FLC

Federal Laboratory Consortium
for Technology Transfer

AWARDS

April 25, 2018 • Philadelphia

Celebrating American Innovation

MESSAGE FROM THE AWARDS COMMITTEE CHAIR

Welcome to the 2018 FLC National Awards Ceremony

Thank you for joining us as we honor this year's elite group of technology transfer professionals who have taken the lead in moving all kinds of technologies from the federal laboratory to warfighters and firefighters, medical patients, and even to smartphone users, to name but a few.

As we "Celebrate American Innovation" in the birthplace of our nation, please take time to notice in the following pages the many examples of how our federal laboratories transferred technologies using not only classic tech transfer mechanisms such as patents and licensing, but also using exciting new tech transfer approaches that are clearly outside of the box.

The FLC 2018 national awards are presented in the following categories:

Excellence in Technology Transfer Awards – 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.

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

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.

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.

FLC Service Award/Harold Metcalf Award – named for a technology transfer pioneer, this category recognizes an individual who has performed sustained service to the FLC as an organization.

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 a transfer effort of a featured technology under the designated initiative for that year. The 2018 award recognizes energy-related technology transfer.

The FLC awards are a prestigious honor in the technology transfer world, with dozens of nominations submitted each year from over 300 federal laboratories and their agencies. It is my great pleasure and privilege to present the recipients of the 2018 FLC national awards.

Congratulations to the winners.

Donna Bialozor
Awards Committee Chair

EXCELLENCE IN TECHNOLOGY TRANSFER AWARDS

FLC NATIONAL AWARDS

Purification and Recycling Wastewater in Space and Decentralized Wastewater Systems

Department of Agriculture
Agricultural Research Service, Southeast Area

Nutrient pollution, caused by too much nitrogen and phosphorus in the environment, is one of America's most widespread, costly, and challenging environmental problems, impacting many sectors of the U.S. economy that depend on clean water. These environmental problems can be mitigated with the deammonification process using anammox (anaerobic ammonium oxidation process), which removes nitrogen for one third of the cost of existing technologies.

Anammox converts ammonia and nitrite to dinitrogen gas under anaerobic conditions. It is a novel, more energy-efficient alternative to conventional biological nitrogen removal systems because it requires much less oxygen and saves 100 percent of the external carbon source for denitrification. In addition, byproducts of anammox do not include greenhouse gases. Deammonification with anammox has been hailed as a game-changing technology in wastewater treatment. Starting with manure sludges, ARS scientists successfully developed an active anammox culture that thrives in high-ammonia environments. It is the first American anammox (other anammox species were discovered in the Netherlands and Asia after 1995) and the first anammox in the world that is reactivated after lyophilization, also known as freeze-drying. Anammox is optimal for wastewater treatment operations because it reduces nitrogen for one fourth of the cost of biological treatment. This made ARS' anammox particularly attractive to Pancopia, Inc., which was looking to innovate the development of wastewater treatment systems for spaces that currently require remote reactivation after long periods of quiescent operations. The Hampton, Virginia-based Pancopia has since licensed the technology from ARS.

Water in outer space is a scarce commodity, costing $83,000 per gallon to transport it there. Recycling water in space is critical to minimizing operating costs and optimizing operations since water represents approximately 92 percent of total life support consumables for the International Space Station (ISS). NASA currently treats wastewater generated on the ISS using a combination of physical/chemical processes that uses a significant number of consumables and generates wastes that require disposal. Development of a biological wastewater system to remove nitrogen and organics could significantly lower costs, enhance the treatment of wastewater, and increase recovery. The ability to rapidly start and shut down a biological wastewater treatment system is one of the major hurdles that must be overcome to successfully implement such a strategy, especially after hibernation during long periods of quiescent operation in space. ARS' anammox was highly effective in a NASA Small Business Innovation Research (SBIR) project led by Pancopia that tested its feasibility. A Phase II project is being conducted to provide NASA with a working biological space module using the microorganism discovered by ARS.

In addition, Pancopia is using its new space water purification technology to commercialize novel add-on systems for household septic tanks in the Chesapeake Bay watershed (52,000 septic systems need upgrading to remove nitrogen). This development could cut the cost of these upgrades by two thirds, saving up to $446 million.

Pictured:
Dr. Mattias Vanotti

Winners not pictured:
Bill Cumbie, Dr. Marina De Pra, Dr. José Martinez, Dr. Michael Rothrock, Dr. Ariel Szogi

Contact: Dr. Mattias Vanotti, (843) 669-5203, mattias.vanotti@ars.usda.gov

Endoscopy Training Platform

Department of Defense
Uniformed Services University of the Health Sciences

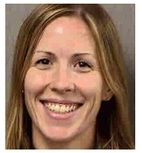
The Simulated Colonoscopy Objective Performance Evaluation (S.C.O.P.E.) was developed at the Uniformed Services University of the Health Sciences (USU) as a training and assessment tool for physicians who perform colonoscopies. S.C.O.P.E. fills the need for a lower-cost, non-virtual-reality based, valid assessment tool. Using a colonoscopy model manufactured by Kyoto Kagaku Co, Ltd., and distributed by Limbs and Things, Inc. as a base platform, surgeons at USU created tasks designed to evaluate the skills necessary for diagnostic endoscopy.

In collaboration with the manufacturer and the distributor, a task was developed and validated under a Cooperative Research and Development Agreement (CRADA) and ultimately licensed, resulting in the commercially available Endoscopy Training System (ETS). Based on a research study demonstrating a 100-percent pass rate of the Fundamentals of Endoscopic Surgery manual skills exam by novice residents, ETS was determined to be a low-technology tool for the objective assessment and training of endoscopic skills. ETS allows surgeons to practice and gain proficiency in flexible endoscopy skills without risk to patients.

As the lead inventor for S.C.O.P.E. and the principal investigator for continued development under the CRADA, Col E. Matthew Ritter, MD, FACS, was key to the successful transfer of the technology due to his knowledge of the endoscopy field, ensuring appropriate licensing terms for the technology as well as the evolution of the endoscopy field. Joshua Girton, JD, LLM, Associate General Counsel, was involved in the review of the CRADA as well as the licensing terms included in the appendix to the CRADA in order to provide a clear path to licensing. Katherine Lipka, PhD, was the primary contact and negotiator for the agreements that resulted in transfer of the technology to Limbs and Things and Kyoto Kagaku. Dr. Lipka ensured that the license agreement was moved forward quickly from initial draft to negotiation to execution to address the aggressive timeframe of the commercial partners, allowing for commercial production of ETS. The technology was transferred through the execution of a mutual nondisclosure agreement, a CRADA that included a summary of the partial licensing terms, and an exclusive license agreement.

This transfer of the S.C.O.P.E. technology through a CRADA and an exclusive license agreement demonstrated excellence in technology transfer because the inclusion of the partial license terms in the CRADA allowed for a faster execution of the license agreement with multiple parties, including one based in Japan, thus allowing the licensees to launch the ETS within four months of the license execution. The short timeframe to the launch of the ETS provides surgeons with a better, lower-cost method to advance the skills necessary for endoscopy. The use of the ETS platform in a training curriculum develops the skills required to pass the Fundamentals of Endoscopic Surgery manual skills exam, thereby improving patient safety.

The Endoscopy Training System allows surgeons to develop and practice skills required to perform endoscopies.



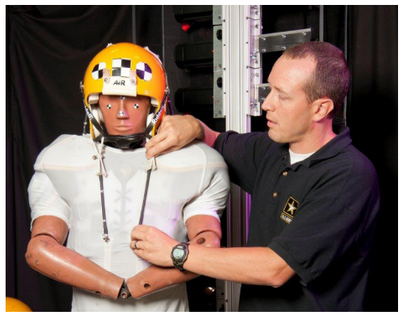
Left to right:
Col E. Matthew Ritter, MD
Joshua Girton, JD, LLM
Katherine Lipka, Ph.D.

Contact: Col. E. Matthew Ritter, (301) 295-3155, eric.ritter@usuhs.edu

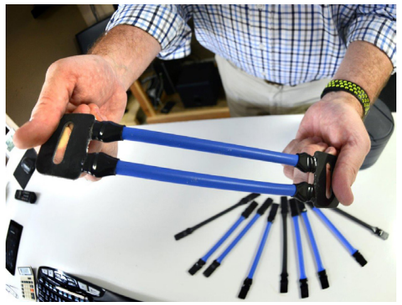
Rate-Activated Tethers (RATs)

Department of Defense - U.S. Army
Army Research Laboratory

A technology developed to help protect warfighters from physical injuries that first drew attention from the National Football League (NFL) is now poised to emerge as the key to an entire family of innovative wearable protective products.



Dr. Eric Wetzel, inventor of RATs. U.S. Army (Photo by Doug LaFon)



Russ Hubbard, Army veteran and founder of Per Vivo Labs, demonstrating resistance band developed with the rate-activated tether technology. (Photo credit: Ned Jilton II for TechLink)

Left: Dr. Eric Wetzel

Included in the nomination, but not pictured: Russ Hubbard, Dr. Joe Hitt, Dr. Bruce Floersheim, Dr. Richard Dombrowski, Dr. Austin Leach, Tom Mulkern, Jason Craley

Protecting warfighters' vulnerable body parts—ankles, heads, joints—has always presented a Catch-22: rigid braces, straps, and other protective gear can help protect soldiers from injury in extreme situations, but they also restrict movement in ways that often make them impractical. But the RATs developed by the Army Research Laboratory (ARL) hold the promise of offering both protection and flexibility—for soldiers, athletes, recovering patients in physical therapy, and a variety of other uses.

ARL's RATs are basically straps filled with shear-thickening fluids—compounds that are "rate responsive," meaning that they are liquid and flowable when at rest or low speeds, but quickly transition to a solid-like material with the consistency of wet sand when sheared rapidly or stressed. ARL's RATs combine shear-thickening fluids with other design components to create a flexible strapping material that exhibits 10-100 times greater resistance and support when strained quickly versus slowly.

Initially explored to replace rigid ankle braces for paratroopers, the technology's potential is now evolving into what could become a full ecosystem of protective wearables both in and beyond the military.

The technology first drew external attention in the NFL's Head Health Challenge initiative, where it was one of only seven grant proposals to improve football players' head protection that received funding from the league, followed by a second round of follow-on funding. Collaboration with the NFL and the Defense Advanced Research Projects Agency' s Warrior Web project further refined the project and led to Cooperative Research and Development Agreements and licensing agreements with the technology's first two commercial partners.

Presently, a number of companies are exploring using the technology for a broad range of applications under the auspices of a deliberate technology transfer strategy by ARL that envisions agreements with multiple partners to ensure the technology is used to its full potential across a wide line of applications. At this time, the two that have been publicly disclosed and prototyped by partner companies are ankle protection (GoX Studio) and bands that provide variable tension for use in physical therapy (Per Vivo Labs). However, other companies in the process of licensing the technology picture a full range of protective gear for athletic use, with clear dual-purpose potential for future military applications. Combined with one company's proposal to manufacture the material, these ongoing efforts suggest the strong potential for a broad ecosystem of developers of mainstream commercial products based on ARL's technology in the near future.

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Mixed Odor Delivery Device (MODD)

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

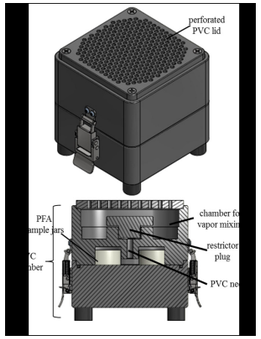
How do you safely train a bomb-sniffing dog? The Mixed Odor Delivery Device (MODD), developed by the Naval Research Laboratory (NRL), is a canine training device that delivers a mixed vapor from binary explosive materials without actually mixing the materials, which leaves them virtually free from risk of detonation. This approach avoids safety issues involved with producing, storing, and transporting live explosives, which make routine canine training difficult.

NRL used a variety of innovative tools to facilitate successful transfer of the MODD technology. The laboratory featured the MODD technology in an Innovation Discovery Event, which led to several commercialization opportunities. With interest from multiple licensing candidates and using a first-of-its-kind approach, NRL issued a "timed offer" for competitive licensing of the MODD technology. Per Vivo Labs was selected as the licensee, and executed a license agreement with NRL in 60 days, much faster than NRL's normal licensing timeline. Throughout this process TechLink, a Department of Defense Partnership Intermediary, and the MODD inventor were instrumental in facilitating successful implementation of these technology transfer (T2) tools and conveying the value proposition for the MODD technology. Per Vivo Labs served the critical role of the unique commercialization partner that NRL needed.

Per Vivo Labs has already placed the commercialized MODD product into the hands of the Kingsport, Tennessee, Police Department K-9 Unit. And days after officially coming on the market on October 2, 2017, Per Vivo Labs sold its product to a private entity. In addition, several state and local government entities have indicated their intent to purchase the product.

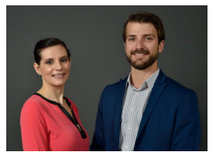
The NRL team strategically maneuvered a small and fragmented market space in order to successfully transfer the MODD technology. Success required a "perfect storm" of complementary goals, relationships, and efforts across multiple T2 ecosystem participants, and that is exactly what the team put together. The suite of tools employed by the nominees and the incredibly short timeline in which they were able to do it speaks directly to their T2 expertise and skill. Together the NRL team enabled the transfer of the technology from the Innovation Discovery Event to the sale of the first device in about 9 months, an impressively rapid commercialization effort, far outpacing the usual cycle of several years from license to product.

The Per Vivo Labs Odor Trace Mixed Odor Delivery Device (OT-MODD) product. (https://www.odortrace.com)



A cutaway view of the NRL MODD. This view highlights the internal components and function of the MODD technology.

The current and potential future benefit of the MODD is obvious. Dogs are often the first line of defense in explosives detection. And while the commercial market is very specific, it is incredibly important given the need to ensure safety in public spaces. The fact that this technology quickly went from license to product availability is attributable to this multidisciplinary team.



Left to right: Amanda Horansky McKinney, Lauryn DeGreeff-Silk, and Austin Leach

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Amorphous Bubble Bonding

Department of Defense - U.S. Navy

Naval Surface Warfare Center, Corona Division

Producing the strongest material with the lightest possible weight is a perpetual goal of materials science, and Navy inventors have succeeded in making stronger, lighter foams from millions of microscopic glass bubbles. A research team at Naval Surface Warfare Center, Corona Division (NSWC Corona) developed and tested the Amorphous Bubble Bonding (ABB) technique to effectively and efficiently produce cellular materials in a wide range of densities, stiffnesses, and strengths. The method heats hollow glass spheres—each about the diameter of a human hair—above the glass transition temperature, resulting in a viscous flow transition that can be controlled via pressure differential to expand or contract the spheres and bond them into the desired morphology.

Version 1 of NSWC Corona bubble maker

Car safety crash-testing is a potential example of the use of shock-absorbent foams made by the Navy's ABB technique.

The NSWC Corona team was largely responsible for transferring the ABB technology to a new startup company, Microsphere Material Solutions (MMS) of Rockville, Maryland, which was created specifically to transition the Navy invention to commercialization. A Patent Licensing Agreement (PLA) and a Cooperative Research and Development Agreement (CRADA), both signed in 2016, were designed to accelerate ABB research and push development into commercial products. The team's contributions to the transfer of the technology included onsite visits to MMS, the loan of crucial laboratory equipment to the company, monthly teleconferences, ongoing technical assistance, and coauthoring grant proposals for additional research and development (R&D) funding.

Among the unique aspects of this technology transfer was a PLA with very creative licensing terms. The agreement between NSWC Corona and MMS allowed a startup company—that was licensing a technology that still required substantial development to bring it to market—the time and financial freedom to be successful. At the same time, this PLA provided the Navy laboratory the opportunity to share in the financial success of the company when it reaches positive revenue. Another notable aspect of the ABB transfer has been the exceptionally high degree of inventor participation, with ongoing engagement by all of the ABB inventors to ensure the company's commercial success.

The new ABB method is a major advance beyond current technologies for fabricating cellular solids, yielding lightweight foams that are shock-absorbent, buoyant, and easily tailored to specific applications. With both military and civilian applications, ABB-based products are expected to attract customers from multiple industries, such as aerospace, automotive, construction, personal safety, lightweight submersibles, electronics, and storage/shipping containers.

Pictured:
Dr. Aaron Wiest

Not pictured: Dr. Dale Connor, Craig MacDougall, Rebecca Stevens

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Dahlgren Decontamination Formulation

Department of Defense – U.S. Navy

Naval Surface Warfare Center, Dahlgren Division

Where do you look for inspiration to develop a "silver bullet" solution for chemical and biological decontamination…one that is fast, environmentally friendly, and easily transportable, and performs better than existing decontaminants? What about the laundry industry?

A team at Naval Surface Warfare Center, Dahlgren Division (NSWCDD) developed a decontamination product, called "Dahlgren Decon," that is highly effective against a wide range of chemical and biological agents, including mustard gas, nerve agents (including VX), anthrax, and Ebola. Concentrated amounts of the decontaminant are packaged in a stable solid form that is activated simply by mixing in water. The solution is then applied by sprayer to the contaminated item.

In 2015, Dahlgren Decon was licensed to a small disadvantaged (8a) business in Virginia called First Line Technology, LLC, for development of a commercial decontamination product. The company's core business area is the design and manufacture of disaster preparedness and response equipment for Department of Defense (DoD) and first responder emergency response missions. Dahlgren Decon was a perfect fit for its existing product line.

The transfer process began with several Cooperative Research and Development Agreements (CRADAs) between NSWCDD and First Line Technology and a Belgian chemical company called Solvay S.A.. Executed in 2011 and 2014, these CRADAs helped to refine the technology's decontamination capability and facilitate its small form factor. The CRADAs enabled the 2015 license and remained in place to facilitate successful commercialization.

In 2016, First Line Technology commercialized the product and made it available for sale. It is available off-the-shelf to the DoD, first responders, or others requiring the decontamination of biological or chemical contaminants.

Since the First Line Technology product came on the market in 2016, the company has successfully marketed (with significant sales) to entities within the Department of Justice, DoD, and several federal intelligence agencies. Numerous state and local agencies have purchased the product, and several international entities are expected to do so soon. The customer base is growing rapidly, and Dahlgren Decon has become the new standard in decontamination.

An example of a spray application of the Dahlgren Decon decontaminant.

A First Line Technology representative demonstrates application of Dahlgren Decon for decontaminating a fire suit.

Left to right: Amit Kapoor, Chris Hodge, Lorraine Harting

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Combat Diver Navigation Module

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

Military combat divers conduct underwater missions in hazardous conditions. Critical to mission success is accurate underwater navigation and staying within oxygen rebreather depth limits to prevent oxygen toxicity. Traditional compasses and depth gauges can be virtually useless in this zero-visibility environment, even with auxiliary illumination.

The S3D technical development team from Naval Surface Warfare Center, Panama City Division (NSWCPCD) understood all too well how underwater missions were seriously hampered by poor visibility conditions. This was their area of specialization.

Diver's mask with CDNM attached.

Military Combat Divers test the CDNM at the Naval Diving & Salvage Training Center, Panama City. (U.S. Navy photo by Jacqui Barker/Released)

Each team member brought their unique experience, expertise, creativity, and innovation to address the challenge—to develop a small, low-cost, low-power, enhanced navigation capability for the dangerous underwater combat navigation mission that would operate in zero visibility, yet enable the diver to remain clandestine and not degrade his night vision for follow-on land operations.

The Combat Diver Navigation Module (CDNM) technology, invented by NSWCPCD and transferred for manufacture via a Patent License Agreement to James Fisher Defence, has changed all that. The CDNM provides a clear visual display of a combat diver's compass heading, depth, and time, even in zero visibility conditions. The tiny micro display, unique custom optical system, and electronics are integrated into a module that mounts to the side of a low-volume dive mask. The small lithium battery provides 20+ hours of operation.

The diver can flip the display up and down, turn the system on and off, adjust the display brightness level, and use the special NAVLOK software feature. When the NAVLOK button is pressed, the selected compass heading is boxed and navigation alignment icons appear to assist the diver with maintaining an accurate navigation course. The screen displays compass heading, diver depth (in either feet or meters), and time in minutes and seconds using low-light red characters to reduce light signature and preserve divers' night vision. There is also a remaining battery life icon.

Although the long-term revenue outcome is yet to be discovered, the immediate result is that James Fisher Defence will be manufacturing a production version of the CDNM for sale to, and use by, joint service military, allies, first responders, public safety, and potentially private-sector civilian entities. The estimated initial quantity for the United States and United Kingdom alone is nearly 3,000 units.

This technology transfer achieves the "grand slam" of technology transfer: Navy-developed technology is embedded in a new product that has both military and non-military applications. Thanks to the innovative thinking and perseverance of the technical development team at NSWCPCD, the CDNM will provide military divers conducting dangerous underwater navigation missions significantly increased accuracy, safety, and situational awareness.

Dennis Gallagher, an engineer from the NSWCPCD explaining advanced diver HUD technology to an attendee of the Office of Naval Research's Naval Future Force Science and Technology (S&T) Expo at the Walter E. Washington Convention Center. (U.S. Navy photo by John F. Williams/Released)

Winners not pictured: William Hughes, Richard Manley, Allie Pilcher, Charles Self, Brian Wentworth

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Android-based Team Awareness Kit (ATAK)

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

The Android Team Awareness Kit (ATAK, aka Android Tactical Assault Kit) is a profoundly useful software collaboration and communication situational awareness application that runs on an Android mobile operating system on a smartphone or a tablet.

ATAK is an affordable, easy-to-use, secure, mobile, interactive geospatial tool that connects multiple people on the go, giving them a common operational picture digitally in an intuitive way. Users can add their own custom functionality and employ multiple types of communication systems simultaneously. It is the only app that provides dozens of capabilities and robust information-sharing in a mobile format on a commercial off-the-shelf handheld cell phone.

Originally created for the military, ATAK currently has 40,000 Department of Defense (DoD) users (Air Force, Army, Special Operations, National Guard, and the Departments of Justice and Homeland Security), 32,000 non-DoD users, and 69 licensees. The app is licensed only to U.S. companies that meet stringent legal requirements.

The Air Force Research Laboratory (AFRL) Information Directorate technical team developed ATAK's plug-in functionality, as well as devised a simple, low-cost licensing model that would allow private companies to easily license the software. The technology transfer was implemented through a highly accelerated, nonexclusive license agreement that can be completed largely online. A company can log in, complete the required information, and, once it is approved, return to the website portal to autogenerate its ATAK license. This novel licensing strategy resulted in the streamlined closure of a license agreement that meets all regulatory and legal requirements.

Licensing partners can modify and adapt ATAK to their particular requirements, but must vet those changes through AFRL. Upgrades often are distributed for use to the entire user community, thus ensuring ATAK's robustness and continuous development into the best possible technology of its kind.

The technology transfer effort benefits the AFRL, its mission, the government, and all users. The government realizes further cost savings by benefiting from shared improvements and having licensees train and service government users. The license enables government officials to provide ATAK to other people on their own authority for official government use, dramatically improving federal, state, and local collaboration. For example, the FBI can share ATAK with state and local counterparts so they can have seamless, interoperable collaboration and communication. During the 2017 hurricanes, ATAK was widely adopted to enable the state and local emergency response to collaborate with the federal and military rescue teams to conduct coordinated rescues and save lives.

The Marine shown in the photo is the team leader and is tracking his team and the drop zone position. (Photo by Lance Cpl. George Melendez)

Ralph Kohler (second from left), principal engineer, AFRL Information Directorate, is honored during the 2014 AFRL Fellows and Early Career Awards Banquet, Oct. 30 at the National Museum of the U.S. Air Force. (U.S. Air Force photo/Wesley Farnsworth)

Winners not pictured: David Canestrare, Daniel Carpenter, Sam Davis, Frank Hoke, Dr. Mark Linderman, Joseph Mancini, Richard Newkirk, Sean Patten, Joshua Sterling

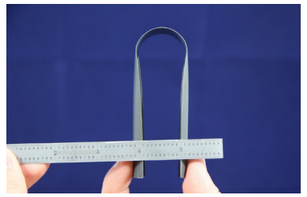
Contact: Ralph Kohler, (785) 363-9277, ralph.kohler@us.af.mil

High Strain Composites for Spacecraft Deployable Structures

Department of Defense - U.S. Air Force
Air Force Research Laboratory, Space Vehicles Directorate

Developing and launching satellites into space is a challenging and expensive enterprise and, as a result, the launch is expensive, costing on the order of $10,000 per pound. Thus, reducing mass is a driving requirement for space systems. The volume and mass of launch vehicles are tied to each other. Large satellites require large fairings (structures whose primary function is to produce a smooth outline and reduce drag), which are naturally heavier than small ones; therefore, satellites must be as compact as possible during launch to minimize the mass of the fairing and the launch vehicle. However, once on-orbit, satellites require large solar arrays to generate power and large antennas for communications. Solar panels for geosynchronous communication satellites have a wingspan of 150 feet, and communication antennas can be 54 feet in diameter. In comparison, the maximum diameter of a launch fairing is 15 feet. Thus, many parts of the satellite must be compactly stowed for launch and unfurled on-orbit, which is the role of deployable structures.

The Structure for Storing and Unfurling a Flexible Material (U.S. Patent 8,356,774), an Air Force-owned invention, demonstrated in this solar technology. (Photo credit: AFRL/RVSV)



The Tape-Spring Deployable Hinge (U.S. Patent 7,354,033), an Air Force-owned invention, can fold compactly for use in high strain composite deployable space structure technology. (Photo credit: AFRL/RVSV)

For the last four decades, deployable structures have largely used metallic pin-clevis joints for articulation. These joints require motors for actuation, springs and latches to lock out, and complex design and testing efforts to ensure they do not bind or fail during operations. As a result, deployment systems were heavy, complex, and expensive. To solve this problem, the Air Force Research Laboratory, Space Vehicles Directorate (AFRL/RV) developed high strain composites (HSCs) that provide revolutionary improvements in deployment mass, cost, and complexity, thereby dramatically improving system performance and enabling new satellite concepts and architectures.

Over the past 10 years, AFRL/RV has developed and patented a portfolio of composite structure technologies. In August 2016, the Directorate signed two exclusive Patent License Agreements (PLAs) with Roccor, LLC, enabling Roccor to build solar array development systems to support mega-constellations. Under the two PLAs, Roccor will undertake the development and marketing of six AFRL/RV patents. Roccor's deployable structure systems utilize elastically stowed and deployable fiber-reinforced polymer composite structural elements. The company specializes in product solutions when traditional deployable space systems are unable to meet performance and/or cost requirements. Its approach is based on leveraging HSC technology from AFRL that enables dramatically lighter, simpler, and, hence, lower-cost solutions.

HSCs have also transitioned to nine other industry partners to address a wide variety of applications in addition to the significant and well-established transfer with Roccor. The technologies' HSCs increase satellite capability/capacity, increase DoD space architecture resiliency, and reduce cost/mass for a wide range of missions, including communication and GPS. For communication satellites, this means more bandwidth, faster speeds, and better signal reliability/consistency (i.e., no dropouts) at reduced cost, whether those satellites are broadcasting vital military communications or DIRECTV programming.

Left to right: Dr. Andrew Williams, Jeremy Banik, Michael Peterson

Contact: Matthew O'Brien, (505) 846-5028, matthew.obrien.27@us.af.mil

EXCELLENCE IN TECHNOLOGY
TRANSFER AWARD

Oscillating Heat Pipes (OHPs) for High-Power Electronics Thermal Management

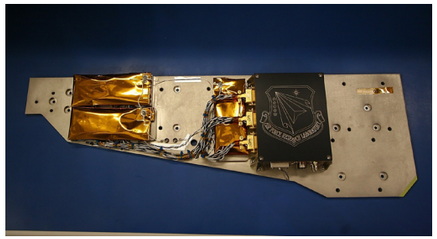
Department of Defense - U.S. Air Force
Air Force Research Laboratory, Space Vehicles Directorate

Waste heat from advanced electronics limits system performance. This is true for computers, consumer electronics, and aerospace systems; it is especially true for satellites with components such as digital signal processors that run at just 10 percent of their terrestrial performance levels. Further complicating this situation is the fact that components continue to shrink in size and increase in performance, thus making the heat problem more challenging. Next-generation electronics are expected to operate 100 times higher than current levels. Without proper thermal management technologies, these electronics will quickly destroy themselves.

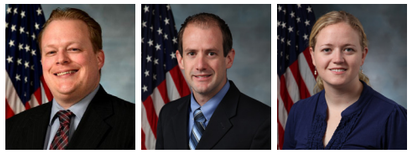
To tackle this challenge, the Air Force Research Laboratory Space Vehicles Directorate (AFRL/RV), in partnership with ThermAvant Technologies, Boeing, and NASA, developed OHPs, which consist of a meandering microchannel that is partially filled with a fluid and embedded in a structure. Unlike heat pipes traditionally used to cool high-performance electronics, OHPs do not contain a wick structure. This difference makes OHPs cheaper to manufacture and, more importantly, alters how they operate, which allows OHPs to transfer significantly more heat than heat pipes. Thus, OHPs can handle 200 times more heat, which increases capability and reduces the cost for a wide range of high-performance systems, including Air Force and commercial communication satellites. For communication satellites, this means more bandwidth, faster speeds, and better signal reliability at reduced cost—whether supporting the warfighter or transmitting DIRECTV Sunday Ticket. In 2008, AFRL/RV initiated OHP research focused on the basic operation principles of the technology. During summer 2012, AFRL investigated the gravitational independence of OHP operation on NASA's microgravity aircraft, aka the "Vomit Comet." This flight experiment proved the OHPs' gravity independence and suitability for space applications. In December 2011, AFRL initiated the technology transfer partnership using a Small Business Innovation Research (SBIR) contract for improving heat rejection in next-generation electronics. AFRL wrote the SBIR topic solicitation, and ThermAvant responded. This initial contract led to the formation of a partnership with ThermAvant and Boeing for the transition of commercial OHP products.

The multi-partner effort led directly to the testing, demonstration, and commercialization of OHPs, including an on-orbit demonstration on the USAF X-37B space plane. Through successful in-house and contracted research, as well as AFRL-led flight experiments, ThermAvant made its first commercial sales in 2013. Since then, ThermAvant has executed more than 14 procurement agreements with 11 prime contractors, addressing needs for the U.S. Air Force, Army, Navy, and consumer electronics companies. This technology has the potential to change the face of an entire industry by replacing traditional heat pipes with OHPs, and its huge success is due to the AFRL team.

Principal Investigator, Brent Taft (upside down), operating the ASETS OHP flight experiment on NASA's zero-g aircraft.



ASETS-II OHP space flight experiment hardware flown on the USAF X-37B.



Left to right: Dr. Andrew Williams, Brenton Taft, Sally Smith Winner not pictured: Dr. Joy Stein

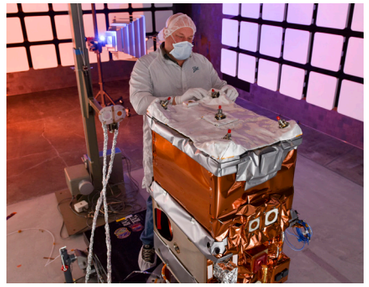
Contact: Matthew O'Brien, (505) 846-5028, matthew.obrien.27@us.af.mil

Green Propellant

Department of Defense - U.S. Air Force

Air Force Research Laboratory, Systems Directorate

AFRL engineer Milton McKay, holding a flask of Green Propellant.



A Ball Aerospace engineer adjusts the thermal insulation on NASA's Green Propellant Infusion Mission spacecraft bus. NASA is testing green alternatives to conventional chemical propulsion systems. (Photo credit: Ball Aerospace)

The U.S. Air Force has developed an advanced, high-density, monopropellant formulation family entitled "Monopropellants of Lessened Toxicity (AF M315E)" (henceforth, Green Propellant). The patent application, U.S. Patent 09/322,786 (under secrecy order), is not issued, but is "allowed." This technology is International Traffic in Arms Regulations (ITAR)-restricted. By a nonexclusive license agreement, Green Propellant has been transferred to Digital Solid State Propulsion (DSSP), a small U.S. company located in Reno, Nevada. Under this agreement, DSSP is the go-to commercial source of Green Propellant, and is licensed to sell it to other U.S. federal agencies and commercial companies for spacecraft propulsion.

Green Propellant represents a high-performance, low-toxicity alternative to the state-of-the-art spacecraft propellant, hydrazine. It is primarily comprised of energetic ionic liquids (EILs), which confer high energy-density in addition to having negligible vapor pressures. The propellant offers a 50-percent improvement in volumetric impulse, which translates to either significantly increased spacecraft lifetimes or performance for a given tank size, or smaller spacecraft. The negligible vapor toxicity results in improved safety as well as lower operational and handling costs with faster turnaround times. Hydrazine has been used in the U.S. space program since the 1970s as the low-power monopropellant for maneuvering the thrusters of spacecraft; however, it has serious disadvantages. It is highly toxic when inhaled, corrosive on contact with skin, and hazardously flammable. It can cause seizures and coma; acute exposure can damage the liver, kidneys, and central nervous system. Consequently, when handling hydrazine, people must wear self-contained atmospheric protective ensemble (SCAPE) suits and breathe supplied air.

Green Propellant provides a nontoxic alternative to hydrazine, and can be handled with standard personal protective equipment. Adam Brand, Principal Engineer, Air Force Research Laboratory, Aerospace Systems Directorate, Rocket Propulsion Division (AFRL/RQR), is the inventor of Green Propellant. Brand began working on Green Propellant in 1997 with a team of four researchers who provided background and technical information. To transfer Green Propellant to industry, he undertook an extensive search for relevant U.S. companies. Brand identified DSSP, the perfect partner to whom AFRL/RQR would license the technology and who would manufacture and market the groundbreaking propellant. Kristen Schario is the AFRL/RQ Technology Transfer Manager who negotiated the nonexclusive license agreement and addressed myriad issues related to the secrecy order on the patent. She worked with the Air Force legal team to ensure that Green Propellant could be licensed and that the secrecy order was not being violated in the process. Successful transfer of the technology to DSSP ensures a stable commercial source of this nontoxic, high-performance spacecraft propellant to the U.S. community in support of Air Force and DoD missions and the U.S. spacecraft industry.

Left: Kristen Schario (right) receives the 2016 George Linsteadt Technology Transfer Achievement Award. Right: Adam Brand

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Innovative Oven for Faster, Less Energy-Intensive Carbon Fiber Manufacturing

Department of Energy

Oak Ridge National Laboratory

The Department of Energy has invested significant resources to advance better, less-expensive techniques for manufacturing carbon fiber. The lightweight, flame-resistant, strong material could reduce passenger car weight by 50 percent and improve fuel efficiency by about 35 percent without compromising performance or safety. Such an advance would save more than $5,000 in fuel over the life of a car at today's gasoline prices. Similar benefits would be achieved for trucks and other freight vehicles, as well as aircraft. It would also significantly reduce our nation's dependence on foreign oil. Other energy-related applications for carbon fiber include wind turbine blades and towers, electronics, energy storage components, and power transmission lines.

Conventional manufacturing methods are slow and energy-intensive, making it costly to use carbon fiber in mass-produced applications. Oak Ridge National Laboratory (ORNL) has licensed a suite of technologies that provides an innovative Atmospheric-Pressure Plasma Oxidation Oven, which ORNL co-developed with licensee RMX Technologies. Used for the manufacture of carbon fiber, the ORNL-RMX innovation provides a better method to oxidize carbon fiber precursors. It achieves a three-fold increase in production throughput while dropping energy requirements by 75 percent; its smaller size reduces capital costs (e.g., smaller building, lower exhaust treatment requirements) and labor costs (e.g., less operational oversight required). The extremely reliable and robust technology produces carbon fiber at least as good as conventionally processed fiber. In some instances, the process has produced better fiber, potentially reducing the amount needed in the composites that use it.

The Atmospheric-Pressure Plasma Oxidation Oven in the Knoxville-based facility owned by 4M Carbon Fiber Corp.

The technology development was truly a team effort, with the participation of both ORNL and RMX equally crucial to the success. ORNL brought its expertise in carbon fiber, while RMX possessed unique, essential knowledge of plasma processing. RMX also contributed an industrial perspective, ensuring scalability in every advance.

In 2015, while planning to commercialize the technology, RMX launched 4M Carbon Fiber, which now has responsibility for commercialization of the transferred technology. The RMX-4M team has also engaged another partner, C. A. Litzler Co., Inc., a large equipment manufacturer based in Cleveland, Ohio, that is providing extremely valuable oven design expertise. The partners jointly designed a pilot industrial oxidation oven capable of 175 metric tons/year throughput, which allows 4M to produce enough carbon fiber to demonstrate/verify performance to potential customers.

Thanks to the cost and energy savings provided by the Atmospheric-Pressure Plasma Oxidation Oven, this technology transfer effort is expected to make the use of carbon fiber within 10 to 15 years as widespread as plastics are used today. It can be used in composites for buildings, bridges, and other structures, as well as textiles and microelectrodes. In summary, this technology transfer effort is a public-private collaboration that launched a U.S.-based company that is poised to grow exponentially within the next 5 years while transforming the market for carbon fiber materials and increasing the nation's role in a major sector of manufacturing.

Left column (top to bottom): C. David Warren, Dick Nixdorf, Edna Gergel
Right column (top to bottom): Marc Filigenzi, Michael Paulus, Nestor Franco

Top: Felix Paulauskas (left) and Truman Bonds (right)
Bottom: Josh Kimmel (left) and Rodney Grubb (right)

Contact: Felix Paulauskas, (865) 576-3785, paulauskasfl@ornl.gov

Licensing ORNL's High-Performance, Low-Cost Alloys to Eck Industries

Department of Energy
Oak Ridge National Laboratory

Alloyed metals are shown being poured from a furnace into a ladle to be used for filling molds.

Aluminum cerium (ACE) alloys exhibit superior high-temperature performance and castability while reducing manufacturing steps. These exceptional characteristics shrink costs and the energy requirements of manufacturing in the automotive, aerospace, and energy industries. ACE alloys open the door to using aluminum in a wide variety of applications that typically require more expensive materials, such as steel or titanium. They also address energy reduction goals and provide a new use for cerium, an abundant and often wasted byproduct of rare-earth mining. This technology exemplifies how low-value materials can be repurposed to develop high-performance products with exceptional value.

Left column: Alexander King, Cori Thorne
Right column: David Weiss, Gerard Ludtka

This technology was produced via a joint effort between Oak Ridge National Laboratory (ORNL), Ames Laboratory, Lawrence Livermore National Laboratory (LLNL), and Eck Industries, Inc.. These four organizations are members of the Department of Energy's Critical Materials Institute (CMI), a group that aims to accelerate discovery and applied research focused on critical energy issues.

ORNL worked with Ames Laboratory and LLNL to obtain their intellectual property rights to the ACE alloys technology in order to sign an exclusive licensing agreement with Eck Industries, a privately owned company based in Manitowoc, Wisconsin. The licensee has committed to an aggressive development plan of the ACE alloys, with the goal of achieving commercial development milestones and bringing the technology to the marketplace. This technology transfer effort was a success due to market-relevant technology, market-savvy innovators, Eck Industries being the agile-yet-powerful licensee, and an overall foundation of trust among the innovators. The technology transfer effort will result in Eck Industries benefiting from both the current market and potential new commercial applications that arise thanks to this innovative and transformative technology.

This is furthering CMI's goal to advance basic and applied research with engineering to accelerate scientific discoveries that address critical energy issues. The partnership illustrates how this goal can be met by developing an innovative material that can address the needs of the U.S. manufacturing industry while assuring market demand for the supply chains of critical materials, such as rare-earth elements, which are important to U.S. security.

Left to right: Jennifer Caldwell, Joe Marasco, Marc Filigenzi, Michael McGuire, Orlando Rios, Ryan Ott, Scott McCall, Zachary Sims

Contact: Orlando Rios, (865) 574-3747, rioso@ornl.gov

EXCELLENCE IN TECHNOLOGY
TRANSFER AWARD

ORNL's Co-Development and Licensing of Large Area Additive Manufacturing Technologies

Department of Energy
Oak Ridge National Laboratory

The Large Area Additive Manufacturing (LAAM) system co-developed by Oak Ridge National Laboratory (ORNL) and Cincinnati, Incorporated (CI), with contributions by Strangpresse, LLC, is a radically new large-scale platform for additive manufacturing (also known as 3D printing) of polymer and composite structures. Now marketed by CI as the BAAM-CI system (for Big Area Additive Manufacturing), the system's technologies are also licensable by other industry players.

The LAAM system enables components of arbitrary geometry to be 3D-printed at a scale 10 times larger than other commercially available systems, and can deposit material more than 500 times faster than the previous state of the art. In addition, its introduction to the market has drastically reduced the price of 3D printing on a large scale, from approximately $100 per pound before these efforts to about $1 per pound today. It is the first system to deposit with carbon-fiber-reinforced plastic pellets, which can double the strength of 3D-printed components and increase their stiffness by a factor of 4–7. In short, the LAAM system co-developed by ORNL and its partners enables 3D printing of large structures much faster and cheaper than ever before, and with stronger results.

The co-developed system was made possible by Cooperative Research and Development Agreements (CRADAs) with both partners. ORNL contributed a large body of intellectual property that extended small-scale 3D printing capabilities to large-scale formats. Strangpresse optimized and tested new extruders as well as new carbon-based fiber depositing materials. CI provided the large gantry systems to house the technologies and optimize them for long-term, robust use.

The LAAM system and component technologies have not only resulted in a market-friendly nonexclusive licensing structure (with CI and Strangpresse being among the first licensees), but they also spurred competition and innovation, giving birth to a new industry and new era of large-scale 3D printing. A significant turning point in the industry was seen in 2014, when the partners (along with Local Motors) successfully produced the world's first 3D printed car in a mere 48 hours at the International Manufacturing Technology Showcase. They printed a second car in just 24 hours the next year at the North American International Auto Show, attended by then-President Obama and Vice President Biden, ushering in a new era of investment in large-scale 3D printing.

These activities have encouraged a new and growing community of startups and business expansions, resulting in new jobs, economic development, and other large-scale 3D printing systems brought to market.

The BAAM-CI system as seen from the inside. (Photo by Cincinnati Incorporated)

Left column: Marc Filigenzi, Randall Lind
Right column: Randy Adams, Rick Neff

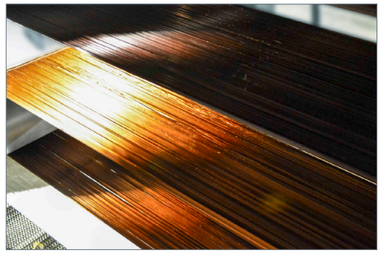
Left to right: Brian Post, Charles George, Colin Cini, Alan Liby, Craig Blue, Eugene Cochran, Lonnie Love, Vlastimil Kunc, William Peter

Contact: Lonnie Love, (865) 946-3161, lovelj@ornl.gov

ORNL Secures Four Licenses for Low-Cost Carbon Fiber Technology

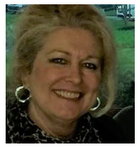
Department of Energy
Oak Ridge National Laboratory

Researchers working in the world-class Carbon Fiber Technology Facility (CFTF) at Oak Ridge National Laboratory (ORNL) developed an innovative method to produce low-cost carbon fiber that is poised to revolutionize the composites market. This revolution is underway thanks to successful licensing of the invention to four companies.



Carbon fiber production at ORNL.

Offering exceptional stiffness and low density, carbon fiber can be combined with polymer/plastic composites to provide a lightweight alternative to much heavier metal components and structures. Historically, carbon fiber has been too expensive for widespread use in automobiles and other high-volume industrial applications. Carbon fiber's high price tag is tied to its expensive polyacrylonitrile (PAN) precursor and the energy-intensive process for converting the PAN precursor into pure carbon fiber. ORNL researchers addressed both of these key limitations by using commercially available, textile-grade acrylic fiber—the same material mass produced for use in clothing and carpets—which costs significantly less than PAN precursor fibers. ORNL's innovative approach that uses acrylic as the precursor reduces the overall cost of carbon fiber manufacturing by 50 percent while significantly reducing energy requirements without sacrificing performance.



Top: Tammy Graham
Bottom: Tom Rogers

ORNL used a competitive process to select between three and five partners to commercialize the intellectual property under semi-exclusive licenses. The goal was to strike a balance between distributing ORNL's technology as widely as possible while still maintaining the companies' competitive advantage.

The ORNL Technology Transfer Office collaborated closely with the laboratory's Science & Technology and Economic Development teams. Science & Technology personnel interacted extensively with the potential licensees and provided insight regarding the technical feasibility of the proposed plans. The Economic Development team helped prospective licensees navigate the complexities of locating and building a major manufacturing facility to commercialize the technology.

Using semi-exclusive license agreements allowed licensees to maximize the competitive advantage, pursue multiple market segments, and raise capital. This also achieved a diverse base of licensees, which mitigated the risks associated with scale-up and a single point of failure. ORNL encouraged licensees to pursue Cooperative Research and Development Agreements (CRADAs) that would allow them to access the CFTF while developing, refining, and validating their scaled-up processes. The four licenses were executed between August 3, 2016 and June 27, 2017. Two CRADAs were executed in May and October 2017. The commercialization of ORNL's technology is expected to result in major energy savings and economic growth.

Left to right: Alan Liby, Amit Naskar, James Roberto, Jesse Smith, Marc Filigenzi, Michael Paulus, Nestor Franco, Ronald Ott

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Transfer of PNNL's Solar Thermochemical Advanced Reactor System to STC

Department of Energy
Pacific Northwest National Laboratory

The Solar Thermochemical Advanced Reactor System (STARS) harnesses solar energy to power compact chemical reactors that produce liquids and gases for transportation, electricity generation, and other industrial processes. The novel, compact system uses patented micro- and meso-channel heat-exchange technology to drive chemical reforming reactions within thin, engineered channels measured in millimeters of thickness. Each STARS unit captures sunlight with a mirrored parabolic dish that directs concentrated solar energy into a four-foot-long and two-foot-wide pod containing the reactor system. The concentrated sunlight heats up chemicals flowing through the channels, which hold a catalyst that helps drive the chemical reforming reactions. The process converts a record-setting 70 percent of the solar energy that hits the mirrored parabolic dish into chemical energy.

Pacific Northwest National Laboratory (PNNL) encouraged the original inventors of the micro- and meso-channel platform to patent their inventions, resulting in a portfolio of over 200 U.S. and foreign patents. PNNL took advantage of an invitation to the Energy I-Corps program, where its development team learned to formulate and execute a business plan that resulted in the creation of the STARS Technology Corporation (STC), a PNNL spinoff founded in 2016 to commercialize STARS. Licenses granted under STC include 32 issued and pending patents, with options on 62 additional patents. PNNL and STC engaged with SoCalGas for two Cooperative Research and Development Agreements (CRADAs) to refine STARS, with the goal of providing a platform to showcase how the technology lowers carbon emissions in natural gas applications.

Due to STARS' high efficiency, a small footprint is required to produce significant quantities of syngas. According to PNNL estimates, a single solar thermochemical plant with 200 solar concentrators on about 4 acres of land could produce 1,500 kilograms of hydrogen per day, which is sufficient to supply a busy fuel-cell-vehicle filling station. Each parabolic dish and the components of the solar thermochemical reaction system offer the potential benefits of production volume economies, allowing STARS to scale and achieve target hydrogen production costs under $2 per kilogram. STARS is also more efficient than other solar-based technologies, providing a potential new source for chemical and energy production that reduces carbon emissions by as much as 40 percent.

Solar technologies are among the leading tools that the United States and the world have embraced to secure a sustainable and renewable energy supply that combats global climate change. STARS provides a viable path to increase the use of solar energy and reduce carbon emissions, thus furthering one of PNNL's and the Department of Energy's missions to advance more environmentally benign methods of supplying energy.

A close-up look at STARS. A single solar thermochemical plant with 200 solar concentrators on about 4 acres of land is expected to produce 1,500 kilograms of hydrogen per day, which is sufficient to supply a busy fuel-cell-vehicle filling station.

PNNL's thermochemical conversion device is installed in front of a concentrating solar power dish. The device converts natural gas into the more energy-rich fuel syngas, which power plants can burn to use less fuel and reduce greenhouse gas emissions.

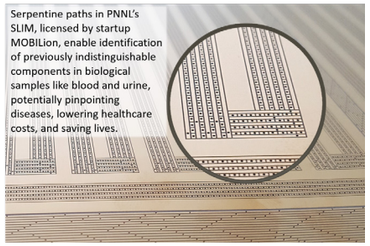
Left to right: Bruce Harrer, Charles Freeman, Chris Klasen, Daryl Brown, Derek Maughan, Peter Brehm, Robert Wegeng, Ron Kent

Contact: Bob Wegeng, (509) 727-7200, robert.wegeng@gmail.com

Transfer of PNNL's Structures for Lossless Ion Manipulations to MOBILion

Department of Energy
Pacific Northwest National Laboratory

Advances in medicine are hindered by the ability to quickly distinguish the presence, structure, and abundance of different compounds in a sample. The standard technology to analyze molecular compounds at levels of interest in biological samples is generally slow, complex, cumbersome, and expensive; it lacks the specificity and sensitivity to clearly distinguish among compounds with similar mass but different structures. Pacific Northwest National Laboratory's (PNNL) Structures for Lossless Ion Manipulations (SLIM) breaks through these analysis boundaries. At 1,000 times faster than typical liquid chromatography methods, SLIM's unprecedented sensitivity can identify trace amounts of similar molecules with different structures in even complex samples containing many different compounds and as small as a single cell.



Serpentine paths in PNNL's SLIM, licensed by startup MOBILion, enable identification of previously indistinguishable components in biological samples like blood and urine, potentially pinpointing diseases, lowering healthcare costs and saving lives.

PNNL began discussions about SLIM with IP Group in 2015. IP Group's mission is to evolve great ideas into world-changing businesses. At the time, its engagement with PNNL and other national laboratories represented the company's first attempt to go beyond its traditional sourcing of technology opportunities from universities. Following an early-stage technology exploration, IP Group invested and formed a startup company called MOBILion Systems, Inc. in December 2016. In addition to incorporating the new company, IP Group also provided substantial initial funding (approximately $4.25 million) to MOBILion to cover its startup costs and support additional research and development work at PNNL. MOBILion exclusively licensed SLIM in various fields in January 2017. The SLIM platform is the premiere technology of the organization.

The PNNL/MOBILion collaboration is a testimony to innovation in meeting the unique needs of a startup company. From concept to product, PNNL provided MOBILion with the information, staff, and industry experience to move quickly through the product development process. PNNL scientists and the commercialization manager worked extensively with the startup—from first discussions to identify the technology, to negotiating an option and license agreement that fit company needs, to continuing research and development to expedite product development. Through its new entrepreneurial leave-of-absence program, PNNL enabled a staff member to transfer to MOBILion, providing a bridge to help MOBILion develop a commercial prototype. PNNL scientists also advised on appropriate laboratory space and equipment needed to further develop SLIM. IP Group and MOBILion were continuously collaborating with PNNL throughout the process, providing commercial perspectives for product development and patenting, and in funding research and development. This continuous collaboration substantially shortened product development time.

SLIM has the potential to foster analyses never before thought possible, ushering in the age of personalized medicine. SLIM should enhance the clinician's ability to predict, diagnose, and treat diseases, thus improving patient outcomes and saving lives. It builds on PNNL's legacy of advancing analytical instrumentation and provides economic development opportunities locally and nationwide. It also fulfills IP Group's mission to evolve great ideas into world-changing businesses, in this case through MOBILion.

Left to right: Bruce Harrer, Dr. Ahmed Hamid, Dr. Melissa Sherman, Dr. Richard D. Smith, Dr. Yehia Ibrahim, Gordon Anderson

Contact: Dr. Richard Smith, (509) 371-6576, dick.smith@pnnl.gov

Transfer of PNNL Suite of Cybersecurity Solutions to Cynash, Inc.

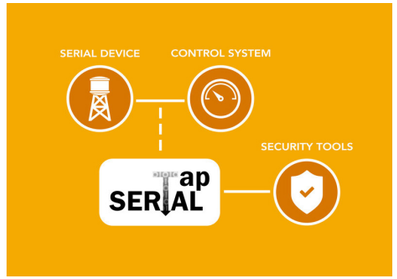
Department of Energy
Pacific Northwest National Laboratory

A combination of three PNNL cybersecurity technologies is creating a comprehensive cybersecurity solution covering a range of computational platforms from mobile to enterprise computing. These technologies, licensed to Cynash, Inc., can protect older legacy devices that lack the capability of current networking to interface with new cybersurveillance products. Ant-Based Cyber Defense (ABCD) is a cybersecurity technology that monitors large networks for novel threats using small roaming programs called "digital ants" to patrol the system. MLSTONES provides new algorithms that examine and categorize programs on a monitored system—analyzing these programs the same way biochemists analyze new proteins. SerialTap is a physical device that taps communication between legacy devices and their control systems—such as hydroelectric dams and systems that control water flow—and sends it over an Ethernet network.

PNNL developed the cybersecurity solutions and partnered with the Department of Homeland Security, which recognized the technologies' potential as part of its Transition to Practice Program (TTP). The technologies caught the interest of entrepreneur Richard Robinson and IP Group's Scott Forbes, independently. Both parties obtained exploratory licenses to investigate the technologies. PNNL, recognizing the potential synergy posed by Robinson's technical team and IP Group's "patient capital," introduced both parties. IP Group established Cynash, Inc., with Robinson at the helm. Cynash now has an exclusive license for all three technologies to produce systems demonstrating novel approaches to difficult cybersecurity challenges.

Cynash, Inc.'s formation brought together public and private sectors to connect three independent technologies, produce new jobs as a cybersecurity startup company, and increase America's competitiveness in the cybersecurity R&D landscape. Now these technologies will be combined to form multiple products that can protect critical infrastructure from current and future cyberattacks. While Cynash currently has six employees and developers, it anticipates growing to a team of 10 to 12 in 2018. The company has already been approached by several clients, including the U.S. Department of Defense, that are interested in testing its newly commercialized technology.

This story is a stellar example of collaborative work across multiple organizations. With the creation of Cynash, Inc., ABCD, MLSTONES, and SerialTap will work together to keep our nation and world safe from cyberattacks.



SerialTap is a physical device that taps communication between legacy devices and their control systems—such as hydroelectric dams and systems that control water flow—and sends it over an Ethernet network.

Left column (top to bottom): Eric Choi, Jereme Haack, Keith Star
Right column (top to bottom): Michael Pozmantier, Richard Robinson, Thomas Edgar

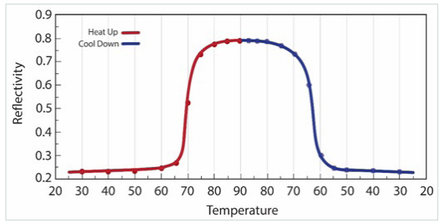
Left to right: Aaron Phillips, Dr. Chris Oehmen, Dr. David McKinnon, Dr. Glenn Fink, Dr. Kannan Krishnaswami, Dr. Nadia Carlsten, Dr. Scott Forbes, Elena Peterson

Contact: Dr. Glenn Fink, (509) 375-3994, glenn.fink@pnnl.gov

Advanced Nanomaterials for Energy Conservation and Temperature Regulation

Department of Energy
Sandia National Laboratories

Sandia National Laboratories' original goal was to develop a self-resetting circuit breaker using vanadium dioxide. But through the partnership of a Sandia scientist, a businessman, and the Center for Integrated Nanotechnologies (CINT), Sandia technology has been transferred to the private sector, and is poised to make a difference in the marketplace by reducing energy needs for consumers in the U.S..



Demonstration of the change in infrared reflectivity of thermochromic coatings with increasing and decreasing temperature. This automatic response to the environmental temperature enables controlled infrared heat gain or reflection from window films and coatings to minimize cooling costs and increase comfort.

Sandia physicist Dr. Paul Clem met a businessman with a company specializing in aerogel windows. William Kurtz told Clem that although they are great in the winter, aerogel windows get too hot in the summer. Clem thought he could adapt his thermochromic thin film material to solve this problem.

Sandia National Laboratories materials physicist Dr. Paul Clem holds a sample of infrared-controlling, nanoparticle-coated glass.

This initial discussion led to a Sandia team working with IR Dynamics to develop the nanoparticles into a low-cost, thermally dynamic technology that will be incorporated into a variety of products for smart regulation of solar heat. The team has developed nanoparticles that have tunable optical properties triggered by the environment. These nanomaterials transition to let the heat through when it is cold outside and reflect heat when it is warm. At cooler temperatures, this material is a clear insulator, but when it is hotter it becomes a metal that reflects infrared (IR) radiation while still transmitting visible light.

Thermochromic materials can be tuned to transition at selected temperatures. For example, it might be best for car windows to start reflecting heat at 78°F, but another temperature might be better for other applications. By tweaking the "recipe," the team has been able to make nanoparticles that can switch at any temperature from 200°F to below zero.

To transfer the technology from Sandia to IR Dynamics and the marketplace, a variety of mechanisms have been utilized, including licenses, a CRADA, New Mexico Small Business Assistance program projects, a User Facility Agreement with CINT, and outside consulting. Development of the first application for the technology, to retrofit window films that homeowners can apply to existing windows to reduce their cooling bills, has been partially funded by a $1.95 million Department of Energy Advanced Research Projects Agency-Energy (ARPA-E) grant.

Future applications include incorporating the nanoparticles into new windows, adding them to architectural plastics, such as the kind used in the Water Cube of the 2008 Beijing Olympics, or creating new high-performance athletic clothing. Many product manufacturers are interested in IR Dynamics' technologies because of their potential to satisfy increasing demand for energy efficiency and personal climate control. This partnership between Sandia Labs and IR Dynamics can help improve the performance of products in industries from apparel to aerospace, and increase energy efficiency in structures from greenhouses to skyscrapers.

Left to right: Dr. Nelson Bell, Dr. Paul Clem, Dr. Dale Huber, Dr. Raegan Johnson, Sandia; William Kurtz, Dr. Klaus Kunze, IR Dynamics

Contact: Dr. Paul Clem, (505) 845-7544, pgclem@sandia.gov

Avelumab, New Therapy for Metastatic Merkel Cell and Urothelial Carcinomas

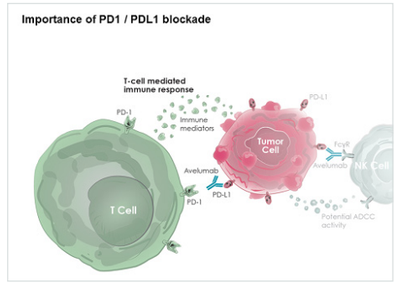
Department of Health and Human Services
National Cancer Institute

Immunotherapy is a type of treatment that uses substances to stimulate or suppress the immune system to help the body fight cancer. Scientists discovered that certain proteins found on T cells and cancers keep immune responses in check and prevent them from killing cancer cells. Monoclonal antibodies block these "checkpoint" proteins and, when blocked, the immune system can be released and is better able to kill cancer cells. Avelumab (Bavencio®) is a human, monoclonal antibody that targets the PD-L1 checkpoint protein.

Through a CRADA with EMD Serono, the National Cancer Institute (NCI) played an instrumental role in developing and expediting regulatory approval of EMD Serono's checkpoint inhibitor, avelumab. Through this CRADA NCI performed early, preclinical studies that evaluated its efficacy and produced promising results, and published data showing avelumab's ability to mediate antibody-dependent cell-mediated cytotoxicity (ADCC). NCI conducted several critical studies that led to FDA approval for patients with urothelial carcinoma (bladder cancer) and Merkel cell carcinoma (MCC).

Once these studies demonstrated positive results, the clinical trial was quickly opened up to accommodate multiple patient groups; NCI participated in many of these expansion cohorts. To date, over 1,700 patients have been enrolled in this single study and received treatment with investigational avelumab. From the point when EMD Serono and NCI amended their existing CRADA in 2013 to include the study of avelumab, they received FDA approval in 2017 for two indications—a remarkably fast developmental and regulatory approval timeline of four years.

By November 2016, the FDA granted avelumab a Biologics License Application (BLA) Priority Review for metastatic MCC, an FDA license that accelerates approval. In March 2017, the FDA approved avelumab for metastatic MCC, a rare skin cancer for which there was no previously FDA-approved treatment. In September 2017, the European Commission and Switzerland also granted approval. These approvals address a significant, unmet medical need. MCC is rarer than some more well-known skin cancers; it is very aggressive, and the proportion of people who die from it is much higher than those with melanoma.



PD-L1, expressed at elevated levels in many tumors, binds T cells, white blood cells that protect the body from disease. This inactivates the T cells, protecting tumor cells from immune attack. Avelumab binds to PD-L1, preventing the T cells from being turned off. Avelumab can also trigger tumor killing by natural killer (NK) cells. "You can actually have two shots on the goal," says James L. Gulley, M.D., Ph.D., Chief, NCI Genitourinary Malignancies Branch, who led the first human trials of avelumab. "You can block this major signal of T cells and also allow NK cells to take out the tumor cells."

In February 2017, FDA granted a BLA for avelumab for urothelial carcinoma. Three months later, the FDA approved avelumab for urothelial carcinoma that has been previously treated, locally advanced, or metastasized. Bladder cancer makes up approximately 90 percent of urothelial carcinomas, and is the sixth most common cancer in the U.S.. When the disease has metastasized, the five-year survival rate is approximately five percent. Despite treatment advances, the prognosis for these patients remains poor. Avelumab's approval provides an important treatment option that will hopefully improve outcomes for these patients.

Below: Renee Donahue, Ph.D.

Left to right: Isaac Brownell, James Gulley, M.D., Jeffrey Schlom, Ph.D., John Greiner, Ph.D., Julius Strauss, Kevin Brand, Michael Pollack, Ravi Madan, M.D.

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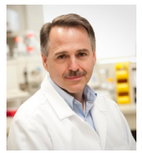
Development of Large-Scale Production, Anti-HIV Microbicide in Soya Beans

Department of Health and Human Services
National Cancer Institute

Cost is a significant barrier in developing human immunodeficiency virus (HIV) treatments that can be accessed by low-income countries where acquired immunodeficiency syndrome (AIDS) is rapidly spreading. The National Cancer Institute's (NCI) Molecular Molecular Targets Laboratory partnered with the Frederick National Laboratory and the Brazilian Agricultural Research Corporation (EMBRAPA) to develop a low-cost method for producing effective and safe HIV infection prevention. These researchers demonstrated that soya bean seeds produce cyanovirin-N (CV-N), a protein capable of permanently inactivating different types of HIV and preventing infection and AIDS. Historically, scientists produced the CV-N protein in a bacterium *(Escherichia coli)* "expression system." However, due to high cost, production of CV-N in bacterial expression systems is not a practical option to make large amounts of the protein.



Left to right: Dr. Barry O'Keefe, Dr. Melissa Maderia, Dr. Mike Currens

Winners not pictured: Dr. Michael Boyd, Dr. Rachel Chikwamba, Dr. Bjarne Gabrielsen, Dr. James McMahon, Dr. Elibio Rech

Genetically modified soya beans provide a low-cost method of producing microbicides that protect against transmission of HIV and prevent AIDS. It is scalable, meaning that the same method can be used to make increasing amounts of protein, including the large amounts required for patient studies. The soybean-produced CV-N is now being developed into a microbicide gel in a collaboration between NCI, the University of London, the Council for Scientific and Industrial Research (CSIR Biosciences) in South Africa, and EMBRAPA.

The groups hope to provide the microbicide gel to Africa, Brazil, and other developing countries where HIV transmission is a public health priority. The soya bean production method could provide a low-cost, effective method for preventing HIV. The production technique is sustainable for resource-poor countries in which HIV and AIDS are rapidly spreading. This accomplishment would pave the way for anti-HIV microbicide development, especially in countries with limited public health funding available for treating HIV infection.

The importance of the NCI's collaborative strategy was highlighted by the journal *Science*, which featured the production of CV-N in soy in the "Editor's Choice" section of the February 13, 2015 issue. This report singled out the achievement of the NCI, EMBRAPA, and CSIR collaboration as a significant advance in the production of biopharmaceuticals in plants. Bringing this technological advancement to the attention of the broad research community, the *Science* article notes that "Affordable antivirals used as vaginal microbicides could have a substantial impact on the HIV epidemic, particularly in the developing world. One potential candidate is cyanovirin-N, a protein produced by a cyanobacterium that prevents viral entry in preclinical studies. Large-scale production of cyanovirin-N, however, is prohibitively expensive. To get around this, (Barry) O'Keefe et al. genetically engineered soybean seeds to make cyanovirin-N. The seeds produced large quantities of the antiviral, and it survived the normal industrial processing systems already in place for soybeans. By rough estimate, one greenhouse growing engineered soybeans could provide enough cyanovirin-N to protect a woman for 90 years." The high potential of the CV-N protein cited in this article illustrates the impact the technology could have in preventing one of the world's most serious public health and economic issues.

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FDA Approval: Personalized Cancer Treatment to Treat Lethal Blood Cancers

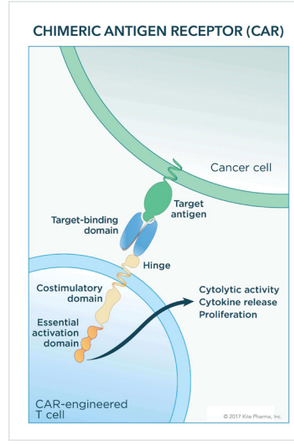
Department of Health and Human Services
National Cancer Institute

The National Cancer Institute (NCI), in collaboration with Kite Pharma Inc., a Gilead Company (Kite), developed a new treatment approved by the U.S. Food and Drug Administration (FDA), which has been shown to be effective for several types of fatal blood cancers. This unique therapy utilizes live cells and harnesses the power of a patient's immune system to combat their cancer. A subset of a patient's own immune cells, called T cells, are genetically modified to recognize the patient's own tumors. The patient's cells are collected, modified, and grown in the laboratory until they number in the billions. These programmed cancer-fighting cells are then reintroduced into the patient, now armed with the ability to potentially recognize and attack the cancer cells. This treatment is termed a "live therapy," and it requires only a single infusion.

NCI's Technology Transfer Center (TTC) played a proactive role in this discovery-to-commercialization story. It began with facilitating a partnership with an industry partner, Kite, which was strongly committed to advancing this novel approach for the treatment of B-cell Non-Hodgkin's lymphoma (NHL). This led to negotiating a complex, clinical trial Cooperative Research and Development Agreement (CRADA) involving both preclinical studies and later clinical trials using treatments made under stringent conditions (i.e., "Good Manufacturing Practice," or GMP). Several other types of transactional agreements were also necessary to support advancement. Successful development of the technology required effective coordination of diverse, multidisciplinary programs within and external to NCI—clinical compliance, regulatory affairs, GMP grade manufacturing, research scientists and T2 professionals (including licensing, patenting, and information technology staff).

Kite's expertise included preclinical and clinical research and development, regulatory, manufacturing, quality systems, and GMP production. This expertise enabled further development of the treatment and larger clinical studies in cancer patients. Armed with positive patient data from the early clinical trials, Kite submitted a Biologics License Application (BLA) to the FDA in March 2017 and was granted Priority Review.

The synergy of NCI's scientific/clinical expertise with Kite's clinical, regulatory, manufacturing, operation, and business capabilities was essential to the successful development and commercialization of this therapy and other products to address these cancers. Persistence was essential to endure the course of this lengthy translational process. However, that endurance has resulted in the development of this immunotherapy that can now benefit patients who are not responding to any other treatments and would otherwise have little chance for survival. This is a significant medical breakthrough for this type of cancer, as evidenced by the FDA's swift approval the therapy in October of 2017.



The engineered receptor on CAR T cells binds to an antigen on cancer cells. After binding, components of the receptor inside the T cell provide signals that activate it. (Photo credit: Kite Pharma)

Left to right: Aida Cremesti, Ph.D., Andrew Burke, Ph.D., Arie Belldegrun. M.D., FACS, David Chang, Ph.D., James Kochenderfer, M.D., Steven Rosenberg, M.D., Ph.D.

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INDIVIDUAL AND TEAM AWARDS

FLC NATIONAL AWARDS

Zika Virus Specimen and Material Sharing

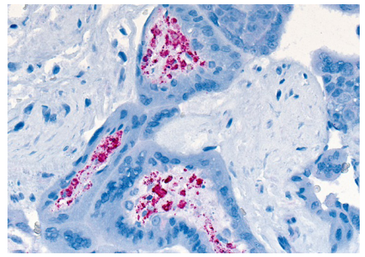
Department of Health and Human Services
National Institute of Allergy and Infectious Diseases, NIH, HHS |
Office of the General Council, NIH Branch, HHS |
Office of the Assistant Secretary for Preparedness & Response, HHS |
Centers for Disease Control and Prevention, HHS

Following increased reports of Zika virus cases in the Americas, the World Health Organization declared a Public Health Emergency of International Concern on February 1, 2016. Zika virus infection is generally diagnosed clinically through the assessment of signs/symptoms and potential exposure, followed by confirmatory testing. Available tests were performed only at the Centers for Disease Control and Prevention's (CDC) Arbovirus Diagnostic Laboratory and some state public health departments. In addition, there was no specific antiviral treatment available for Zika virus, and there is no vaccine available to prevent Zika virus infection.

In March 2016, the Technology Transfer and Intellectual Property Office at the National Institute of Allergy and Infectious Diseases (NIAID) and CDC's Technology Transfer Office worked with the Office of General Counsel at the National Institutes of Health and the Office of the Assistant Secretary for Preparedness and Response at the U.S. Department of Health and Human Services to structure a one-page Emergency Use Simple Letter Agreement (EUSLA) for the rapid and robust transfer of Zika virus and specimens.

The NIAID Division of Microbiology and Infectious Diseases used existing infrastructure to disseminate research materials via the Biological and Emerging Infections Research Resources Repository (BEI Resources). Zika specimens, diagnostic assays, and other valuable Zika materials (i.e., reagents) were shared with academic institutions, companies, and public health agencies worldwide.

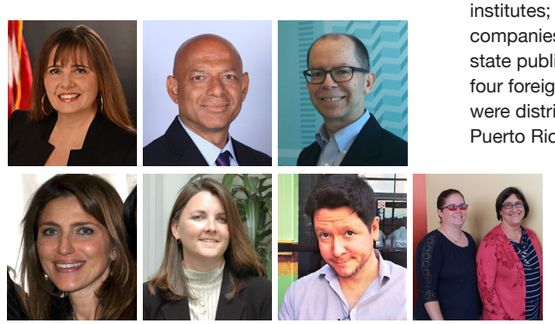
BEI Resources has received deposits of Zika materials from 17 organizations, including CDC, NIAID, and three other federal agencies, and has fulfilled 1,865 requests for Zika materials under EUSLA. A total of 430 agreements were put in place to allow the shipment of Zika materials to 124 universities, hospitals, and research institutes; 43 biotech and pharma companies; 16 federal agencies and state public health departments; and four foreign governments. Materials were distributed to 35 U.S. states, Puerto Rico, and 23 countries.



The photo depicts Zika virus antigens in placenta detected by immunohistochemistry (IHC) microscopy. Federal partners have facilitated Zika sample/specimen sharing with numerous partners for research purposes. (CDC photo by Sherif Zaki)

Front row (center): Dr. Juliana Cyril; back row (from left to right): Kevin Brand, Naureen Iqbal, Lisa Blake-DiSpigna and Dr. Suzanne Seavello Shope

Winners not pictured: Dr. Dale Berkley, Dr. Ruvani Chandrasekera, Dr. Brent Davidson, Joseph Foster, Dr. Dana Hsu, Dr. Wendi Kuhnert-Tallman, Dr. Susan Sherman



Top row (left to right): Dr. Maria Marinissen, Dr. Mukul Ranjan, Dr. Michael Mowatt
Bottom row (left to right): Dr. Cristina Cassetti, Kimberly Stemple, Michael Finn, Dr. Brandy Russell, Dr. Barbara Johnson

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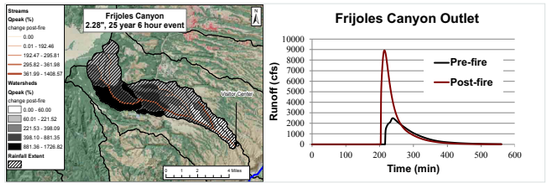
AGWA Streamlines Burn Area Emergency Response (BAER) Efforts

USDA Agricultural Research Service | Environmental Protection Agency | National Interagency Fire Center | Bureau of Land Management | National Weather Service | University of Arizona

Wildfires burn millions of acres annually, taking lives and property, and consuming billions of dollars in suppression costs. Interagency Burned Area Emergency Response (BAER) teams conduct post-fire watershed assessments to identify and prioritize watershed treatments to stabilize threats and protect downstream assets. Through an outstanding technology transfer effort by scientists from the USDA Agricultural Research Service, Environmental Protection Agency, National Interagency Fire Center (NIFC), Bureau of Land Management, National Weather Service (NWS), and University of Arizona, the Automated Geospatial Watershed Assessment (AGWA) tool has been innovatively transferred to NIFC member agencies (i.e., Fish & Wildlife Service, Bureau of Indian Affairs, National Park Service, Forest Service, and National Weather Service) to speed the completion of post-fire watershed assessments that identify and focus treatments and money where they are most needed to reduce threats. A pioneering aspect of the technology transfer process involved embedding AGWA team members with BAER teams on actual post-wildfire deployments to increase an understanding of BAER workflow, information requirements, decision processes, and reporting requirements. Between fire seasons, the AGWA team attended BAER pre-season workshops and taught a two-day AGWA training course with computer tutorials derived from prior wildfires. Feedback during the training sessions prioritized improvements that would further enhance AGWA for BAER team use. These improvements were then tackled by staff and graduate student research projects supported by funding built into a four-year Interagency Agreement (IA).



AGWA pre- and post-fire runoff predictions at the Bandelier National Monument Visitor Center in Frijoles Canyon, New Mexico

BAER and AGWA teams inspect damage from the Las Conchas wildfire in New Mexico.

Pictured:
David C. Goodrich

Winners not pictured:
Jane Barlow, I. Shea Burns, T.J. Clifford, D. Phillip Guertin, William Kepner, Michael Schaffner, B. Scott Sheppard, Gabriel Sidman

As the IA progressed, the embedding of AGWA experts decreased as the BAER team members became more proficient. AGWA expertise within the BAER teams has progressed to the point where BAER team experts are now training new members to run and apply AGWA. AGWA has enabled BAER teams to rapidly model the risk of post-fire runoff, erosion, and sediment transport to all downstream values (water supply intakes, road crossings, property, recreation sites, etc.). In one example from 2013 (the 130,000-acre Elk Wildfire Complex in Idaho), the BAER team used AGWA to prioritize the most important 2,000 acres for mulch stabilization treatments out of the initial 16,000 acres identified for treatment. This example alone resulted in documented savings of between $7M and $8M.

To date, AGWA has been used in over 50 BAER assignments for more than 3.3-million burned acres. As an added technology transfer bonus, BAER leaders requested the assistance of the NWS with post-fire flash flood warning. As a result, the AGWA/KINEROS2 model has been evaluated in 7 NWS Weather Forecast Offices for real-time flash flood forecasting in 43 watersheds. All of the agencies involved in this effort embraced the technology transfer of AGWA through in-kind support, extensive interagency communication, and a passion to improve the nation's response to increasing numbers of wildfires.

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Houston Launch and Sustained Growth of SpaceCom and Spaceport Summit

National Aeronautics and Space Administration

NASA Johnson Space Center | Greater Houston Partnership | Houston First

NASA has a long history of technology transfer, but it has been looking for new ways to multiply its reach and to introduce its technology portfolio and needs to a diverse set of industries. In particular, the Johnson Space Center (JSC) was looking to maximize its reach to multiple industries simultaneously and to increase the potential pull from future partners versus a push from within.

Houston has been proud of its "Space City" identity, but with the end of the Space Shuttle program it was looking for a way to recapture that identity and position itself for the growing commercial space market. Towards that end, in 2011 JSC entered into a Space Act Agreement (SAA) with the largest economic development organization in the region, the Greater Houston Partnership (GHP). Part of the agreement was to identify an event that would gather industry from within and outside the Houston region to assist with the commercialization of NASA technology and to identify technologies that could be transferred into NASA to support space exploration. In addition, the GHP was looking to expand the industry in the Houston region by either growing the commercial space industry in Houston by leveraging NASA expertise and technology or attracting industries that could benefit from NASA technology.

SpaceCom was a new event created to introduce NASA technologies to five industries that are important to the Houston economy: energy, medical, advanced manufacturing, maritime trade, and agribusiness. SpaceCom facilitated cross-industry conversations with solutions-oriented case studies, intensive roundtables, and practical sessions about how to create opportunities for technology transfer across industries.

SpaceCom's second year featured a NASA Challenges and Solutions pavilion, where NASA shared technologies available to other industries and challenges that needed technology solutions.

At SpaceCom, connections were made, and new technology requests were initiated; however, the event's success is best demonstrated by one example. During industry roundtable discussions about the synergy between space medicine and medicine in remote locations, it was determined that an enclosed habitat/laboratory would be essential in regions with a pandemic outbreak. As a result, the decision was made to create an SAA between Baylor College of Medicine's Global Initiatives and NASA. This agreement would facilitate the exchange of technology between the two organizations, as well as the development of additional technologies.

GHP serves over 1200 member companies in the 11-county Houston region, including Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, San Jacinto, Walker, and Waller counties.

Left to right: James Causey, Jason Ford, Michael Heckman, Steven González

Contact: Steven González, (281) 483-6314, steven.a.gonzalez@nasa.gov

Successful Collaboration Accelerates Testing of New Blade Designs

Department of Energy
Sandia National Laboratories

Testing new wind turbine blade designs is extremely expensive and time-consuming due to the multimillion dollar and multi-month investment required to construct the complex molds needed to manufacture the blades. Sandia National Laboratories wanted to test a new subscale wind turbine blade design as part of the National Rotor Testbed project, which is developing an open source wind blade that can be used by researchers at Sandia and other public and private institutions to discover new wind technologies.

The Scaled Wind Farm Technology (SWiFT) facility operated by Sandia National Laboratories, where the National Rotor Testbed blades will undergo flight testing.

To accomplish these goals, Sandia partnered with Oak Ridge National Laboratory (ORNL), which has expertise in additive manufacturing and the largest commercially available polymer 3D printer in the world, and corporate partner TPI Composites, which has experience with wind turbine blade design and manufacturing. Additionally, the team received assistance from two Department of Energy offices and the National Renewable Energy Laboratory (NREL) to prove the viability of additive manufacturing to shorten the time and reduce the cost of producing prototype blades.

Left to right: Dr. Lonnie J. Love, Dr. Brian Post, ORNL; Stephen Nolet, TPI Composites

Since short production runs for wind blade prototypes are cost-prohibitive, innovation is stifled. The goal was to see if this novel design-build approach could be economically feasible not only for subscale research blades, but also potentially for full-size commercial blades. This partnership brought together expertise from laboratories and industry to quickly go from concept to demonstration through a highly cooperative team.

Now that it is being tested on subscale blades, this new method for creating wind blade molds is also attracting interest from companies like Ingersoll Machine Tools, Inc., which would like to build larger 3D printers to accommodate the needs of the large-scale tooling industry. The company can see how additive manufacturing will make it easier to produce new designs and make changes more quickly.

Together, national laboratories and industry partners are coming up with new ways to lower the cost of wind energy and accelerate the deployment of new wind energy technologies directly to the industry. By marrying Sandia's blade design capabilities with ORNL's 3D printing capabilities, NREL's blade structural testing capabilities, and the worldwide commercial design and manufacturing capabilities of wind blade manufacturer TPI, the team was able to build an innovative wind turbine blade accurately, quickly, and cost effectively to accelerate new wind energy technologies from concept to market.

The first of the National Rotor Testbed blades is undergoing static and load testing at t he NREL.

Left to right: Dr. Brandon Ennis, Dr. Chris Kelley, Dr. David Maniaci, David Minster, Dr. Brian Naughton, Joshua Paquette, Brian Resor, Dr. Jon White, Sandia

Joshua Paquette, (505) 844-7766, japaque@sandia.gov

Jason Craley

Department of Defense - U.S. Army
Army Research Laboratory

Since 2014, Jason Craley has been a Technology Transfer (T2) Specialist at the Army Research Laboratory (ARL) Technology Transfer and Outreach Office, located at Aberdeen Proving Ground in Maryland. His responsibilities include the facilitation and negotiation of Cooperative Research and Development Agreements (CRADAs) and Test Service Agreements, the negotiation and execution of Patent License Agreements, intellectual property (IP) marketing, and international program management.

Craley and his colleagues demonstrated exceptional performance while negotiating a CRADA with the University of California, Riverside (UC) that established a collaborative ARL presence at UC. The CRADA focuses on the assessment of new materials based on radially reinforced composites. A significant challenge he faced was that each UC campus had its own approach to engaging with ARL. ARL preferred a master CRADA that would apply to the entire UC system; however, because there are foreign nationals at all UC campuses, Craley needed to coordinate with ARL security and legal personnel to modify the CRADA language to satisfy UC and ARL's security needs. He mastered background laws and security requirements, examined the researchers' resumes and citizenship status, and conceived a mutually agreeable collaborative mechanism. The result was an agreement between ARL and the UC system that serves as a future template for engagement with sister UC campuses in the ARL West region, including a new CRADA at UC Irvine, which ARL is currently negotiating.

Craley also established and implemented one of the first ARL foreign nongovernmental CRADAs with New Zealand for work with Auckland Uniservices, Ltd. (University of Auckland). This effort addresses Auckland Uniservices' interest in exploring potential uses for ARL-developed custom materials related to robotic control. The CRADA demonstrates ARL's continued push toward expanding Open Campus collaboration not just to the U.S., but internationally. Initially, there were many concerns regarding the IP implications. Craley worked closely with ARL and University of Auckland legal teams to determine how ARL could ensure Auckland's level of comfort with the agreement. His dedication and ability to negotiate remotely over multiple time zones resulted in a successful, mutually beneficial agreement. Without his maturity, patience and persistence, this groundbreaking agreement would have been impossible.

Craley thinks outside the box to resolve problems quickly and efficiently. He has a penchant for streamlining the ARL's Technology Transfer and Outreach Office processes, and looks for new and innovative ways to complete technology transfers with the least amount of friction and greatest customer satisfaction. Though still a T2 rookie, he is a master at balancing his workload, shifting gears, and tracking multiple projects simultaneously, while meeting both deadlines and customer expectations.

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Michelle Miedzinski
Rick Tarr

Department of Defense - U.S. Navy
Naval Air Warfare Center - Aircraft Division

Michelle Miedzinski and Rick Tarr have transformed technology transfer (T2) operations at the Naval Air Warfare Center Aircraft Division (NAWCAD) into a vital economic engine for southern Maryland. Together, their innovative approaches are delivering dual-use successes that meet pressing Department of Defense needs, growing a network of industry and public-sector partners that has a positive impact on the local economy, and cultivating an entrepreneurial spirit at NAWCAD.

The renaissance at NAWCAD, located in Patuxent River, began with a fundamental overhaul of T2 operations. The team evaluated its tasks, streamlined procedures, and developed process maps that clearly defined each step required to complete core agreements and tasks. At the same time, the team revived the laboratory's patent award ceremony to promote and recognize participation in T2. They also partnered with laboratory leadership to present the NAWCAD Commander's Award for Patent of the Year.

Other initiatives included a program to bring in high-powered speakers to address topics that inspire laboratory scientists and engineers to collaborate with industry, and creation of opportunities for newly hired junior scientists to rotate through the T2 office. One of these junior scientists became interested in entrepreneurial opportunities, formed his own company, and licensed the NAWCAD technology, aluminum rich (Al-Rich).

Miedzinski and Tarr have also worked extensively to break down barriers that prevent NAWCAD scientists and engineers from collaborating with regional technology companies. The three-pronged approach includes a partnership with the University of Maryland's Smith Business School, establishment of a technology incubator in partnership with a statewide partnership intermediary activity and the local county government, and a program to bring together the area's entrepreneurial and innovation partners on a regular basis through Southern Maryland Innovation and Technology.

The team's innovativeness and creativity are best demonstrated by the licensing of Al-Rich, an anti-corrosion product developed by a NAWCAD inventor that has significant health and environmental benefits over other primers. A licensing strategy was needed to maximize opportunities for commercial applications of this technology.

The pair developed a licensing strategy to manage the due diligence, the allocation of domestic and international patent rights, and the successful licensing of Al-Rich coatings by 10 companies, ranging from start-ups to industry heavy hitters. According to Michael Schroeder, Director of the Technology Transfer Office at NAWCAD, "This transfer is significant not only because of its environmental and health improvements over previous available products, but also through commercialization of the technology it becomes more available to our military at a lower price through economy of scale."

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Rick Tarr, (301) 342-3400, richard.tarr@navy.mil

Dr. Philip Perconti

Department of Defense - U.S. Army
Army Research Laboratory

The U.S. Army is ranked among the world's most innovative research institutions, and the Army Research Laboratory (ARL) is its preeminent laboratory. ARL's mission is to discover, innovate, and transition science and technology (S&T) to ensure dominant strategic land power and to provide innovative S&T and analyses to enable full-spectrum operations.

As ARL Director, Dr. Philip Perconti ensures that moving technology transfer (T2) out of the laboratory into the commercial marketplace is achieved by combining in-house technical expertise with academic and industry partners via ARL's Technology Transfer/Outreach Office (T2O2).

The Open Campus Initiative is the successful primary vehicle for ARL's T2. Designed to create an S&T ecosystem emphasizing mutual reliance and interdependent collaborative research as a critical element of national security, it has flourished under Dr. Perconti's energetic leadership. For example, ARL has leveraged more than $70 million in in-kind contributions, including $29.9 million in FY16 alone, for Army-focused research.

Each year, Dr. Perconti hosts the Open Campus Open House. The Open House gives industry and academic researchers the opportunity to tour ARL's research laboratories, discuss U.S. Army priorities with ARL scientists/engineers and managers, and determine how they can most effectively engage with ARL's research and T2 programs.

Under his leadership, ARL now has "hubs" across the country at ARL West (University of Southern California), ARL South (University of Texas at Austin), ARL Central (University of Chicago), and the ARL Northeast (Boston area). The ARL T2O2 has also established Cooperative Research and Development Agreements (CRADAs) with regional universities/partners and exciting new international partnerships with Auckland Uniservices, Ltd. (University of Auckland) in New Zealand, Nanyang Technological University in Singapore, and several others via international CRADAs.

Two recent examples illustrate Dr. Perconti's devotion to technology transfer. He improved ARL's operating model for CRADAs by significantly lowering barriers for cooperation, thus enabling ARL researchers to effectively transfer intellectual knowledge to their partners. This new model boosted the number and quality of CRADAs significantly during his tenure—from 20 to over 400 projects with hundreds of new collaborators.

Dr. Perconti has established CRADAs with large companies, such as Lockheed Martin, and small start-ups. In July 2017, his expeditious handling of a license decreased the signatory process time from three months to one, enabling a small firm to begin producing an ARL-developed technology ahead of schedule.

As the highly visible, outspoken champion of ARL, Dr. Perconti affords scientists/researchers and partners the opportunity to exercise their talents to the fullest, benefiting not only the soldier in the field, but the U.S. economy.

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Mojdeh Bahar, JD, MA, CLP

Department of Agriculture
Agricultural Research Service

Mojdeh Bahar is the Assistant Administrator for Technology Transfer at the U.S. Department of Agriculture's (USDA) Agricultural Research Service (ARS). Bahar has broad responsibility for managing the intellectual property that evolves from the Agency's research programs, and she serves as a resource for the management of intellectual property and technology transfer across the USDA. She leads ARS's interactions with government agencies, industries, commodity groups, and universities on matters dealing with intellectual property and technology transfer.

For over a decade, Bahar has also provided service to the Federal Laboratory Consortium for Technology Transfer (FLC) in many different roles, as a member at large, regional coordinator, national chair, past chair, speaker, and instructor. Through her FLC service, she has been instrumental in creating new tools and approaches to technology transfer that have benefited all federal laboratories. Bahar also frequently references the FLC in her interactions with industry and government policymakers.

As Coordinator of the FLC's Mid-Atlantic Region (FLC-MA), Bahar created workshops that brought together federal, state government, university, and industry researchers working in the same area of science, such as nanotechnology and bioinformatics. These workshops resulted in new research collaborations and continue today with new topics.

Bahar created a networking group called the Federal Technology Network (FedTechNet) to augment the FLC-MA's annual meeting by encouraging laboratory professionals to meet quarterly to develop new marketing ideas and best practices. She also helped establish a multiparty, multidisciplinary initiative to prepare post-doctoral fellows for corporate positions by creating a class at a local college, known informally as the Chief Scientific Officer (CSO) Boot Camp.

As FLC-MA Coordinator, Bahar worked with regional economic development organizations to showcase federal research and technologies. Two such outcomes were the launch of the Innovation to Commercialization (I2C) Conference and Gateway for Innovation: Federal and Academic Technology Transfer and Commercialization. A goal of the Gateway is to "Provide Matchmaking and Partnering Opportunities Among Interested Business Entrepreneurs, Federal Civilian and Military Laboratories, Academia, Investors, and National Associations and Foundations."

As FLC National Chair, Bahar led efforts to create the Available Technologies Search Tool, and conceived and led in the creation of the Federal Business Resource, a compilation of funding, programs, and facilities at federal labs that assist businesses with research and development. This tool, now called "FLC Business," provides businesses with one-stop shopping for federal laboratory information, including technologies available for licensing, laboratory facilities and equipment, funding opportunities, and lab-specific special programs.

Contact: Robert Griesbach, Robert.griesbach@ars.usda.gov

REGIONAL AWARD WINNERS

FLC NATIONAL AWARDS

The FLC congratulates the following winners for outstanding technology transfer efforts in their respective regions in 2017.

Far West

Technology Transfer Professional of the Year Award

Gary W. Smith, Sr.
Idaho National Laboratory

Outstanding Commercialization Success Award

National Energy Technology Laboratory
Ampere Scientific
"Arc Position Sensing"

Naval Facilities Engineering and Expeditionary Warfare Center
"Spindle Locating Tool"

Sandia National Laboratories
Sandstone Diagnostics
"SpinDx™ & Trak® Male Fertility Testing System"

USDA ARS Pacific West Area
Healthy Processed Foods Unit
"Development and Commercial Implementation of New Infrared Heating Technologies"

USDA ARS Pacific West Area
Grain Legume Genetics & Physiology Research Unit
"Development and Commercial Licensing of New Lentil & Chickpea Cultivars"

Outstanding Partnership Award

NASA Armstrong Flight Research Center
Cal Poly Pomona

Idaho National Laboratory
INL-Energy Environment Science & Technology Directorate
Montana Tech - University of Montana

Outstanding Technology Development Award

Idaho National Laboratory
"Remediation of Toxic Algae Blooms"

Lawrence Livermore National Laboratory
"Neodymium-Doped Fiber Amplifier & Laser"

Lawrence Livermore National Laboratory
"PEEL - Polyelectrolyte Enabled Liftoff"

Sandia National Laboratories
"SmartLAMP"

Mid-Atlantic

Educational Institution and Federal Laboratory Partnership Award

USDA ARS Appalachian Fruit Research Station
USDA ARS Beneficial Insects Introduction Research Laboratory
Cornell University
North Carolina State University
Oregon State University
Pennsylvania State University
Rutgers University
University of Delaware
University of Maryland
Virginia Polytechnic Institute and State University
Washington State University
"Specialty Crop Initiative Coordinated Agriculture Project The BMSB"

Excellence in Technology Transfer Award

National Cancer Institute
"Avelumab, New Therapy for Metastatic Markel Cell and Urothelial Carcinomas"*

National Cancer Institute
"Development of Large Scale Production, Anti-HIV Microbicide in Soya Beans"*

U.S. Army Edgewood Chemical Biological Center
"Low-Volatility Agent Permeation Verification and Validation Program"

Interagency Partnership Award

U.S. Army Edgewood Chemical Biological Center
Bureau of Alcohol, Tobacco, Firearms and Explosives
"ECBC – ATF Partnership"

Rookie of the Year Award

Technology Transfer Ambassadors Program Team
National Cancer Institute

** Also a 2018 national award winner*

Mid-Continent

Outstanding Laboratory Award

USDA Agricultural Research Service, Center for Grain and Animal Health Research

Regional Partnership Award

U.S. Fish and Wildlife Service/Colorado Parks and Wildlife/ Colorado Serum Company/U.S. Department of Agriculture, National Wildlife Research Center/U.S. Geological Survey, National Wildlife Health Center
"Protecting Endangered Black-footed Ferrets Through the Development of an Oral Sylvatic Plague Vaccine for Prairie Dogs"

Sandia National Laboratories/Oak Ridge National Laboratory/TPI Composites, Inc./Wetzel Engineering, Inc.
"National Rotor Testbed: Using Large-Scale 3D Printing to Test New Wind Blade Designs"*

Notable Technology Award

Air Force Research Laboratory
Space Vehicles Directorate
"High Strain Composite (HSC) Deployable Space Structures"*

Los Alamos National Laboratory
"dfnWorks Software Suite"

Los Alamos National Laboratory
Naval Medical Research Center
"EDGE Bioinformatics"

NOAA Earth System Research Laboratory, Physical Science Division
"For the design, implementation, and operation of a 21st-century observing network to address water resource and flood protection issues in the Western U.S."

Sandia National Laboratories
"Neuromorphic Cyber Microscope"

Excellence in Technology Transfer Award

Ames Laboratory
"Advanced Gas Atomization Processing for Ti and Ti Alloy Powder Manufacturing"

Sandia National Laboratories
"Advanced Nanomaterials for Energy Conservation and Temperature Regulation"*

USDA ARS Crops Research Laboratory, Soil Management and Sugar Beet Research Unit
"USDA-ARS Sugar Beet Research with High Impact in Colorado, the USA, and the World"

Midwest

Excellence in Technology Transfer Award

USDA Agricultural Research Service, Midwest Area
"Vaccine to Reduce Salmonella in Food Animals"

Naval Surface Warfare Center, Crane Division
"NSWC Crane Partnership with GoX Studio"

Air Force Research Laboratory, Sensors Directorate
"Bringing the ACTIVE Shooter Alert System to the Market"

Interagency Partnership Award

Naval Surface Warfare Center, Crane Division/NASA Glenn Research Center
"NSWC Crane Partnership with NASA Glenn Research Center"

State and Local Economic Development Award

EPA National Risk Management Research Laboratory
"Confluence, a Water Technology Innovation Cluster"

Southeast

Excellence in Technology Transfer Award

Oak Ridge National Laboratory
"High Performance Aluminum Cerium (ACE) Alloys"*

USDA Agricultural Research Service Southeast Area
"Mannitol Measurement to Detect Deterioration in Sugarcane and Sugar Beet Processing and Distilling"

USDA ARS Southeast Area, Southeast Poultry Research Laboratory
"Recombinant Highly Pathogenic Avian Influenza Virus Vaccine"

Excellence in Technology Transfer Award – Project of the Year

USDA Agricultural Research Service Southeast Area
"Novel Anammox Bacterium Isolate for Purification and Recycling Wastewater in Space and Decentralized Wastewater Systems"*

Interagency Partnership Award

Oak Ridge National Laboratory
Department of Homeland Security
"Transition and Transfer of Cybersecurity Technologies"

Regional Laboratory Award

Air Force Research Laboratory Information Directorate

** Also a 2018 national award winner*

FLC AWARDS COMMITTEE

The FLC expresses its gratitude to the members of the Awards Committee for their tireless efforts in making the 2018 awards program a success.

Donna Bialozor
National Cancer Institute
(Committee Chair)

Whitney Hastings
Food and Drug Administration
(Committee Vice-Chair)

Mojdeh Bahar, JD, MA, CLP
USDA ARS Beltsville Area

Dr. Sudeep Basu
Frost & Sullivan

Jeremy Benton
Y-12 National Security Complex

Dr. Sabarni Chatterjee
National Institutes of Health

John Dement
Naval Surface Warfare Center -
Crane Division

Patricia Doutriaux
Naval Research Laboratory (retired)

Dr. Sevim Erhan
USDA ARS Eastern
Regional Research Center

Hannah Farquar
Lawrence Livermore National Laboratory

Dr. Suzanne Frisbie
National Institute of Allergies and
Infectious Diseases

Wade Green
National Institute of Allergy
and Infectious Diseases

John Hewes
National Cancer Institute

Amanda Horansky-McKinney
Naval Research Laboratory

Megan Irvin
National Institute of Allergy
and Infectious Diseases

Vlado Knezevic
National Institute of Diabetes and
Digestive and Kidney Diseases

Dr. Katherine Lipka
Henry M. Jackson Foundation

Marianne Lynch
Department of Energy

Carolyn McMillan
Marshall Space Flight Center

David Missal
Riverside Research

Michele Newton
National Cancer Institute

Melissa Ortiz
Air Force Research Laboratory

Jeff Pixton
National Radio Astronomy Observatory

Gail Poulos
USDA ARS Beltsville Area

Keith Quinn
Air Force Research Laboratory
Propulsion Directorate

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

Robert Sons
National Cancer Institute

Dr. Thomas Stackhouse
National Cancer Institute

Marc Suddleson
National Oceanic and
Atmospheric Administration

Dr. Joseph Teter
Naval Surface Warfare Center,
Carderock Division

Patricia Tomczyszyn
Minority Business Development Agency

Kathryn Townsend
Naval Meteorology and
Oceanography Command

David Yang
National Cancer Institute

Dr. Hailing Yu
Volpe National Transportation
Systems Center

Dr. Xiao-Ying Yu
Pacific Northwest National Laboratory

FLC AWARDS PROGAM CALENDAR

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) 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.

FLC

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