



Federal Laboratory Consortium  
for Technology Transfer

# AWARDS

April 24, 2019 • Orlando



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### Welcome to the 2019 FLC National Awards Ceremony

Welcome to this year's celebration of technology transfer superstars as they are publicly recognized for their outstanding efforts. These scientists, inventors, entrepreneurs, and the technology transfer professionals who brought them together truly personify this week's theme of "Creating Innovative Collaboration."

The commercialized technologies that we will hear about are new and innovative, but they will soon take their place in our everyday lives as many of our past winning technologies have—such as rechargeable lithium batteries, proton therapy to treat prostate cancer, and smartphone microscopes, to name only a few.

As amazing as the technologies are, however, the methods used to transfer them are noteworthy also. While tried-and-true mechanisms such as patents and licensing were used, some exciting new technology transfer approaches were implemented. Federal technology transfer is ever-evolving, and the individuals we are honoring have more than rose to the challenge.

The FLC 2019 national awards are presented in the following categories:

**Excellence in Technology Transfer Award** – Recognizes employees of FLC member laboratories and non-laboratory staff who have accomplished outstanding work in the process of transferring federally developed technology.

**Interagency Partnership Award** – Recognizes agency and/or laboratory employees from at least two different agencies who have collaboratively accomplished outstanding work in transferring a technology.

**State and Local Economic Development Award** – Recognizes successful initiatives that involve partnership between state or local economic development groups and federal laboratories for economic benefit.

**Executive Board Technology Focus Award** – Presented to a laboratory that has most successfully completed the transfer of a featured technology under the designated initiative for that year. The 2018 award recognizes energy-related technology transfer.

**Rookie of the Year Award** – Recognizes the efforts of an FLC laboratory technology transfer professional with three years (or less) experience who has demonstrated outstanding work in the field of technology transfer in a manner significantly above and beyond what was called for in the normal course of their work.

**Outstanding Technology Transfer Professional Award** – Recognizes the efforts of an FLC laboratory technology transfer professional (or team) who has demonstrated outstanding work transferring a technology in a manner significantly above and beyond what was called for in the normal course of their work.

**Laboratory Director of the Year Award** – Honors FLC laboratory directors who have made maximum contributions to support technology transfer activities in their organizations.

**FLC Service Award/Representative of the Year Award** – Presented to the FLC Representative who has made the most significant contribution to the Consortium in the past three years.

The FLC awards are a prestigious honor in the technology transfer world, with dozens of nominations submitted each year from among 300 federal laboratories and their agencies. It is my great pleasure and privilege to present the recipients of the 2019 FLC national awards.

Dr. Whitney Hastings

Awards Committee Chair



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# **EXCELLENCE IN TECHNOLOGY TRANSFER AWARDS**

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# Novel Sampling Methods for Beef Trim Pathogen Testing

Department of Agriculture  
Agricultural Research Service Plains Area, Meat Animal Research Center

Foodborne *E. coli* O157:H7, *Salmonella* and other Shiga-toxigenic *E. coli* (STECs) are common worldwide human infectious agents that can cause severe debilitating symptoms and, in some cases, may result in death. *E. coli* O157:H7 is a highly virulent agent that only requires a few organisms to make people sick. Carcass contamination by such agents during processing into food is one of the biggest challenges facing the meat industry today. To counter the threat, beef processors, under the supervision of the USDA Food Safety and Inspection Service (FSIS), have implemented comprehensive, robust food safety systems to keep beef safe and wholesome for consumers.

An important component of this safety system is a “test-and-hold” process whereby easily traceable batches of beef trimmings are isolated, sampled, and tested for *E. coli* O157:H7 and released for further processing only after a negative bacterial test result. Scientists at the U.S. Meat Animal Research Center in Clay Center, Nebraska, developed novel methods for collecting samples of fresh beef trimmings during meat production. A new process was developed that continuously samples beef trimmings as they fall from a conveyor belt into a 2,000-pound bin. A simple continuous sampling device (CSD) is positioned at the end of the conveyor so the majority of beef trimmings are sampled for bacterial contamination as they fall into the bin. The CSD consists of a stainless-steel bracket that holds a two-piece plastic cartridge that clamps and holds a food-grade sampling cloth specifically designed to capture bacterial samples. This makes it possible to sample more surface area of the beef trimmings during processing in a manner that easily integrates into existing processor systems. This technology concept was supported by the Nebraska

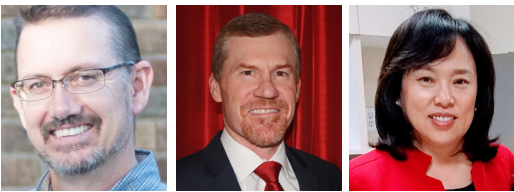
Beef Council through the Beef Checkoff and was commercially developed via a Cooperative Research and Development Agreement (CRADA) with partner AEMTEK, Inc.

AEMTEK exclusively licensed the technology from ARS in September 2017 and then sublicensed to Sentry Equipment Company to manufacture and market the CSD hardware as Pathtect®. AEMTEK also created a subsidiary company, FREMONTA Corporation, to sell the sampling cloth as the MicroTally® swab.

From a cost standpoint, this new technology provides the nondestructive testing of fresh meat products. This is significant as one of the previous methods required almost one pound of meat per sample, and some commercial beef processing companies run over a million tests per year. The technology revolutionizes beef trim sampling and when fully implemented will reduce worker sampling injuries, reduce sampling/testing costs, and reduce foodborne illnesses and costly product recalls.



Photograph of the continuous sampling device (CSD).



Left to right:  
Dr. Terrance Arthur, Dr. Tommy Wheeler, Dr. Florence Wu

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# Birds Don't Always Like What They See

Department of Agriculture  
Animal and Plant Health Inspection Service, National Wildlife Research Center

Wildlife cause billions of dollars of damage to agriculture and personal property each year. Scientists at the National Wildlife Research Center (NWRC) have long-standing partnerships with private companies and industry groups to investigate bird- and rodent-repellent compounds, formulations, and application strategies for reducing wildlife damage. One such partnership with Arkion Life Sciences has resulted in an intellectual property portfolio that includes two issued patents and two patent-pending applications regarding an animal's perception of ultraviolet (UV) light. These discoveries have allowed Arkion to develop repellent products based on a naturally occurring, plant-based compound called anthraquinone (AQ) for mitigating wildlife damage to agriculture and personal property. These products are cost-effective, practical, environmentally safe and socially responsible, and are currently marketed and sold nationally and internationally.

AQ was first patented in 1944 as a repellent to reduce bird damage to agricultural crops. At that time, the assumed mode of action was post-ingestive stress (e.g., experiencing a negative reaction to consumption). NWRC-Arkion research led by NWRC research wildlife biologist Dr. Scott Werner has shown that AQ can also cause avoidance behaviors in birds and mammals through visual cues related to the compound's absorption of the UV spectrum. As a result, additional repellent products and application strategies have been designed that “trick” birds and mammals into overlooking food items or deter them from sitting or perching on items. Werner's research has also shown that if birds come into contact with AQ first, other less expensive compounds with similar UV

spectral characteristics can be substituted for AQ in subsequent applications or subsequent applications of AQ can be made at lower application rates.

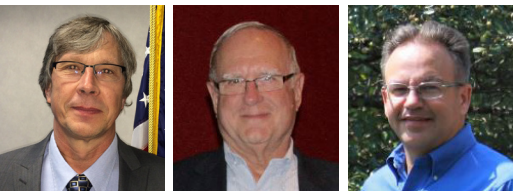
The results of the NWRC-Arkion partnership not only impacts wildlife conservation and crop and disease protection in the U.S., but also food production in less-developed countries. For example, an AQ-based product used as a seed treatment on upper Midwest corn crops has significantly reduced sandhill crane damage to newly planted corn seed, thus reducing the need to lethally remove cranes. Rice seed treatments significantly reduce blackbird and grackle damage to newly planted rice, and foliar applications to emergent soybeans reduce damage caused by grazing geese. Furthermore, applications made to perch sites on the outside of poultry facilities cause wild birds to avoid those areas, thereby reducing the threat of wild birds transmitting diseases to domestic poultry flocks. Most recently, Arkion announced the registration of a product in the Republic of Ghana for an AQ-based repellent for rice seed. Initial repellent field trials on Ghanaian rice have doubled its yield, representing changes from subsistence to cash crop farming and allowing children to go to school rather than scaring birds away from rice fields.



Ghanaian farmers harvest rice following a field trial with Arkion's anthraquinone-based bird repellent.

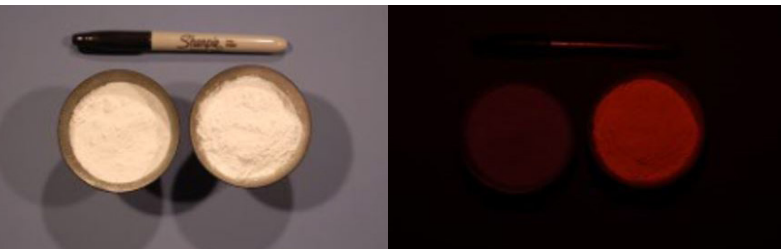


A European starling sampling an ear of corn treated with Arkion's anthraquinone-based bird repellent.



Left to right: John Eisemann, Ken Ballinger, Scott Werner

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Anthraquinone (AQ) is used as a bird repellent. It looks white to people (left photo), but red to birds. USDA solely owns one patent, co-owns one patent, and co-owns three provisional patent applications for AQ technologies with Arkion Life Sciences.



## Niagarafiles/Apache NiFi

Department of Defense  
National Security Agency

Managing data in motion—the flow of information through and between different systems—is mission-critical for both the intelligence community (IC) and virtually every commercial enterprise. Technology developed by the National Security Agency (NSA) to route and prioritize intelligence information for mission use has been released to the open source software community and adapted to serve the growing big data needs of industries ranging from energy and communications to the emerging Internet of Things (IoT).

To ensure that the IC gets the most valuable information to those who need it first, the NSA developed Niagarafiles, technology that automatically manages the flow of data across systems. Niagarafiles automates the management, manipulation, and storage of large streams of data in real time. The technology can understand and transform data in a variety of formats, easing transfer across different systems and technologies. To prioritize data flows, Niagarafiles makes complex routing decisions based on both the content of the data and its context. The technology also provides interactive command and control of data flows, allowing engineers to quickly change how data is assessed and transmitted. By automatically embedding context into discrete data flows as they move across and between systems, Niagarafiles creates a fine-grained chain of custody for information, which led to organic interest across the IC.

First created in 2006, Niagarafiles was rapidly adopted for mission use by the IC over the next three to four years. In 2014, the technology was released to the open source community as Apache NiFi, and more than 150 unique contributors have made improvements that have benefitted both the NSA and its commercial users. By releasing its source code to the open source software community, the NSA both increased NiFi's agility and security, and brought to commercial markets the big data technology now used by hundreds of companies worldwide. Fortune 500 companies ranging from ExxonMobil and Ford to AT&T and Lenovo are now using open source and commercial adaptations of NiFi to manage data flows. For the NSA, open sourcing the technology has led to significant improvements relevant to its mission to strengthen the tool's capabilities. The NiFi release was the first to use the standardized NSA open sourcing process that the NSA Technology Transfer Program (TTP) developed for the future release of other technologies. More than 30 additional NSA technologies have been released into the public domain, benefitting the Agency, industry, and the nation's economy.



Left to right:  
Joe Witt, Linda Burger, Karen Presley

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## Transfer of Nipah Virus Treatment Amid an Outbreak in India

Department of Defense  
Uniformed Services University of the Health Sciences

In May 2018, Kerala State in India experienced its first outbreak of the deadly Nipah virus. Due to the high fatality rate of Nipah virus (typically over 75 percent), the Indian Department of Health sought assistance, through the Uniformed Services University (USU), obtaining the experimental treatment, m102.4 human monoclonal antibody, to prevent further deaths. m102.4 is the only known existing treatment for humans exposed to and infected with the deadly Nipah virus and the closely related Hendra virus.

The m102.4 antibody was developed in the laboratory of Dr. Christopher Broder at USU, in conjunction with colleagues formerly at the National Institutes of Health. Dr. Broder, contacted by individuals in India for the m102.4 treatment, connected all parties involved in the transfer of this technology, as well as remained involved in discussions throughout the process. Dr. Mark Scher at The Henry M. Jackson Foundation for the Advancement of Military Medicine, Inc. (HJF), through the joint USU-HJF Office of Technology Transfer, received the official request from the Indian Department of Health, via Dr. Jeanette Young, Chief Health Officer of the Queensland Australia Government (Queensland Health), who previously worked with HJF and USU for transfer of the m102.4 for compassionate use in humans in Australia due to Hendra virus infections or exposures. Dr. Martina Jones of the Australian Institute for Bioengineering and Nanotechnology of the University of Queensland (which produced and stockpiled the Australian supply of good manufacturing

practice-produced m102.4) acted quickly to ensure that the agreement with the Indian Council for Medical Research (ICMR) for the physical transfer was executed. Balram Bhargava, Secretary of the Indian Department of Health, acted on behalf of the government of India and provided the assurances required for the transfer to ICMR.

Recognizing the critical need and high priority of the request in order to save lives, the multiple international parties worked together to rapidly draft and execute the multiple letters of agreement and a material transfer agreement permitting transfer and use of the m102.4 in the Kerala outbreak, as well as permitting stockpiling for future outbreaks. All of these agreements were executed in seven days, and the m102.4 material arrived in India seven days later. Although the m102.4 was not administered in the May 2018 outbreak, ICMR now has the m102.4 on hand for the next outbreak. In addition, this transfer allowed the stockpiling of m102.4 for compassionate use in a short time frame.



Left to right:  
Christopher Broder, Ph.D.  
Mark G. Scher, Ph.D.

Winners not pictured:  
Dr. Jeanette Young  
Dr. Martina Jones  
Balram Bhargava

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## Exemplary Retransfer of Aquatic Biomonitor Through Combined In-Licensing/Out-Licensing

Department of Defense - U.S. Army  
U.S. Army Center for Environmental Health Research

The Aquatic Biomonitor (AB) is a device that analyzes the changes in behavior of bluegill fish to detect toxins in water. It can be used to monitor water quality at the source (such as a reservoir) or after treatment (such as treated wastewater outflow). The device is useful for utilities such as water treatment plants and wastewater treatment facilities, and serves to protect both the people who drink the water as well as the environment.

Although source water is tested and treated before it is passed along to citizens for consumption, it is only periodically tested for certain toxins based on Environmental Protection Agency protocol. Toxins could be present but not detected. Similarly, although wastewater must meet certain quality standards before it is released, levels of toxins are not constantly monitored. The AB technology allows highly sensitive continuous detection of toxins and remotely notifies authorities if there is any change in fish behavior that could indicate contamination. The device is calibrated to limit false alarms and is amazingly accurate.

David Trader, a research scientist and technology transfer specialist at the U.S. Army Center for Environmental Health Research (USACEHR), worked with Blake Sajonia, a technology transfer licensing officer from USACEHR's parent lab, Medical Research and Materiel Command (MRMC), to salvage a stalled original transfer of this technology and establish a new licensee, Blue Sources, LLC. The tech transfer process was complicated by the fact that the original licensee had developed technical drawings,

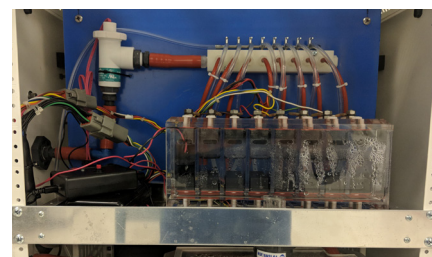
material lists, and critical software source code that was not part of the original patent relinquished to the Army. Trader and Sajonia were able to acquire the source code and other materials through a strategically designed in-license with Honeywell, which owned the rights to the materials needed. They then established a license agreement with Terry Collins and Dave Barr of Blue Sources that provided everything necessary to resurrect the technology. From that license grew a Cooperative Research and Development Agreement between Blue Sources and USACEHR for ongoing technical support and funding support from Maryland TEDCO.

This technology transfer is unique in that it gave second life to a previously defunct technology transfer. It also represents an innovative use of in-licensing for both USACEHR and MRMC. The in-license was executed masterfully so the needs of both USACEHR and Honeywell were met, and Blue Sources was also able to begin its work seamlessly despite what could have been a major bump in the tech transfer process. The AB technology quietly protects hundreds of thousands of people from potential toxins in their drinking water and protects the environment from toxic harm in areas where it is installed.



*Pictured: Col. Thomas Timmes, David Trader, Blake Sajonia, Terry Collins, and Dave Barr*

*Winner not pictured: P.J. Bellomo*



*Inside a Blue Sources Aquatic Biomonitor unit is a chamber that houses eight bluegill in separate compartments flanked above and below by electrodes that monitor their behavior changes. (Photo credit: Terry Collins)*



*Bluegill (*Lepomis macrochirus*) are fish that are very sensitive to changes in water quality and thus can be used by humans to monitor the condition of water sources. (Photo credit: David Trader)*



*The Aquatic Biomonitor technology was selected to be showcased at the 2nd Annual Smithsonian Military Invention Day in spring 2018. (Photo credit: Christina Watson)*

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## Antimalarial Drug Tafenoquine

Department of Defense – U.S. Army  
U.S. Army Medical Materiel Development Activity

With no vaccine yet available, malaria persists as one of the top infectious disease threats to U.S. military service members and support staff stationed overseas. A serious and sometimes fatal disease, malaria is transmitted by *Anopheles* mosquitoes infected with one of several species of the causative agent, the protozoan *Plasmodium*. Although only about 1,700 U.S. cases are diagnosed each year, the vast majority are found in travelers returning from endemic areas that include sub-Saharan Africa, the Middle East, and South Asia. Malaria occurs in more than 100 countries and territories and threatens almost half of the world's population. The World Health Organization (WHO) estimates that 216 million clinical cases of malaria occur annually, causing 445,000 deaths. The disease has long wreaked havoc globally on both public health systems and local/national economies, and WHO's strategies are now targeting the reduction of global incidence by at least 90 percent by 2030.

Tafenoquine recently became the first new prophylactic drug against this global health threat approved by the U.S. Food and Drug Administration (FDA) in more than 18 years. An 8-aminoquinoline chemical derived from primaquine, the drug was first synthesized in 1978 by scientists at Walter Reed Army Institute of Research (WRAIR). Following extensive WRAIR research on the candidate drug, a technology transfer effort by the U.S. Army Medical Materiel Development Activity (USAMMDA) now adds an important weapon to the U.S. military's antimalarial repertoire, protecting troops during overseas deployments.



*The tafenoquine team - Left column (top to bottom): MAJ Katherine A. Carr, MAJ Victor E. Zottig, Col. Lisa Thomas Read, Col. (ret) Bryan Smith Group photo (left to right): Barry Datlof, Robert Charles, Jeremiah Kelly, Judy L. Holian, Jennifer Rebelez*

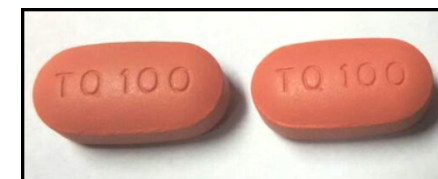
Contact: Judy Holian, (301) 619-4712, judy.l.holian.civ@mail.mil



In 2013, USAMMDA accelerated Army efforts to transition the WRAIR tafenoquine technology as a prophylactic drug seeking FDA approval. The tafenoquine team compiled a list of requisite criteria for successful tech transfer of tafenoquine and contacted several pharma companies, focusing on each company's interest in and capabilities to achieve the additional tafenoquine research and development needed to take the drug to FDA review and subsequent marketing.

The tafenoquine team at USAMMDA subsequently selected 60° Pharmaceuticals as the best fit to commercialize tafenoquine and best protect deployed Department of Defense (DoD) personnel. A notable factor in the company's selection was the expertise of former WRAIR/USAMMDA scientist Geoffrey Dow, the company's co-founder and current CEO, who has more than 20 years' experience in tropical diseases, including antimalarial drug development.

In December 2017, 60° Pharmaceuticals submitted technical documents on tafenoquine to the FDA for U.S. licensing. The company had to ensure that its tafenoquine tablets are in full compliance with FDA regulations regarding quality, bioavailability, and other factors. The company also submitted a market licensing application to the Therapeutic Goods Administration in Australia (approved September 2018). It has committed to provide the drug commercially, with anticipated launches in U.S. and Australian markets this year.



*Unlike currently available antimalarial drugs, tafenoquine, which comes in tablet form, is effective against all life-cycle stages of the malaria parasite.*



*Partners USAMMDA and 60° Pharmaceuticals have succeeded in developing an FDA-approved, once-weekly malaria prophylaxis drug called Arakoda.*



*Malaria is transmitted by *Anopheles* mosquitoes infected with one of several species of the causative agent, the protozoan *Plasmodium*.*





## The Burn Navigator

Department of Defense – U.S. Army  
U.S. Army Medical Research and Materiel Command |  
U.S. Army Institute of Surgical Research Burn Center

The need for a decision support system that would allow non-expert clinicians to administer high-level burn resuscitation protocols in the field or at a hospital drove the development of the Burn Navigator. This computer-assisted system was developed by the U.S. Army Medical Research and Materiel Command (USAMRMC)/U.S. Army Institute of Surgical Research (USAISR) in collaboration with the University of Texas Medical Branch (UTMB). The technology was transferred via interinstitutional agreement between USAISR and UTMB and via patent license from UTMB to its commercial partner, Arcos, Inc.

Burn Navigator can prevent both burn shock syndrome and compartment syndrome, resulting in better overall outcomes and fewer burn injury deaths. It is equally applicable in prolonged field care and in hospitals and burn units. Some of the foremost burn centers in the country, together with USAISR and the Blocker Burn Unit at UTMB, are part of a two-year study to determine how the Burn Navigator affects outcomes for 300 patients.

The Burn Navigator is currently used throughout the Army's deployed units and in 12 percent of U.S. civilian burn centers. The technology underlying the Burn Navigator was awarded seven patents between 2010 and 2016. It received U.S. Food and Drug Administration clearance in 2013, and is currently being distributed to Army medical field units. It has been field-tested at USAISR and is now the standard of care there.

The Burn Navigator is the only product of its kind, thus providing a unique capability. It is the only device that synthesizes the collective knowledge of burn experts into a tool that can help medical staff anywhere, at any time, to provide the highest level of care.



Arcos Medical Burn Navigator™ - U.S. Army  
(Photo credit: Dr. Steven Galvan - USAISR Public Affairs)

The mission of the USAISR Burn Center is to serve as the “sole facility caring for combat burn casualties, beneficiaries and civilian emergencies within the Department of Defense.” State-of-the-art scientific care is coupled with combat casualty care research focused on improving battlefield care for the combat wounded. The Burn Navigator addresses the need for improved battlefield care superbly, especially during the first critical 24-48 hours of care after a traumatic burn injury. The software was first developed for use on a computer and then transitioned to a mobile tablet; it is now available as a cloud-based version and for use with a smartphone. Arcos, the company commercializing the technology, is currently working on a Burn Navigator app to be used on any smart device.

Burn Navigator collects expert burn clinicians' knowledge and experience, and uses several algorithms to recommend the best course of action based on the real-life experience. The



Burn Navigator in use at USAISR Burn Center - U.S. Army. (Photo credit: Dr. Steven Galvan - USAISR Public Affairs)



Pictured:  
Chris Meador



Left to right: George Kramer, Ph.D., Jose Salinas, Leopoldo C. Cancio, MD, Maria Serio-Melvin, Neche N. Harris, Paul Mele, Ph.D., Richard J. Jocz, Scott Brady  
Winners not pictured: Dr. Kevin Chung, Guy Drew, Ada Garcia, Col. (Ret.) Elizabeth Mann-Salinas, Dr. Sundeep Mattamana, Dr. Steven Wolf

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## SHRAIL™ (the Sirkin-Hiles Rail)

Department of Defense - U.S. Army  
U.S. Army Medical Research and Materiel Command

Despite dramatic advancements in combat medicine, medical litters or stretchers have changed little over the conflicts of the past century, and surgeons in far-forward situations often are unable to use standard surgical tools in the absence of an operating room table equipped with a retractor, arm boards, intravenous poles, lights, and other instruments.

Conceived by two U.S. Army combat surgeons, the SHRAIL™ (Sirkin-Hiles Rail) medical device is a lightweight rail system that allows medical personnel to attach a small surgical rail to the side of a standard litter that, in turn, serves as a standard attachment point for any needed medical equipment. Consisting of four anodized aluminum rails with color-coded locking nuts, the SHRAIL weighs 15 pounds and can be collapsed and carried in a backpack, making it available in a broad range of battlefield scenarios.

Despite the seeming simplicity of the solution, previous efforts to create a portable, lightweight support system for surgical tools on standard litters had failed. What Army Col. Jason Hiles and Maj. Max Sirkin did was envision an elegant, easy-to-assemble solution that met the size, weight, and time constraints of medical personnel operating in austere combat and far-forward scenarios.



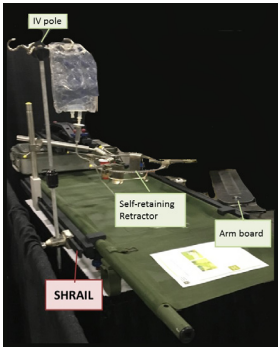
U.S. Army combat surgeons Col. Jason Hiles (L) and Maj. Max Sirkin (R) drew from their experience in the field to develop the SHRAIL (Sirkin-Hiles Rail), a lightweight rail system that mounts to a standard NATO litter to enable surgical procedures and other medical interventions that would otherwise not be possible in far-forward and inaccessible locations. Along with helping save lives in combat situations, the technology has commercial applications, including remote search-and-rescue operations, humanitarian efforts, and the ability to create overflow critical care capacity in civilian hospitals responding to mass casualty events. In December 2017, Morzine Medical, LLC, entered a patent licensing agreement with the U.S. Army Medical Materiel Development Activity (USAMMDA) in conjunction with the U.S. Army Medical Research and Materiel Command (USAMRMC) Medical Technology Transfer office to market the SHRAIL as an off-the-shelf commercial product.

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In December 2017 Morzine Medical, LLC, entered a patent licensing agreement with the U.S. Army Medical Materiel Development Activity (USAMMDA) in conjunction with the U.S. Army Medical Research and Materiel Command's Medical Technology Transfer office. Morzine Medical, which manufactures other austere surgical products including a stationary operating table, developed a commercially available SHRAIL™ and is preparing to market it as a commercial off-the-shelf product. The company proved to be an ideal partner to commercialize the USAMMDA technology, having already successfully penetrated the field medicine market through U.S. military sales of its Doak M4 Portable Surgical Table. The SHRAIL™ was a perfect fit to expand the company's product line and provide a resource for purchase of the product for the military.

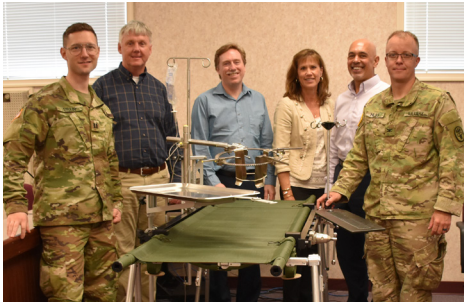
Along with helping to save lives in combat situations, the technology has commercial applications, including remote search-and-rescue operations, humanitarian efforts, and the ability to create overflow critical care capacity in civilian hospitals in the event of a mass casualty event. For the U.S. Army, commercial transfer is a necessary component of ensuring that the SHRAIL meets its potential of saving the lives of seriously injured warfighters in combat settings or remote locations. Licensing the patented technology to a commercial developer exploring these potential markets makes it far more likely that the lifesaving device will be manufactured at scale and made available to the military to assist austere medical operations in combat and far-forward situations.



The SHRAIL's universal mount allows medical personnel to treat patients on a medical litter or stretcher with standard surgical tools, including an arm board, self-retaining retractor, IV pole, and lighting. Without such tools, many forms of surgery and other life-saving medical procedures are not possible in remote locations.



Drawing from the example of the common Picatinny rail system used on all military firearms, Drs. Hiles and Sirkin envisioned the SHRAIL as a universal platform on which medical personnel could quickly and consistently mount whatever equipment they needed to treat a patient in austere emergency situations.



Pictured: Maj. Max Sirkin, Mark Brown, Steven Hawbecker, Judy Holian, Blake Sajonia, and Col. Jason Hiles

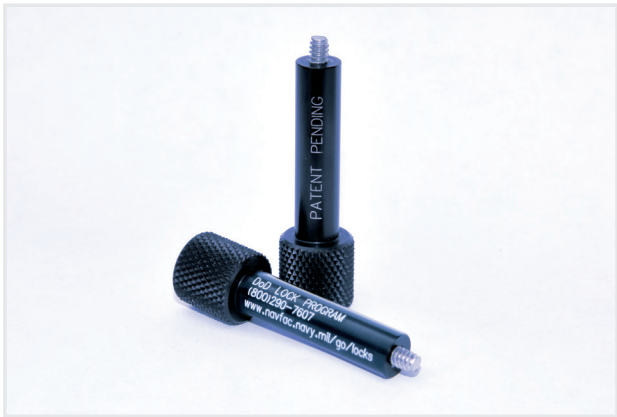
Winners not pictured: Alan Epstein, Barry Datlof





## Spindle Locator Tool

Department of Defense - U.S. Navy  
Naval Facilities Engineering and Expeditionary Warfare Center, Port Hueneme



How does the federal government physically store its most sensitive information? Special security containers and electromechanical combination locks are used everywhere that high-value national security information (i.e., classified information) must be stored. The locks are used across 17 different U.S. intelligence organizations (e.g., Central Intelligence Agency, Federal Bureau of Investigation, and elements within the Department of Defense) all over the world.

A problem with the lock could have far-reaching implications for the federal government user and even national security. A problem was indeed discovered that permeated the U.S. intelligence community and reached the highest level of its leadership, the Director of National Intelligence. This problem was that users were being locked out of their own containers, aptly named a “critical lockout failure.” The problem boiled down to improper installation of the lock and, specifically, improper alignment of the internal spindle that engages the device when the dial is turned.

For resolution, the problem was brought to John Schmutz, Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC), a Physical Security Specialist and field support technician for the Department of Defense (DoD) Lock Program. Schmutz devised a solution, called the Spindle Locator Tool, that helps the installer ensure that the spindle is properly seated inside the lock. The tool can also be used to inspect the lock after

installation. This simple solution ensures proper installation of the lock, preventing future critical lockout failures and avoiding the expense of valuable time and money—anywhere from \$9,000 to \$120,000 per instance, depending on the severity and geographic location (e.g., overseas) of the lockout. The solution also means that users avoid work stoppage and mission downtime, potentially several weeks, from a lockout failure. For users in the military and intelligence services, delays can mean risks to personnel safety and national security.

The team of Schmutz, Victor Cai, and Marti Elder enabled transfer of the Spindle Locator Tool to Lockmasters, the company that had the capability to manufacture and distribute it, and overcame significant challenges in the process to ensure the success of the transfer. In their respective roles as inventor, interim Office of Research and Technology Applications (ORTA) officer and agreement facilitator, these three individuals provided technical acumen, vision, leadership, and expertise at a time when the NAVFAC EXWC technology transfer office was undergoing a difficult transition period. They also devised and executed a strategy to expedite the technology transfer timeline in the face of pressure from the nation’s highest levels of U.S. government intelligence. Navigation of the extensive and multifaceted technology transfer process, including execution of complex technology transfer agreements, would not have been possible without their individual contributions.



*Pictured:*  
John Schmutz  
*Winners not pictured:*  
Victor Cai, Marti Elder

Contact: John Schmutz, (805) 982-6962, john.e.schmutz@navy.mil

## GoX Studio Ergo Wearable Sensor Kit

Department of Defense - U.S. Navy  
Naval Surface Warfare Center, Crane Division

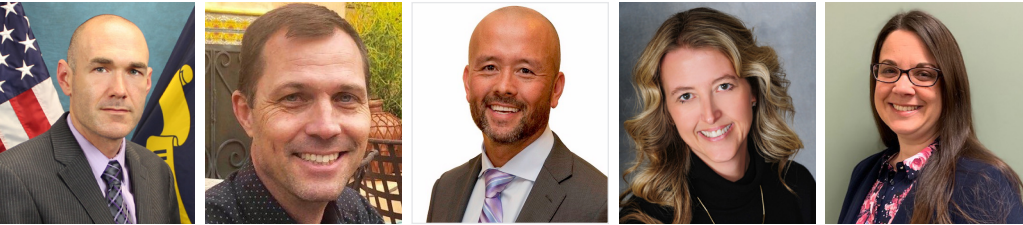


A patented approach to measuring power generated during activities such as walking and running, developed by an injured veteran working at the Naval Surface Warfare Center, Crane Division (NSWC Crane), is now being integrated into next-generation military equipment as well as athletic, therapeutic, and human performance solutions in the commercial space.

NSWC Crane engineer Dr. Robert Templeman, an avid runner and specialist in microelectronics, recognized the potential benefit of applying the same kind of power-measuring technology found in sensors embedded in the pedals of cycling equipment to measure human performance during walking, running, and other physical activities. The ability to measure foot power, not just steps and stride, can be combined with software algorithms to measure form, fatigue, force, and the rate of exertion, making it easier to protect individuals from injury and improve their performance.

This patented NSWC Crane technology was identified by GoX Studio’s founders as the “missing link” in an integrated software and sensor package the veteran-owned small business was developing for the ergonomics, healthcare, and fitness markets. Enabled by a Patent Licensing Agreement and a Cooperative Research and Development Agreement between NSWC Crane and GoX Studio, the collaboration resulted in the creation of several working prototypes of the technology embedded as sensors in shoe insoles, which were used in U.S. military human-performance trials.

Along with commercially marketing the technology to companies in the fitness, ergonomics, and healthcare sectors, GoX Studio’s insole technology also is being integrated into the initial prototype for the TALOS (Tactical Assault Light Operator Suit), the so-called “Iron Man” exoskeleton being developed by the U.S. Special Operations Command to support future warfighters with both physical protection and information from embedded sensors. With the ability to better serve the warfighter and grow the economy by leveraging the current demand for wearable tracking devices in the commercial marketplace, the collaboration between NSWC Crane and GoX Studio exemplifies the dual benefits of technology transfer.



*Left to right:* Dr. Robert Templeman (inventor), Dr. R. Bruce Floersheim (co-founder of GoX), Dr. Joseph Hitt (co-founder of GoX), Brooke Pyne (NSWC Crane ORTA) and Jenna Dix (NSWC Crane Agreements Manager)

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## LED Air Warning System (LAWS)

Department of Defense - U.S. Navy  
Naval Surface Warfare Center, Panama City Division

First Responder public safety divers (PSDs) often conduct dive missions in environments characterized by zero visibility. These poor visibility conditions make it virtually impossible to read air pressure gauges, even with auxiliary illumination, resulting in divers being unable to effectively monitor their remaining air supply during missions. Because the situation is so perilous, loss of life for PSDs in these conditions is not uncommon. The majority of PSD communities use a device with a single light emitting diode (LED) indicator light that alerts only when air supply is critically low, essentially amounting to a “warning of last resort.”

The LED Air Warning System (LAWS) has changed that, providing a clear visual display of a diver’s air pressure (even in zero visibility conditions) over the duration of a dive. The LAWS technology is effective, affordable, integrates with existing equipment, and meets a critical need in the PSD community. LAWS also has application to military diving missions, as well as a direct commercial application for recreational, scientific, (e.g., for research and scientific study), and commercial diving industries such as oil exploration, offshore construction, underwater inspection and maintenance, and underwater photography and videography.

A team at the Naval Surface Warfare Center, Panama City Division (NSWC PCD) brought their unique experience, expertise, creativity, and innovation to address the challenge and create a successful technology transfer. Dennis Gallagher, NSWC PCD Office of Research and Technology Applications (ORTA) representative, played the leading role, bringing together critical players and driving the transfer from concept to commercialization. Gallagher led the implementation via partnerships between federal government, industry, and academia, including an

Education Partnership Agreement with Florida State University-Panama City; and a Cooperative Research and Development Agreement with industry partner Interspiro AB.

Gallagher pulled together a team of scientists and engineers from different disciplines at key points in the transfer process. Together, these individuals used their collective expertise to satisfy design and functionality requirements, reduce complexity, and reduce costs in the final product design, driving the technology’s development and ultimate transfer.

LAWS will provide increased safety and new capability for PSDs. The commercial potential for the technology is significant, with a potential sales projection of 8,000-15,000 units in the U.S. alone. The international diver market also holds great commercial potential, and commercial partner Interspiro already operates in nine countries on four continents. LAWS hit the “grand slam” of technology transfer. A federally developed technology was transitioned to a new product with direct application to the military user, first responders, and the private sector.



LAWS unit mounted to Interspiro Divator MK II Full Face Mask



Left to right: Allie Williams, Bengt Kjellberg, Bill Hughes, Brian Wentworth, Bryan Le, Dennis Gallagher, Geoffrey Brooks, Ph.D., Richard Manley, Hayden DeForge

Contact: Dennis Gallagher, (850) 235-5417, dennis.g.gallagher@navy.mil

## Laser Analysis and Sorting Instrument (LASI)

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

The Laser Analysis and Sorting Instrument (LASI) is a Navy-patented device and method of using lasers to separate and characterize particles in fluids. Developed at the U.S. Naval Research Laboratory (NRL), the technology uses a combination of advanced optics and microfluidics. A fluid flow pushes samples containing particulates through a network of flowing channels, where laser light interacts with streaming particles to create optical forces unique to those particles. Different particles, such as red blood cells or bacteria, react differently based on factors like size, surface morphology, shape, refractive index, and internal structures. By measuring cell responses, the instrument can identify and sort single cells based on their physical, biochemical, and biological characteristics.

The NRL team—Dr. Sean Hart, Dr. Rita Manak, Alex Terray, and Amanda Horansky McKinney—were principally responsible for the successful LASI technology transfer to LumaCyte, LLC, a research, instrumentation, and analytics company based in Charlottesville, Virginia. Formal transfer of the NRL-developed technology to LumaCyte occurred under a Cooperative Research and Development Agreement (CRADA) signed in March 2014, followed by a Patent License Agreement (PLA) executed in the same month.

The technology transfer effort built upon professional relationships among the team members that began years earlier at NRL, where co-inventors Dr. Hart and Terray worked together for more than a decade developing LASI technology. These relationships underlie the unique aspect of this transfer: the uncommon technology transfer process of an NRL inventor (Dr. Hart) leaving the lab to create a company (LumaCyte) specifically to transition his invention, while his co-inventor (Terray) remained at NRL, running the

LASI program and serving as the Navy lab’s lead during the technology transfer. Under the CRADA and PLA agreements negotiated by NRL’s technology transfer experts (Dr. Manak and Horansky McKinney), the two LASI researchers sustained a constant, symbiotic exchange of information that yielded a much-improved commercial product.

This effort led directly to LumaCyte’s LASI-based Radiance™ instrument now on the market, which offers a more rapid, highly sensitive automated analysis and sorting of cell mixtures. By depending on the cell’s intrinsic properties, LASI has the noteworthy feature of not requiring the addition of antibody or genetic labels typically used to tag cells pre-assay. This is a significant advance over similar instrument technologies. There is a constant need for more powerful laboratory tools across the myriad fields within biological research, development, and technology. Anticipated beneficiaries of the Navy technology include R&D programs in vaccine manufacturing, cell therapy, infectious disease, drug discovery, and cancer diagnostics and treatment.



LumaCyte’s Radiance™, shown with an optional auto-sampler, utilizes Laser Force Cytology (LFC) based upon NRL’s LASI technology.



Left to right: Alex Terray, Amanda Horansky McKinney, Dr. Sean Hart  
Winner not pictured: Dr. Rita Manak

Contact: Dr. Sean Hart, (888) 472-9295, sean.hart@lumacyte.com



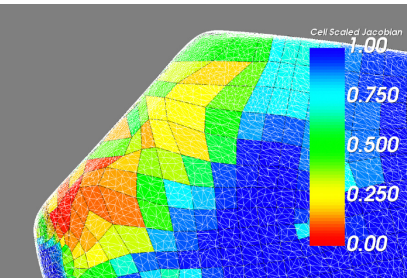


# FEMORPH Section 801 Software License: First in Department of Defense

Department of Defense - U.S. Air Force  
Air Force Research Laboratory, Aerospace Systems Directorate



Each part in a modern warplane's engine is a complex, costly, and mission-critical component. By developing modeling and simulation software to assess irregularities in turbine blades, the U.S. Air Force Research Laboratory Aerospace Systems Directorate (AFRL/RQ) created a new approach and software package to determine which mission-critical parts are within fault tolerances, thereby providing opportunities for substantial cost savings and improved readiness within the Air Force—and beyond.



Developed by AFRL/RQ engineer Dr. Jeff Brown, FEMORPH brings advanced modeling and simulation (M&S) computational models to bear on one of the most mission-critical parts of a warplane—the turbine blades powering its engines. By comparing precise turbine blade measurements against historical data to answer mission-critical questions involving their airworthiness, remaining life and risk of failure, FEMORPH provides repair facilities with better information, increasing the number of repairable parts, extending their usable life, reducing costs, and ultimately resulting in more airworthy planes for the warfighter.

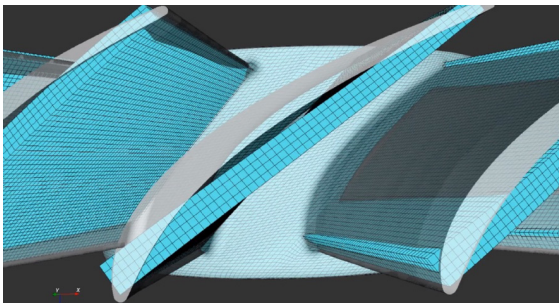
Dr. Brown also recognized the software's potential to help the original equipment manufacturers (OEMs) who create the parts identify manufacturing and repair deviations, resulting in reduced defects and manufacturing costs. Initial conversations with



Pictured: Dr. Jeff Brown  
Winners not pictured:  
Charles Figer  
Alexander Kaszynski

engineers at a major turbine blade manufacturer improved FEMORPH's capabilities and ultimately resulted in the first technology transfer using a new software licensing approach within the Department of Defense, as established in Section 801 of the 2014 National Defense Authorization Act.

Licensing support and feedback from OEM manufacturers are allowing Dr. Brown and AFRL/RQ to further refine the software and develop new modules for different processes, including different repair approaches such as blending, which will yield further benefits for warfighters over time. Beyond aerospace, the computational models embodied by FEMORPH also have a significant potential role in quality control in virtually any advanced manufacturing industry involved in the creation and maintenance of mission-critical parts, which could ultimately help sustain the nation's overall economic competitiveness as a manufacturer of complex, high-value equipment in a variety of sectors.



Developed by an AFRL engineer and contractor, FEMORPH software takes advantage of new ways to measure the complex contours of engine turbine blades to compare precise measurements against historical data to answer mission-critical questions involving their airworthiness, remaining life, and risk of failure, as illustrated by these two screenshots. Recognizing the value of the technology in manufacturing as well as maintenance, AFRL/RQ entered the first-ever Department of Defense software licensing agreement with a licensee in the aerospace industry.

Contact: Dr. Jeff Brown, (937) 255-7223, jeffrey.brown.70@us.af.mil

# LLMDA and Applied Biosystems Axiom Microbiome Array (ABAMA)

Department of Energy  
Lawrence Livermore National Laboratory



Human disease, agricultural contamination, and pharmaceutical impurity are caused by pathogens—bacteria, viruses, and fungi. Knowing which pathogen is present is the key to ensuring human safety. Imagine a technology that can identify in one comprehensive test any pathogen that may compromise safety. You are envisioning the Lawrence Livermore Microbial Detection Array (LLMDA), a compact sensor developed at Lawrence Livermore National Laboratory (LLNL) that can detect the presence of thousands of microbial species.

The technology was brought to the market as Thermo Fisher Scientific's Applied Biosystems Axiom Microbiome Array (ABAMA), the first high-throughput pan-microbial detection product. Public health and medical professionals have used the technology to detect and respond to bioterrorism, and to find pathogens in human samples (blood, urine, feces, sputum, cerebrospinal fluid, tissues), biological materials, and environmental samples. The technology has been used to identify disease-causing organisms that contaminate products such as vaccines and other biologicals, or that exist in specific environments such as in buildings or in the air, water, and soil of natural environments where a pathogen is suspected as a causative agent of an outbreak. It has also been used in archaeological studies.

Affymetrix, a company focused on producing DNA microarrays, has worked with LLNL periodically since 2000. The company licensed the LLMDA technology at the end of a Collaborative Research

and Development Agreement (CRADA) in 2015. Thermo Fisher, a \$20-billion scientific products and services company, acquired Affymetrix in 2016. In August 2016 Thermo Fisher introduced the Axiom Microbiome Array based on the LLMDA technology. Thermo Fisher provides products and services in the areas of genetic testing, research services, pharmaceuticals, chemicals, analytical instruments, and laboratory equipment.

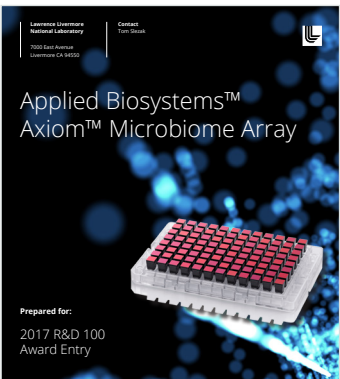
Some earlier versions of LLMDA arrays have already made their way into testing at government agencies such as the Department of Homeland Security, the Centers for Disease Control, and the Naval Medical Research Center—assisting soldiers, researchers, doctors and first responders. Now, with LLMDA technology coming to market, its utility can expand to more hospitals, municipalities, biotechnology companies, and medical organizations to make the world a safer place.

As one of the largest life sciences technology companies in the market today, Thermo Fisher is well-positioned to take the research and development performed by Affymetrix and LLNL and expand it for the greatest possible impact. With its role in the Applied Biosystems Axiom Microbiome Array, LLMDA can identify and stop food and vaccine contamination, assist in safeguarding livestock and agriculture, analyze risk factors for human papillomavirus, and even help with research on historical pathogen outbreaks.

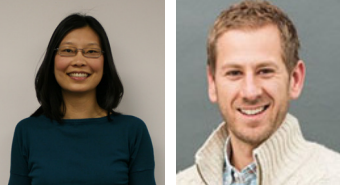


Crystal Jaing analyzing an LLMDA array used at the Sausalito-based Marine Mammal Center to diagnose diseases that struck California sea lions and harbor seals.

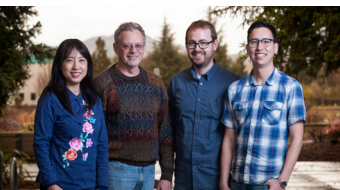
Contact: Connie Pitcock, (925) 422-1072, pitcock1@llnl.gov



2017 R&D 100 Award Winning Nomination



Left column (top to bottom): Catherine Elizondo, Ida Shum, Tom Slezak  
Right column: Dr. Michael Shapero, Kevin Christopher, Yash Vaishnav



Pictured: Crystal Jaing, Kevin McLoughlin, James Thissen, Nicholas Be

Winner not pictured: Shea Gardner



# Qrypt Licensing of Quantum Random Number Generator from ORNL

Department of Energy  
Oak Ridge National Laboratory

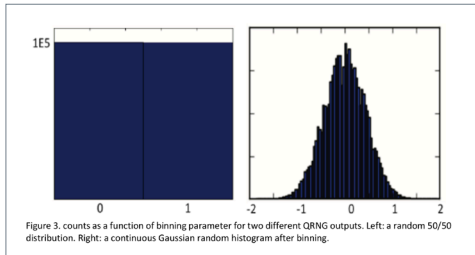


Figure 3. counts as a function of binning parameter for two different QRNG outputs. Left: a random 50/50 distribution. Right: a continuous Gaussian random histogram after binning.



Qrypt founder and CEO Kevin Chalker addresses ORNL's management at the license signing ceremony on August 27, 2018. Mr. Chalker spoke about the benefits of collaboration with national laboratories and identifying technology that complements and helps advance their company's mission to improve data security.

With the global cybersecurity market expected to grow from \$160 billion in 2015 to \$170 billion by 2020, quantum random number generators (QRNGs) have the potential to impact the cryptography and multifactor authentication markets that serve governments and businesses worldwide. Oak Ridge National Laboratory's (ORNL) QRNG is positioned to maximize this market potential and public benefit thanks to an excellent approach to technology transfer that has resulted in significant improvements in the state of the art, along with a strategic licensing approach. The result is an exclusive license to start-up Qrypt—an innovative, well-financed start-up venture focused on building the cybersecurity market's only practical and scalable quantum secure encryption technology. With development collaborations ongoing with ORNL, Qrypt is uniquely positioned to exploit the cybersecurity market using ORNL's patented technology in combination with its own intellectual property (IP).

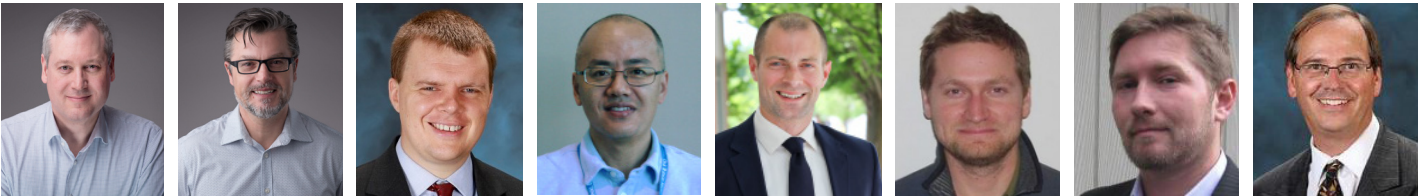
ORNL's key efforts included both market preparation of the technology and an extensive licensing strategy. A milestone-driven, two-year development effort using ORNL's unique Technology Innovation Program (TIP) enabled a deliberate approach to maturing the technology for market. Through

TIP, ORNL inventors reduced the risk of pseudo-randomness, which is susceptible to hacking. They also improved the speed and bias of the device compared with the previous state of the art—two of the major outstanding issues that have limited QRNG market adoption and penetration. In addition, the end-user cost of the technology was reduced to approximately \$100, making it the most affordable QRNG available.

TIP also provided a springboard for licensing the technology: The unique program provided a framework for selecting the partner best qualified to maximize the commercial potential. The technology incubation allowed the licensee to not only understand the technology's benefits in theory, but also to observe a working prototype in order to demonstrate the advantages in practice.

Building on its success with TIP, ORNL's Technology Transfer Office developed a robust marketing campaign, which brought the technology to Qrypt's attention and generated serious interest from three potential licensees. ORNL's strategic selection of Qrypt as an exclusive licensee and its use of non restricted royalties is enabling further technology development that improves Qrypt's own products and strengthens its IP position.

The ORNL inventors' incubation and market preparation of the QRNG technology, combined with the strategic licensing approach of technology transfer personnel and the collaborative development efforts of Qrypt, have resulted in a technology that dramatically improves upon the state of the art and is uniquely positioned to maximize adoption and penetration by the rapidly growing cybersecurity industry.



Left to right: Christopher Knapp, Denis Mandich, Dr. Benjamin Lawrie, Dr. Bing Qi, Dr. Brian Williams, Dr. Raphael Pooser, Dr. Travis Humble, Dr. Eugene Cochran

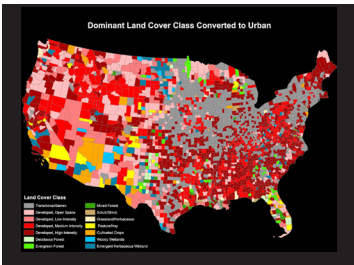
Contact: Dr. Eugene Cochran, (865) 576-2830, cochraner@ornl.gov

# Strategic Licensing of the LandScan/LandCast Population Datasets

Department of Energy  
Oak Ridge National Laboratory



Originally conceived for use by U.S. military and intelligence, the Oak Ridge National Laboratory (ORNL) LandScan™ Global Population Datasets are the community standard for understanding the spatial distribution of at-risk populations and effectively planning for emergencies at federal, state, and local levels around the world.



LandCast™ pinpoints where long-range urbanization is likely to occur. This information is used by the public sector to adjust policy and by utilities and commercial businesses to site infrastructure.

Thanks to a decade of strategic distributor licensing and promotional campaigns, combined with continuous technological upgrades, the datasets have had broad application. More than 1,400 government, nongovernment,

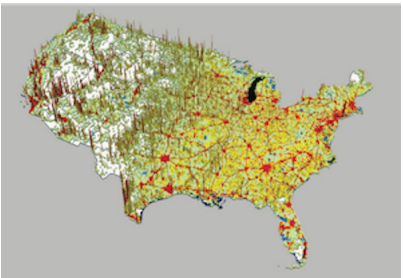
and commercial end users in more than 50 countries have used ORNL's datasets to formulate emergency response plans, mobilize humanitarian relief, manage health pandemics, place cell towers, factor population impact on wildlife and agriculture, and preserve national security, among numerous other uses.

In addition to updating the datasets annually, ORNL recently extended LandScan technology to a new dataset, LandCast™. By providing population distribution forecasts for the years 2030 and 2050, LandCast is especially useful for future urban development, critical infrastructure siting, infection prevention and control, and preparing for the impacts of climate change and migration.

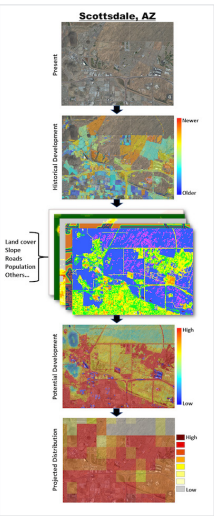
In 2017, ORNL researchers noted that large numbers of researchers, educators, and students were often unable to access these sophisticated, high-quality datasets. ORNL decided to pursue a new licensing model for academic and research users. The Lab created an easy-to-use registration and dataset download website (<https://landscan.ornl.gov/>) and began offering no-cost licenses to academic researchers. By forgoing near-term fees, ORNL has begun building long-term relationships with users who will grapple with the effects of climate change, global migration, and more.

Since January 2018, ORNL has received 800 requests for LandScan datasets from almost 600 organizations in 76 countries, a virtual explosion in academic interest. More academic licenses were granted in the past 9 months than were issued in the entire preceding decade. Although it is unusual to see datasets credited, ORNL has now been cited in more than 150 academic and research publications, a practice that will attract even more users. ORNL has also experienced an increase in U.S. government and commercial sector requests, which the researchers attribute to the website's improved search engine optimization.

Continually evolving datasets based on user requirements and a flexible approach to licensing ensure that the adoption of LandScan and LandCast technology will continue to increase.



LandCast™ three-dimensional representation of relative projected population growth. Red indicates higher levels of population growth, whereas vertical spikes signify population growth with new land development.



The LandScan™ algorithm uses census and other data, historical population patterns, cultural settlement patterns and spatial data (both manmade and natural topography) enhanced by high-resolution imagery analysis averaged over a 24-hour period to calculate a refined population distribution down to the individual country, neighborhood, and 1-square-kilometer level.



Left to right: Aaron Myers, Dr. Amy Rose, Dr. Budhendra Bhaduri, Dr. David Sims, Eddie Bright, Jake McKee, Marc Filigenzi, Marie Urban

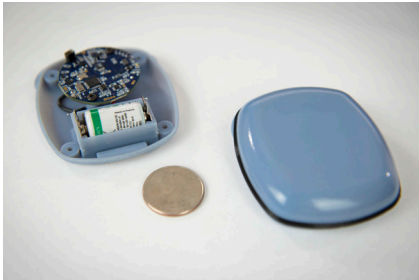
Contact: Dr. Amy Rose, (865) 576-3561, rosean@ornl.gov





# Transfer of PNNL's Acoustic Gunshot Detection Technology to Security USA

Department of Energy  
Pacific Northwest National Laboratory



PNNL researchers designed acoustic gunshot detection technology to be inexpensive. The golf-ball sized sensor contains a Wi-Fi-enabled microcontroller, microphone, and battery.



PNNL researchers Michael Hughes (left), James Skorpik (center), and Eric Gonzalez (right) tested the acoustic gunshot detection system with live rounds in multiple buildings. They found the sensor detected gunshots with extreme statistical precision, the results of which were published in the peer-reviewed Journal of the Acoustical Society of America.



Left to right: Boaz Raz, Kannan Krishnaswami  
Winner not pictured: Jim Spracklen

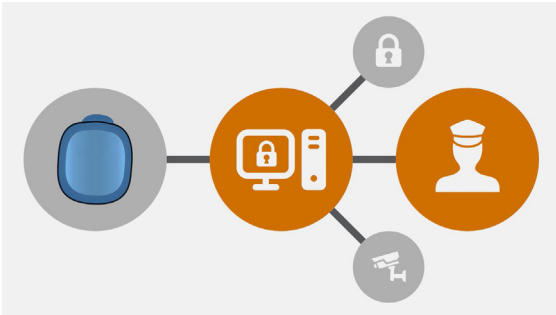
Pacific Northwest National Laboratory's (PNNL) acoustic gunshot detection technology provides a method of instantaneously detecting a gunshot indoors with a high degree of accuracy, providing information on the weapon type (caliber) and, depending on configuration, the location of the gunshot. This information, coupled with a notification, can be helpful in enabling first responders to take swift action, initiating emergency and law enforcement response measures.

The wireless technology includes a microcontroller, an algorithm, a miniature microphone, and a military-grade battery that are all contained in a small case. In most instances, just one sensor can monitor an entire classroom, hallway, or cafeteria. Compared to other detection systems, the technology can be used to distinguish between actual gunshots and other loud sounds with a high level of accuracy.

PNNL recognized that the acoustic sensors it developed for other federal government applications could readily be adapted to potentially limit loss of life during mass shooting events. The team protected the intellectual property and secured internal funds to further develop a test prototype gunshot sensor and a weapon caliber classification algorithm. PNNL then worked with federal and local agencies to test the technology in real-world settings. The first licensee, Security USA Services, LLC (Security USA), replaced its original detectors with those developed by PNNL in its prototypes. PNNL's technology offered a low-cost solution that is battery-powered and wirelessly connected, rendering it significantly easier and less expensive to install and use than the company's earlier device, and therefore perhaps more attractive for schools with limited funds.

Once PNNL had tested this detection technology in real-world settings, it pursued limited exclusivity licensing that allowed for four concurrently active licenses available to facilitate broad deployment of the technology in the marketplace. Security USA signed a license agreement with PNNL in March 2017 and now has a product in the market. In October 2017, the innovation was licensed to a second firm, Eagle Integrated Systems, which is developing a product. Later, media reports on the technology and a prestigious national award generated significant interest, leading to negotiations with two additional licensees.

A number of Security USA customers received the improved Emergency Automatic Gunshot Lockdown (EAGL) system in 2018. EAGL introduced a new detection and notification capability to their facilities, potentially increasing occupant safety and perhaps deterring shooting incidents. From an economic perspective, licensing PNNL's technology enabled Security USA to hire 12 new employees to facilitate the product release. The company has sold approximately 25 systems (1,000 sensors) to date, and has an impressive backlog of pending orders.



When the acoustic gunshot detection technology detects a gunshot, it automatically sends this information wirelessly to initiate an emergency lockdown procedure, activates alarms, and triggers a 9-1-1 call to law enforcement and first responders.

Contact: Kannan Krishnaswami, (509) 375-4597, kannan@pnnl.gov

# Transfer of PNNL's Ethanol-to-Jet Fuel to LanzaTech

Department of Energy  
Pacific Northwest National Laboratory



Virgin Atlantic 747 jet liner being fueled prior to the inaugural commercial flight using the PNNL-LanzaTech blendstock from Orlando, Florida, to London's Gatwick Airport on October 2, 2018.

To stay relevant, commercial aviation needs to decouple carbon emission growth from passenger growth. This problem presents a need to pair conventional jet fuels with fuels from sustainable sources that have high energy density and low emissions.

That's now feasible on a commercial scale thanks to the partnership between Pacific Northwest National Laboratory (PNNL) and LanzaTech to develop an ethanol-based jet fuel that can use any sustainable ethanol as a feedstock.

PNNL started to develop the catalytic chemistry needed to create jet fuel from ethanol with a small in-house project. From that technical baseline, it partnered with industry. After eight years, a breakthrough fuel was ready for commercialization. The process can use ethanol from any sustainable source, including waste gas captured at steel mills, energy crops, cellulosic residues, and unsorted, unrecyclable municipal waste. The ethanol is converted to alcohol-to-jet synthetic paraffinic kerosene (ATJ-SPK) through PNNL's unique catalytic process. The fuel produced by blending ethanol-based ATJ-SPK with conventional jet fuel is cleaner burning and pipeline-ready.

At PNNL, the technology transfer was led by a core group of scientists and specialists—John Holladay, Corinne Drennan, Rick Orth, and Eric Lund—who envisioned, led, and supported the technical, funding, and legal steps needed to go from idea to process and on to a patented, licensed technology. A PNNL

technical team—Richard Hallen, Michael Lilga, and Karl Albrecht—used bench-scale experiments to develop a key conversion step and generated data and fuels for developing preliminary process models.

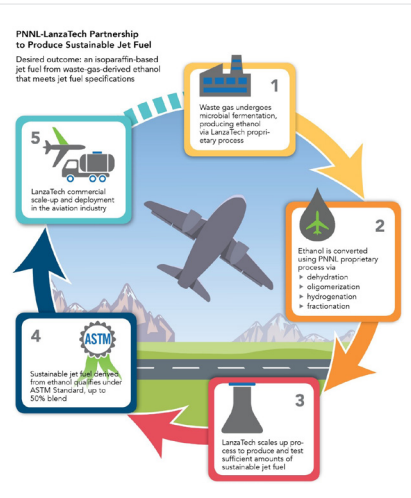
At LanzaTech, vision, funding, and technical and legal help came from CEO Jennifer Holmgren; executive vice president for Chemistry, Catalysis, and Fuels Michelle Kocal; vice president of Government Relations Lauren Harmon; and patent counsel Frank Molinaro. LanzaTech scaled up and demonstrated the process, produced large volumes of ATJ-SPK fuel, provided financial support, and brokered alliances with other industrial partners.

In 2008, PNNL researchers began developing the catalytic chemistries needed to convert sustainable feedstocks into jet fuel. In 2010, PNNL began a technical collaboration with Imperium Renewables, joined by LanzaTech in 2012. This culminated in the 2018 technology transfer from PNNL to LanzaTech.

The new sustainable aviation fuel will lower the cost and the carbon footprint of jet fuel, trimming down the 3 to 5 percent of global carbon dioxide emissions linked to jet aircraft. It also fulfills PNNL's green-fuels mission. The fuel production pathway, already internationally qualified, could help airlines meet long-term carbon and fuel efficiency goals, reduce investor risk, and open new markets for sustainable ethanol. This technology transfer illustrates the importance of national laboratory-industry partnerships in developing technologies to address environmental and societal challenges.



Virgin Atlantic flight attendants showcase the renewable fuel produced as a result of the PNNL-LanzaTech collaboration in front of the LanzaTech manufacturing facility, which has produced over 4,000 gallons of jet fuel blendstock to date.



PNNL-LanzaTech Partnership to Produce Sustainable Jet Fuel



Right: Lauren Harmon



Left to right: Jennifer Holmgren, John Holladay, Corinne Drennan, Frank Molinaro, Karl Albrecht, Michael Lilga, Michelle Kocal, Richard Hallen, Rick Orth, Eric Lund

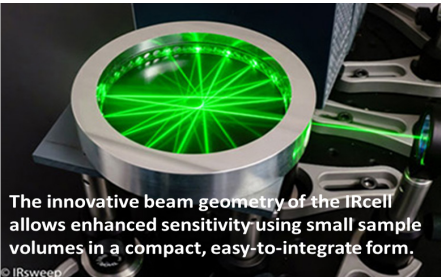
Contact: Dr. John Holladay, (509) 375-2025, john.holladay@pnnl.gov



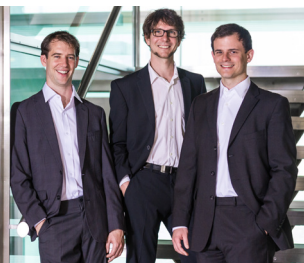


## Transfer of PNNL's IRcell to IRsweep

Department of Energy  
Pacific Northwest National Laboratory



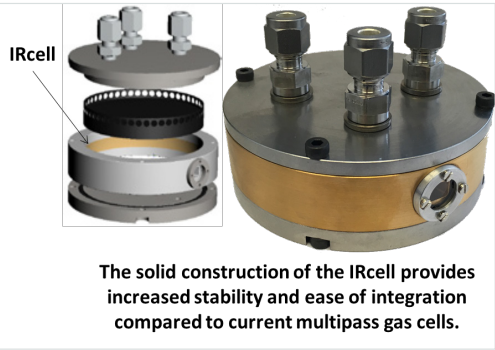
IRcell in action.



Top (left to right): Dr. Markus Mangold, Dr. Andreas Hugi, Dr. Markus Geiser  
Bottom row (left to right): Dr. Bruce Bernacki, Dr. Kannan Krishnaswami

IRcell is an optical sensing technology developed by Pacific Northwest National Laboratory (PNNL) and IRsweep researchers to detect and measure trace amounts of gaseous effluents at their source, such as manufacturing plants and factories. The reflected laser light is folded into a compact star pattern, exhibiting measurement sensitivity down to the parts-per trillion level in a small footprint instrument that is easily integrated into other systems. Thanks to a commercial licensing agreement, PNNL and IRsweep brought together their technical expertise to bring IRcell to market as a dramatic improvement to traditional detection methods.

PNNL and IRsweep were independently working on infrared (IR) sensing designs when it became clear that joining forces could be beneficial and potentially lead to a commercially viable product. PNNL received numerous inquiries for its patented multipass optical device and process, but as a national laboratory PNNL was unable to build or sell them commercially. Simultaneously, IRsweep developed a patented phase mask that reduced interferences and improved the performance of IR sensing, but the overall cell design still needed work. What originally began as discussions of mutual technical interest evolved into a technology transfer opportunity and the manufacturing of an improved product, IRcell.

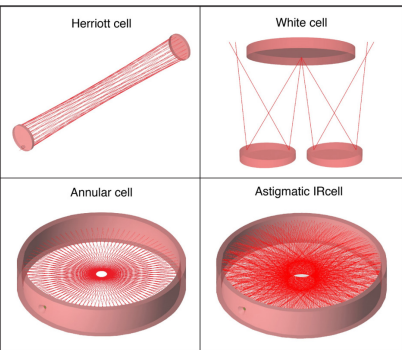


The solid construction of the IRcell provides increased stability and ease of integration compared to current multipass gas cells.

PNNL brought to the partnership a patented design, an understanding of sensing needs and instrument design challenges, and a list of potential customers interested in procuring this device. IRsweep brought its unique intellectual property, technical capability, and resources to integrate the two technologies into its novel cell design and established a manufacturing facility to produce them cost effectively.

Now being sold worldwide, IRcell is revolutionizing optical IR absorption spectroscopy and gas sensing. The technology has been integrated into critical instrumentation with applications as diverse as gas analysis to identify nuclear materials processing and proliferation, and early detection of toxic industrial chemicals and breath analysis. IRsweep was recently awarded funding from the European Space Agency Business Incubator Center of Switzerland to adapt the technology to monitor air pollution. The Swiss federal laboratory Empa also deployed this device as part of a rugged sensor mounted on a tram in Zurich to continuously monitor for nitrite concentrations as low as a few parts-per-trillion in ambient air at levels.

Additionally, the IRcell technology was chosen as one of *R&D* magazine's R&D 100 Award winners in 2017. The prestigious award honors great R&D pioneers and revolutionary ideas in science and technology. With its great sensitivity, faster speed, enhanced stability and reduced footprint, IRcell offers just that—innovation and revolutionary capability in the IR spectroscopy market, all resulting from the PNNL-IRsweep technology transfer.



The astigmatic IRcell (bottom right) versus traditional methods. The analysis path length, resolution, and sensitivity increase dramatically the more times the laser beam bounces within the cell, interrogating the sample, making the IRcell unparalleled for analysis.

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## Protecting Healthcare Workers by Detecting Contamination from Hazardous Antineoplastic Drugs

Department of Health and Human Services  
Centers for Disease Control and Prevention



Antineoplastic drugs, also known as anti-cancer drugs or chemotherapy, are used in the treatment of many types of cancer. Exposure of healthcare workers to antineoplastic drugs from contaminated surfaces and drug vials in hospitals and pharmacies is a continuing problem since the drugs can cause skin problems, birth defects, reproductive issues, and increased risk of various cancers.

Centers for Disease Control and Prevention (CDC) researchers at the National Institute for Occupational Safety and Health (NIOSH) developed technology to rapidly detect three commonly used antineoplastic drugs. (The technology is applicable to many types of antineoplastic drugs.) CDC initially developed the lateral flow immunoassay that allows sampling of surfaces to assess drug contamination. CDC NIOSH's partners at Becton, Dickinson, and Company (BD) licensed, further developed, and incorporated the technology into a portable device. The resulting tool, the BD™ HD Check system, can analyze samples for doxorubicin and methotrexate (two common chemotherapy drugs) and provide reliable results in less than 10 minutes.

CDC NIOSH's Research to Practice (r2P) Office coordinated communications with all involved parties. CDC's Technology Transfer Office (TTO) handled the first agreements, patent applications, and licensing. The CDC Team at NIH's National Institute of Allergy and Infectious Diseases (NIAID) Technology Transfer and Intellectual Property Office (TTIPO) oversaw licensing and patenting on CDC TTO's behalf beginning in October 2013.

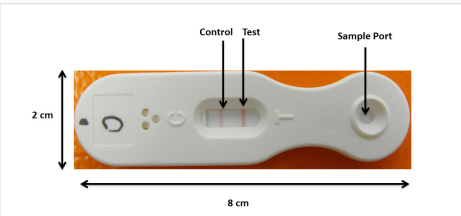
The nominees leveraged multiple mechanisms, resources, and activities to successfully transfer this technology. Initiatives included patent protection (one patent in Japan has been granted; patent protection is also being pursued in the U.S. and Europe), a conference presentation, marketing at additional conferences and via websites, four publications, relationship building, multiple agreements (two confidential disclosures, a research collaboration, and two licenses [one non-exclusive and the current exclusive]), joint field tests, and product launch material consultations. CDC NIOSH inventors and BD currently still engage in ongoing collaborative research.

Currently, an estimated 8 million U.S. healthcare workers are potentially exposed to antineoplastic drugs. Workers prepare, administer, or dispose of antineoplastic drugs when providing chemotherapy to cancer patients. Traditional sampling methods to test for surface contamination produce results in several weeks, involve significant expense, and require analysis in a laboratory. CDC and BD's new technology empowers healthcare workers to test surfaces when and where needed — and quickly determine the level of contamination in areas where hazardous antineoplastic drugs are present.

In April 2018, BD launched the HD Check system in the U.S. to strong interest from the pharmacy and nursing communities. BD expects to make the product commercially available in Europe, Japan, Canada, and Australia in 2019. NIOSH and BD will continue research to potentially incorporate additional hazardous drugs in the rapid detection kits. This effort will enable reduction strategies to prevent workplace illness and injuries.



BD launched the BD™ HD Check system, the first and only rapid hazardous drug detection system, in the U.S. in April 2018. The commercial product reflects a successful transfer of a CDC NIOSH technology. (Photo credit: BD)



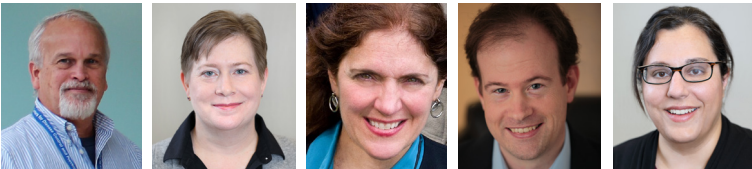
CDC NIOSH early technology to detect surface contamination by hazardous antineoplastic drugs. (Photo credit: CDC NIOSH)



CDC NIOSH inventors (left to right): Deborah Sammons, Shirley Robertson, and Dr. Jerry Smith. (Photo credit: Kathleen Goedel, CDC)

Below (left to right): Francisco (Paco) Candal, Dr. Tara Kirby, Lisa Marianni, Dr. Patrick McCue, and Karen Surabian

Winners not pictured: Kathleen Goedel, Fatima Sayyid, Suzanne Seavello Shope, and Dr. Erik Witt



Contact: Kathleen Goedel, (513) 533-8686, [keg2@cdc.gov](mailto:keg2@cdc.gov)



# INDIVIDUAL AND TEAM AWARDS



## Kennedy Space Center Interagency Partnership Award Nomination

NASA Kennedy Space Center | Defense Advanced Research Projects Agency |  
United States Air Force | Federal Aviation Administration

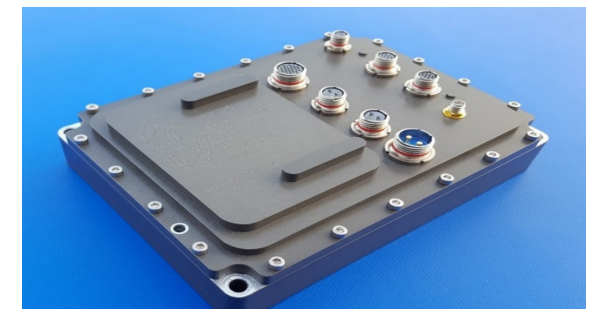


The National Aeronautics and Space Administration (NASA), Defense Advanced Research Projects Agency (DARPA), United States Air Force (USAF), and Federal Aviation Administration (FAA) have successfully partnered to fund, develop, test, and transfer the Autonomous Flight Termination Unit (AFTU) technology to U.S. commercial space companies. The AFTU is an independent, self-contained subsystem mounted onboard a launch vehicle. The AFTU autonomously makes flight termination/vehicle destruct decisions using configurable software-based rules implemented on redundant flight processors using data from redundant navigation sensors. The ability to perform this function on the launch vehicle results in tremendous cost savings by eliminating the need for ground personnel, transmitters, telemetry receivers, and radars historically used for this purpose. It also provides global coverage because launch vehicles using the AFTU no longer need to be launched from a dedicated range. The AFTU can also support multiple vehicles simultaneously, such as flyback boosters.

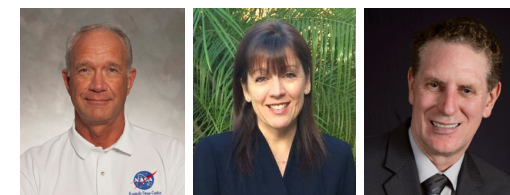
The four partners in the AFTU transfer story each had a unique role in its success. DARPA, through its Airborne Launch Assist Space Access (ALASA) program, provided funding for AFTU research, development, and prototyping, as well as launch opportunities for AFTU hardware and software testing aboard various launch vehicles. NASA Kennedy Space Center (KSC) and the Air Force combined their expertise to jointly develop the Core Autonomous Safety Software (CASS) that is flown on any launch vehicle utilizing the AFTU technology.

CASS is mission-critical for any launch vehicle equipped with an AFTU because it contains the algorithms to process mission rules and parameters used by the AFTU to make flight termination/vehicle destruct decisions. This cooperative joint effort was key to developing CASS software that meets all safety critical requirements for operational use. DARPA funded the independent validation and verification testing of the CASS software required for CASS to be declared flight-ready. NASA KSC was responsible for the development, prototyping, and testing of the AFTU hardware, as well as the wrapper software that allows the CASS software to interface with the AFTU hardware. The USAF and the FAA provided oversight of the AFTU hardware design and helped write, coordinate, and approve NASA AFTU requirements for design, test and operation.

The result of this four-way partnership is a generic engineering version of the AFTU hardware and wrapper software, along with CASS software that can be used by commercial space companies as a baseline for developing their own versions of the system for their launch vehicles. This will significantly shorten each company's development timeline and cost. To date the KSC Technology Transfer Office has completed 35 transfers of the AFTU technology to commercial space companies and other government agencies.



*Pictured: AFTU hardware*



*Left to right:  
Lewis Parrish, Lisa Valencia,  
Roger Zoerner*

*Winners not pictured: Wynn Aung, Jeff Cherry, Mark Gotfraind, Todd Griffin, Erik Magnuson, Todd Master, Scott Mosher, Alexis Rudd, Richard Russett, Howard Schindzielorz, Will Wascom, Clarence Wilcox, Melissa Wright*

Contact: Lisa Valencia, (321) 867-6937, [lisa.m.valencia@nasa.gov](mailto:lisa.m.valencia@nasa.gov)





## Interagency Partnership for Xenon International

Department of Energy | Department of Defense | Department of State |  
Pacific Northwest National Laboratory | Teledyne Brown Engineering

Brought together by a shared mission to eliminate the testing of nuclear weapons worldwide, several federal agencies, government contractors, and private industry established a unique partnership to develop and commercialize a radioxenon monitoring system to detect nuclear weapons testing. The effort included the Department of State (DOS), Department of Defense (DoD), Department of Energy (DOE), Pacific Northwest National Laboratory (PNNL) and Teledyne Brown Engineering (TBE).

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a multilateral treaty that bans any type of nuclear explosion. The United States signed the CTBT in 1996 and supports the establishment and operation of the International Monitoring System (IMS). The IMS monitors countries' compliance with the CTBT's ban on all nuclear explosions—underground, underwater, or in the atmosphere. A primary method used to identify nuclear explosions is through the detection of trace amounts of noble gases, particularly radioxenon. The data obtained through the IMS is continuously reported to national data centers around the world, where the data is reviewed and categorized. Due to the significant impacts of potential findings, noble gas monitoring systems must operate with great sensitivity and reliability in order to provide accurate information.

The first radioxenon monitoring systems were custom prototypes put together by several countries, including the United States. These systems were tested and compared over a number of years, with a number of needed improvements identified. It became apparent that no single U.S. government agency had

full responsibility for implementing the improvements or making the system commercially available as ultimately needed for long-term operations. Thus began the partnership among several agencies, a national laboratory, and a commercial vendor.

Xenon International is a fully automated unattended system designed to collect, separate, purify, quantify, and perform nuclear counting on radioxenon isotopes, as well as transmit data using two-way communications. The technology is designed to stringent national and international requirements that make it a high performance next-generation system for use in nuclear explosion monitoring networks such as the CTBT IMS. It also is a field-based system that continuously monitors for radioxenon gases released from an underground nuclear explosion.

The transfer of the Xenon International technology began in July 2013 when, recognizing the need to bring on a commercial partner as a collaborator early in the process, PNNL selected TBE from a pool of solicited candidates as the subcontractor. The level of collaboration between the two entities spanned from concept to fabrication, resulting in a commercial license signed in May 2017 that grants TBE the rights to build and sell Xenon International systems worldwide (<https://tbe.com/energy/xenon-international>). PNNL continues to collaborate with TBE, DOE, and the DoD to finalize testing as manufacturing begins. The first customer is positioned to purchase the units in 2019.



The Xenon International generates data that can be reported to national data centers around the world where data is reviewed and categorized to determine if nuclear explosions occurred.



Xenon International systems are nearly four times more sensitive than other available systems and can detect a signal roughly half the size – detecting smaller explosions and those that take place hundreds of miles away.

Interagency Partnership Award winners:  
PNNL: James Hayes, Mark Panisko, Matthew Cooper, Warren Harper, Mike Ripplinger, Charlie Hubbard, Timothy Stewart, Dan Keller, Matt Covert, Kannan Krishnaswami, Eric Lund  
Department of State: John Conlon, Terrill Ray  
Department of Energy: Leslie Casey  
Department of Defense: Scott Smith, Patrick Roberts, James Scoville, Gerard Vavrina, David Williams, Glenn Sjoden  
Teledyne Brown Engineering: Michael Howard, Aaron Orr

Contact: Dr. James Hayes, (509) 375-1793, [jc.hayes@pnnl.gov](mailto:jc.hayes@pnnl.gov)

## Safeguarding Warfighter Access to Next Generation Munitions through Wastewater Technology

Department of Defense  
U.S. Army Engineer Research and Development Center | Combat Capabilities Development Command Armaments Center (CCDC Armaments Center) |  
U.S. Army Joint Munitions Command | Program Executive Office – Ammunition |  
U.S. Military Academy

A multi-agency team that included personnel from the U.S. Army Engineer Research and Development Center (ERDC); the Combat Capabilities Development Command Armaments Center (CCDC Armaments Center); the Program Executive Office – Ammunition (PEO Ammo); the U.S. Army Joint Munitions Command (JMC); and students and faculty from the U.S. Military Academy's (USMA) Systems Engineering Department collaborated to streamline and modernize the treatment technologies of new insensitive munitions (IMs) formulations at load-and-pack (LAP) industrial base operations and to transfer their technologies to the U.S. Army and the private sector.

Initially, the team started working together to solve simple process control and plant operation issues associated with the caustic, pH 3, IM production water, i.e., the IM water was degrading the transfer plumbing and becoming a potential operations issue. The team successfully developed and transitioned an innovative application of a process to replace high-cost sorptive treatment of wastewater. To overcome the obstacle of the IM material's high water solubility, the team developed two new steps to be incorporated into the treatment process. They strategically designed these two steps together to cost-effectively remove most of the contaminants from the IM wastewater, leaving the last step only for removing trace amounts of the contaminants.

The team worked on this effort with an initial assessment of the new munitions constituents and the implications of these new materials for LAP operations

and installations such as Iowa Army Ammunition Plant (IAAAP), Crane, and McAlester Army Ammunition Plant (MCAAP). The impacted sites included both government-owned and government-operated (GOGO) and government-owned and contractor-operated (GOCO) industrial base facilities. Research and development progressed from benchtop experiments, to laboratory pilot treatment systems, to field-deployed treatment systems and required operational modifications to accommodate the new explosive fills.

Best management practices (BMPs) were established for the handling of IM production water and process wastewater in a safe and environmentally sustainable manner. These BMPs include a cost-effective and environmentally safe process water treatment system that has been incorporated into full-scale operations at LAP ammunition plants. The team's innovative treatment technology significantly reduced treatment costs from \$6.00 per gallon to \$0.55 per gallon.

Through their intensive, multidimensional approach to technology transfer, the team transitioned their effective research and development technology to ammunition plants performing load-and-pack on an industrial scale, guaranteeing the economic viability of these plants—thereby ensuring that our nation's warfighters receive the most effective and safest equipment to accomplish their critical missions.



Left to right: Dr. David B. Gent, Dr. Steven Larson, Jared Johnson, Luke Gurtowski, Sarah Grace Zetterholm

Winners not pictured: Brian Hubbard, Dr. Gregory O'Connor, Benjamin Smolinski, Kevin Tiemeier







## The Partnership Between NETL and the City of Pittsburgh

Department of Energy  
National Energy Technology Laboratory | City of Pittsburgh



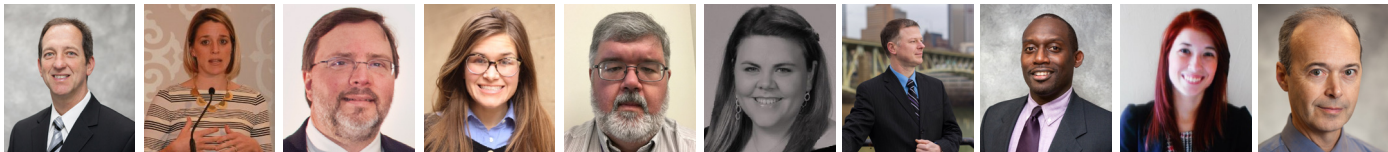
The near zero-emission prototype fuel cell system that NETL funded. It will be tested at the NRG Energy Center.



Left column (top to bottom):  
Aftyn Giles, Ariel Lattanzi,  
Dan Oryshchyn



Right column (top to bottom):  
Ashley LeDonne, Grant Ervin



Left to right: Jim Wilson, Kate Marks, Randy Gemmen, Rebecca Kiernan, Robert James, Sarah Yeager, Thomas Tarka, James Ferguson, Kristen Welsh, Mark McKoy

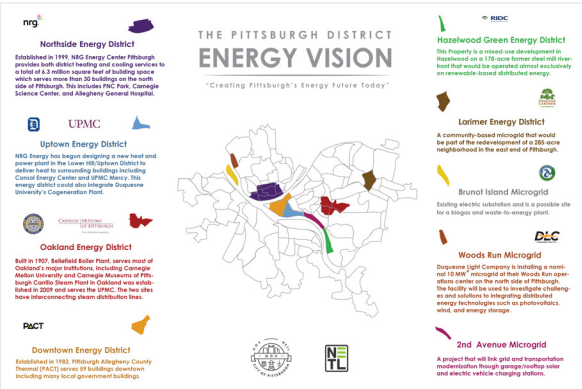
Known as the Steel City due to its rich industrial heritage, Pittsburgh is home to about 300,000 residents in western Pennsylvania—the nation’s second-largest natural gas producer and third-largest coal producer in 2017. As the city prepared to enter its third century, its leaders signed a Memorandum of Understanding (MOU) with the National Energy Technology Laboratory (NETL), a longtime regional partner with world-renowned expertise in energy technology solutions, to establish Pittsburgh as the “Clean Energy City of the Future.” The MOU initiated a collaboration between the City of Pittsburgh and NETL to transform the city’s energy system and aging infrastructure by implementing an innovative “grid of microgrids” concept.

Capitalizing on five existing energy districts and the city’s unique geographic features, NETL is working with Pittsburgh and regional partners to create a network of small-scale distributed energy systems that supply local residents with clean, reliable and cost-effective power. Rather than relying on a centralized grid supplied by distant facilities, these systems can operate independently or in conjunction with the main electrical grid and incorporate a diverse mix of energy sources, including advanced energy technologies pioneered by NETL and other national laboratories.

Since the MOU was signed in July 2015, Pittsburgh has been actively engaged in economic development and clean energy initiatives that support the MOU effort—including the U.S. Department of Transportation’s Smart Cities Challenge, which earned the city \$10.9 million. NETL has examined electricity and natural gas use across 165 square miles of

the greater Pittsburgh area, funded development of a new fuel cell power plant that runs on clean natural gas, connected the city with DOE experts on combined heating and power opportunities, launched studies of geothermal energy options, and initiated a pathway assessment that evaluates the benefits of deploying different energy technologies. NETL has also connected the city with university and industry stakeholders that have invested tens of millions of dollars in groundbreaking energy endeavors that will create jobs and benefit future generations.

Pittsburgh’s collaboration with NETL has cemented the city’s position as a global leader in next-generation energy planning and development. This innovative partnership creates a model for other local governments and demonstrates how the federal government—and national laboratories, specifically—can be a key asset in helping cities meet the economic development and job creation needs of the 21st century. The City of Pittsburgh MOU has also shown that fossil fuels can play a valuable role in a clean energy future and proven that NETL is developing cutting-edge technologies that make safe and efficient use of the nation’s abundant domestic resources.



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NETL Website, City of Pittsburgh MOU Project: <https://www.netl.doe.gov/mou>

## Cogent Energy Systems

Department of Energy  
Idaho National Laboratory



Large waste-to-energy (WTE) facilities have existed for decades, but technology that allows for economic recovery of energy from waste on a small scale has remained elusive. Founded in 2012, Cogent Energy Systems has been developing a process to do that.

The story starts with Idaho National Laboratory (INL) and research being conducted on the creation of nanoparticles. Specifically, it was this modular hybrid plasma technology that evolved into the core of a gasifier for WTE applications. Through discussion with the inventor, Dr. Peter Kong, Cogent’s officers concluded that the same concept could be applied to gasifying waste materials for energy recovery applications, turning biomass or virtually any waste into usable products at a small scale.

The resulting proprietary ionic gasification process—embodied in Cogent’s HelioStorm Gasifier—involves the direct-contact processing of waste inside an active plasma field at temperatures of 3,000 to 10,000 degrees Celsius. The result is a clean, high-energy synthesis gas (or “syngas”) that can be used to make many valuable end products, including electricity, hydrogen, liquid fuels, and chemical precursors.

Founded in 2012, Cogent Energy Systems of Merrifield, Virginia, was the recipient of the transferred technology. The company’s technology development

takes place in Idaho Falls, Idaho, near INL, where the modular hybrid plasma technology at the heart of its HelioStorm Gasifier originated. Since its founding, the company has been awarded a succession of grants from the Department of Energy (DOE), INL, the U.S. Navy, and the National Renewable Energy Laboratory. In partnership with these organizations and Creare, an engineering research and development firm in Hanover, New Hampshire, Cogent has developed and demonstrated two full-scale waste-to-energy gasifiers, with plans for a complete end-to-end commercial demonstration system scheduled to go online in 2019.

In order to reserve rights in the INL modular hybrid plasma technology while conducting due diligence, Cogent executed a license option agreement with INL in 2012. The option to license the technology was exercised by Cogent two years later in 2014. INL stands ready to help Cogent leverage DOE programs and assets to achieve commercial success. In the relationship with Cogent, INL has taken the approach that a successful technology transfer requires a sustained effort that does not end with execution of the license agreement.



Left to right: Abraham Haspel, Peter Kong, Ryan Bills

Contact: Dr. Peter Kong, (202) 640-2558, pkong@cogentenergysystems.com





Jenna Dix

Department of Defense - U.S. Navy  
Naval Surface Warfare Center, Crane Division



One of Naval Surface Warfare Center – Crane Division’s (NSWC Crane) most impressive successes over the past year can be directly traced to its Technology Transfer (T2) Agreements Administrator, Jenna Dix, and her exceptional service and outstanding execution of the laboratory’s T2

responsibilities. In June 2018, after nine months of negotiations and careful planning, Dix executed a singularly important multi-party Collaborative Research and Development Agreement (CRADA) that will benefit the entire region for decades to come and make Southwest Central Indiana the preferred destination for microelectronics. This CRADA leverages the talent, resources and expertise of multiple entities (Advanced Research Institute, Indiana University, Purdue, Notre Dame and NSWC Crane) and pools everyone’s strengths to fulfill their missions and benefit the entire regional ecosystem of federal, state, academic and business organizations and leaders.

Dix’s creative use of existing contract vehicles has allowed her to support the warfighter directly by structuring 47 limited use CRADAs for vendors demonstrating their gear to warfighters at the Advanced Naval Technology Exercises (ANTX), thus enabling military personnel to provide real-time feedback and input on the gear shown to allow the vendor companies to improve and adjust their products to better serve our troops.

Since Dix started in her position in 2015, newly executed CRADAs have increased by an unbelievable 1,360 percent (from 5 to 73), and total active CRADAs have increased by 892 percent (from 12 to 119). The overall active T2 agreements of any kind have shot up by 91 percent (from 129 to 246). She has completely overhauled, restructured, and streamlined NSWC Crane’s tech transfer agreement process and implemented efficient standard operating procedures to achieve these unbelievable increases in active tech transfer activity.

Dix comes highly recommended for this award by her supervisor and NSWC Crane Office of Research and Technology Applications (ORTA) representative Brooke Pyne, who summed up Dix’s outstanding qualities: “The transformation Jenna has effected has been incredible. The background, the integrity and honesty, and the professionalism that Jenna has brought to the team and the office is foundational to the culture shift we’re seeing in our program. It has fostered trust with all the stakeholders involved, and provided confidence in the program and system. At the core we’re relationship builders, brokers and facilitators, and Jenna epitomizes our conviction that we will seek out internal partners and external collaborators while capitalizing on tech and talent to serve our lab’s mission to support the warfighter. Looking at what she’s been able to accomplish in such a short time, I can’t wait to see what she’ll do next - Jenna Dix is just getting started!”

Contact: Jenna Dix, (812) 854-5049, jenna.dix@navy.mil

James M. Mitchell

Department of Interior  
U.S. Geological Survey



James Mitchell is a Technology Enterprise Specialist with the U.S. Geological Survey (USGS). In that role, he provides expert advice on all matters regarding intellectual property (IP), managing the bureau’s patent and licensing portfolio and coordinating with outside legal counsel, along with reviewing and negotiating technology transfer (T2) agreements on behalf of the USGS.

Over the past year, Mitchell has demonstrated exceptional service through his capable leadership and expertise related to the Federal Technology Transfer Act (FTTA) and associated laws. He has produced a high volume of agreement reviews, and provided highly regarded advisory services to scientists and managers. He also provided training on intellectual property and licensing matters to various stakeholders and users within USGS and other Department of Interior agencies.

Mitchell employed an innovative approach to solving a trademark issue for a laboratory program for earthquake monitoring systems. He met with the program managers and private parties that wanted to commercialize the technology, was able to see their technology firsthand, and identified respective concerns and interests. Mitchell drafted commercial licenses for the technology that addressed the concerns expressed by the partners and provided them the flexibility to best exploit the technology.

Contact: James Mitchell, (703) 648-4344, jmmitchell@usgs.gov



While several companies developed their technology in partnership with USGS for a couple of years, Mitchell’s diligent efforts, legal training, and business insight provided the USGS the ability to meet its targeted goals of granting its first commercial license in 2018. He truly has a passion for technology transfer and its importance to federal research and development. Mitchell’s strength lies in his ability to convey that passion, recognize opportunities, and creatively link IP with science to foster partnerships.

Mitchell has displayed an uncommon amount of enthusiasm and passion by volunteering to travel to various labs to speak with engineers and scientists about T2. The USGS has started to see a shift in culture from focusing purely on public release of scientific information to considering how T2 and IP could be used to better impact the public at large. As a result, scientists are now preemptively contacting Mitchell to discuss patent scopes and how their proposed research might be affected by another patent.

One scientist describes Mitchell’s contribution as being able to add valuable insight (based on law and business) to topics in a manner that is much different than what would be expected from a typical scientist. The statement highlights the importance of having a Technology Transfer Office, which often comes down to thinking outside the box to help researchers engage others in a manner that promotes bringing research development to market.





## James A. Poulos, III

Department of Agriculture  
Agricultural Research Service, Northeast Area



James A. Poulos, III heads up the technology transfer activities of the USDA's Agricultural Research Service (ARS) in the Northeast Area, one of five such ARS geographic areas. Through the efforts of Poulos, the Northeast Area is considered a leader in technology transfer. In the past two years, he has negotiated 33 Cooperative

Research and Development Agreements (CRADAs). Seventeen CRADAs were signed in 2017, which led all ARS areas in CRADA signings.

During that same time, Poulos has negotiated and signed over 60 Material Transfer Research Agreements. In 2017, he assumed responsibility for the technology transfer efforts of Plum Island, and in 2018 was assigned the task of clearing most export control reviews for Material Transfer Agreements (MTAs), CRADAs, Material Transfer Research Agreements (MTRAs), and licenses for the entire ARS. In FY 2018 to date, 225 export control reviews have been conducted, leading to Poulos's filing four applications for export control licenses, all of which have been granted.

Poulos was the lead author on a successful application to the American Chemical Society to designate the Beltsville Agricultural Research Center in Beltsville, Maryland, as a National Historic Chemical Landmark. It was in Beltsville that USDA scientists chemically isolated phytochrome, the chemical that produces phototropic responses in plants. The National Historic

Chemical Landmarks in Maryland are the National Institutes of Health, the National Institute of Standards and Technology, and now ARS.

Outside of ARS, Poulos's technology transfer activities included participation as a lecturer in the recent 2018 national FLC intellectual property course and serving as the national FLC Awards Committee Chair from 2011 until 2014. During his tenure, the criteria for awards were made more robust. The time range for which a technology transfer effort may be considered for an Excellence in Technology Transfer Award was increased from 5 years to 10 years, recognizing that not all technologies lend themselves to near-term licensing, and the definition of what constitutes an eligible "lab" was clarified.

His leadership efforts in tech transfer can be found in many of the agreements with which he is involved. The "Seeds of Commercialization" is just one example of those efforts. Ornamental pepper plants were produced by cooperating labs in Beltsville, Maryland. A CRADA was established with a commercial nursery in Georgia to commercialize the peppers. The peppers—named Lil' Pumpkin, Midnight Creeper and Pepper Jack—have a Halloween-type theme that adds to their commercial appeal. The CRADA partner signed a license and then encountered a commercialization problem because the peppers could not be propagated as anticipated. Through Poulos's efforts—proposing new licensing tools, drafting creative MTAs, and negotiating calmly while pushing forward a reasoned ARS strategy—"Seeds for Commercialization" still grow through a new partner.

Contact: James A. Poulos, III, (301) 504-6464, jim.poulos@ars.usda.gov

## Dr. Larry Clark

Department of Agriculture  
Animal and Plant Health Inspection Service, National Wildlife Research Center



Since becoming Director of the USDA National Wildlife Research Center (NWRC) in 2008, Dr. Larry Clark has strived to increase and promote NWRC's impact as the leading international institution for wildlife damage management research. Under his direction, technology transfer has become

a major focus of the Center's outreach efforts.

In 2013, Dr. Clark initiated the development of a robust technology transfer program, creating the Center's first Office of Research and Technology Applications (ORTA) and Technology Transfer Coordinator (TTC) position to coordinate intellectual property (IP) creation, protection, and transfer. Together, Dr. Clark and the TTC support the Center's scientists in the creation of technology transfer partnerships.

Dr. Clark's emphasis on IP development and technology transfer activities has a significant impact on the Center's research culture. He encourages the NWRC experts to work across teams to find innovative solutions to wildlife damage management problems. Although NWRC only employs about 30 Ph.D. research scientists, it collaborates on average with 140 unique entities each year. Since 2013, NWRC has entered into nearly 400 intellectual property agreements (Nondisclosure, Material Transfer, Material Transfer Research, Data Sharing and Memoranda of Understanding), including 27 Cooperative Research and Development Agreements (CRADAs). In total, these agreements have brought \$4.5 million in extramural funding to the Center.

Between 1944 and 2013, NWRC scientists received 25 patents (an average of 1 patent every 2.8 years). Since Dr. Clark began emphasizing technology transfer, NWRC scientists have received 6 patents (1 patent every 1.2 years). In addition, NWRC currently has three U.S. patent applications under review. NWRC now receives annual royalties from three licensed technologies and is the only entity within the USDA's Animal and Plant Health Inspection Service that has successfully licensed patented technology.

A great example of Dr. Clark's work ethic and impact is shown by NWRC's partnership with a private engineering firm to create tools for the control of invasive brown treesnakes on Guam. This effort required significant scientific input, coordination and planning with numerous federal stakeholders and a series of agreements with a private company. Enlisting the aid of a local stakeholder organization, he tapped into the engineering resources needed to initiate and complete this mission-critical project. The result was one issued patent, one provisional patent application, jobs creation in Colorado and Guam, and the expansion of a local engineering firm's portfolio.

To exemplify the impact Dr. Clark has had on the local research and business community, Dan Powers, Executive Director of CO-LABS, a consortium of federally funded scientific laboratories, universities, businesses and leaders organized to nurture and champion Colorado as a global leader in research, technology, and their commercialization, stated the following: "Larry has been a significant supporter of CO-LABS and personally welcomed groups we organized to visit the NWRC facilities. His informed insight has been a resource for growing our network, and we are fortunate to have his leadership within the research and innovation ecosystem in Colorado."

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## Elizabeth Brooke Pyne

Department of Defense – U.S. Navy  
Naval Surface Warfare Center, Crane Division



Elizabeth “Brooke” Pyne serves as Midwest Regional Coordinator for the FLC alongside her dual roles as NSWC Crane’s ORTA and T2/SBIR Program Manager. As Regional Coordinator, her responsibilities include initiating, organizing, and supporting the T2 efforts of all federal

laboratories in the region. She functions as an essential part of the FLC infrastructure by building and fostering a network of T2 professionals, facilitating communication between labs and industry, enabling T2 education, and expanding FLC programs. Pyne aligns prospective academic and industry partners with the federal lab network, enables them to navigate the lab system, and introduces them to the resources and tools available from the FLC.

Pyne has endeavored to create a region that cooperates, communicates, and enables each federal lab to achieve its T2 goals. She has made expanding the regional awareness of T2 and its benefits a priority by participating in outreach activities with new-user communities. As an example, Pyne engaged with the U.S. Army Engineer Research and Development Center (ERDC) and the Tank Automotive Research Development and Engineering Center (TARDEC), introducing technology transfer, best practices, lessons learned and advice on how to execute programs and engage with the FLC. Thanks in part to her informal mentorship, an ERDC official won her own FLC award. “My primary goal is the betterment and engagement of the FLC as a whole,” said Pyne.

As the Midwest Regional Coordinator, Pyne has spearheaded the FLC’s SBIR engagement activities to reach the entrepreneurial community and has been able to make new connections with “bridgers” using the technology focus area (TFA) as a catalyst. In 2017, Pyne opened doors to reach new communities by partnering with the Midwest Energy Research Consortium (M-WERC) to bring education and resources to laboratories and energy industry professionals across the country. As partners, the M-WERC and the FLC co-sponsored four events in the first quarter of 2018, including M-WERC Smart Grid and Grid Modernization Conference, Energy Transmission Webinar, M-WERC 2nd Annual Energy Storage Technical Conference, and FLC Energy Storage Webinar.

Pyne is able to leverage her understanding of T2 and her experience with SBIR programs to promote the FLC as a key partner for entrepreneurs and small businesses looking to engage with federal labs. She has participated in several SBIR Road Tours, where her activities included presenting on the merits of engaging with the FLC, meeting with companies and individuals one-on-one to assist with aligning them to the federal laboratories, and advocating the use of FLC Business to the SBIR community.

For her commitment and dedication to the FLC and its mission, Brooke Pyne is awarded the 2019 FLC Service Award for Representative of the Year. Her service in reaching new communities among industry and academia has resulted in increased regional awareness of the federal lab network and the role of technology transfer. Her work fulfills the FLC’s mission to foster T2 education, promote and strengthen T2 nationwide, and make the T2 process as accessible as possible for commercialization successes.

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# REGIONAL AWARD WINNERS





The FLC congratulates the following winners for outstanding technology transfer efforts in their respective regions in 2018.

Far West

Outstanding Partnership Award

Idaho National Laboratory  
Rocky Mountain Scientific Corporation  
“Phosphate Sponge for Remediation of Toxic Algae Blooms”

EmiSense Technologies  
Lawrence Livermore National Laboratory  
“Electrochemical Solid-State NOx Detector”

Sandia National Laboratories  
California Fire and Rescue Training Authority  
Sacramento Metropolitan Fire District  
“SUMMIT: Standard Unified Modeling, Mapping and Integration Toolkit”

NOAA ESRL GSD, GMD, PSD, CSD | NOAA ARL | NOAA NCEP |  
DOE Wind Energy Technologies Office, NREL, LLNL, PNNL, ANL  
| Vaisala | Sharply Focused, LLC | U of Colorado-Boulder CIRES,  
ATOC | Colorado State CIRA, Texas Tech, Notre Dame  
“Wind Forecast Improvement Project 2”

Forage Seed & Cereal Research Unit, Corvallis, OR  
“Pacific Northwest Biochar Atlas”

USDA ARS DK Inouye Pacific Basin Agricultural Research Center  
- HI | USDA Forest Service Institute of Pacific Islands Forestry |  
UH - Manoa Tropical Agriculture & Human Resources  
“Discovery, Diagnosis and Distribution of Educational Material on  
Rapid Ohī’a Death”

Outstanding Technology Development Award

Idaho National Laboratory  
“Autonomic Intelligent Cyber Sensor (AICS)”

Lawrence Livermore National Laboratory  
“FemtoProWrite: A Femtosecond Projection Lithography System”

NASA Ames Research Center  
“NASA Task Load Index (TLX) for iOS”

Sandia National Laboratories and XIA, LLC  
“Organic Glass Scintillator”

Space & Naval Warfare Systems Center Pacific (SPAWAR)  
“Use of Heptadecanoic Acid to Detect, Prevent, and Treat Metabolic  
Syndrome, Anemia and Inflammation”

Space & Naval Warfare Systems Center Pacific (SPAWAR)  
“High-Temperature Superconducting SQUID Array Radio Frequency  
Sensor”

Outstanding Commercialization Success Award

Lawrence Livermore National Laboratory (LLNL)  
European Extreme Light Infrastructure (ELI)  
“High-repetition-rate Advanced Petawatt Laser System (HAPLS)”

Mid-Atlantic

Educational Institution and Federal Laboratory Partnership Award

National Cancer Institute  
Society for Immunotherapy of Cancer  
“NCI Immunotherapy Co-sponsored by Society for Immunotherapy  
of Cancer”

Excellence in Technology Transfer

U.S. Agency for International Development  
“Unlocking the Protein Potential of Grasshoppers and Locusts”

USDA ARS National Cold Water Marine Aquaculture Center  
“Genetic Improvement of Germplasm for the U.S. Atlantic Salmon  
Industry”

USDA ARS Genetic Improvement for Fruits and Vegetables  
Laboratory  
“Pepper Jack, Midnight Creeper & Lil’ Pumpkin”

USDA ARS Plum Island Animal Disease Center  
“A Cell Line Sensitive to Foot and Mouth Disease Virus”

Interagency Partnership

U.S. Agency for International Development  
National Aeronautics and Space Administration  
“Connecting Space to Village – NASA and USAID’s SERVIR Program”

USDA Agricultural Research Service  
USDA National Institute of Food and Agriculture  
“SBIR-Technology Transfer Program”

Outstanding Technology Transfer Professional

James A. Poulos, III  
USDA Agricultural Research Service, Northeast Area\*

Rookie of the Year

Dr. Sidra Ahsan  
National Cancer Institute

State and Local Economic Development

National Energy Technology Laboratory  
City of Pittsburgh  
“The Partnership Between NETL and the City of Pittsburgh”\*

\* Also a 2019 national award winner

Mid-Continent

Regional Partnership Award

USDA APHIS, National Wildlife Research Center  
“Birds Don’t Always Like What They See”\*

Sandia National Laboratories and Goodyear  
“How Simulation is Key to Designing Tomorrow’s Tires”

USDA Agricultural Research Service  
“Combining Technologies to Transfer a Reference Genome Assembly  
for Cattle”

Technology Transfer Professional of the Year

Eric Payne  
National Renewable Energy Laboratory

Jason Martinez  
Sandia National Laboratories

Notable Technology Development Award

Ames Laboratory  
“Resource Sustainability for Rare Earth Materials via Efficient  
Recycling Technology”

National Renewable Energy Laboratory  
“Nitrilation Process: A Sustainable Solution to Produce Cost-  
Competitive Acrylonitrile”

Excellence in Technology Transfer Award

Air Force Research Laboratory Space Vehicles Directorate  
“Oscillating Heat Pipes (OHPs) for High Power Electronics Thermal  
Management”

USDA-ARS U.S. Meat Animal Research Center  
“Novel Sampling Methods for Beef Trim Pathogen Testing”\*

Los Alamos National Laboratory  
“INSIGHT”

Midwest Region

Excellence in Technology Transfer Award

Argonne National Laboratory  
“Transfer of Parallel Perturbation Model (PPM4CVV) to Convergent  
Science”

U.S. Army Engineer Research and Development Center  
“Shake Table Testing: Ebola Patient Transportation-Isolation System &  
Shock-Isolation System”

USDA Agricultural Research Service, Midwest Area  
“Starch Analysis and Application for Animal Feeds and Pet Foods”

Interagency Partnership Award

U.S. Army Engineer Research and Development Center  
Department of Energy  
“ERDC & DOE: Oak Ridge Institute for Science and Education”

State and Local Economic Development Award

Naval Surface Warfare Center, Crane Division  
Ivy Tech Community College  
“Entrepreneurship Summer Camp”

Northeast

Excellence in Technology Transfer Award

MIT Lincoln Laboratory  
“Next-Generation Incident Command System”

U.S. Army Armament Research, Development, and Engineering  
Command  
“Electromagnetic Rail Gun”

Industry/Non-Federal Government/University Award

Princeton Plasma Physics Laboratory  
“Princeton Field Reversed Configuration Fusion Reactor for Space  
Rocket Propulsion”

Regional Laboratory Award

Air Force Research Laboratory, Information Directorate

Southeast

Excellence in Technology Transfer Award

Air Force Research Laboratory, Munitions Directorate  
“AF96 Low Alloy High Performance Steel”

Oak Ridge National Laboratory  
“Licensing SCALE 6.2: A Software Package for Nuclear Safety  
Analysis and Design”

Oak Ridge National Laboratory  
“Qrypt Licensing of Quantum Random Number Generator from  
ORNL”\*

Oak Ridge National Laboratory  
“Strategic Licensing of the LandScan/LandCast Population Datasets”\*

Excellence in Technology Transfer Project of the Year

Centers for Disease Control and Prevention  
“CDC Zika Virus Specimen for Research & Development and  
Diagnostic Technologies”

Interagency Partnership Award

NASA Kennedy Space Center  
Defense Advanced Research Projects Agency  
United States Air Force  
Federal Aviation Administration  
“Transfer the Autonomous Flight Termination Unit (AFTU) Technology  
to U.S. Commercial Space Companies”\*

Outstanding Service Award

Doolittle Institute’s Technology Transfer Team

\* Also a 2019 national award winner



The FLC expresses its gratitude to the members of the Awards Committee for their tireless efforts in making the 2019 awards program a success.

**Dr. Whitney Hastings**  
Food and Drug Administration  
(Committee Chair)

**Mojdeh Bahar**  
USDA ARS Beltsville Area

**Dr. Sudeep Basu**  
Frost & Sullivan

**Hemant Bhimnathwala**  
Argonne National Laboratory

**Donna Bialozor**  
National Cancer Institute (retired)

**Sharon Borland**  
U.S. Geological Survey

**Robert Charles**  
Army Medical Research and Materiel  
Command

**Dr. Sabarni Chatterjee**  
National Institutes of Health

**Eric Cheng**  
National Institutes of Health

**Ellen Cline**  
ellenwrites.com

**John Dement**  
Naval Surface Warfare Center Crane Division

**Manohar Deshpande**  
National Aeronautics and Space  
Administration

**Patricia Doutriaux**  
Naval Research Laboratory (retired)

**Dr. Sevim Erhan**  
USDA ARS Eastern Regional Research  
Center

**Hannah Farquar**  
Lawrence Livermore National Laboratory

**Steven Ferguson**  
National Institutes of Health

**Dr. Suzanne Frisbie**  
National Institute of Allergy and Infectious  
Diseases

**Tara Gonzalez**  
Department of Energy

**Wade Green**  
National Institute of Allergy and Infectious  
Diseases

**John Hewes**  
National Cancer Institute

**Megan Irvin**  
National Institute of Allergy and Infectious  
Diseases

**Vlado Knezevic**  
National Institute of Diabetes and Digestive  
and Kidney Diseases

**Marianne Lynch**  
Department of Energy

**Lisa Marianni**  
Centers for Disease Control and Prevention

**David McCallum**  
Argonne National Laboratory

**Michael Merriken**  
Space and Naval Warfare Systems Center  
(SPAWAR) - Atlantic

**Chris Meyers**  
Los Alamos National Laboratory

**David Missal**  
Riverside Research

**Dr. Andrew Myers**  
Kansas City National Security Campus

**Michele Newton**  
National Cancer Institute

**Melissa Ortiz**  
Air Force Research Laboratory

**Amanda Osborne**  
U.S. Army RDECOM TARDEC

**Jeff Pixton**  
National Radio Astronomy Observatory

**Gail Poulos**  
USDA ARS Beltsville Area

**Elsie Quaite Randall**  
Lawrence Berkeley National Laboratory

**Johnette Shockley**  
U.S. Army ERDC - Cold Regions Research  
and Engineering Laboratory

**Dr. Thomas Stackhouse**  
National Cancer Institute

**Marc Suddleson**  
National Oceanic and Atmospheric  
Administration

**Stefan Susta**  
Air Force Research Laboratory Aerospace  
Systems Directorate

**Dr. Joseph Teter**  
Naval Surface Warfare Center, Carderock  
Division

**Jeffrey Walenta**  
USDA ARS Plains Area

**Patricia Tomczyszyn**  
Minority Business Development Agency

**David Yang**  
National Cancer Institute

**Dr. Hailing Yu**  
Volpe National Transportation Systems  
Center

**Dr. Xiao-Ying Yu**  
Pacific Northwest National Laboratory

The calendar year for the FLC awards program runs from June to May. Each year, awards are presented in the following categories:

- Excellence in Technology Transfer Awards
- Interagency Partnership Award
- Laboratory Director of the Year
- Outstanding Technology Transfer Professional Award
- Rookie of the Year Award
- FLC Service Awards
  - › Harold Metcalf Award
  - › Representative of the Year Award
  - › Outstanding Service Award
- State and Local Economic Development Award
- Technology Focus Award.

The following timeline reflects the awards program activity as of press time. Please refer to the FLC website ([www.federallabs.org](http://www.federallabs.org)) for updates.

**June/July**  
Criteria for all awards are reviewed and revised.

**August/September**  
Nomination period opens.

**October**  
Nomination period ends.

**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/May**  
Award winners register for FLC national meeting; awards presented at FLC national meeting.





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