supercritical carbon dioxide to blast oil residue off of empty plastic motor oil bottles. With this process, which produces no waste streams, both the residual oil and clean plastic can then be reused.

The Kansas City Plant patented this process and licensed the technology to Itec Environmental Group, which used it to develop a plastics recycling system called the ECO2. Itec has been able to use this system to recycle not only motor oil bottles, but almost every other type of consumer plastic as well. ECO2 has proven to be superior to conventional plastic recycling methods because it produces no waste, generates cleaner and more marketable plastic, and can recover residual oil for recycling, which no other system can do.

Propelled by the Kansas City Plant's cleaning technology, Itec's ECO2 system surpasses other methods of plastics recycling for several reasons. Most importantly, the liquid carbon dioxide and special solvent it uses are both reusable, so ECO2 does not create any wastestreams, unlike water-wash systems that collectively discharge 100 billion gallons of contaminated water into the environment each year. And because it has no environmental impact, special waste permits are not required to set up an ECO2 recycling facility, which makes it less costly to start up. Overall, the ECO2 system costs 30% less to operate than traditional water-wash recycling systems, which provides for higher profit margins due to decreased operating costs.

Not only is the ECO2 system more environmentally friendly and less expensive, but it creates a better product. Though originally intended for cleaning used oil bottles, this technology can completely remove glue, labels, oil and dirt from plastic containers as well. It also eliminates all odors, making the plastic cleaner, more marketable and more profitable than plastics cleaned with water-washing. ECO2 generates FDA-approved clean plastics, which are in high demand in the plastics industry, especially for use in produce packaging.

From left: Henry Smith, George Bohnert, Thomas Hand and Ronald Olson

Because of this technology transfer effort, Itec has been able to commercialize the ECO2 recycling method and start up a promising new company that has captured the interest of both the plastics industry and environmental waste management organizations.

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Department of Energy
Pacific Northwest National Laboratory

Breakthrough Treatment for Prostate Cancer

This technology transfer story epitomizes the value of a national laboratory in enabling a small business to develop its breakthrough cancer therapy technology to the point where it is helping treat and cure cancer patients. Pacific Northwest National Laboratory (PNNL) provided access to equipment and two user facilities in a unique way to transfer its radiological expertise to IsoRay Medical, Inc. (IsoRay) of Richland, Washington, to enable the successful launch of its commercial product. IsoRay is producing a powerful new kind of brachytherapy seed made from cesium-131 (131Cs) for treating prostate and other cancers.

Through access to specialized PNNL facilities, equipment, and expertise under a variety of collaborative agreements between IsoRay and PNNL since 1998, researchers from both organizations contributed to the development of the brachytherapy seed and associated fabrication process. This brachytherapy seed uses 131Cs, which has a low-energy x-ray that effectively provides a cancer-killing dose to a tumor in a short period of time. In the October 13, 2005 Business Wire, IsoRay's 131Cs brachytherapy seed is described as a "breakthrough" and "the biggest advancement in seed brachytherapy since the introduction of palladium-103 19 years ago."

IsoRay, which became a publicly owned company in July 2005, started the effort to produce the seeds commercially using PNNL's Radiochemical Processing Laboratory (RPL) in May 2004 under the current agreement with PNNL. Such an arrangement provided critical and timely national laboratory support for IsoRay in working toward a commercial production facility of its own. In October 2004, the world's first 131Cs seed implant was performed at the University of Washington Medical Center in Seattle. Since then, approximately 90 patients have been implanted to treat, and hopefully cure, prostate cancer using 131Cs seeds. 131Cs brachytherapy procedures are currently available at 17 treatment centers in 13 states. IsoRay is currently housed in a PNNL- and Department of Energy-sponsored and supported incubator user facility, the Applied Process Engineering Laboratory. The company conducts its production operations under a first-of-its-kind arrangement with PNNL using the RPL to process and purify source material, manufacture its product, and qualify it under stringent Food and Drug Administration standards.

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Improving Medical Care and Saving Lives with Bioactive Thin-Film Coatings

Department of Energy
Pacific Northwest National Laboratory

Researchers at Pacific Northwest National Laboratory (PNNL) developed the first-ever water-based process that allows calcium-phosphate thin-film coatings containing controlled-release bioactive therapeutic agents to be deposited on orthopedic devices and other medical implants, such as catheters and stents.

Benefits to the 750,000 implant recipients each year are twofold: 1) the antimicrobial agent in the coating has been proven in tests to kill bacteria or greatly inhibit its growth in the body, helping to prevent dangerous and costly post-surgical infections, and 2) the water-based deposition process coupled with the bioactive antimicrobial agent provides an advanced method for applying thin films containing calcium-phosphate coatings—a natural component of bone—to artificial joints, allowing for enhanced bone bonding and helping to avoid rejection of the implant by the body. The thin-film technology received two patents in the late 1990s, and subsequent animal testing by U.S. Army orthopedic surgeons provided PNNL researcher Dr. Allison Campbell and Commercialization Manager Dr. Eric Jurrus with the preclinical data needed to market the technology to medical device companies. The marketing-to-licensing process encompassed four years of intense effort, dedication, and overcoming obstacles. PNNL ultimately forged a relationship with Bacterin, a medical device testing laboratory for medical implant manufacturers. The technology was licensed in 2004 by Bacterin, which has since made *Fortune* magazine's top 25 breakout companies in 2005.

Bacterin recently joined forces with the Department of Defense, receiving a $1.4-million appropriation to coat metal rods and pins with the technology for use in the battlefield. In addition, Bacterin has forged new relationships with three medical device manufacturers—Baxter International, C.R. Bard, and Cook—who have agreed to use the unique coating on their products. Bacterin expects its revenues to rise by $16 million this year, according to *Fortune*.

Bacterin began production of the technology in 2005 with a handful of coated medical devices now ready for manufacture. This technology will play a major role in dramatically reducing post-surgical infections in implant recipients and wounded military personnel, and will greatly increase acceptance of artificial joints by the body.

Dr. Allison Campbell

Dr. Eric Jurrus

Preventing these infections promises billions of dollars of savings to patients and the U.S. government in followup medical care. In addition, significant cost savings and reduced environmental impact will be realized in the manufacturing process, as the simplified water-based deposition process does not require use of multi-million dollar instruments and uses very few hazardous materials.

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Department of Energy
Pacific Northwest National Laboratory

Self-Assembled Monolayers on Mesoporous Silica (SAMMS) Technology for Mercury Reduction

From left: Dr. Glen Fryxell, Dr. Eric Lund, Dr. James Toth, Dr. Richard Skaggs, Dr. Shas Mattigod, Dr. Thomas Zemanian. Not pictured: R. Shane Addleman

Mercury contamination poses a serious threat to the environment and human health. Researchers from Pacific Northwest National Laboratory (PNNL) have developed an innovative technology that quickly and easily reduces or removes mercury content without creating hazardous waste or by-products, and that can be disposed of as a nonhazardous waste. SAMMS is simple, inexpensive and easy to use; it is highly adaptable for use in reducing and removing other contaminants from soil and water; and it has numerous applications, including water treatment, waste stabilization, and metal processing and finishing. It is also significantly faster, more effective, and far less expensive than other mercury removal methods used in the past. The PNNL team has demonstrated innovative research and incredible teamwork in developing the initial technology, and in developing adaptations to expand its applications. PNNL proactively pursued broad transfer of the technology to multiple fields of use based on a "technology portfolio" approach, which provides a source of dedicated support to research staff and management in developing opportunities to enhance or create commercial products from PNNL-derived technologies. Various methods of technology transfer are employed, with the ultimate goal to provide broad-based returns from deployment of PNNL intellectual assets.

The team first researched and selected a subset of emerging environmental issues. The strategy then was to develop a portfolio of products based on the basic SAMMS technology. The initial issues selected included treatment of arsenic in drinking water and treatment of mercury associated with industrial processes and wastes. In each area, the team conducted "proof-of-principle" experiments to demonstrate the viability of SAMMS as a potential solution. The results of these experiments were then documented in a variety of ways, including brochures, the SAMMS website, presentations at selected industrial conferences, and technical literature. Then opportunities were sought to present information about the technology to appropriate audiences and relationships with industry partners such as Steward Advanced Materials, Chevron (formerly Unocal), Molycorp, and PECO were developed.

Articles on the technology have been featured in numerous high-profile scientific, technical and trade publications, including *Science*, *Environmental Health Perspectives*, *TechComm* magazine, *Environmental Science & Technology*, *Water and Wastewater* magazine, *Small Time*, and even *Business Week*. The technology was honored with an R&D 100 award recognizing the 100 most technologically significant products and advancements in the world, and was a finalist in the environmental category in *Discover* magazine's annual awards for technological innovation.

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Starlight Information Visualization System

Department of Energy
Pacific Northwest National Laboratory

From left: Brian Kritzstein, Dennis McQuerry, John Pinto, John Risch, Michelle Hart, Scott Dowson, Wes Hatley

The commercialization of the Starlight Information Visualization System has enabled nearly 40 entities to access and interpret information about business intelligence, consumer trends, medical records, current events, and cyber security data and to enhance their operations by exploiting the data to their competitive advantage. Some companies report saving millions of dollars in the process. These companies use Starlight to extract consumer and product information pertinent to their business operations from enormous masses of data that previously were virtually inscrutable.

Starlight is the only software that can integrate many different data types and formats, perform high-speed, high-efficiency analysis, and display the results graphically so that the relationships among the data and their implications can be quickly and easily understood. While other commercial software products support only a few predefined data types, Starlight supports the concurrent analysis of an unlimited variety of information types. Furthermore, the software combines multiple visualization techniques to enable many different aspects of large information collections to be analyzed simultaneously. This flexibility enables Starlight to address a wide range of problems that used to be difficult or impossible to interpret.

Starlight was originally developed for intelligence analysis applications, and its national security uses are still growing. But the astute and innovative researchers at Pacific Northwest National Laboratory (PNNL) who developed Starlight recognized that its capabilities were germane to many enterprises in the commercial marketplace as well and began to direct efforts to successful technology transfer. he PNNL team had a vision for this powerful software tool from the beginning. They started the technology transfer process with invention disclosures in 1997. A market analysis was performed and an aggressive business strategy established in 1999. In 2000, licensing discussions began with commercial entities, and a website was launched to describe Starlight's capabilities to a wide range of potential customers. Between 2000 and 2005, nearly 40 licenses were issued to enterprises ranging from government offices to academia, from small competitive intelligence companies to large companies such as Toyota and Procter and Gamble.

These customers consistently report that Starlight provides a higher level of visualization analytics capability than any other product on the market today. This product has found enormous success in the commercial sector.

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Department of Energy
Sandia National Laboratories

Robust, Wide-Range Hydrogen Sensor

The emerging hydrogen economy will require a large number of hydrogen sensors for safety and efficiency.

Sandia National Laboratories' (SNL) Robust, Wide-Range Hydrogen Sensor is the only one of its kind to offer both low- and high-range hydrogen measurement capability on the same chip, virtually eliminating false readings and making it an ideal candidate for a variety of government and commercial applications.

Existing technologies for detecting hydrogen have numerous drawbacks. They have a limited dynamic range, poor reproducibility and reversibility, are subject to false alarms, and tend to be slow, unreliable, and difficult to use. In comparison, the SNL sensor provides: hydrogen detection over a broader range of concentrations; smaller size to allow monitoring at various points; reliable performance over greater temperature range; chip temperature maintained at constant value; and dependable operation in diverse environments (vacuum, non-oxygen ambient, extreme vibration/radiation conditions).

H2scan Corporation of Valencia, California, has licensed SNL's sensor technology and, through a formal Cooperative Research and Development Agreement (CRADA), has developed a small in situ sensor with the capability of detecting hydrogen concentrations between 10 parts per million (ppm) and 100%. Today, H2scan has three retail products in commercial use and has delivered sensors to over 200 government and industry customers, including a classified Department of Energy plant in Idaho Falls, Idaho.

This new technology provides customers with an inexpensive hydrogen sensor that essentially eliminates false readings by detecting the presence of hydrogen, with or without oxygen, against virtually any background gas. The sensor is applicable to the automotive industry, the hydrogen production market, the petrochemical industry, nuclear waste monitoring, government, and companies with an interest in monitoring hydrogen levels in transformers. Four additional patents have been filed by H2scan, including foreign patent protection.

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SMART: Sensor for Measurement and Analysis of Radiation Transients System

Department of Energy
Sandia National Laboratories

Researchers at Sandia National Laboratories (SNL) have developed a new tool in the fight against terrorism. The Sensor for Measurement and Analysis of Radiation Transients—or SMART—system uses detectors and software to distinguish between normally occurring radioactive materials and potential signatures of terrorist activities. SNL's proprietary software is the key to the technology's success. The software helps operators easily and accurately identify the isotopes associated with radiological emissions. The system operates in real time and indicates the level of confidence (low, fair, high) that the material has been correctly identified. A video imager captures an image of the person or vehicle carrying the radioactive material when the detector alarms.

SNL licensed its FitToDB and PASSBY software technology and its GADRAS-LT software to Thermo Electron in 2003 and 2004, respectively. The company is incorporating the software technology into existing Thermo Electron hardware platforms with the plan of delivering third-generation systems to the market. Under a Cooperative Research and Development Agreement (CRADA) signed in mid-2005, SNL and Thermo Electron also collaborated on refinement of the SNL-developed software for large-scale commercial deployments in Thermo Electron's advanced spectroscopic portal system.

The SMART system will be a key component in the protection of military assets and the homeland against the threat of dirty bombs and other nuclear devices. The system, when fully commercialized and proven, can be deployed at seaports, airports, border patrol stations, government buildings, military bases, and other environments that could be targets for terrorist radiological attacks.

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Department of Energy
Sandia National Laboratories

SUMMiT V™ Fabrication Process and SAMPLES™ Program

Sandia National Laboratories' (SNL) Ultraplanar, Multilevel MEMS Technology (SUMMiT™) fabrication process is a MicroElectroMechanical Systems (MEMS) batch fabrication process that uses conventional integrated circuit processing tools to achieve high volume, low cost MEMS production. SNL's SUMMiT V™ technology is unique in that it is the only MEMS technology currently available that offers four levels of structural polycrystalline silicon (poly) and an electrical poly level isolated from the silicon substrate and that is fabricated using traditional integrated circuit processing techniques.

Micromachined polysilicon has excellent mechanical properties—it is stronger than steel, extremely flexible, and does not readily fatigue. The design flexibility in a five-layer technology is staggering. Examples include photonic communications, wireless communications, automotive accelerometers, lab-on-chip systems, and smart sensors for myriad applications, such as chemical-biological sensors and micro-fluidic devices. Additionally, devices for applications that have not yet been imagined are now a possibility.

To facilitate MEMS education and access to its cutting-edge SUMMiT™ process technology, SNL launched the Sandia Agile MEMS Prototyping Layout Tools, Education and Services (or SAMPLES™) Program in 2001. The objective of the SAMPLES™ Program is to enable customers to develop their own innovative MEMS-based products by leveraging advanced design, fabrication (utilizing the baseline SUMMiT IV™ and V™ technologies), and characterization technologies originally developed for federal laboratory applications. Program participants can attend short courses, purchase design and visualization software and, ultimately, have those designs fabricated at SNL through a cost-shared program. This approach reduces cost and risk and thus opens the door to a larger market, facilitating the realization of prototypes and a better understanding of MEMS in general.

To date, the SAMPLES™ Program has enabled the fabrication of 145 individual modules of partner designs using the SUMMiT™ technology. The program has also generated 49 Work for Others agreements and over 75 software licenses related to the SUMMiT™ fabrication processes. Over 800 students representing dozens of companies, universities, and national laboratories have participated in SAMPLES™ classes.

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Kepivance®: Improving the Quality of Life for Cancer Patients

Department of Health and Human Services
National Institutes of Health
National Cancer Institute

From left: Dr. Paul Finch, Dr. Jeffrey Rubin, Dr. Stuart Aaronson

Cancer is the second largest cause of mortality in the U.S., but researchers have made tremendous progress in developing new and effective treatments to reduce these mortalities. The National Cancer Institute's 2015 challenge goal is to turn cancer from a killer into a chronic disease in the next ten years. Thus far, progress in the fight against cancer has come at a heavy price in the form of devastating side effects. While meant to kill cancer cells, most cancer drugs also destroy normal tissue.

Mucositis (painful sores and ulcers in the lining of the mouth) is a common complication of chemotherapy and/or radiation, affecting approximately 80% of patients who undergo this intensive treatment prior to bone marrow transplantation. In this condition, the cells lining the mouth and throat are damaged, making the patients' everyday activities, such as eating, drinking, swallowing and talking, difficult or impossible. They require longer hospitalization, high doses of painkillers, and intravenous feeding. Prior to Kepivance®, there was no treatment for this condition.

This invention describes the use of Palifermin, a recombinant human keratinocyte growth factor (KGF) that can be used to reduce the incidence and duration of oral mucositis in cancer patients. Dr. Jeffrey Rubin and his collaborators at the National Institutes of Health (NIH) discovered the original molecule, realized its importance, and filed for patent protection in 1989. Amgen was then chosen as a commercial partner to develop a useful therapeutic with this molecule, because they had worked with other growth factors such as PDGF and G-CSF. Convinced that KGF would fit well in Amgen's product development strategy, NIH granted them an exclusive license to the invention in 1992.

Approved by the Food and Drug Administration in 2004 and sold under the brand name Kepivance®, this is a first-of-its-kind medicine that directly and effectively addresses the issue of a cancer patient's quality of life, and it is bound to inspire other drug developers to introduce such valuable products. Currently, this drug benefits approximately 11,000 adult Americans with hematologic malignancies who undergo bone marrow transplantation each year. As other indications are pursued and the medical community realizes the value provided to their patients by this treatment, the number of people benefiting from Kepivance® is bound to multiply. First-of-a-kind drugs generally see a delayed but rather dramatic upswing in usage as practitioners become more comfortable prescribing them and as new uses are developed.

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NASA
John F. Kennedy Space Center

Zero-Valent Metal Emulsion for Reductive Dehalogenation of DNAPLs

From left to right: Dr. Christian Clausen, Dr. Jacqueline Quinn, Kathleen Brooks, Dr. Debra Reinhart, Dr. Cherie Geiger

During the early history of the space program, the ground around Launch Complex 34 (LC-34) at Kennedy Space Center (KSC) was polluted with chlorinated solvents used to clean Apollo rocket parts. Dense nonaqueous phase liquids (DNAPLs) were left untreated in the ground and contaminated water resources in the area. DNAPLs are a common cause of environmental contamination at thousands of DOE, DOD, NASA, and private industry facilities. Current approaches for remediation of DNAPL source areas are either inefficient or slow or costly (e.g., thermal treatment).

In response to this environmental contamination risk, KSC developed Emulsified Zero-Valent Iron (EZVI) for the in-situ treatment of DNAPLs.

EZVI is composed of a food-grade surfactant, biodegradable vegetable oil, water, and ZVI particles, which form emulsion particles that contain the ZVI in water surrounded by an oil-liquid membrane.

This technology is one of the few methods available that can treat the DNAPL source. EZVI also overcomes the limitations of current DNAPL treatment technologies by providing a method that is quick, effective, and cost-competitive. Benefits include direct treatment of the contaminant source, immobilizing contaminants, producing nontoxic and more easily degradable by-products, and its environmentally safe qualities. KSC signed five nonexclusive licenses with companies to market and further develop EZVI. One company in particular, GeoSyntec, intends to market this innovation to clients across North America, Europe, and Australia. Additionally, GeoSyntec also has been awarded funding from the DOD Environmental Security Technology Certification Program (ESTCP) to enhance the application of this technology through further laboratory and field demonstrations.

TEA, the first EZVI licensee, has either manufactured or deployed over 65,000 gallons of EZVI at private and federal facilities as of October 2005. Weston Solutions injected EZVI at two private industry sites with great success during 2005. Huff and Huff has manufactured and deployed EZVI during 2005, and RNAS received a grant from the Soybean Council to further investigate using soybean oil in its EZVI formulation.

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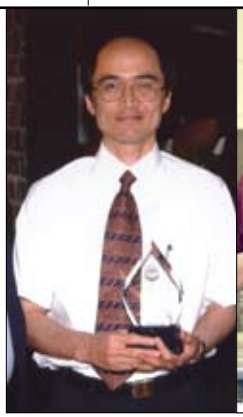
High-Strength, Wear-Resistant Aluminum Alloy

NASA
George C. Marshall Space Flight Center



Dr. Po-Shou Chin

Jonathan Lee

Dr. Sam Nabors

A team at Marshall Space Flight Center (MSFC) began work on the high-strength, wear-resistant aluminum alloy when a major automobile manufacturer approached NASA about developing a new, stronger, low-cost alternative to current materials used in automotive applications.

Originally developed by NASA as a high-performance piston alloy to help meet U.S. automotive legislation requiring low-exhaust emission, the novel substance offers the dramatic increase in tensile strength at elevated temperatures (from 450 to 650°F) needed for many applications. An ideal low-cost material for cast automotive components, the innovative alloy is enabling engine manufacturers to make engines that produce more horsepower at lighter weights and emit less pollutants. At high temperatures, it is four times stronger than conventional alloys now used in automobile engine manufacturing, and it can be produced at a cost of less than $1 per pound.

The high-strength, wear-resistant aluminum alloy was recently used in Bombardier Recreational Products' (BRP) Evinrude product line to meet the unique requirements of a direct-injected, two-stroke outboard engine with world-class emissions levels. The BRP engine design has led to the NASA alloy recently winning first place in the 2005 Environmental Excellence in Transportation (E2T) Awards, sponsored by the Society of Automotive Engineering (SAE) and recognizing significant innovations that reduce environmental impacts caused by the transportation industry.

Applications for the high-strength, wear-resistant aluminum alloy continue to expand and evolve. NASA is investigating the alloy's potential applications for net shape casting of some propulsion systems in rocket-powered engines.

Another application includes the production of high strength, thin aluminum sheet metal that could be used for the "skin" of certain aircrafts operating at high speed.

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2006 FLC Awards

Evaluator Panel—Awards for Excellence in Technology Transfer

Evaluator Panel

Awards for Excellence in Technology Transfer

Representing a cross-section of federal laboratories, industry, and academia, the members of the Evaluator Panel enthusiastically devote their time and effort to judging the dozens of nominations submitted for the Awards for Excellence in Technology Transfer. Selecting the winning technologies is a difficult task, but these evaluators admirably rose to the challenge. The FLC recognizes their tireless efforts and expresses its gratitude.

Linda Blackburn, NASA Langley Research Center

Marv Erickson, Pacific Northwest National Laboratory

Eric Froehlich, National Security Agency

Kathleen Goedel, National Institute of Occupational Safety and Health

Bryan Kaphammer, Department of Agriculture, Agricultural Research Service

Mark Langguth, Argonne National Laboratory

Susan LeVan-Green, Department of Agriculture, Forest Service

Roger Lewis, Department of Energy

J. Terry Lynch, National Institute of Standards and Technology

Margaret McNamara, University of Buffalo

Susan McRae, Army Space and Missile Defense Command

Lewis Meixler, Princeton Plasma Physics Laboratory

Robert Morelli, National Security Agency

Geoffrey Phillips, Defense Microelectronics Activity

Charles Schlagel, Naval Medical Research Center

Herbert Spiegel, Applied Science and Technology Associates, Inc.

Tara Weaver-Missick, Department of Agriculture, Agricultural Research Service, Office of Technology Transfer

2006 FLC Awards

Laboratory Director of the Year

Philip Brandler

Technology transfer is an integral part of Natick Soldier Center's (NSC) mission, which is to conduct research, development, testing, and evaluation focused on maximizing the individual warrior's survivability, combat effectiveness, and quality of life in the field. Through his leadership and advocacy, Philip Brandler has been instrumental in all aspects of technology transfer and industry partnerships.

Brandler encourages researchers and engineers to develop technologies and products from the start with both military and commercial applications in mind. Under his tenure, the number of CRADAs and partnerships with such high profile partners as Boeing, Battelle, and Johns Hopkins University has steadily increased. In addition, during this time the NSC has been named as the Army's R&D Laboratory of the Year - Small Development Laboratory category for three years in a row.

Department of Defense
Naval Research Laboratory

Dr. John Montgomery
Capt. David Schubert

Dr. John Montgomery and Captain David Schubert have jointly facilitated technology transfer innovations at the U.S. Naval Research Laboratory (NRL). Their combined leadership is leveraging the NRL research investment to yield greater benefits in the private and public sectors. Together, this team has effectively fostered process improvements, staff growth, and an extensive NRL interface, all of which have yielded a dynamically growing NRL technology transfer program.

Under Dr. Montgomery and Captain Schubert's leadership, the results of new technology transfer teamwork and revitalized processes are evident. During FY05, NRL technology transfer received $711,207 in licensing fees and royalties, representing more than half of the licensing revenue collected by the entire U.S. Navy for that year. Fourteen patent licenses were executed in FY05. In addition, the number of Cooperative Research and Development Agreements increased to 38, collectively yielding $1,467,000 in funds.

A clear sense of pride and achievement is growing in the NRL technology transfer office. The momentum created from this new environment of change is attributed directly to the joint leadership of Dr. John Montgomery and Captain David Schubert.

Department of Defense
Air Force Research Laboratory
Human Effectiveness Directorate

Dr. Hendrick W. Ruck

In May 2003, a change in leadership brought Dr. Hendrick Ruck to the helm as Director of the Air Force Research Laboratory – Human Effectiveness Directorate (AFRL/HE). This change was characterized by a robust, forward-looking leadership style, as well as a refocusing of efforts within the Directorate. Dr. Ruck energetically embraced the concept of technology transfer as a strategic planning tool and immediately began utilizing the Technology Transfer Office as a resource in seeking collaborative partnerships for all AFRL/HE operating locations, including Wright-Patterson AFB, Ohio; Brooks City-Base, San Antonio, Texas; and Mesa, Arizona.

In less than three years under Dr. Ruck's leadership, the performance measures for HE technology transfer have reflected great strides, including a 45% increase in technology transfer agreements; over 100 collaborations with government peers; 101 Small Business Innovation Research contracts; and, thanks to facility Cooperative Research and Development Agreements (CRADAs) and Technology Transfer Agreements with major aerospace industry organizations, CRADA income increased within two years by more than 13 times, from $62,500 to $861,000.

2006 FLC Awards

Service Awards

Department of Defense
Army Aviation & Missile Research,
Development, and Engineering Center

Kelly McGuire

Harold Metcalf Award

Kelly McGuire exemplifies the highest standards of dedication and service to the FLC, has made significant contributions to the quality and capabilities of many laboratory Offices of Research and Technology Applications (ORTAs), and provided outstanding leadership to the FLC Southeast Region as Regional Coordinator from 2001-2005.

As Southeast Regional Coordinator, McGuire began a program to reinvigorate participation by the region's federal laboratories in FLC activities and initiatives. His successes as ORTA served as a model for several of the regional initiatives he supported as Regional Coordinator, including establishing the first continuing education unit (CEU)-based regional conference opportunity for professional development for ORTAs; strengthening the Southeast Region awards program to expand the FLC's visibility within the laboratories and the communities; and developing a Regional Coordinator Handbook for reference and use by subsequent Regional Coordinators and to preserve the uniqueness of the Southeast Region.

During this time, McGuire also strengthened and improved technology transfer activities within his own laboratory by initiating and maintaining ongoing training seminars in intellectual property management for scientists and engineers; quadrupling the number of Cooperative Research and Development Agreements and patent licenses signed on his laboratory's technologies; and supporting classes and opportunities for young entrepreneurs at the University of Alabama Huntsville.

Department of Defense
U.S. Army Benét Laboratories

Dr. Lee Greenberg

Representative of the Year Award

Dr. Greenberg has served with dedication the FLC Northeast Region and the national FLC Executive Board. He has implemented visionary approaches to federal technology transfer and industry collaboration and, through these activities and more, has significantly elevated awareness of the FLC in the Northeast, and communicated new practices and prime examples of novel technology transfer methods to the nationwide FLC community.

Dr. Greenberg established the technology transfer program at Benét Laboratories and put the first Cooperative Research and Development Agreement (CRADA) into place, enabling the Army to accept funds. To date, Dr. Greenberg has been instrumental in approximately 150 CRADAs. The value of these CRADAs has directly resulted in a cumulative $70 million in business.

Within the FLC, Dr. Greenberg is an invaluable resource. He frequently assists FLC members, providing direction and solutions to complex issues pertaining to technology transfer mechanisms and instruments. Serving as a Member-at-Large on the FLC Executive Board, he regularly provides consultations, presents his innovations and business achievements, and offers classes to FLC members and other DOD laboratories.

GEO-CENTERS, Inc.

Tim Wittig

Outstanding Service Award

Tim Wittig's many years of exceptional service in educational presentations and innovative suggestions for technology transfer have, through his sustained and dedicated association, significantly benefited the FLC. The founder and principal of the Technology Management Group at GEO-CENTERS, Inc., Wittig has created a team of professionals who help technology owners leverage their technology investments to expand mission capability while reducing costs and strengthening the U.S. economy in the international marketplace.

Because of his multifaceted career path, legal background and experience, Wittig has acquired a unique perspective on the technology transfer process, and he has been generous in sharing this knowledge, which has resulted in significant contributions to the federal technology transfer program.

Through the years Wittig has been actively involved in the FLC. He has made numerous presentations at FLC national conferences and is also a frequent presenter at FLC regional meetings. These presentations have enabled FLC members to conduct more effective technology transfer by increased knowledge of laws, regulations, and tools such as Cooperative Research and Development Agreements. Wittig is co-author of Creating a Technology Incubator, a monograph published by the FLC based on his work with a laboratory client to create the first technology incubator on a military post. In addition, he is past co-chair of the FLC Legal Issues Committee.

By forging productive relationships with federal laboratories and private sector clients, offering training to technology professionals, and through creative problem solving, Wittig has had a significant and lasting impact on the FLC.

2006 FLC Awards

Regional Award Winners

Regional Awards

Far West

Outstanding Laboratory Representative

Dr. Stephen Lieberman, Navy SPAWAR Systems Center San Diego

Outstanding Technology Development Award

Naval Medical Center, San Diego

"Preventing and Reducing the Effects of Noise-Induced Hearing Loss: The Hearing Pill"*

Outstanding Partnership Award

DOD Tech Match
Center for Commercialization of Advanced Technology

Far West Region/Mid-Continent Region

Outstanding Technology Development Award

Sandia National Laboratories
"Bio-Explosive Destruction System (EDS)"

Mid-Atlantic Region

Awards for Excellence in Technology Transfer

National Institute of Aging, National Institutes of Health
"Taxus® Express2™: Bypassing By-Pass Surgery with Paclitaxel-Coated Stents"

Agricultural Research Service, Floral and Nursery Plants Research Unit
"New Star-of-Bethlehem Plants"

Agricultural Research Service, Sustainable Agricultural Systems Laboratory
"Enhancing Growth, Yield and Fruit Quality of Date Palm Trees in Coachella Valley, California"

**Also a 2006 FLC national award winner.*

National Energy Technology Laboratory
“Combustion Control and Diagnostics Sensor (CCADS) for Gas Turbines”

National Institutes of Health; Heart, Lung, and Blood Institute
“Parvovirus B19 Diagnostic Test Kit”

National Institutes of Health, National Heart, Lung and Blood Institute, Laboratory of Cardiac Energetics
“Accelerated Magnetic Resonance Imaging (T-SENSE)”

Agricultural Research Service, Plum Island Animal Disease Center
“Humane Device for Bleeding Mice”

Goddard Space Flight Center
“Micro Pulse Lidar (MPL) and the MPL Network (MPLNET)”

U.S. Army Institute of Surgical Research (USAISR)
“Special Medical Emergency Evacuation Device (SMEED)”*

National Cancer Institute, National Institutes of Health
“Kepivance®: Improving the Quality of Life for Cancer Patients”*

U.S. Army Medical Research and Materiel Command
“Identification of Small Molecule Inhibitors of Anthrax Lethal Factor”

U.S. Army Center for Environmental Health Research
“Apparatus and Method for Automated Biomonitoring of Water Quality”

Mid-Continent Region

Outstanding Partnership Award

New Mexico’s Institute of Mining and Technology

New Mexico Technology Research Collaborative

Hydrogen Technology Partnership (HyTep)

**Also a 2006 FLC national award winner.*

Outstanding Technology Development Award

USDA Wildlife Services, National Wildlife Research Center
"OvoControl-G®"

Sandia National Laboratories
"Aeroelastic Twist-Bond Coupling Design for Carbon/Glass Hybrid Wind Turbine Blades"

Los Alamos National Laboratory
"NOx HyCat: A New Catalytic System for Diesel Engines"

Los Alamos National Laboratory
"High Temperature Superconducting (HTS) Tape"

National Renewable Energy Laboratory
"Integrated BioRefinery (DuPont)"

National Renewable Energy Laboratory
"Separating Organic Material Into Value-Added Chemical"

Department of Energy Rocky Mountain Oilfield Testing Center
"Thermal Hydraulic Engine (THE)"

Ames Laboratory
"Bio-Diesel Fuel Catalyst"

Outstanding Laboratory Award

USDA Wildlife Services, U.S. Livestock Insects Research Laboratory

Distinguished Service Award

Dr. George Kraus, Ames Laboratory

Outstanding Laboratory Representative

Debra Covey, Ames Laboratory

Award of Appreciation

J. Susan Sprake, Los Alamos National Laboratory

Northeast Region

Regional Coordinator's Excellence Award

Dr. Lee Greenberg, U.S. Army Benet Laboratories*

Regional Laboratory Award

Armaments Research, Development and Engineering Center (ARDEC)

Regional Appreciation Award

Tim Wittig, GEO-CENTERS, Inc.*

Excellence in Technology Transfer Award

Naval Undersea Warfare Center Division Newport
"Robust Dimension Reducing Decision Support Tool for Large, Complex Datasets"*

Southeast Region

Project of the Year

NASA Marshall Space Flight Center
"High-Strength, Wear-Resistant Aluminum Alloy"*

Excellence in Technology Transfer Award

USDA, REE, Agricultural Research Service, Mid-South Area
"Vaccines for Prevention of the Two Major Diseases of Catfish"*

USDA, REE, Agricultural Research Service, South-Atlantic Area, Southeastern Fruit and Tree Nut Research Laboratory
"A Fertilizer for Alleviation of Nickel Deficiencies"*

Kennedy Space Center
"Zero-Valent Metal Emulsion for Reductive Dehalogenation of DNAPLs"*

Oak Ridge National Laboratory
"Flame Doctor® Burner-Monitoring System"

Oak Ridge National Laboratory
"Laser-Based Item Monitoring System (LBIMS)"

**Also a 2006 FLC national award winner.*

Oak Ridge National Laboratory
“Polyelectrolyte Thin-Film Array Slide (PETAS™)”

Y-12 National Security Complex
“Responder Assets Management System (RAMS)”

2006 FLC Awards

Honorable Mention

Honorable Mention
Awards for Excellence in Technology Transfer

The FLC recognizes the following nominees for their commitment to technology transfer and support of our mission.

Department of Agriculture

Agricultural Research Service, Beltsville Area, Nutrient Data Laboratory, Beltsville Human Nutrition Research Center
"Free Applications Make USDA National Nutrient Database Available Anytime, Anywhere"

Agricultural Research Service, Beltsville Area, Sustainable Agricultural Systems Laboratory
"Enhancing Growth, Yield and Fruit Quality of Date Palm Trees in Coachella Valley, California"

Agricultural Research Service, Grain Marketing and Production Research Center
"Technology to Sort Grain Based on Economically Important Attributes"

Agricultural Research Service, Mid South Area
"Improved Sugarcane Varieties for the Louisiana Sugarcane Industry"

Agricultural Research Service, Mid South Area
"Intermediate-Temperature and Hot Lime Clarification Processes for Sugar Processing"

Agricultural Research Service, Midwest Area
"First Commercialization of the New Crop Cuphea"

Agricultural Research Service, North Atlantic Area, Plum Island Animal Disease Center, Foot-and-Mouth Disease Research Unit
"Humane Device for Bleeding Mice"

Agricultural Research Service, Pacific West Area, Vegetable and Forage Crops Production Research Unit
"New Varieties of Anti-Oxidant Containing Colored Potatoes"

Agricultural Research Service, Pacific West Area, Western Human Nutrition Research Center
"Nutrition Evaluation Scale System (NESSy)"

Agricultural Research Service, Pacific West Area, Western Regional Research Center and Yakima Agricultural Research Laboratory
"Development of Natural Controls for the Codling Moth"

Agricultural Research Service, South Atlantic Area
"Suppression Technology for Melaleuca Quinquenervia"

Agricultural Research Service, South Atlantic Area
"Technology for the Environmentally Sustainable Treatment of Livestock Manure"

Beltsville Human Nutrition Research Center, Beltsville Agricultural Research Center, Food Surveys Research Group
"Automated Multiple Pass Method: An Improved Method for Collecting Dietary Intakes"

Floral and Nursery Plants Research Unit
"New Star-of Bethlehem Plants"

Kika de la Garza Subtropical Agricultural Research Center
Children's Nutrition Research Center
"Development of an On-the-Vine technology for Infiltrating Melons with Calcium to Extend Marketable Shelf-life"

Department of Defense - Army

U.S. Army Center for Environmental Health Research
"Apparatus and Method for Automated Biomonitoring of Water Quality"

U.S. Army Edgewood Chemical Biological Center
"Modified Vaporized Hydrogen Peroxide Decontamination Technology"

U.S. Army Medical Research and Materiel Command
"Identification of Small Molecule Inhibitors of Anthrax Lethal Factor"

U.S. Army Space and Missile Defense Command/U.S. Army Forces Strategic Command
"Advanced Warfare Environment (AWarE)"

Department of Defense - Navy

Naval Aerospace Medical Research Laboratory
"Compact, Portable Reduced Oxygen Breathing Device (ROBD) for Hypoxia Training"

Naval Undersea Warfare Center Division Newport
"BLUE ROSE Fiber Optic Perimeter Security and Detection System"

Space and Naval Warfare Systems Center, San Diego
"Bioluminescent Bioassay System (QwikLite)"

Department of Defense - Air Force

Air Force Research Laboratory – Propulsion Directorate
"X-Ray Fluorescence (Xrf) Detector for Bearing Diagnosis"

Department of Energy

Argonne National Laboratory
"GREET Model for Evaluating Energy/Emission Impacts of Advanced Vehicles/Fuels"

Argonne National Laboratory
"MPICH2, the Widely Adopted, High-Performance Message Passing Interface Implementation"

Lawrence Livermore National Laboratory
"Accelerator Mass Spectrometry for Biological Research"

Lawrence Livermore National Laboratory
"Real-time Multiplicity Counter and Fission Meter"
Los Alamos National Laboratory
"Alliance for Advanced Energy Solutions"

Los Alamos National Laboratory
"MESA: Measuring Enzyme-Substrate Affinities"

Los Alamos National Laboratory
“Underground Radio—Reach the Right People at the Right Time—in Time”

National Energy Technology Laboratory
“Combustion Control and Diagnostics Sensor (CCADS) for Gas Turbines”

National Nuclear Security Administration, Kansas City Plant
“Appraisal Planning/Support System for CMMI Certification”

National Renewable Energy Laboratory
“Bringing E1 Thermostable Endoglucanase to the Biomass Industry”

National Renewable Energy Laboratory
“Separating Lignocellulosic Material Into Value-Added Products”

Oak Ridge National Laboratory
“Flame Doctor® Burner-Monitoring System”

Oak Ridge National Laboratory
“Graphical Structured Packing Interface (GraSPI)”

Oak Ridge National Laboratory
“Laser-Based Item Monitoring System (LBIMS)”

Oak Ridge National Laboratory
“SensArray® INtegratedWafer Wireless Microchip Fabrication Monitor”

Princeton Plasma Physics Laboratory
“The Miniature Integrated Nuclear Detector System (MINDS)”

Sandia National Laboratories
“Back-Contact Photovoltaic Cell”

Savannah River National Laboratory
“StrataSampler™ Device”

Y-12 National Security Complex
“Responder Assets Management System (RAMS)”

Department of Health and Human Services

Centers for Disease Control and Prevention, National Center for Infectious Diseases
"Diagnosis of Medically Important Fungi"

National Instititutes of Health, National Heart, Lung, and Blood Institute, Laboratory of Cardiac Energetics
"Accelerated Magnetic Resonance Imaging (T-SENSE)"

National Institutes of Health, National Institute of Aging
"Taxus® Express™: Bypassing By-Pass Surgery with Paclitaxel-Coated Stents"

National Institute for Occupational Safety and Health, Pittsburgh Research Laboratory
"HASARD – A Low-Frequency Electromagnetic Proximity Warning System"

National Aeronautics and Space Administration

Glenn Research Center
"Multi-Parameter, Microsensor-Based Low False Alarm Fire Detection System (MMFDS) for Aircraft"

Goddard Space Flight Center
"GPS-Enhanced Onboard Navigation System (GEONS/GEODE)"

Goddard Space Flight Center
"Micro Pulse Lidar (MPL) and the MPL Network (MPLNET)"

Goddard Space Flight Center
"Recursive Hierarchical Segmentation (RHSEG) Pre-processing Software: For Analyzing Imagery Data"

Marshall Space Flight Center
"The TRACeR III-V (NASA-enhanced X-Ray Fluorescence (XRF) Scanner)"

Honorable Mention

Laboratory Director of the Year

The FLC recognizes the following nominee for his leadership and contributions to technology transfer.

Dr. Neal Martin

U.S. Dairy Forage Research Center

Honorable Mention
FLC Service Awards

The FLC recognizes the following nominee for his longstanding service and support.

Representative of the Year Award

Donald A. Nordlund
U.S. Department of Agriculture,
Agricultural Research Service,
Office of Technology Transfer

FLC Awards Program Calendar

The calendar year for the FLC awards program runs from June to May. The timeline below reflects the awards program's activity as of press time. Please refer to the FLC website (www.federallabs.org) for updates.

June/July
Criteria for Awards for Excellence in Technology Transfer, Laboratory Director of the Year, and FLC Service Awards are reviewed and revised as needed.

August/September
Nomination forms for Awards for Excellence in Technology Transfer, Laboratory Director of the Year, and FLC Service Awards are distributed via electronic mail, standard mail, FLC roundtables, and the FLC website.

October
Completed nominations for Awards for Excellence in Technology Transfer, Laboratory Director of the Year, and FLC Service Awards are submitted to the FLC Management Support Office for processing.

November/December
Judging period for submitted award nominations in all categories.

January
Notification of award winners and non-winners in all categories.

February/March/April
Award winners register for FLC national meeting; non-winners of the Awards for Excellence in Technology Transfer receive written feedback from award evaluators.

May
Awards presented at FLC national meeting.

2006 FLC Awards