2002 FLC Awards Program

MAY 2002

FLC

Welcome to the FLC Awards Program

Thank you for attending the 2002 FLC Awards Program. This promises to be an exciting evening, as the FLC salutes its best and brightest. The success the FLC has experienced through the decades would not be possible without those government scientists and technical personnel who pursued their visions and ideas, and took them from the drawing board to actual use. Just as important are the people in federal labs who have dedicated themselves to encouraging and initiating partnerships with the private sector to make technology an invaluable part of our lives. What separates a good technology from a great technology is its impact on our quality of life.

Victor Chavez
Awards Committee Chair

As the technology transfer efforts within the FLC are diverse in their scope and large in number, we are pleased to present awards in the following areas:

- **Excellence in Technology Transfer—**Presented to individuals in the FLC who have successfully transferred 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.

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

- **Innovative Partnership Award—**Recognizes an individual in the FLC who has shown the greatest commitment to the long-term results of technology transfer.

The FLC awards are a prestigious honor in the world of technology transfer, with dozens of federal laboratories submitting nominations each year. These awards have become not only a crowning achievement for the winning laboratories, but a source of great pride for their government agencies.

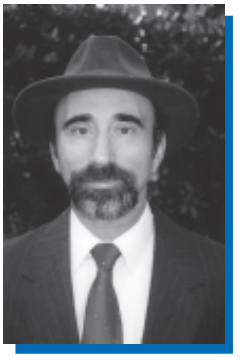
As you read this booklet, you will be impressed with how these individuals worked together and used their experience and resources to create technologies and products that benefit all of us. I am proud and pleased to present the recipients of the 2002 FLC awards.

FLC AWARDS
FOR
EXCELLENCE IN TECHNOLOGY TRANSFER

U.S. Department of Agriculture
Agricultural Research Service (ARS)
Behavior & Biophysics Research Unit

Automated Insect Detection and Monitoring System for Reduced Insecticide Use and Integrated Pest Management

The cost of protecting bulk-stored agricultural commodities from insect infestations, as well as direct losses caused by insects, exceeds $34 billion annually worldwide. Alternatives to insecticides are needed, especially ones that can detect infestations early and eliminate the need for scheduled insect control treatments. The Electronic Grain Probe Insect Counter (EGPIC) System is an automated computer-based electronic sensing system for monitoring weevil and beetle populations in bulk stored commodities. Developed by Dr. Dennis Shuman, the EGPIC provides remotely displayed real-time infestation data from storage bins that aid in making pest management decisions.



Dr. Dennis Shuman

Dr. Shuman has actively pursued technology transfer opportunities for his patented system. The recognition of EGPIC's value—combined with the need to validate its performance in a number of settings—led him to form the EGPIC Working Group. Dr. Shuman also established both a licensing agreement and a Cooperative Research and Development Agreement (CRADA) with OPI Systems to install the technology worldwide. As part of the CRADA, Dr. Shuman invented an enhancement to EGPIC: the Sensor Output Analog Processing (SOAP) identifies insect species and eliminates erroneous insect counts.

EGPIC will create a new standard whereby grain will be tracked and monitored as a way of preserving quality. This technology will establish a new paradigm in food protection by being the world's first commercially available automated stored-product insect monitoring system.

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U.S. Department of Agriculture
Agricultural Research Service (ARS)
Catfish Genetics Research Unit

NWAC103 Line Catfish

Channel catfish farming began over 30 years ago and is one of the most successful aquaculture enterprises in the U.S., surpassing production of other commercially cultured fish for human consumption. Approximately 180,000 acres of ponds are in production, with an annual yield of 600 million pounds of fish. Unlike the poultry, beef and swine industries, genetic improvements of catfish had not had an impact on commercial production and profitability. To this end, the Catfish Genetics Research Unit Team developed a genetically improved catfish line, NWAC103, that has enhanced growth due to higher feed consumption. This has resulted in the faster production of marketable commercial catfish.

The technology transfer process was set in motion when the team collected and analyzed data from studies that compared fish performance in tanks and ponds with NWAC103 catfish. The study provided supporting documentation that allowed NWAC103 catfish to be released to selected catfish producers. To review the data, a joint committee comprised of the team members and representatives from the Mississippi State University Agricultural and Forestry Experiment Station was created. The committee voted unanimously to release the fish to 35 catfish producers in Mississippi, Arkansas, Alabama, Louisiana, and North Carolina in the fall of 2000.

The fish developed by the team is set to have positive economic returns within the catfish production industry. It is projected that once the NWAC103 fish are available in all 180,000 production acres, the industry will see annual production revenues ranging from $23 to $46 million.

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U.S. Department of Agriculture (USDA)
Agricultural Research Service
Crops Research Laboratory
Molecular Plant Pathology Laboratory

A Superior Soybean Nitrogen Fixation Inoculant

Dr. William Hunter of the USDA's Crops Research Laboratory and Dr. L. David Kuykendall of the USDA's Molecular Plant Pathology Laboratory worked together to develop a bacterial strain that is a superior soybean inoculum. The inoculum, also known as *Bradyrhizobium japonicum*, TA-11 NOD$^+$, increases nitrogen fixation, yield, and the amount of organic nitrogen left for non-legume crops. This patented technology can be of great help to soybean farmers in the U.S. as they are constantly under pressure to increase crop yield yet maintain sustainable agriculture. The increase in seed yield and quality from the inoculum comes from "natural selection" rather than genetic engineering, which makes it acceptable to both conventional and organic farmers.

The primary means of transferring the technology has come from an exclusive licensing agreement with Urbana Labs. Now produced and sold by Urbana Labs, the "USDA Strain" has become popular and well-known among soybean farmers. With the inoculant used on almost 4.3 million acres of land in 2001, Urbana Labs has purchased a controlling interest in a new, ultramodern fermentor facility to meet production needs. In the five years it has been used, the superior soybean inoculum has generated approximately $150 million in revenue.

The commercialization of this technology has revitalized soybean production by making sustainable agriculture profitable. The inoculant has put more money into farmers' pockets and increased the health of a major economic segment of the agricultural community.

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Dr. L. David Kuykendall

Dr. William Hunter

U.S. Department of Agriculture
National Animal Disease Center

Laser Detection of Fecal Contamination

The production, processing, and marketing of an adequate supply of fresh, bacteria-free meat at a reasonable price is a constant challenge for the meat production industry. Contamination of a carcass during the slaughter and processing phase is difficult to avoid. Many people can become ill or die if contamination is not detected and eliminated. A team at the National Animal Disease Center developed a contamination imaging technology, based on the properties of laser light, that determines meat carcass/product cleanliness in real time. This patented system scans freshly processed meat without making contact and detects contamination on the carcass with extremely high sensitivity.

The technology transfer process began when the team collaborated with Dr. J. W. Petrich of Iowa State University to patent the system. Later, the team, Iowa State University and eMerge Ineractive, Inc. entered into a CRADA, with eMerge Interactive also licensing the product. The technology is scheduled to be available for purchase this year.

The tangible benefits from this technology are many. By assuring a safer supply of meat, this innovative detection system will protect the $94 billion revenue from meat sales; protect the jobs of 460,000 U.S. meat and poultry workers; reduce the 9,000 deaths per year associated with foodborne illness; and provide the meat industry with a powerful, accurate and reliable new tool to produce a safer product.

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Dr. Tom Casey (left) and Dr. Mark Rasmussen (right)

U.S. Department of Agriculture
Parasite Biology, Epidemiology & Systematics Laboratory
Animal and Natural Resources Institute

Recombinant Proteins Derived from the Human Pathogen *Cryptosporidium Parvum*

At present, there are no effective drugs to treat individuals infected with *Cryptosporidium (C.) parvum*, a protozoan parasite that is a frequent cause of death in AIDS patients. In addition, *C. parvum* can adversely affect the growth of calves through diarrhea-induced weight loss. Working to develop therapeutic methods to treat those infected, Dr. Mark Jenkins used genetic engineering to clone a gene from the *C. parvum* pathogen. The goal of Dr. Jenkins' research is to use the parasite's recombinant proteins to produce immune reagents that can be used as immunotherapy.

Dr. Mark Jenkins

This patented technology was transferred via a CRADA and licensing agreement with Merial, a biotechnology company based in France. Dr. Jenkins also established licensing agreements with Fort Dodge Animal Health of Kansas and New Jersey-based American Home Products.

In the U.S. each year, *C. parvum* outbreaks cause an estimated $100 million loss to the dairy industry. Preventing these parasitic infections in calves would thwart the spread of *C. parvum* in the environment. In humans, those infected with AIDS—as well as others with vulnerable immune systems—could be treated for *C. parvum* contamination.

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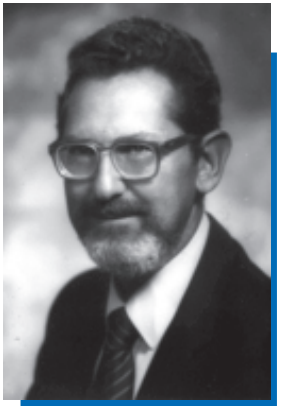
U.S. Department of Agriculture
Sustainable Agricultural Systems Laboratory
Animal & Natural Resources Institute

Forage Soybean Cultivars

Dairy and livestock producers need an inexpensive, readily available, on-farm source of high protein feed to economically and efficiently produce meat and dairy products. Dr. Thomas Devine, a plant breeder, bred three unique soybean cultivars to produce a livestock feed that is high in protein, yet cost-effective. Dr. Devine's cultivars are capable of growing to heights of six feet or more—twice the height of most traditional grain-type soybeans. These patented cultivars are less expensive than other forage crops because they thrive in summer heat, can withstand the stress of winter temperatures, and do not require insecticides or herbicides.



Dr. Thomas Devine

The technology transfer process involved licensing to several companies, including Seedway of Hall, N.Y.; Wolf River Valley Seed Company of White Lake, Wis.; and the Southern States Cooperative of Richmond, Va.

In addition, Dr. Devine received extensive publicity for his cultivars through interviews with trade publications, radio and television, and presentations at farm industry gatherings. To date, the cultivars have been planted on 20,000 acres of farmland throughout the U.S.

Planting the cultivars has strengthened local farms in the northeastern, southern, and midwestern regions of the U.S. Reduced production costs have increased farm income, enabling families to keep their farms. By making the cultivars a staple of the livestock diet, production efficiency of meat and dairy products strengthens the competitiveness of U.S. agricultural products abroad.

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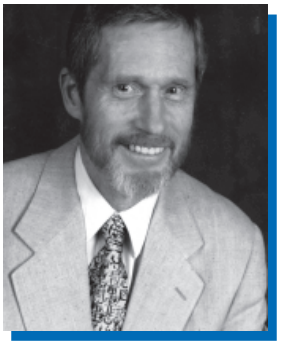
Department of Commerce
National Institute of Standards and Technology (NIST)

Advanced Cryocooler Technology

Dr. Ray Radebaugh has advanced the science and technology of refrigeration methods by devising a sophisticated thermodynamic and mathematical procedure for the optimization of gas mixtures in the mixed-gas Joule Thomson refrigeration process. He applied these principles—in collaboration with CryoGen, Inc.—to develop a 3-mm-diameter cryogenic catheter capable of achieving very low temperatures at its tip for use in freezing spots on the heart that cause arrhythmias. This patented technology has also been used in a uterine catheter that freezes the lining of the uterus in women with abnormal bleeding.



Dr. Ray Radebaugh

Technology transfer between Dr. Radebaugh and CryoGen, Inc. was established through a CRADA. CryoGen provided the medical expertise and guidance for developing the catheter; NIST determined the optimum refrigeration process compatible with medical requirements to develop a prototype.

Of the 2.5 million people in the U.S. who suffer from heart arrhythmia, most can be successfully treated with Dr. Radebaugh's heart catheter. Each year 120,000 American women receive hysterectomies because of abnormal bleeding. The uterine catheter developed as a result of the CRADA can treat these women, with a success rate of almost 90 percent based on clinical trials. In addition, compared to spending weeks recovering from a hysterectomy, women treated with the catheter can return to normal activities the following day.

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

The Biological Detection Kit

Increased awareness of the potential use of biological agents as weapons of terror and mass destruction underscores the importance of finding a means to sample and detect agents quickly and effectively. The Biological Detection Kit (BDK) consists of sampling and detection equipment for biological agents, including large area surfaces, small solid samples, liquid samples, and air samples. The kit is integrated into a single package that can analyze samples for the presence of DNA, protein, and bacteria. The BDK borrows techniques from food safety, personal air monitoring and other arenas, and integrates them with new approaches to create a technology that can be easily used in the field.

The BDK team's technology transfer effort took several forms. A CRADA was established with New Horizons Diagnostics, Inc. to package the kit. EAI Corporation served as another CRADA partner to further refine and market the BDK. Other vendors, including Turner Designs, Inc., Molecular Probes, Inc., and Chemmetrics, Inc., are providing the BDK team with supplies, reagents and specialized expertise. In addition, an information exchange agreement established with the Military Institute of Hygiene and Epidemiology in Poland enabled joint development of the kit's spore luminescence protocol.

The efforts behind the BDK have resulted in the development of BioHaz™, a system that provides users with the capability to sample and detect biological materials in suspect samples. This product is currently being marketed by the Response Equipment Corporation, a subsidiary of EAI Corporation. The kit is also being marketed as the SWIPE™ sampling and spore luminecscence kit by New Horizons Diagnostics, Inc. This technology has been used by hazmat teams in several cities—including Washington, D.C. and Virginia Beach, Va.—in response to recent anthrax incidents.

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Biological Detection Kit Team

Seated: Dorothea Paterno
Standing, from left: Dr. Peter Stopa, Maurice Milton, Philip Coon, Alan Seitzinger, James Genovese
Not pictured: Darlene Tieman

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

Integrated Virus Detection System

The Integrated Virus Detection System (IVDS) represents a fundamentally new method for detecting and identifying viruses and nanoparticles. Capitalizing on the physical properties of size and density allows viruses to be counted and identified without using biochemical reactions. Dr. Charles Wick invented and developed the IVDS and transferred the technology to Virus Detection Company, LLC (VSDC) through an exclusive license.

Dr. Charles Wick

Analysis and identification through the use of the patented IVDS has led to a wide range of new discoveries, including the ability of some viruses to pass through filters, change easily, live a long time under harsh environments, and live in soil and water. Recent outbreaks such as the West Nile virus, other alphaviruses, influenza, and foot and mouth disease make this technology extremely useful and timely.

The IVDS technology transfer effort is producing tangible results in terms of creating capital and jobs in the U.S., and several industries will benefit directly from the development of the IVDS. The bioprocessing industry will be able to use this technology to develop new products, including vaccines, as well as expand into new regions of science and technology. Materials technology will use IVDS to refine its nanoparticle-based creations that can have applications in a number of areas, including paints, coatings, and transparent films used as computer monitors and television screens. The computer industry will be able to produce newer and more complex computing devices with improved nanometer-sized separations and tolerances. Finally, the IVDS has provided a new standard of measurement on the nanometer scale, which relies upon such instruments as electronmicrography and light scattering.

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Department of Defense—U.S. Navy
Carderock Division, Naval Surface Warfare Center

Plasma Arc Waste Destruction System

For almost a decade, researchers at the Carderock Division, Naval Surface Warfare Center have been investigating plasma arc technology as a method to destroy shipboard combustible solid waste. Dr. Eugene Nolting and Jon Cofield developed the Plasma Arc Waste Destruction System (PAWDS), which offers a small size, rapid and efficient operation, and the ability to incinerate a wide variety of garbage. Forming an electric arc in a gas—a process that generates temperatures hotter than the sun's surface—creates the plasma used in the system. This allows operation at such an extremely high temperature that combusting materials releases very few pollutants to the environment.

Dr. Eugene Nolting

The team was able to move this patented technology forward through both a Cooperative Research and Development Agreement (CRADA) and a licensing agreement with PyroGenesis, Inc., a privately owned company that develops and commercializes customized thermal plasma technologies. PyroGenesis plans to manufacture and install PAWDS on commercial cruise liners.

The primary beneficiary of PAWDS is the cruise industry, which is subject to stringent pollution control regulations. International law prohibits ships from indiscriminately dumping trash at sea, so much of the waste must be burned in conventional incinerators or stored for later removal. Because the incinerators cannot burn plastic, the garbage is spread out on a table and hand sorted. PAWDS eliminates the need to hand sort garbage and store contaminated plastic. Not only are labor costs lowered by the use of PAWDS, but its smaller size results in additional room, which often is used as cabin space by paying customers. Because ships have limited space, this benefit is very important. In addition, the technology produces a waste gas stream that is so clean it can be operated during the daytime without impacting passengers' quality of life.

Jon Cofield

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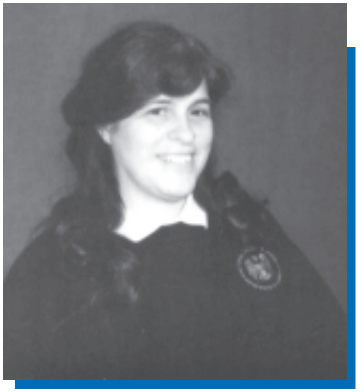
Department of Defense—U.S. Navy
Naval Research Laboratory (NRL)

Advanced Nontoxic Fouling Release Coatings

Dr. Joanne Jones-Meehan of NRL developed and commercialized an environmentally safe coating system for ship hulls and pipeline applications, such as power plant water intakes. This patented coating system reduces the problem of biofouling (the undesired growth of barnacles, mussels, algae, etc.) without the use of toxic metals and biocides by providing a surface to which organisms find it difficult to adhere. There is a pressing need for an environmentally safe method for controlling biofouling to replace current methods that involve metals and other chemicals that are potentially harmful to aquatic life and workers alike.



Dr. Joanne Jones-Meehan

Smart Surfaces, LLC of Annapolis, Md. entered into a licensing agreement with NRL to bring Dr. Meehan-Jones' technology to the marketplace. During the technology transfer process, Dr. Jones-Meehan was involved with testing of the product on ten ships and at three power plants, as well as the application and inspection of the test coatings.

The coating system, as licensed by Smart Surfaces, will be used on commercial, private and government-owned ships, as well as power plant water intake systems. Benefits will be realized in a number of areas since workers will no longer be exposed to the potentially harmful chemicals of antifouling paints; the electric power generating industry will save up to $5 billion a year by avoiding water intake cleanup; and the aquaculture and fishing industries will see a significant reduction in the number of lost lines, nets, and other equipment from biofouling.

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Department of Defense—U.S. Navy
Naval Research Laboratory (NRL)

High Speed, Ultrastable, Fiber-Optic Communications Laser

A team at NRL has developed an advanced fiber-optic laser that generates ultrashort pulses of light. Because pulsed laser light is used to carry digital information, the ultrastable, ultrafast NRL fiber laser technology enables—among other things—development of next-generation communications systems. In addition, this patented technology can be used for radar systems and other applications such as navigation and surveillance.

The team has successfully transferred the laser by establishing licensing partnerships with two companies, PriTel, Inc. and Calmar Optcom. The primary results of the technology transfer efforts are the numerous products that are being manufactured and sold under the NRL licensing agreements. To date, four models of optical clocks, three optical transmitters, and two high-power polarization-maintaining fiber amplifiers are on the market.

Advances in communication via telephone, local networks or the Internet as a result of this technology will benefit any business or activity that relies on the exchange of information, including banks and financial service providers, hospitals, government agencies, distance education programs, and the military.

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Dr. Thomas Carruthers

Irl Duling

Michael Dennis

Department of Defense—U.S. Navy
Naval Undersea Warfare Center (NUWC) Division, Newport

Digital Image Enhancement

A sailor trying to find mines in a cluttered underwater environment faces the same challenges as a physician looking for microcalcifications in a mammogram of dense breast tissue. Both of these searches can benefit from digital image enhancement. Michael Duarte of the Naval Undersea Warfare Center (NUWC) Division, Newport developed a digital image enhancement technology that uses wavelets and mathematical functions, which serve as building blocks to represent data. Applying the digital image enhancement allows small objects to be found in a large, complex area. This patented technology, as applied to breast cancer screening, would improve the physician's ability to detect microcalcifications on a mammogram, thus catching cancer at an earlier stage than previously possible. Early detection would improve the patient's chance of survival and allow less invasive treatment options.

James Kasischke

Duarte, a digital signal processing expert, noted the similarities between underwater mine-hunting sonar and the problems of detecting small lesions in mammograms. Under dual-use funding, he began working on mammogram digital image enhancement, using NUWC's state-of-the-art technical facilities. Duarte then worked with James Kasischke, a NUWC patent attorney, to identify business and patent opportunities that led to CRADAs with Advanced Image Enhancement, Inc. (AIE) and the Slater Center for Interactive Technologies. A licensing agreement has also been established with AIE.

Michael Duarte

Thanks to Duarte, the Navy has successfully transferred undersea mine-hunting technology to the medical community. Digital image enhancement will enable doctors to have greater success detecting early-stage breast cancer, and women will benefit from early detection, resulting in thousands of lives saved.

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Department of Defense—U.S. Air Force
Air Force Research Laboratory, Propulsion Directorate (AFRL/PR)

Lightweight, Carbon Composite Cages for Low-Heat Generation Bearings

An AFRL/PR team developed a composite cage for rolling element bearings. The lightweight, carbon-carbon (C-C) and carbon-phenolic (C-Ph) composite cage enables rolling element bearings to operate at a higher speed with significantly less frictional heat generation than bearings fitted with traditional steel and cotton-based phenolic cages. This technology has proven to be helpful in solving critical heat generation problems in advanced demonstrator engines for cruise missile applications.

The partner of the AFRL/PR team in this technology transfer effort is Allcomp, Inc. The arrangement took the forms of an exclusive patent licensing agreement and a CRADA. Allcomp was responsible for manufacturing the composite bearing cages; AFRL/PR handled the cage/design specifications, conducted validation testing, and transitioned the technology to military programs.

Beneficiaries of the composite bearing cage technology include domestic bearing manufacturers, as well as users of rotating equipment and turbomachinery. Uses subject to extreme operating conditions and poor marginal lubrication conditions will find the composite cages of great value. Specific examples include aircraft and power generation gas turbine engines, automotive turbochargers, machine tool spindles, medical X-ray machines, and rotating devices in satellites.

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Wei Shih

Dr. Nelson Forester (left) and Lewis Rosado (right)

Department of Energy
Argonne National Laboratory (ANL)

Autothermal Fuel Reforming Catalyst for Fuel Cells

The autothermal fuel reforming catalyst, produced by a team at ANL, is the key component of a fuel processor that can efficiently convert methanol, ethanol, natural gas, gasoline, and diesel into hydrogen that can be fed to a fuel cell to produce electricity. The fuel processor produces high-quality hydrogen fuel within two minutes of startup at temperatures that are several hundred degrees centigrade below those required for processors based on a noncatalytic action. This will make fuel-cell-powered automobiles practical.

ANL's patented technology was transferred through a combination of CRADAs and license agreements with Süd-Chemie, Inc. and H2fuel, LLC. Both companies are in the process of making the technology available on the open market.

The autothermal fuel reforming catalyst will present a number of benefits. The technology will allow fuel-cell-powered cars to run on conventional fuels rather than pure hydrogen—making them more attractive to consumers. Unlike most conventional catalysts, which are poisoned by sulfur, the ANL catalyst can tolerate the sulfur present in petroleum-derived fuels. The new technology could also help make fuel cells more attractive as power sources for homes, commercial buildings, and portable power applications in remote locations.

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Autothermal Fuel Reforming Catalyst Team

From left: John Kopasz, Joong-Myeon Bae, J. David Carter, Romesh Kumar, Michael Krumpelt, Shabbir Ahmed

Department of Energy
Lawrence Berkeley National Laboratory (LBNL)

The Berkeley Lamp

Developed by an LBNL team, the Berkeley Lamp is a high-performance, energy-efficient table lamp that saves energy in homes and offices while greatly increasing lighting quality and visibility. The lamp uses two independently controllable and fully dimmable compact fluorescent lamps (CFLs). One lamp's light is directed downward to illuminate the table or desk, the other directs light toward the ceiling, providing high-quality indirect lighting. An optical "septum" separates the two lamps, allowing three modes of lighting: down, up, or up and down simultaneously. At full power, the two-lamp fluorescent system matches the combined luminous output of a 300-watt halogen lamp and a 150-watt incandescent table lamp while using only one-quarter of the energy.

The patented technology was transferred through licensing agreements with three California utilities—Sacramento Municipal Utility District, Southern California Edison, and Pacific Gas and Electric—along with Light Corporation of Grand Haven, Mich. To date, 600 prototypes have been manufactured, and demonstration projects are underway with a number of companies and institutions, including: Doubletree Hilton Hotel, Beverly Hills Hotel, U.S Coast Guard, U.S. Forest Service, Department of Energy Headquarters, City of Berkeley, California Energy Commission, and the University of California.

With its superior lighting, competitive price, and projected energy savings of more than $1 billion, high levels of sales are projected for the Berkeley Lamp. By reducing our dependence on fossil fuels, this technology will benefit the U.S. and, in turn, the nation's security.

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Berkeley Lamp Team

From left: Michael Siminovitch and Erik Page

Department of Energy
Lawrence Berkeley National Laboratory (LBNL)

EnergyPlus

Imagine architects and engineers having a robust simulation engine to accurately model all types of energy use within a building: heating, cooling, lighting, ventilation, and equipment. Imagine them testing, optimizing, and redesigning buildings while still on the drawing board to maximize energy efficiency—long before the first cement is ever poured. EnergyPlus, created by a team at LBNL, is a next-generation energy software simulation program for building design that has the potential to save billions of dollars in energy costs to America. The program allows users to calculate the impacts of different heating, cooling, and ventilating systems, as well as various types of lighting and windows. The "Plus" in EnergyPlus allows the calculation of indirect environmental effects associated with a building's energy use—such as atmospheric pollutants produced at power plants that supply electricity to the building.

As part of the technology transfer effort, copyright licensing partnerships were established with several entities, including the University of Illinois Urbana/Champaign, the Department of Energy, and the U.S. Army Construction Engineering Research Laboratory. To bring EnergyPlus to the marketplace, a creative, scalable licensing scheme was implemented to address the needs of diverse groups of users. This included coming up with alternatives to licensing, such as no-cost downloads for internal use, nominal cost code downloads for collaborative developers, and commercialization licenses for private distributors.

Available for just over a year, EnergyPlus is being adopted by architects, designers, and builders more rapidly than anyone imagined, with thousands of user licenses issued. The San Francisco Federal Building—a new landmark—is currently being designed with EnergyPlus. This technology benefits both public and private sectors by reducing energy bills, fossil fuels use, and pollution and greenhouse gases.

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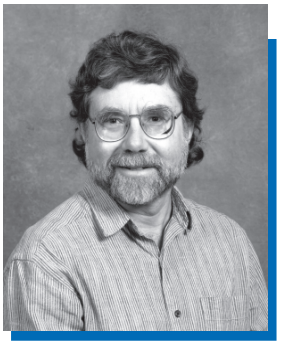
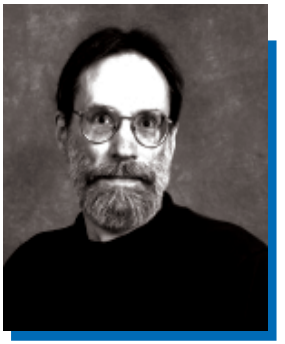
EnergyPlus Team



Fred Winkelmann



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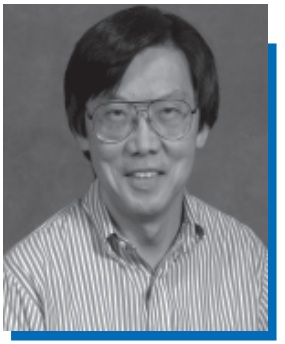
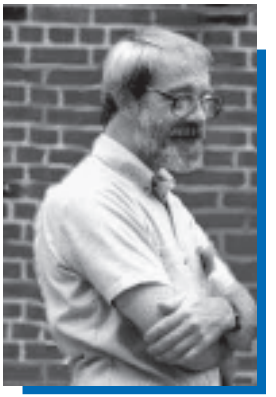


Joe Huang

Richard Strand

Drury Crawley



Curtis Pedersen

Department of Energy
NNSA Kansas City Plant

Feature-Based™ Machining Advisor

All manufactured items—from the $2 billion space shuttle to the simplest ink pen—start with product drawings. These drawings are then broken into piece parts that can be manufactured. For more complex products, the process of translating design drawings into manufacturing parts demands precision and high tolerance specification, and requires expensive materials and highly skilled labor. The Feature-Based™ Machining Advisor, developed by a team at the Kansas City Plant, is the manufacturing software of the future. It is composed of three foundational software libraries integrated with a Windows®-based graphical user interface, and it runs on a PC desktop system. This package addresses critical problems by providing solid model-based tools to represent and analyze tolerance information, and to automate both geometrical calculations and the process plan design for machining.

The team's technology transfer partners in this effort were CADKEY Corporation of Marlborough, Mass., and STEP Tools of Troy, N.Y. These partnerships were successfully carried out through patent licensing agreements and CRADAs.

Because the Feature-Based™ Machining Advisor was developed by engineers specifically for a manufacturing application, its reception by the industry has been strong and highly favorable. The use of this technology will ultimately result in improved quality; reduced fabrication, materials and labor costs; and commensurate increases in precision manufacturability.

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Feature-Based™ Machining Advisor Team

Bill Simons

Jim Butler

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John Kirk

Curtis Brown

Bob Ward

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Department of Energy
National Renewable Energy Laboratory (NREL)

DRWiN™ Electronically Scanning Antenna

The Dynamically Reconfigurable Wireless Networks (DRWiN™) is the first commercially available electronically scanning antenna. With the ability to be reconfigured from a very broad 120° beam to a narrow 2° beam, this antenna can scan across the full service area, enabling dramatic increases in network capacity, reliability and noise discrimination. This technology, developed by an NREL team, fills wireless operators' need to provide higher quality and more reliable service to an increased subscriber base.

The transfer process for this technology involved NREL, St. Petersburg State Electrotechnical University (Eltech), and Paratek Microwave, Inc. The partnership—for which NREL serves as the coordinator—utilized the design talents of Eltech, the materials and process capabilities of NREL, and the materials and commercialization efforts of Paratek.

The DRWiN™ antenna provides a "last-mile" solution as an alternative to fiber, cable, and DSL. Because this technology is architecture-independent, wireless services can be provided to rural and undeveloped regions that lack existing infrastructure.

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DRWiN™ Electronically Scanning Antenna Team

From left: Dr. David Ginley, Dr. John Perkins, Tanya Rivkin, and Dr. Philip Parilla
Not pictured: Dr. Chris Carlson

Department of Energy
Oak Ridge National Laboratory (ORNL)

Direct-to-Digital Holography

As the semiconductor industry continues to reduce the size of its components to maintain economic benefits and increased processing speed, the need to improve production yield rises. To improve yields by reducing deficits, inspection during the production process is essential. This means that inspection technology must be able to detect smaller defects more quickly to maintain high yield. Direct-to Digital Holography (DDH), invented by an ORNL team, is an innovative 3-D inspection technology that detects submicron-scale defects on complex or simple surfaces. This patented technology can detect submicron defects within surface features having aspect ratios greater than 10 to 1, a critical need for the next generation of defect-detection devices.

The team moved the DDH forward by entering into two CRADAs, as well as an exclusive licensing agreement with nLine Corporation, based in Austin, Tx. Through the partnership, the first DDH prototype was developed, built and implemented in less than 11 months.

Ultimately, the benefit of the DDH will be to U.S. manufacturers of semiconductor products for state-of-the-art computing and telecommunications devices. Because the semiconductor industry is worth over $150 billion annually to the U.S. economy, a technology such as DDH can save the industry millions of dollars annually in lost products, energy consumption and waste mitigation.

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Direct-to-Digital Holography Team

First row seated (left to right): James Hardy, Dave Rasmussen, Kathy Hylton, Jeff Price
Second row standing (left to right): Philip Bingham, Jim Goddard, Greg Hanson, Chuck Schaich, John Simpson, Ken Tobin
Not pictured: Larry Baylor, Matt Chidey, John Turner

Department of Energy
Pacific Northwest National Laboratory (PNNL)

Molecular Beam Epitaxy for Semiconductor Wafer Development

Semiconductors have had an unprecedented impact on our lives, largely because the industry has steadily delivered exponential increases in performance without an increase in expenditures. That trend is now at risk. Finding and implementing a solution in the quest for cost-effective nanoscale semiconductors has been the mission of a team from PNNL.

The Molecular Beam Epitaxy (MBE) system uses multiple atomic beams to grow well-defined, controlled layers of materials for studying film and interface properties. Advanced MBE technology has the potential to revolutionize semiconductor design and processing through the creation of advanced materials with properties that can be tailored to specific applications.

The PNNL team's technology transfer partner was Motorola Labs. A full range of mechanisms was used to accomplish the transfer, including a user facility agreement, procurement of the system, and a CRADA. As a result of the partnership, Motorola now has an enhanced MBE instrument system and the scientific and technical knowledge to gain maximum benefit from the technology. This system is giving the company a competitive edge by enabling its researchers to solve critical problems in the development of nanoscale components for advanced electronic products and services for industry, consumers, and national defense.

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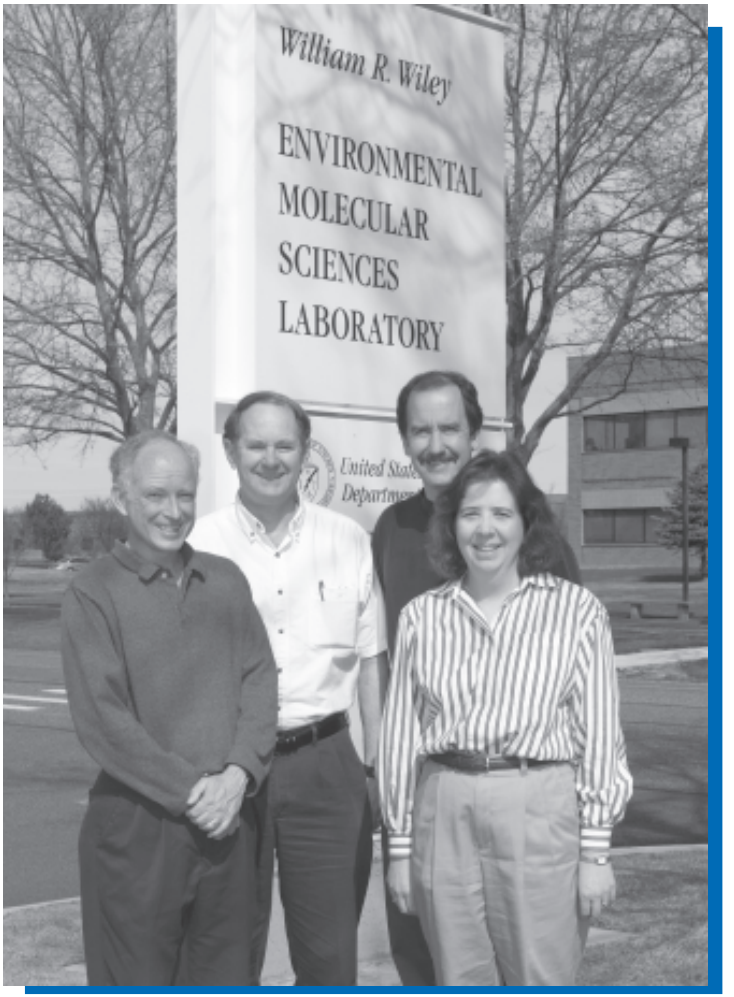
Molecular Beam Team



From left: Scott Chambers, Bruce Harrer, Don Baer, and Mary Peterson

Department of Energy
Pacific Northwest National Laboratory (PNNL)

Ultra-Barrier Coatings for Flat-Panel Displays

A team of researchers from PNNL has developed a polymer multilayer deposition process and ultra-barrier coatings for flat-panel electronic displays. These coatings allow improvements in materials and manufacturing processes that will lead to lighter, brighter, more energy-efficient displays. The technology has the potential to be used in numerous applications, such as cell phones, smart cards, electronic books, pagers, and laptop computers.

The primary partner in the commercialization is Vitex Systems, Inc. Once a subsidiary of Battelle, the company was formed specifically to commercialize advanced packaging systems for the electronics market using vacuum polymer technology. While involved with a technology transfer partnership with PNNL, Vitex also formed strategic alliances with companies in the manufacturing industry who were producing display components. In 2001, Mitsubishi joined Vitex as an equity partner, acting as a strategic investor that brought financial, sales, and marketing expertise to the venture.

Presently, the PNNL technology is known commercially as Flexible Glass™ substrates and Barix™ encapsulation technology, which are being tested for use in electronic equipment by manufacturers around the world. In addition, the technology enables flexible displays to be used in car and aircraft instrument panels, large wall displays or billboards, and even in fabrics.

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Department of Energy
Sandia National Laboratories (SNL)

Mongrow/Thermogrow/ADVISOR Systems for Thin-Film Processing

A team at SNL has developed optical diagnostic tools and data collection/analysis software that dramatically improve the fabrication of devices for networking, telecommunications, solar energy conversion, sensors, and solid-state light sources. The methods and instruments used in the technology started out as tools for fundamental research designed to examine the basic chemistry and physics of film disposition. However, these tools were clearly valuable as routine in situ monitors of thin film growth during actual device fabrication. The team took it upon themselves to accelerate their research to a commercial product in order to benefit the nation's semiconductor industry.

SNL transferred this technology through licensing agreements with Thermo Oriel, an optical tool manufacturer, and Emcore Corporation, a manufacturer of tools and processes used to fabricate compound semiconductor wafers and devices. Along with SNL, Emcore is also the holder of a joint patent of the technology.

This technology has led to an easy-to-use commercial instrument for measuring growth rates, temperature, and thickness uniformity of thin film growth rates. In addition, calibrations that typically take days to complete can now be performed in only two hours.

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Department of Energy
Pacific Northwest National Laboratory (PNNL)

Radio Frequency Identification Tags for Tracking and Inventory

Radio frequency identification (RFID) tags, developed by a team at PNNL, are small, inexpensive tags that can identify, locate, and even determine the condition of any item to which they are attached. The tag is programmed with information that can be read by a hand-held reader, or interrogator, and sent to a computer. This technology can locate, secure and deactivate equipment; locate injured soldiers and send information to medical units; inventory and track weapons, tools and clothing; monitor nuclear reactors and material; and monitor emissions from vehicles. The tags developed by PNNL work well in highly metallic environments such as ships and airplanes.

The technology was brought to the marketplace by a PNNL spinoff company, Wave ID, to manufacture, market and distribute the tags. Because of the extensive marketing research done by the team, Wave ID successfully raised venture capital and formed business relationships. Within a year, Wave ID merged with Alien Technology, a company with a patented technology that dramatically reduces the cost of manufacturing electronic products.

Current global security concerns will likely increase the demand for products such as the RFID system. The ability to track and deactivate items such as military equipment and weapons may become extremely important in the war against terrorism. This technology, with its ability to be easily attached to anything that needs to be monitored or located—such as airplanes or ships—could prove to be a vital element in providing protection against terrorist acts.

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Radio Frequency ID Tag Team

Curt Carrender

Jill Farris

Michael Lind

Gary Morgan

Ron Gilbert

Department of Health and Human Services
Centers for Disease Control and Prevention (CDC)

Human Microvascular Endothelial Cell Line

Endothelial cells are crucial components of basic physiological processes such as tumor growth, wound healing, graft rejection, inflammation, circulation, and immune function. Most of these processes occur at the blood vessel level. The very qualities of endothelial cells present a problem for researchers because they are difficult to isolate and have a limited life span. As a result, scientists have had to use highly variable human tissue or live animals to conduct experiments. When Dr. Edwin Ades' research was stymied because of the inability to maintain a dependable source of cells, he recognized the need for an immortalized cell line. This led Dr. Ades and Francisco Candal, both of the CDC, to create the Human Microvascular Endothelial Cell Line (HMEC-1)—the first immortalized human microvascular endothelial cell line that retains the morphological, phenotypical, and functional characteristics of normal cells.

Francisco Candal

Dr. Ades and Candal were able to move the development of HMEC-1 forward through inter-institutional and licensing agreement with Emory University. Specifically, the university supplied the human cells for the HMEC-1 experiments. This technology has been successfully marketed through the original paper describing HMEC-1. This paper has achieved the status of being a classic in its field, having been cited in nearly 250 scientific publications according to the ISI Science Citation Index.

The HMEC-1 cell line is now used as an alternative to animal testing in the cosmetic and pharmaceutical industries to screen new compounds and drugs for toxicity to skin. The cells are also used to produce and harvest cellular products used in cancer screening protocols. In addition, HMEC-1 is used to coat vascular prostheses, such as stints, to reduce rejection. The technology has become a vital basic research tool in many fields such as immunology, wound healing, and viral infection.

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Dr. Edwin Ades

National Aeronautics Space Administration
Marshall Space Flight Center

Video Image Stabilization and Registration (VISAR)

Dr. David Hathaway and Paul Meyer of the NASA Marshall Space Flight Center (MSFC) have worked on a number of cases with police and the FBI, including the bombing at the 1996 Summer Olympic Games in Atlanta. The scientists successfully clarified nighttime videotapes filmed with handheld camcorders to reveal important details about the bomb and the explosion. Using their expertise and equipment for analyzing satellite video, Dr. Hathaway and Meyer created technology that can dramatically improve video images—including crime scene videos. Video Image Stabilization and Registration (VISAR) can turn dark, jittery images captured by home videos, security systems, and video cameras in police cars into clearer, stable images that reveal clues about crimes.

The MSFC team, which also included Sammy Nabors, transferred the technology through licensing with Barco Inc. and Intergraph Corporation. Barco is using its license to develop real-time hardware processing products. Intergraph Corporation is using VISAR software on its proprietary platform, called the Video Analyst System. A patent is pending on VISAR. In addition, VISAR has been well publicized on such media outlets as the Discovery Channel, CNN, Headline News, and a host of other national and international media.

The beneficiaries of VISAR technology include federal and local law enforcement, as well as the Department of Defense. With its ability to enhance and clarify video images, VISAR stands on the verge of revolutionizing image-processing technology. The economy will be greatly impacted through product development, not only in the U.S. but internationally. Thus far, nearly $100 million in product revenue has been projected.

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Dr. David Hathaway and Paul Meyer

Sammy Nabors

FLC LABORATORY DIRECTOR OF THE YEAR

FLC SERVICE AWARDS

FLC INNOVATIVE PARTNERSHIP AWARD

FLC SPECIAL RECOGNITION AWARD

Laboratory Director of the Year

The FLC honors these Laboratory Directors, who have made maximum contributions to the overall enhancement of technology transfer for economic development in 2001. Their accomplishments include support of FLC activities, internal efforts, industry involvement, and community service.

Dr. Antoinette Betschart
U.S. Department of Agriculture
Agricultural Research Service
Western Regional Research Center

Dr. Robert Goldston
Princeton Plasma Physics Laboratory

Brian Simmons
U.S. Army Developmental Test Command

FLC Service Awards

Harold Metcalf Award

Presented to an FLC Representative for sustained significant service to the FLC as an organization.

Winner: **Richard Dimmick,** Army Research Laboratory

FLC Representative of the Year

Presented to the FLC Representative who has made the most significant contribution to the FLC program in 2001.

Winner: **Patrick Rodriguez,** Air Force Research Laboratory

Outstanding Service Award

Presented to an individual who is not an FLC Laboratory Representative or Alternate for a notable contribution to the FLC in terms of sustained support and/or service.

Winner: **Mary Weiss,** Defense Technical Information Center

FLC Innovative Partnership Award

Dr. John Dinan
U.S. Army Communication-Electronics Command, Research, Development and Engineering Center (CECOM-RDEC)
Night Vision and Electronics Sensors Directorate

Dr. John Dinan is the recipient of the 2002 FLC Innovative Partnership Award, which recognizes an individual within the FLC who has shown the greatest commitment to the long-term results of technology transfer. As head of the Microfactory Group at the Night Vision and Electronics Sensors Directorate (NVESD), Dr. Dinan has been dedicated to nurturing technology transfer partnerships to a successful outcome.

Dr. John Dinan

Through Dr. Dinan's direction, new materials have been developed for the next generation of infrared focal plane arrays (IRFPA). The primary experimental vehicle for this development is the NVESD Microfactory, a six vacuum chamber that had become the focal point for mercury cadmium telluride materials development for the U.S. Dr. Dinan played a major role in exploiting the Microfactory to advance the technology transfer efforts at his facility in a number of ways. The structure is used by government scientists for experiments and fabrication. In addition, the Microfactory has become the site of technology development for the Army Small Business Innovative Research (SBIR) program.

To illustrate his commitment to bringing together government and industry, Dr. Dinan is working with several companies on the continued development of IRFPA technology. These companies include Rockwell Scientific, Raytheon, DRS Technologies, and Lockheed Martin. Dr. Dinan is also active in encouraging scientists and engineers from private industry to work alongside NVESD scientists at the Microfactory. From these partnerships, there have been four examples of technologies that have been "spun off" and are now in use at industrial sites.

Dr. John Dinan has proven himself to be a champion of technology transfer partnerships in the long-term and is a worthy recipient of this prestigious honor.

FLC Special Recognition Award

Dr. Jagdish Mathur
BAE Systems

The FLC recognizes Dr. Jagdish Mathur, of BAE Systems, for his longstanding dedication to the FLC as Chair of the National Advisory Council (NAC) from 1994 to 2001. An integral part of the FLC since 1993, Dr. Mathur has used his expertise in technology transfer issues to make the FLC accessible to everyone who participates in the technology transfer process.

As NAC Chair, Dr. Mathur worked to change the composition of the group to encourage more equitable representation. To this end he rewrote NAC bylaws to make the membership process simpler and actively recruited members from federal agencies, industry and academia.

Realizing that directors of federal laboratories had very little involvement in the FLC, Dr. Mathur devised an incentive to encourage their participation. In 1996, he established the Laboratory Director of the Year Award, which recognizes laboratory directors who have made maximum contributions to the overall enhancement of technology transfer for economic development. Dr. Mathur also established a second vehicle to spark laboratory director participation in the FLC. The Laboratory Directors Forum, held each year at the FLC national meeting, enables laboratory directors to share their perspectives on technology transfer and the FLC with an audience of technology transfer professionals.

Thanks to Dr. Mathur's proactive approaches, the participation of laboratory directors in the FLC has significantly increased. This provides a great benefit to the FLC laboratory directors, who as enthusiastic members provide greater support to their Offices of Research and Technology Applications (ORTAs). Although he stepped down as Chair last year, Dr. Mathur is still a member of the NAC, providing his experience and insight. The FLC is proud and appreciative of Dr. Mathur's commitment to the FLC—and to technology transfer.

Dr. Jagdish Mathur

HONORABLE MENTION: FLC AWARDS FOR EXCELLENCE IN TECHNOLOGY TRANSFER

Honorable Mention
2002 FLC Awards for Excellence in Technology Transfer

The FLC also recognizes these laboratories for their contributions to technology transfer.

Department of Agriculture

Crop Genetics and Production Research Unit, "Early Soybean Production System for the Mid-Southern U.S."

Honey Bee Breeding, Genetics, and Physiology Research Unit, "For Providing American Agriculture and Its Beekeepers with Honey Bees Resistant to Parasitic Mites"

Mosquito and Fly Research Unit, "Novel Attractant-Based Systems for Mosquito Detection, Surveillance and Management"

National Center for Agricultural Utilization, "Biodegradable Lubricants and Hydraulic Fluids from Renewable Resources"

Natural Resources Systems Research Unit, "Computer Modeling Technology for Water Resource Processes"

Nematology Laboratory, "Accurate Analysis of Nematodes in U.S. Wheat Exports"

Northwest Irrigation and Soils Research Laboratory, "Advantages of Afternoon Harvested Conserved Forages"

Small Grains and Potato Germplasm Research Unit, "Development of New Potato Varieties for the Pacific Northwest"

Southeast Fruit and Tree Nut Research Laboratory, "Development of Peach Varieties and Rootsticks for the Southeastern Peach Industry"

Western Cotton Research Laboratory, "Novel Method for Marking Insects Used in Biological Control"

Department of Commerce

National Institute of Standards and Technology, "Customer Service and Quality Improvements for Charpy Impact Verification Customers"; "Interoperability and Data Interchange Specifications for Biometric Technologies"

Department of Defense—U.S. Army

Army Research Laboratory, "Cascading Lasers"

U.S. Army Natick Soldier Center, "Flexible Composite Structural Textiles"

Department of Defense—U.S. Navy

Naval Research Laboratory, "Software Application for Hyperspectral Image Analysis"

Department of Defense—U.S. Air Force

Air Force Research Laboratory Propulsion Directorate, "Plasma Process for Silicon Carbide High Power Device Fabrication"

Air Force Research Laboratory Sensors Directorate, "Boeing Offers In-flight Internet Access Using AFRL Phased Array Antenna"

Department of Energy

Argonne National Laboratory, "Hand-Held Ultrasonic Gas and Particulate Sensor"

Idaho National Engineering and Environmental Laboratory, "Bioavailability Enhancement Technology for Remediation of Chlorinated Solvent-Contaminated Groundwater"; "PPAN Analyzer for Nondestructively Determining the Service Life of Materials"

Lawrence Livermore National Laboratory, "Commercialization of Aerocapacitor"; "Commercialization of the Hand-Held Advanced Nucleic Acid Analyzer Technology"; "In Situ Groundwater Remediation Using Commercialized Hydrous Pyrolysis Technology"; "Restructuring the High-Speed Flow Cytometry Technology License with Cytomation Inc."

National Renewable Energy Laboratory, "BioMax-15 Community Power System"

Oak Ridge National Laboratory, "Hybrid Valve Technology for Liquid Handling and Dual-Manifold System"; Prospect© Protein Structure Prediction and Evaluation Computer Toolkit"

Sandia National Laboratories, "Decontamination Formulation That Destroys Anthrax"; "EUVL Alpha Exposure Tool for Making Computer Chips Using Extreme Ultraviolet Light"; "LIGA Micromachining Process Technology"

NASA

Ames Research Center, "Smart Surgical Probe"

Glenn Research Center, "Numerical Propulsion System Simulation Version 1"

Goddard Space Flight Center, "Optical Fiber Cable Chemical Stripping Fixture"

Marshall Space Flight Center, "Commercialization of Direct Part Marketing of Matrix Symbols"

Kennedy Space Center, "Conversion of Nitrogen Oxide Scrubber Liquor to Fertilizer"

HONORABLE MENTION:
FLC LABORATORY DIRECTOR OF THE YEAR

Honorable Mention
FLC Laboratory Director of the Year Award

The FLC recognizes these nominees for their commitment to technology transfer activities within their laboratories.

Dr. K. Darwin Murrell
U.S. Department of Agriculture
Agricultural Research Service

Roy Bridges, Jr.
NASA
Kennedy Space Center

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

Dr. Ann Whitaker
NASA
Marshall Space Flight Center

HONORABLE MENTION: FLC SERVICE AWARDS

Honorable Mention
FLC Service Awards

The FLC recognizes these nominees for their longstanding service and support.

Harold Metcalf Award

Jerry Jones
Department of Defense
U.S. Air Force
Air Armament Center

Representative of the Year Award

Victor Chavez
Department of Energy
Sandia National Laboratories

Kelly McGuire
Department of Defense
U.S. Army
Army Aviation and Missile Command

Outstanding Service Award

Dr. Jagdish Mathur
BAE Systems

FLC National Meeting
May 6 - May 10, 2002
Little Rock, Arkansas