2021 FLC NATIONAL MEETING

AWARDS

***Excellence** in Extraordinary Times*

FLC
Federal Laboratory Consortium
for Technology Transfer

Awards Summary
Click on any award category header to jump directly to that award category.

Message from the Awards Subcommittee Co-Chairs

EXCELLENCE IN TECHNOLOGY TRANSFER AWARDS

Department of Agriculture

Department of Defense

Department of Defense - U.S. Army

Department of Defense - U.S. Navy

Department of Energy

Department of Health and Human Services

Department of Health and Human Services – National Institutes of Health

Get social with the 2021 FLC National Meeting Award Winners and post their success. Follow ***@federallabs*** *and join in by using* ***#FLCawards****.*

INDIVIDUAL AND TEAM AWARDS

Interagency Partnership Award

State and Local Economic Development Award

Impact Award

Technology Transfer Innovation Award

Technology Focus Award

Rookie of the Year Award

Outstanding Technology Transfer Professional Award

Laboratory Director of the Year Award

SPECIAL RECOGNITION

WELCOME

TO THE 2021 FLC NATIONAL AWARDS

We are doubly excited about this year's showcase of outstanding federal technology transfer efforts. Not only have this year's award winners continued to raise the bar for collaborative innovation, they've done so during one of the most difficult years in recent memory.

With federal laboratories making so many significant contributions to national and global pandemic response efforts, the FLC National Awards program has a unique opportunity to spotlight those accomplishments.

As you read through this publication, look for the COVID-19 Response Distinction seal that designates T2 projects related to the pandemic. And remember that the many award-winning T2 projects not directly related to COVID-19 also made significant contributions with work that benefits the economy, society and national security—all will be key to the nation's pandemic recovery.

We are thrilled and honored to be able to share these remarkable achievements with you.

The FLC 2021 National Awards are presented in the following categories:

EXCELLENCE IN TECHNOLOGY TRANSFER AWARD
Recognizes employees of FLC member laboratories and non-laboratory staff who have accomplished outstanding work in the process of transferring federally developed technology.

INTERAGENCY PARTNERSHIP AWARD
Recognizes agency and/or laboratory employees from at least two different agencies who have collaboratively accomplished outstanding work in transferring a technology.

STATE AND LOCAL ECONOMIC DEVELOPMENT AWARD
Recognizes successful initiatives that involve partnership between state or local economic development groups and federal laboratories for economic benefit.

IMPACT AWARD
Honors employees of FLC member laboratories and non-laboratory staff whose technology transfer efforts have made a tangible and lasting impact on the populace or marketplace ranging from a local to global scale.

TECHNOLOGY TRANSFER INNOVATION AWARD
Recognizes federal laboratories that successfully implemented innovative or unconventional technology transfer approaches that resulted in a significant increase in technology transfer activities

TECHNOLOGY FOCUS AWARD
Presented to a laboratory which has most successfully completed a transfer effort of a featured technology under the initiative for that year. The 2021 award recognizes technology transfer related to autonomous systems.

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 transferring a technology in a manner significantly above and beyond what was called for in the normal course of their work.

OUTSTANDING TECHNOLOGY TRANSFER PROFESSIONAL AWARD
Recognizes the efforts of an FLC laboratory technology transfer professional (or team) who has demonstrated outstanding work transferring a technology in a manner significantly above and beyond what was called for in the normal course of their work.

LABORATORY DIRECTOR OF THE YEAR AWARD
Honors Laboratory Directors who have made maximum contributions to the overall enhancement of technology transfer for economic development.

The FLC awards are a prestigious honor in the global technology transfer profession, with dozens of nominations submitted each year from more than 300 federal laboratories and their agencies. It is our great pleasure and privilege to present the recipients of the 2021 FLC National Awards.

Dr. Whitney Hastings

Dr. Whitney Hastings, Awards Subcommittee Co-Chair

Lisa Marianni

Lisa Marianni, Awards Subcommittee Co-Chair

AWARDS

EXCELLENCE IN TECHNOLOGY TRANSFER

USDA AND INDUSTRY PARTNER IMPROVE NITROGEN RECOVERY FROM LIVESTOCK AND MUNICIPAL WASTES

U.S. Department of Agriculture
Agricultural Research Service Southeast Area

Researchers from the U.S. Department of Agriculture (USDA) Agricultural Research Service Southeast Area (ARS SEA) have developed a new way to recover nitrogen from livestock wastes, which has been commercialized by Renewable Nutrients.

Conservation and recovery of nitrogen from livestock, industrial and municipal wastes is important for economic and environmental reasons. In the United States, the largest source of ammonia emissions — and the distinctive odor they generate — is livestock farming.

The nitrogen components of ammonia are useful as a fertilizer, but many areas in the U.S. produce more manure-generated nutrients than the available cropland can assimilate. Therefore, the removal and recovery of ammonia is desirable when treating livestock waste because the nutrients can be exported off the farm. This could solve the problems of nitrogen surpluses in concentrated livestock production, provide a substitute for commercial fertilizers and create new businesses.

The new technology recovers ammonia-nitrogen from wastes using gas-permeable membranes. The process involves passing ammonia through microporous hydrophobic membranes and concentrating it in a clear solution. The process can be used for removing and recovering nitrogen from two types of livestock waste: liquid manures in storage tanks and the air of poultry and animal barns. It can recover 98% of the nitrogen.

Renewable Nutrients, a small business with experience recovering phosphorus from wastes, was the recipient of the ammonia trapping technology through two exclusive licenses granted by the USDA. A Cooperative Research and Development Agreement (CRADA) facilitated testing of a company-developed pilot unit to determine its suitability for municipal wastes and helped identify the best membrane material composition for commercial units. The technology is commercialized as Quick Wash® Nitrogen Removal & Ammonia Recovery.

Other technology transfer mechanisms and activities included:

- Five U.S. patents covering the ammonia capture technology using gas-permeable membranes developed by ARS for both liquid and air applications.
- Three on-farm demonstrations by ARS scientists for universities and research centers. At the University of Maryland Eastern Shore, in chicken houses fitted with the ammonia recovery system, the ammonia decreased 46% in the air and 45% in the chicken house bedding compared with standard processes.
- A pilot ICorps@ARS program for customer discovery and feedback of research needs by the livestock industry that broadened the impact of the research.
- Webinars and training on the new technology presented by scientists to the USDA Natural Resources Conservation Service and the Environmental Protection Agency.

Above: Ammonia recovery from wastewater with gas-permeable membranes.

In 2021, the technology was selected for expanded delivery by the Agriculture Innovation Agenda (AIA), a new initiative to facilitate goals of increasing U.S. agricultural production by 40% while reducing the environmental footprint of agriculture by 50% by 2050. Implementing the new technology in municipal plants could have global positive impacts, increasing nitrogen recycling and reducing greenhouse gas emissions.

TEAM MEMBERS: *Dr. Matias Vanotti, Dr. Ariel Szogi, Dr. Maria Garcia-Gonzalez, Dr. Patricia Millner, Dr. Fawzy Hashem, Dr. Patrick Dube, Dr. Michael Rothrock Jr., Gail Poulos, Jeff Dawson*

Excellence in Technology Transfer Award

ARS-DEVELOPED WOUND DRESSING USES DOMESTIC COTTON TO SLOW BLEEDING AND PREVENT INFECTION

U.S. Department of Agriculture
Agricultural Research Service Southeast Area, Southern Regional Center

Researchers from the U.S. Department of Agriculture's Agricultural Research Service (ARS) partnered with a cotton farmer, a trauma dressing company and a university to develop two special types of non-woven cotton dressings that treat for bleeding control and infection prevention.

The ability to control bleeding and prevent infection in traumatic wounds is essential for warfighters and emergency responders, especially those in isolated or remote areas, since delays in treatment can lead to serious complications, including sepsis.

The success of the products will also provide a needed boost to the U.S. cotton textile industry, which has faced high surpluses and decreasing demand for more than a decade due to foreign competition and the growth of petroleum-based synthetic materials.

The dressing for bleeding control contains a special type of unbleached cotton that improves clotting over standard bleached cotton gauze. The dressing is 60% more absorbent and 30% lighter than regular bleached cotton gauze, sheds fewer fibers and has suitable properties for the Individual First Aid Kits that are standard issue for soldiers going into battle.

After the 2014 publication of an ARS paper describing the potential of highly cleaned unbleached domestic cotton for bleeding control, H&H Medical Corp. — which sells military-grade trauma management products — expressed interest in commercializing the technology. This led to a Cooperative Research and Development Agreement (CRADA) between the two parties and T.J. Beall Corp., the textile company where CEO and cotton farmer Lawson Gary developed the intensely clean cotton used in the ARS paper.

Scientists at the Medical College of Virginia worked with ARS to determine how the dressing affected clotting times for fresh platelet-containing blood, which behaves differently from the blood samples typically used in laboratory clotting experiments. When the product was market-ready, Mogul, a Turkish nonwoven textile manufacturer with a facility in South Carolina, provided large-scale production (Mogul South Carolina was acquired by FiberTex Nonwovens in January 2019).

Above: The ARS bleeding-control dressing is now marketed by H&H Medical as TACgauze. (Photo courtesy of H&H Medical.)

The dressing is now marketed as TACgauze™ (TAC stands for "tactical") for bleeding control and is the first U.S.-produced cotton dressing that uses only domestic cotton, exceeding the 80% level needed for goods used by the Department of Defense to be Berry Amendment compliant. The dressing also provides a U.S.-made surgical gauze for supply to the DoD that is sustainable and resistant to supply chain disruptions.

A second dressing (BIOgauze) designed to prevent infection as well as control bleeding will be made available to the DoD as well. Infusion with a small amount of ascorbic acid causes the TACgauze material to release hydrogen peroxide at levels that promote healing and prevent nearly 100% of bacterial growth. Like TACgauze, BIOgauze is Berry Amendment compliant and intended to facilitate affordable wound treatment on the battlefield or in other situations involving less than ideal conditions.

TEAM MEMBERS: *Dr. J. Vincent Edwards, Lawson Gary, Dr. Nicolette Prevost, Dr. Dorne Yager, Paul Harder, Joseph DaCorta, Dr. Brian Condon*

VIPR SYSTEM FROM ARS COULD SAVE $750M PER YEAR AND RESTORE U.S. REPUTATION FOR CLEAN COTTON

U.S. Department of Agriculture
Agricultural Research Service, Plains Area

A system for detecting and removing plastic contaminants from harvested cotton, developed and commercialized by the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) and industry partners, could help to restore the financial health and reputation of the nation's cotton industry.

American-grown cotton was once known for being some of the cleanest in the world, but that is no longer true. Much of the plastic contamination showing up in marketable, ginned cotton comes from plastic used to wrap the cylindrical bales of cotton in the field. Despite diligent efforts by cotton gin personnel to remove all traces of plastic before processing, it still finds its way into the cotton gin's processing system 10 times more often than before the advent of cylindrical baling.

This contamination has led to significant losses for the cotton industry — more than $750 million annually. For an average cotton farmer growing 1,500 acres of the crop, the plastic-related losses would be more than $30,000 per year.

To mitigate this loss of quality and profit, ARS and industry partners have developed the Visual Inspection and Plastic Removal (VIPR) technology, which efficiently detects and removes plastic contamination during post-harvest processing of cotton. Because cotton gins have extremely low profit margins, the VIPR system was designed to be much less expensive than the detection and removal technologies used in other industries.

VIPR is a "bolt on" system, built using off-the-shelf parts such as cellphone cameras and embedded image processors. These detectors are coupled to a pneumatic ejection system, which blows plastic contamination out of the cotton processing stream. Overall, the VIPR technology prevents more than 90% of all plastic from getting into cotton bales.

The ARS Lubbock Lab took the lead in developing the detection hardware and software and in forming the strategic partnerships. The Las Cruces Lab designed and built the first prototype and in May 2018 made a proof-of-concept video showing it successfully ejecting plastic from seed cotton.

Above: Housing, built and designed by VIPR team, is designed to port cooling air over the embedded cell-phone CPU, which is then routed into a custom air-knife directed over the camera lens to keep it free of lint and dust.

The new VIPR system was developed, tested and successfully transferred under Cooperative Research and Development Agreements (CRADAs) between ARS and industry partners. Process engineering firm Bratney Cos. became a CRADA partner in October 2018 with the goal of commercializing the technology.

Bratney and a previous ARS CRADA partner, longtime cotton gin manufacturer Lummus Corp., formed a partnership whereby Bratney would manufacture the VIPR units and Lummus would sell, help install, and service them. This partnership helped to get the system into the hands of cotton ginning professionals as quickly as possible.

The first commercial units were sold in December 2019 and were installed and tested in a cotton gin in Georgia in January 2020. Additional units were sold in 2020 despite pandemic challenges, with more sales expected in the near future.

TEAM MEMBERS: *Dr. Mathew Pelletier, Dr. Greg Holt, Dr. John Wanjura, Dr. Derek Whitelock, Carlos Armijo, Dr. Paul Funk*

Excellence in Technology Transfer Award

RADIATION-RESISTANT BACTERIA INSPIRE USU-BMI VACCINE AGAINST POLIO AND EMERGING SUPERBUG

U.S. Department of Defense
Uniformed Services University of the Health Sciences, Henry M. Jackson Foundation

Researchers at the Uniformed Services University of the Health Sciences (USU) have harnessed powerful antioxidants from the bacterium *Deinococcus radiodurans* to create a safer, more effective method of vaccine development.

A collaboration between USU and Biological Mimetics Inc. (BMI) resulted in joint intellectual property (IP) for a new polio vaccine, with a patent application with both USU and BMI inventors under prosecution management by BMI. A second joint invention, for a novel vaccine against an emerging "superbug," the multiple drug-resistant bacterium *Acinetobacter baumannii*, has also resulted from this technology transfer partnership.

Deinococcus radiodurans is capable of surviving 3,000-fold more gamma radiation than humans. After discovering that these bacteria survive by accumulating powerful Mn antioxidants, the USU team harnessed this knowledge to design and patent an antioxidant-based strategy for vaccine development. The USU inactivation method combines the antioxidant with a live pathogen: When the antioxidant-pathogen mixture is exposed to supra-lethal doses of gamma rays, the genomes are destroyed but the surface proteins are protected, so the vaccine closely resembles the original shape of the virus or bacterium.

These novel antioxidants are applied to produce inactivated vaccines with improved immunogenicity in partnership with BMI. The John W. Lowe Joint Office of Technology Transfer, which serves both USU and the Henry M. Jackson Foundation (HJF), has helped USU protect its IP while facilitating a partnership that includes USU, HJF and BMI.

The technology transfer process began with a Non-Disclosure Agreement in 2013 and has since progressed from a Materials Transfer Collaboration Agreement to three distinct development projects under three Cooperative Research and Development Agreements (CRADAs). BMI is seeking to develop strategic industry partnerships to commercialize the polio vaccine technology, which it is calling ultraIPV (ultra inactivated poliovirus vaccine).

The foundational IP developed by USU has far-reaching potential. In addition to the field-specific licenses with BMI (for polio and *A. baumannii* vaccines, thus far), there is further opportunity for many more tech transfer deals — with BMI or other potential licensees — for the development of other vaccines and additional non-vaccine applications of the powerful antioxidants developed at USU.

Above: Dr. Michael J. Daly, in his laboratory, holds a petri dish growing the extremely radiation-resistant bacterium Deinococcus radiodurans, *from which the novel vaccine technology sprung.*

Although global campaigns have succeeded in eradicating wild poliovirus types 2 and 3, efforts to eradicate type 1 are ongoing. The USU-BMI technology transfer relationship may help achieve this World Health Organization goal. It could also help control outbreaks of polio vaccine-derived infections, prevent reversion of polio vaccines to a pathogenic virus, reduce costs and facilitate local manufacturing of polio vaccines in developing areas.

There is no vaccine for *A. baumannii* infection, which is becoming increasingly troublesome to both military and civilian health systems, especially in intensive care units. The USU-BMI collaboration will provide a protective strategy for at-risk warfighters and patients.

TEAM MEMBERS *Dr. Michael J. Daly (USU), Dr. Mark Scher (HJF), Dr. Gregory Tobin (BMI)*

DOD COLLABORATIONS DRIVE RAPID DEVELOPMENT AND DEPLOYMENT OF COVID-19 ISOLATION CHAMBER

U.S. Department of Defense – U.S. Army
U.S. Army Medical Research & Development Command

Collaboration across the Department of Defense (DoD), including an innovative five-way Cooperative Research and Development Agreement (CRADA) involving four DoD labs and a commercial licensee, led to the rapid deployment of a low-cost isolation chamber to protect health care workers from COVID-19 exposure.

By summer 2020, the COVID-19 Airway Management Isolation Chamber (CAMIC) had been used in more than 100 surgical procedures in the military health system. Within seven months of initial conceptualization, 150 CAMIC devices had been commercially manufactured and were awaiting final approval for distribution.

CAMIC is a clear isolation chamber that drapes around the head, neck and shoulders of a patient, creating a portable negative pressure environment that captures and removes viral particles using vacuum lines.

CAMIC was conceived in the spring of 2020 by physicians at Walter Reed National Military Medical Center (WRNMMC) and refined in just three weeks with the support of three Army labs: the Telemedicine & Advanced Technology Research Center (TATRC), U.S. Army Medical Materiel Development Activity (USAMMDA) and the Clinical and Translational Research Program Office (CTRPO). CAMIC's simple construction from readily available materials allowed rapid fabrication of the chambers by military treatment facilities after the Food and Drug Administration (FDA) granted an emergency use authorization in June.

Technology transfer efforts reflected the same sense of urgency and collaboration, with T2 staff across multiple chains of command working nights and weekends to accelerate processes and forestall intellectual property (IP) issues that could have slowed — or outright halted — commercialization.

"In 25 years of technology transfer, I have never seen more moving parts," one member of the T2 team said.

An emergency use license was granted to Prep Tech Healthcare Technologies, a Louisiana health care technology developer. Prep Tech, which had also begun rapidly prototyping its own self-contained isolation chambers for use against COVID-19, worked with technology transfer officials at the U.S. Army Medical Research and Development Command (USAMRDC) and TechLink to secure an emergency use license in June, followed by a CRADA several months later, to further the testing, development and commercial manufacture of the CAMIC device.

A second emergency use license was granted in October to Atrix International, a manufacturer of ultrafine filtration vacuums for the health care industry. The combination of a portable isolation chamber with an Atrix cordless vacuum offers a mobile solution for the DoD as well as civilian medical transport applications.

While other isolation chambers are now commercially available, the CAMIC satisfied an urgent, high-priority need for the DoD's military facilities, including those overseas in remote locations, and opens the door for further collaboration with industry partners in this important and rapidly developing technology area.

Above: In just four months, CAMIC progressed from ideation to initial commercialization efforts. As one member of the technology transfer team put it, "Everyone worked together. We cut through the red tape to directly impact everyone working to save lives."

TEAM MEMBERS

Maj. (Dr.) Steven Hong, Nathan Fisher, Maj. (Dr.) Douglas Ruhl, Maj. (Dr.) Charles Riley, 2nd Lt. Joseph Krivda, Capt. (Dr.) Timothy Blood, Capt. (Dr.) Jonathan Perkins, Maj. (Dr.) Paul Wistermayer, Leigh Callander, Stephen Johnson, PhD, Blake Sajonia, Quinton King, PhD, Dr. Paul Michaels, Don Townsend, Freda Krosnick, Dr. Mark Paxton, Jelena Gvozdenovic-Jeremic, Maj. Scott Baker, Martin Hindel

THREE DECADES OF ARMY PERSISTENCE PAYS OFF WITH FDA APPROVAL OF IV THERAPY FOR SEVERE MALARIA

U.S. Department of Defense – U.S. Army
U.S. Army Medical Research & Development Command

The Food and Drug Administration (FDA) approval of Artesunate for Injection in May 2020 marked the culmination of three decades of collaboration by physicians, scientists and technology transfer (T2) staff in the U.S. Army to address a critical global shortage of treatment options for severe malaria.

Malaria, which is transmitted through the bite of an infected mosquito, remains one of the top infectious disease threats to U.S. military personnel deployed overseas. Although rare in the United States, malaria threatens about half of the world's population. There are an estimated 216 million clinical cases annually, and without appropriate treatment, about 15% become severe, resulting in 445,000 deaths each year.

Artesunate, derived from a natural plant source, has curative qualities discovered by Chinese physicians thousands of years ago. Researchers, clinicians and T2 professionals from the Walter Reed Army Institute of Research (WRAIR) and the U.S. Army Medical Materiel Development Activity (USAMMDA) — both subordinate commands of the U.S. Army Medical Research & Development Command (USAMRDC) — developed, tested, produced and ultimately commercialized artesunate as a treatment for severe malaria.

Finding a commercial partner capable of manufacturing IV artesunate in compliance with FDA regulations was challenging, in large part because of the changing economics of the pharmaceutical industry and the limited potential profitability of treatments for rare conditions in much of the developed world. Army T2 staff remained persistent and nimble in the face of those strong economic headwinds.

Those efforts paid off in a partnership with Amivas USA LLC, a health care company that was founded by veterans of the U.S. and Australian military in 2016 expressly for manufacturing IV artesunate as the initial product in a pipeline of low-volume but critical treatments for severe malaria and rare or neglected tropical diseases.

Amivas and USAMMDA signed a Cooperative Research and Development Agreement (CRADA) in 2017, then collaborated on the FDA's New Drug Application preparation, filing and review processes, culminating in FDA approval of the technology in May 2020. The approval also came with the potential to receive a priority review voucher, an FDA incentive to invest in tropical disease treatments, which entitles its holder to one FDA priority review for any future drug or vaccine.

Amivas will now manufacture, distribute and commercialize IV artesunate as Artesunate for Injection, and is setting up a nationwide product distribution network for launch in early 2021. Artesunate for Injection is now the first-line drug for treatment of severe malaria in the United States and on the World Health Organization Model List of Essential Medicines.

The global potential is even greater. In an era of shrinking new-drug research and development pipelines, particularly for diseases that are rare in developed nations, USAMMDA's sustained efforts will have wide-ranging impact far beyond the core goal of protecting the warfighter.

Above: Malaria, which is transmitted through the bite of an infected mosquito, is rare in the United States but occurs in more than 100 countries and territories, threatening about half of the world's population.

TEAM MEMBERS: *Col. Peter Weina, Bill Ellis, Judy Holian (PMP), Maj. Victor Zottig, Col. Lisa Thomas Read, Col. Bryan Smith (retired), Bob Charles, David Humphrey, Maj. Katherine Carr*

Excellence in Technology
Transfer Award

NRL-QROMIS PARTNERSHIP POSITIONS GALLIUM TO DETHRONE SILICON IN SEMICONDUCTOR DEVICE MARKET

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

Gallium nitride (GaN) is poised to become a less expensive, more efficient commercial replacement for silicon in semiconductor devices, thanks to a partnership between the Naval Research Laboratory (NRL) and Silicon Valley-based semiconductor start-up Qromis.

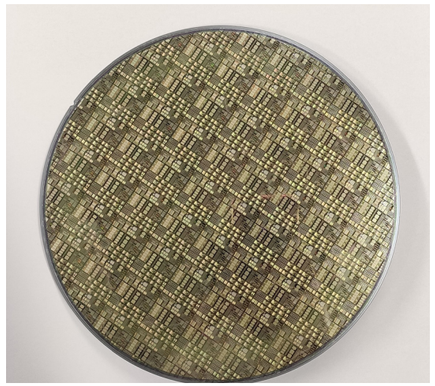
Compared with silicon, the most commonly used material for semiconductors, GaN can conduct electrons more than 1,000 times more efficiently and can be manufactured at a lower cost. However, pairing GaN with most of the cost-effective materials that can be used as substrates (the surfaces on which semiconductors are deposited in the manufacture of circuits) results in instabilities in the structural integrity of devices and/or wafers, which are thin slices of semiconductor material used as substrates in microelectronics. This has so far prohibited GaN's widespread use.

The concept for a large-area substrate technology compatible with GaN was developed at NRL in the early 2000s. Through a series of license agreements and other transfers, the concept has been refined and commercialized into a product that could redefine the $40 billion semiconductor power market.

This T2 story began in 2009, when six patents based on the NRL innovation were licensed to a small business called AmberWave Systems Corp. In 2010, AmberWave was acquired by Micron Technology, which in 2015 spun off the NRL intellectual property into a new company (and licensee) that became Qromis.

The transfer has resulted in Qromis' trademarked product called Qromis Substrate Technology (QST®), protected by nearly 100 patents worldwide, and has made the company a start-up to watch in the semiconductor industry. Qromis has already sold thousands of units, which will reduce the costs of a variety of commercial and military products.

Instead of manufacturing QST substrates directly, Qromis and NRL orchestrated a manufacturing



Above: 8-inch GaN-on-QST® 650V Power IC Device Wafer

sublicense to Taiwanese semiconductor foundry Vanguard International Semiconductor Corp. to produce QST substrates and GaN-on-QST epi wafers (wafers made up of crystals) exclusively for Qromis and serve as an epi wafer foundry service.

"It's been almost the 'holy grail' of licenses," said Amanda Horansky-McKinney, head of the Technology Transfer Office at NRL. "Qromis has become well positioned to do exactly what we hope our licensees will do: invest and develop an IP base supporting a competitive market position for their product, using NRL technology as the base."

Through additional partnerships, Qromis is on the cusp of commercializing the technology for potential widespread application in the commercial electronics industry, including the world's largest makers and users of semiconductor devices. The company is also exploring other multibillion-dollar market applications including light-emitting diodes (LEDs) and radio-frequency (RF) communications.

Commercial availability of the new technology will also support NRL's mission by facilitating next-generation Navy systems, including air and missile defense radars, electronic warfare and radar jamming systems, and satellite applications.

TEAM MEMBERS: ***NRL*** *Amanda Horansky-McKinney, Dr. Karl Hobart, Dr. Francis (Fritz) Kub* ***TechLink*** *Dr. Austin Leach* ***Qromis*** *Dr. Cem Basceri, Dr. Vlad Odnoblyudov*

LLNL AND ARGON ELECTRONICS MAKE RADIATION FIELD TRAINING FOR FRONT-LINE WORKERS MORE REALISTIC

Department of Energy
Lawrence Livermore National Laboratory

The Lawrence Livermore National Laboratory (LLNL) and Argon Electronics (U.K.) Ltd. have partnered to commercialize the Radiation Field Training Simulator (RaFTS), an ultra-realistic radiation simulator for training emergency responders.

Responders to a suspected act of nuclear or radiological terrorism or accident rely on radiation detectors to assess the threat and respond appropriately. However, interpretation of data collected is nuanced and requires clear understanding of equipment and the impact of different scenarios on performance. For example, some detectors show only the magnitude of the hazard or the presence of contamination. Others identify the radioactive isotope. All are affected by the details of the scenario.

Because radiation is invisible, realistic detector-specific training is critical. Previously, training with high-hazard radioactive materials was accomplished only at specialized facilities not generally available to most emergency responders. Responders need the ability to train with their own equipment against the most realistic hazards in the locations where they are expected to respond. LLNL RaFTS technology makes this possible.

RaFTS can connect to radiation detection instruments of any type — and eventually from any manufacturer — generating signals indistinguishable from a real radiation source. Training for radiation emergencies can occur without risking unnecessary radiation exposure. RaFTS also eliminates the expense and transportation risk of training with radioactive materials.

RaFTS represents a paradigm shift in emergency response training, revolutionizing the way responders learn to detect and identify radioactive threats and perform their other operations.

Moving this technology from lab to market required the dedicated effort and coordination of LLNL's Innovation and Partnerships Office (IPO) and technical team to secure development opportunities and increasing levels of commercialization funding. The team carefully vetted potential partners over several years to secure a commercialization plan that would make RaFTS as widely available as possible to the first responder community, while minimizing the potential for any redesign or

Above: *Researchers from LLNL and Argon Electronics conduct a test with the Radiation Field Training Simulator (RaFTS). From left: Dave Trombino, Erik Swanberg and Josh Oakgrove, all from LLNL; Philip Dunn of Argon Electronics; Greg White of LLNL; and Steven Pike of Argon Electronics.*

reengineering required of equipment manufacturers.

In 2019, Argon Electronics signed a two-year, $2.5 million Cooperative Research and Development Agreement (CRADA) to make RaFTS market-ready; an exclusive license followed in 2020. LLNL's IPO could have licensed the technology to only one radiation detection instrument manufacturer, but that strategy would have constrained RaFTS to a limited number of instrument makes/models. By partnering with an internationally positioned developer and manufacturer of hazardous material detector simulators — U.K.-based Argon Electronics — the partnership ensures that the greatest number of users will benefit from this unique training tool.

Argon is developing versions of RaFTS to work with instruments of different types and from various manufacturers through a common interface to be standardized across the instrument manufacturing community. In the future, the RaFTS concept is expected to extend to instruments and scenarios involving chemicals or other hazards.

TEAM MEMBERS: *Dr. Annemarie Meike, Greg White, Dr. Steven Kreek, Josh Oakgrove, Dan Bower, Steven Pike, Philip Dunn (retired)*

Excellence in Technology Transfer Award

Lawrence Livermore National Laboratory

IPO INNOVATION & PARTNERSHIPS OFFICE COMMERCIALIZING LLNL TECHNOLOGY

LLNL AND PARTNERS TAKE COVID-19 VENTILATOR TECHNOLOGY FROM DESIGN TO EUA IN THREE MONTHS

Department of Energy
Lawrence Livermore National Laboratory

COVID-19 RESPONSE DISTINCTION

A collaboration between Lawrence Livermore National Laboratory (LLNL) and medical device company BioMedInnovations LLC (BMI) resulted in an innovative mechanical ventilator for COVID-19 patients that was approved for emergency use just three months after the design work began.

As the COVID-19 pandemic surged and estimates predicted a critical nationwide shortage of ventilators, LLNL immediately began designing a durable, portable mechanical ventilator made from readily available parts to avoid burdening an already-strained supply chain.

On the other side of the country, BMI was also pivoting toward the pandemic from its traditional focus on devices used in organ and tissue perfusion. BMI is a North Carolina-based medical device startup that makes precision air and fluid flow devices.

LLNL and BMI came up with a promising design — tentatively dubbed NERVe (Novel Emergency Response Ventilator) — after only two weeks of late nights and extended hours of remote conferencing. Highly accurate pressure regulation technology was contributed by Equilibar LLC, a BMI partner. At five weeks, the team had the necessary ventilator test data and documentation to submit the design to the Food and Drug Administration (FDA) for approval.

The solution to the team's manufacturing needs came from an unexpected source: professional race car engine shops, which were idle because of the postponement of all professional sports necessitated by the pandemic. The ventilator — renamed SuppleVent™ — is being manufactured by Roush Yates Manufacturing Solutions (RYMS), which builds engines for NASCAR teams as well as hardware for aerospace, defense and medical uses.

On June 8, SuppleVent was added to the FDA emergency use authorization (EUA) list. The device operates in continuous ventilation mode for late-stage COVID-19 patients but is adaptable to patients who eventually breathe independently while being treated. The machine is built from a minimal set of components to facilitate a rapid volume-build while keeping costs very low for global use.

Above: A group of LLNL researchers representing disciplines from engineering, biotechnology, computer modeling, and micro- and nanotechnology convened to develop a prototype portable ventilator that could immediately meet the needs of COVID-19 patients.

LLNL and BMI designed, produced and tested an easily reproducible ventilator design while partnering with manufacturing facilities and gaining authorization for the device's emergency use. This remarkable "all hands on deck" collaboration was largely remote, with many scientists, engineers, and medical experts contributing from home offices due to shelter-in-place orders.

The T2 mechanisms used to move SuppleVent from design to development so quickly included a Non-Disclosure Agreement among LLNL, BMI and Equilibar, executed March 30, and a Cooperative Research and Development Agreement (CRADA) for the NERVe innovation, between BMI and LLNL, executed May 6.

BMI and its partners are set to manufacture up to 1,000 SuppleVent machines per month. As of Oct. 30, the first round of devices was ready to ship, and 100 more devices were ready for assembly. The company is also addressing logistics to handle recent requests from multiple countries.

TEAM MEMBERS: *Dr. Jack Kotovsky, Patrick Dempsey, Genaro Mempin, Alicera Aubel, Dr. Sherif Gabriel, Carrie DiMarzio, Gokhan Yildiz, Brent Johnson, Wayne Lucado, Jeff Jennings*

ORNL AND SPARKZ WORK TO MAKE LITHIUM BATTERIES COBALT-FREE, BOOSTING EV MARKET POTENTIAL

OAK RIDGE National Laboratory

Department of Energy
Oak Ridge National Laboratory

A strategic partnership between Oak Ridge National Laboratory (ORNL) and energy storage startup SPARKZ Inc. aims to commercialize a suite of interrelated technologies designed to eliminate the unsustainable cobalt metal from lithium-ion (Li-ion) batteries.

Li-ion batteries power a range of electronic devices, including electric vehicles (EVs). Cobalt is rare and costly, hindering the potential growth of the EV market. Only 4% of the world's cobalt reserve is in North America; the resource is primarily exported from the Democratic Republic of the Congo, where reports of ethical and human rights violations have subjected mining practices to international scrutiny. Those reasons — as well as health, safety and environmental concerns related to cobalt — have made the development and commercialization of cobalt-free alternatives for Li-ion batteries a national priority.

"Moving forward to an electrified world with millions of electric cars, cobalt is not sustainable," said Dr. Ilias Belharouak, Electrification Section head in ORNL's Electrification and Energy Infrastructures Division.

ORNL's technologies, when scaled for industry by SPARKZ, will address all of these concerns with cobalt-free alternatives that do not sacrifice critical performance parameters.

ORNL's innovations include cobalt-free materials, battery design changes that incorporate the new materials, and a large-scale manufacturing process. Together these technologies will enable mass production of more sustainable, fast-charging, cobalt-free batteries — potentially allowing electric charging stations to become the gas stations of the future.

In addition to licensing the laboratory's intellectual property (IP) to SPARKZ, ORNL's technology transfer efforts include collaborating with SPARKZ to incubate and validate these innovations for the marketplace under Department of Energy (DOE) commercialization programs. Those programs include the Technology Commercialization Fund and the Lab Investment Incubator Activity — each of which facilitated significant investor funding and a Cooperative Research and Development Agreement (CRADA).

Credit: Carlos Jones/Oak Ridge National Laboratory, Department of Energy

Above: Sanjiv Malhotra, CEO of Sparkz Inc., seated right, and Thomas Zacharia, ORNL laboratory director, signed a licensing agreement in November 2019 to advance five ORNL energy storage technologies for cobalt-free, fast-charging batteries for electric vehicles and the power grid. Standing, from left: Tien Duong, battery R&D technology manager of DOE's Vehicle Technologies Office (VTO); David Howell, VTO deputy director; and Peter Faguy, VTO battery R&D technology manager.

Short-term significant impacts of the technology transfer partnership include:

- Collaboration with SPARKZ at ORNL's Manufacturing Demonstration Facility, enabling uninterrupted collaboration and synergy between R&D and industry scale-up efforts.
- Plans for the first U.S.-based Li-ion battery manufacturing facility by the end of 2021.
- Drawing industry attention to the potential of cobalt-free alternatives to expand the U.S. presence in the Li-ion battery market and create a domestic supply chain for next-generation transportation and power grid solutions.

TEAM MEMBERS: *Dr. Jennifer Caldwell, Dr. Michael Paulus, Dr. Ilias Belharouak, Dr. Jagjit Nanda, Dr. Sanjiv Malhotra*

ORNL AND MVP JOIN FORCES TO MAKE THERMOSET MATERIALS AN OPTION FOR LARGE-SCALE 3D PRINTING

Department of Energy
Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL) and Magnum Venus Products Inc. (MVP) of Knoxville, Tennessee, have created and deployed the world's first large-scale thermoset additive manufacturing machine.

Thermoset materials have several advantages over thermoplastics in additive manufacturing, which involves depositing a material onto a build platform and building up an object layer by layer. Layering times with thermoset materials are shorter, printing requires less energy, and the cross-linking of polymers between printed layers results in stronger products that are more tolerant of high temperatures.

The Reactive Additive Manufacturing (RAM) machine is the first product of its type that is commercially available to industry for 3D printing of thermoset materials. Introduced to the market in September 2019, the RAM allows for a wide range of applications, including low-cost fixtures, tools and autoclave molds for a variety of industries such as marine, tub and shower, automotive and aerospace.

With a current print area of 16 by 8 by 3.5 feet, the RAM machine can produce large-scale parts, in various resolutions, using thermoset materials. The patent-pending removable table decreases print-cycle time and streamlines post-processing.

"Thanks to this innovation, research and development managers will be able to prototype faster and bring products to market faster," said Bob Vanderhoff, CEO of MVP.

At ORNL, partnerships with industry — the additive manufacturing industry in particular — are a key success factor.

"We value working closely with our industrial partners like MVP to ensure we're accelerating the path for commercialization to increase American competitiveness," said Moe Khaleel, deputy for projects at ORNL.

Above: The RAM product jointly developed by ORNL and MVP was launched on Sept. 17, 2019. Craig Blue, Bill Peter, Moe Khaleel, Bob Vanderhoff and Vlastimil Kunc were among those who attended the ribbon-cutting ceremony.

A family-owned business for more than 80 years, MVP is a global manufacturer of fluid movement and production solutions for industrial applications in composites and adhesives markets.

MVP has worked with ORNL under two Cooperative Research and Development Agreements (CRADAs). Signed in April 2017, the first CRADA was a two-year agreement focused on raising the technology's readiness to the level of operational prototype for demonstration. Each party brought $500,000 in value to the effort.

The second CRADA, signed in February 2020, is a three-year agreement not only to further develop the RAM but also to advance new techniques for making filament-wound additively manufactured cores, which will further enhance the RAM's market potential. MVP is recognized as a leader in the filament winding industry.

In April 2020, ORNL licensed two technologies to MVP. The first was a non-exclusive license for the Reactive Polymer Fused Deposition Manufacturing technology solely developed by ORNL. That technology has now been licensed by three companies. The second agreement was an exclusive license for the segmented build platform co-developed by MVP and ORNL.

TEAM MEMBERS: *Dr. Eugene Cochran, Dr. Christopher Hershey, Mike Kastura, Dr. Vlastimil Kunc, John Lindahl*

Excellence in Technology Transfer Award

PNNL-PST COLLABORATION COULD SAVE BILLIONS THROUGH PROACTIVE DETECTION OF FLUID CONTAMINANTS

Department of Energy
Pacific Northwest National Laboratory

In the oil and gas industry, undetected fluid contamination can lead to billions of dollars in losses due to equipment damage. Safe, non-invasive, real-time identification of fluid contaminants is now possible thanks to a technology transfer collaboration between Pacific Northwest National Laboratory (PNNL) and Perceptive Sensor Technologies (PST).

The FluID™ suite of technologies works by launching sound waves into a container and analyzing the return echoes to determine the temperature-corrected acoustic velocity (the sound wave speed) and the relative acoustic attenuation (energy loss) as the sound wave travels through the liquid. If the technology measures an acoustic "signature" that does not match the known properties of the fluid being analyzed, contamination is likely the source; during testing, the technology demonstrated 99.86% accuracy for identifying/discriminating threat liquids from hundreds of non-threat liquids.

The transfer between PST and PNNL started in March 2018 with an Exploratory License arrangement. PNNL is currently the only Department of Energy national laboratory to offer low-cost, low-risk licenses that allow companies to test-drive promising technologies for six months without requiring the full commitment of a standard license. These six months allowed PST to fully understand PNNL's advanced acoustic measurement capabilities. Impressed, PST began exploring options for a licensing arrangement with PNNL and a sublicensing arrangement with Mehl, Griffin & Bartek (MGB), the company that held an exclusive license for PNNL's originally patented acoustic technology upon which the new system was developed and further patented.

Unfortunately, MGB's CEO passed away unexpectedly in January 2018, jeopardizing the future of this three-way partnership. To ensure that FluID still entered the market, PNNL orchestrated the termination of MGB's rights and the activation of PST's license.

A Technical Services Contract was arranged to allow PST to tap into PNNL's deep expertise, and a Materials Transfer Agreement enabled PNNL to lend PST a working prototype instrument. The company then compared results generated from its newly engineered system with the original, ensuring that the detection and classification algorithms were working correctly.

Above: A user leverages PNNL technology to investigate the unidentified liquid contents within a barrel.

PST is a growing business that has created more than 20 direct jobs, engaged numerous contract engineering firms and consultants, and secured over $4.5 million in capital to support the commercialization of the FluID technology for use in industrial markets. FluID is now in production, with products being used by some of the best-known companies in the oil and gas industry.

PST also announced a distribution partnership with Hawk Measurement as its global sales partner, with sales representatives in 50 countries to quickly establish international distribution of the FluID system. Hawk Measurement will target the mining, water management, wastewater, food processing and chemical industries.

TEAM MEMBERS: *Aaron Diaz, Juan Valencia, Dr. Brian Tucker, Dr. Margaret Greenwood, Dr. Kannan Krishnaswami*

START-UP MPOWER TARGETS SPACE INDUSTRY FOR COMMERCIALIZATION OF SANDIA SOLAR CELL TECHNOLOGY

Department of Energy
Sandia National Laboratories

After a complicated technology transfer process involving a sprawling intellectual property (IP) portfolio and a start-up launched by former laboratory employees, Sandia National Laboratories' Microsystems Enabled Photovoltaics (MEPV) high-efficiency solar cell technology is poised for commercialization.

Currently being further developed and marketed by Albuquerque-based start-up mPower Technology, the MEPV technology is now called DragonSCALES™ (SemiConductor Active Layer Embedded Solar). mPower plans to introduce the technology to the space solar power market for low-Earth orbit satellite constellations, an initial demonstration intended to facilitate the technology's introduction into larger, more cost-sensitive markets like rooftop or utility-scale solar energy.

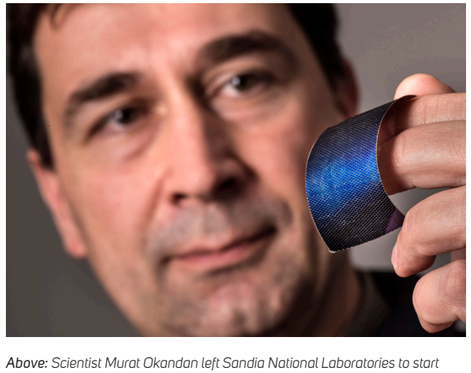
Like more typical solar cells, MEVP solar cells are made from silicon. But while traditional, large format solar cells are quite brittle and fragile, the MEPV cells are small and interconnected, making them foldable and almost unbreakable. MEPV cells are efficient to manufacture since they combine advances in photovoltaic cell design with mature microsystem production and manufacturing techniques.

The small size reduces material costs while enhancing cell performance. It also provides the freedom to integrate solar power capability into everyday objects. The technology's potential applications include buildings, houses, clothing, portable electronics, vehicles and other contoured structures.

Three Sandia employees from the original MEVP development team started mPower Technology in 2015, taking advantage of Sandia's Entrepreneurial Separation to Transfer Technology program (ESTT).

In March 2015, Sandia and mPower entered into a Non-Disclosure Agreement. A License Option Agreement (LOA) for 20 patents and patent applications in the MEPV portfolio was executed on Aug. 24, 2015. The LOA included business milestones as well as a unique feature: Among the 20 patents was a group that Sandia agreed to not license for six months while mPower determined whether it needed them.

A full commercial license for 17 patents was executed on Jan. 23, 2017, just four months after mPower elected to exercise the LOA — a very short time for such a complex license. It has been amended four times, most recently in December 2019.



Above: Scientist Murat Okandan left Sandia National Laboratories to start mPower Technology Inc., whose primary product is Dragon SCALEs, small, lightweight, flexible solar cells that fit into and power devices or sensors of any shape or size. Okandan, who signed a licensing agreement with Sandia, shows a prototype here.

Initial protection of the IP in both the U.S. and foreign countries and a long option period were combined with sublicensing rights for mPower, but only when coupled with patents it subsequently developed. The license also was structured with different royalty rates and requirements for four different markets mPower was initially pursuing.

mPower has received a $1.1 million Army Small Business Innovation Research (SBIR) grant for portable remote power requirements and raised $4.35 million in Series A round funding.

mPower recently delivered a demonstration unit to Airbus for its Sparkwing solar array product, which was integrated into the launch of the Momentus Vigoride satellite delivery platform, which is expected to launch later this year. mPower is also in talks with several major corporations interested in terrestrial and IoT (internet of things) applications.

TEAM MEMBERS: *Dr. Murat Okandan, Kevin Hell, Dr. Robert Westervelt, Dr. Keith Ortiz*

CDC TRAP FOR CONTROL, SURVEILLANCE OF MOSQUITOES THAT SPREAD ZIKA, DENGUE AND OTHER VIRUSES

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

Researchers from the Centers for Disease Control and Prevention (CDC) developed a patented, low-cost, and pesticide-free mosquito trap to monitor and control mosquito populations. The CDC's industry partner, AP&G, commercialized the technology. A second licensee also distributes the CDC's technology.

Mosquitoes can spread deadly viruses — such as dengue, Zika, chikungunya, and yellow fever — that can cause significant outbreaks and disease. The World Health Organization reports that almost half of the world's population is at risk for dengue and there are up to 390 million dengue infections annually. Aedes species mosquitoes can transmit viruses through bites to people. They are found throughout tropical and subtropical countries around the world, including U.S. territories and the southern U.S.

CDC researchers developed the autocidal gravid ovitrap (AGO), a simple-to-assemble and easy-to-maintain trap that targets female Aedes species mosquitoes looking for a place to lay eggs. The trap model stands 18 inches (45 cm) tall and is made from a 5-gallon (~18.9 liter) bucket.

The AGO trap's unique design lures mosquitoes by using water and an all-natural, organic hay attractant. Once inside the trap, adult mosquitoes get captured on a non-toxic, sticky adhesive placed inside a chamber within the trap so they cannot escape. Optionally, the trap may include a hydrogel to capture laid mosquito eggs, which are collected for mosquito population surveillance and testing for virus presence. CDC's AGO technology has significant advantages: 100% non-toxic trap, inexpensive to manufacture and maintain, successfully field-tested in communities, proven to reduce mosquito populations and the viruses they spread, and currently in use to control the spread of Zika and dengue through Aedes mosquitoes.

CDC leveraged numerous technology transfer mechanisms in developing and commercializing the AGO trap technology. Researchers collaborated with partners, conducted field studies and authored/co-authored 20 publications. Inventors and staff promoted AGO traps via 38 scientific conferences and marketing. CDC's Technology Transfer Office handled first patent applications, agreements and licensing.

Above: CDC mosquito trap for control and surveillance of mosquitoes including carriers of Zika and other viruses.

CDC's team at NIH's National Institute of Allergy and Infectious Diseases (NIAID) Technology Transfer and Intellectual Property Office (TTIPO) oversaw licensing and patenting for the CDC after October 2013. Staff initiated or facilitated 16 different agreements with interested parties, including a non-exclusive licensing agreement with AP&G signed in November 2016.

Partners at AP&G licensed, further developed and incorporated CDC's technology into a commercialized product under the company's Catchmaster® brand. AP&G entered the mosquito management industry with the CDC-developed non-toxic Ovi-CatchTM trap. AP&G sells the traps to pest management companies, consumers and property owners throughout the U.S.

This effort furthers CDC's mission to protect America from health and safety threats, both foreign and domestic. AGO traps have proven success in surveillance, mosquito control and disease reduction. Field trials in which AGO traps were installed in most homes in a community have shown that they reduce not only mosquito populations but also rates of infection. Partners continue to prevent mosquito-borne disease and improve lives for those in high-risk areas by deploying traps. Additional studies are underway. CDC seeks more commercial partners with the goal to distribute AGO traps worldwide.

TEAM MEMBERS:

CDC: *Dr. Roberto Barrera, Manuel Amador (retired), Dr. Andrew Mackay (former CDC), Naureen Iqbal, Francisco (Paco) Candal (retired), Suzanne Seavello Shope (former CDC), Lisa Marianni*

CDC team at NIAID: *Dr. Tara Kirby, Dr. Jeremiah Mitzelfelt, Dr. Patrick McCue*

AP&G: *Ed Dolshun, Dr. Stan Cope*

Credit: Photo credit: CDC National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) Puerto Rico laboratory

National Institute of Allergy and Infectious Diseases

T2 HELPS NIAID RAPIDLY SHARE COVID-19 VIRUS PARTICLES FOR RESEARCH ON TREATMENTS AND VACCINES

Department of Health and Human Services – National Institutes of Health
National Institute of Allergy and Infectious Diseases

Within hours of the public release of the viral genome sequence for SARS-CoV-2, the virus that causes COVID-19, scientists at the Vaccine Research Center (VRC) of the National Institute of Allergy and Infectious Diseases (NIAID) and their collaborators engineered a key protein to enable its study as a vaccine candidate and for research applications.

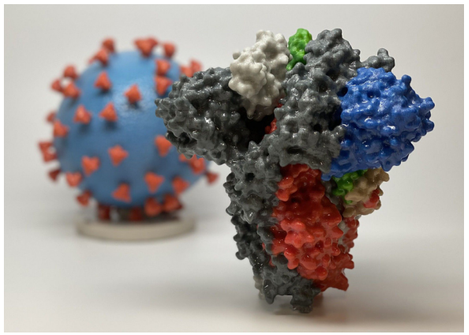
In the months that followed, the NIAID, through its Technology Transfer and Intellectual Property Office (TTIPO), facilitated rapid distribution of the key protein to the global research community, enabling critical research and the global scientific response to the COVID-19 pandemic.

Like other coronaviruses, SARS-CoV-2 particles are spherical and have proteins called spikes protruding from their surface. These spikes latch onto human cells, then allow the virus membrane to fuse with the human cell membrane. The viral genes can then enter the host cell to be copied, producing more viruses.

Based on earlier work with SARS-CoV-1 and other coronaviruses, researchers at the VRC and collaborators quickly engineered a version of SARS-CoV-2 with spike proteins stabilized in their prefusion conformation, which makes them more easily produced and a more useful target for vaccine development than the native spike protein.

Despite similarities between the spike proteins of SARS-CoV-1 and SARS-CoV-2, three different antibodies for the SARS-CoV-1 spike protein did not bind to the SARS-CoV-2 spike protein in tests. This early finding suggested that potential vaccines and antibody-based treatments would need to be specific to SARS-CoV-2. It also demonstrated the importance of rapid sharing of SARS-CoV-2 prefusion stabilized spike proteins, and the plasmid molecules that encode them, with researchers working to develop treatments and vaccines.

As of Oct. 8, 2020, NIAID had negotiated 83 Material Transfer Agreements (MTAs) with 70 academic organizations, nonprofits, government agencies and other entities to provide SARS-CoV-2 prefusion stabilized spike proteins or plasmids for their research projects.



Above: *A 3D-printed model of a spike protein of SARS-CoV-2, the virus that causes COVID-19, in front of a 3D-printed model of a SARS-CoV-2 virus particle. The spike protein (foreground) enables the virus to enter and infect human cells. On the virus model, the virus surface (blue) is covered with spike proteins (red) that enable the virus to enter and infect human cells.*

About 60% of the MTAs were signed within three days, and more than 70% were completed within one week; nearly 80% were completed within two weeks.

To further expedite sharing for research use worldwide, NIAID designated its Biodefense and Emerging Infections Research Resources Repository (BEI Resources) to produce and distribute the spike materials. Since June 2020, BEI Resources has fulfilled 55 requests for SARS-CoV-2 spike plasmids. In September, the TTIPO also signed an agreement with the National Institute for Biological Standards and Control (NIBSC), a large repository in the United Kingdom, to produce and distribute the materials.

Additionally, 21 license agreements were executed with biotechnology and pharmaceutical companies for technologies related to SARS-CoV-2 prefusion stabilized spike proteins. Many of the licenses were signed within two weeks and the vast majority within one month. Most licensees planned to use the technology to support vaccine development.

TEAM MEMBERS: *Dr. Barney Graham, Dr. Kizzmekia Corbett, Dr. Amy Petrik, Dr. Carol Salata, Dr. Vincent Feliccia, Dr. Michael Mowatt, Judy Stein, MPH, MBA*

AWARDS

INDIVIDUAL AND TEAM AWARDS

AGENCIES UNITE TO FIGHT COVID-19 BY RAPIDLY SHARING SARS-COV-2 VIRUS SAMPLES AND MATERIALS

Department of Health and Human Services
Centers for Disease Control and Prevention, National Institute of Allergy and Infectious Diseases, Office of Global Affairs

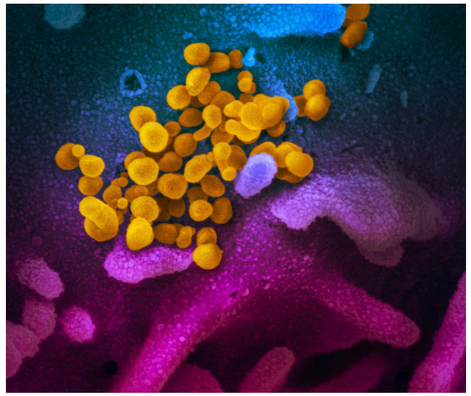
Collaboration among three Health and Human Services (HHS) agencies enabled rapid sharing of viral materials to accelerate the scientific and medical responses to the coronavirus disease 2019 (COVID-19) pandemic.

In early 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified as a novel virus and tracked around the world. As this happened, it became apparent that scientists knew little about the basic biology of SARS-CoV-2 or how to treat the resulting infectious disease now known as COVID-19.

Rapid sharing of SARS-CoV-2 materials, especially virus strains, thus became essential to improving scientists' general understanding of the virus and supporting the development of effective diagnostic techniques, treatments and vaccines. Academic centers, U.S. government agencies, private companies and the public health community requested specimens from the National Institute of Allergy and Infectious Diseases (NIAID) to support SARS-CoV-2 research and development of medical countermeasures.

Fortunately, the HHS agencies had developed a strategy for sharing viral and biological samples during the Zika virus epidemic in 2016. Since then, the NIAID, the Centers for Disease Control and Prevention (CDC) and the HHS Office of Global Affairs have worked out an even more efficient and collaborative approach for sharing critical viral materials.

Central to this effort, two mechanisms developed during the Zika outbreak were adapted to the COVID-19 pandemic. First, the interagency partners developed a streamlined Materials Transfer Agreement (MTA) for use in emergency situations. This Emergency Use Simple Letter Agreement (EUSLA) allows the materials to be used for any legitimate purpose required to rapidly prevent, detect, prepare for and respond to the spread or transmission of SARS-CoV-2, including commercial development. Second, the team used a NIAID-supported biorepository to receive, grow, validate and distribute viral materials.



Above: This scanning electron microscope image shows SARS-CoV-2 (yellow), the virus that causes COVID-19, isolated from a patient in the U.S., emerging from the surface of cells (blue/pink) cultured in the lab. Image captured and colorized at NIAID's Rocky Mountain Laboratories (RML) in Hamilton, Montana. (Credit: NIAID)

The CDC reached out to its extensive global network of partner laboratories and sentinel surveillance sites to access SARS-CoV-2 samples in early February 2020. Similarly, NIAID scientists were able to access samples from around the world by communicating through the agency's grantee and contractor network.

The volume of transfers documented, and the diverse nature of the recipients, attests to the success of this strategy:

- 22 organizations contributed materials to the biorepository.
- 8,441 requests for materials were fulfilled, all under the EUSLA.
- 4,108 agreements were negotiated with 319 academic institutions, 509 companies, 39 federal and state agencies, and five foreign governments.
- Materials were distributed to 49 U.S. states, Puerto Rico and 43 countries.

TEAM MEMBERS

CDC:
Dr. Natalie Thornburg
Dr. Wendi Kuhnert-Tallman
Kevin Brand
Marie-Christine Reames

NIAID:
Dr. Mukul Ranjan
Dr. Michael Mowatt
Dr. Peter Tung
Dr. Alan Embry
Kimberly Stemple
Dr. Marciela Maria De Grace
Dr. Brooke Bozick

HHS:
Dr. Robin Moudy
Ruvani Chandrasekera

Interagency Partnership Award

PNNL TEAMS WITH DEPARTMENT OF STATE'S ENR TO BOLSTER CENTRAL AMERICAN REGIONAL ENERGY SYSTEM

Department of Energy
Pacific Northwest National Laboratory
Department of State
Bureau of Energy Resources Power Sector Program

Central America's regional electricity grid is more robust and reliable today, thanks to technical support provided through a partnership between Pacific Northwest National Laboratory (PNNL), the U.S. Department of State's Bureau of Energy Resources (ENR) and Central America's regional power system operator Ente Operador Regional (EOR).

EOR manages regional electric power reliability and power trade among six countries: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. EOR and national utilities jointly serve more than 10 million customers. However, for years the region has been challenged in its efforts to increase the volume and efficiency of electricity trade between countries, along with integrating renewable energy.

Addressing these challenges through technical support can optimize power delivery, lower system costs and enhance reliability for the region's electric grid. Such improvements can also reduce energy costs for residents and foster economic growth, raising the standard of living and increasing regional stability.

The ENR-led Power Sector Program provides technical assistance to foreign governments to create more solvent, reliable, transparent and sustainable power sectors around the world. Between 2013 and 2019, PNNL, the ENR and EOR collaborated on multiple projects that included analysis of transmission expansion, grid stability, cross-border regional markets, continuity of operation of the regional control center, and resource integration in Central America.

Results of several technical assessments became the basis of U.S. policy engagement on electricity integration in Central America. Regional and national power system operators, planners and regulators adopted recommendations from these assessments related to cross-border and national electricity transmission investment requirements, and renewable integration rules proposed in these assessments were adopted for use in the regional electricity market in October 2018.

Above: PNNL electrical engineer Malini Ghosal gives a training presentation to Central American engineers in San Salvador, El Salvador. The training enabled grid operators to use PNNL-developed tools to monitor and analyze conditions on the regional grid.

Another result of this collaboration was a rapid transfer of software tools for power system analysis to individual nations served by EOR. Through the partnership with the State Department, PNNL secured approval to use government use rights to grant permission to individual EOR member nations for their national utilities to use PNNL's proprietary tools without a license. This unique strategy for technology transfer enabled utilities to access the software within weeks of their requests, rather than the many months that would have been needed to secure individual licenses for each utility.

"Never in my 11 years of doing technology transfer at a DOE laboratory have I worked with another government agency to transfer rights this way before," said Peter Christensen, deputy director for licensing at PNNL.

As part of the technology transfer plan, PNNL engineers trained more than 28 engineers from six countries to use the software. Today, EOR and three of the national electric utilities still use several of the tools transferred, working to build technical capacity, improve grid security, and integrate more variable renewable energy in the years ahead.

TEAM MEMBERS

PNNL:
Dr. Marcelo Elizondo
Karen Studarus
Dr. Nader Samaan
Dr. Pavel Etingov
Dr. Abhishek Somani
Dr. Xiaoyuan Fan
Dr. Jim Follum
Scott Mix
Malini Ghosal
Frank Tuffner
Dr. Bharat Vyakaranam
Dr. Mallikarjuna Vallem
Jeff Dagle
Peter Christensen

U.S. State Department:
Faith Corneille
Anna Shpitsberg
Levi White
Paul Hueper

EOR:
Christian Muñoz
Carlos Erroa
Marlon Castillo
José Hernández
Bili Martinez
René Gonzalez

State and Local Economic Development Award

NIST National Institute of Standards and Technology U.S. Department of Commerce

NIST-TEDCO ENTREPRENEURSHIP PROGRAM FACILITATES 11 NEW START-UPS AND $2.7M IN ANNUAL REVENUE

Department of Commerce
National Institute of Standards and Technology

An entrepreneurial program created by the National Institute of Standards and Technology (NIST) and the Maryland Technology Development Corp. (TEDCO) has resulted in 11 new businesses that have generated $2.7 million in annual revenue.

The NIST Science and Technology Entrepreneurship Program (N-STEP) is a joint effort by the NIST Technology Partnerships Office (TPO) and TEDCO to facilitate new company formations by departing NIST employees and commercialization of NIST technologies, which in turn, creates jobs. Informally, two-way tech transfer is also happening as N-STEP recipients maintain relationships with their NIST contacts.

Since the start of the program in 2016, N-STEP has resulted in the creation of 11 businesses (including eight in Maryland), which have generated $2.7 million in annual revenue, $1.2 million in investment, an additional $4.8 million in follow-on funding (e.g., grants), and 26 jobs reported through February 2020.

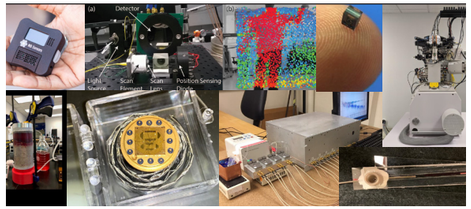
Individuals who are nearing the end of their term of NIST employment are eligible for N-STEP; these include postdoctoral researchers (an average of 85 each year) and associate researchers who are at NIST on temporary appointments (more than 3,500 each year).

Departing NIST employees in the N-STEP program get to launch their own companies, built on NIST research and their own skills, with the support they need for start-up success.

TEDCO, an independent instrumentality of the State of Maryland, provides business assistance and funding for early-stage, technology-based businesses and fosters technology transfer and commercialization from state universities and federal labs.

N-STEP can be characterized as having low hurdles for its participants to clear. Participants receive mentorship and training, leading to a business proposal that participants present to the TEDCO staff. If they are successful, a contingent award is made, and the participants learn how to form a company and secure a patent license.

N-STEP funding is $100,000 for a one-year project to advance a technology toward commercialization.



Above: Companies and technologies that have resulted from the N-STEP program include (clockwise from top left): N5 Sensors, Inc. (Chip-scale hybrid gas sensors for indoor air quality monitoring), Z-senz, LLC (Resonant LIDAR electronics for small UAVs), Vapor Cell Technologies, LLC (Optimized bonding technology to mass-manufacture chip-scale vapor cells), zeroK NanoTech, LLC (Low temperature ion source for nanomachining and nano-microscopy), Parman Tech, LLC (Analytical nano-particle separation instrumentation for pharmaceutical applications), Microbial Pulse Diagnostics, LLC (A rapid biophysical diagnostic for antimicrobial susceptibility testing), Graphene Waves, LLC (Affordable quantum resistance standards based on graphene), and Pathotrak, LLC (MVP design and fabrication of a system for the separation of pathogenic bacteria from food samples).

An additional $12,000 must be used to develop the entrepreneur's business acumen. Companies are encouraged to pursue follow-on grant funding to further develop and sustain the company.

N-STEP uses standard technology transfer mechanisms, starting with a research license at no cost to the company, preserving the start-up's cash for operations and translational development efforts. The knowledge transfer is often facilitated with a Cooperative Research and Development Agreement (CRADA), allowing access to unique facilities, equipment, etc., and lowering the cost for the start-up.

Three Small Business Innovation Research (SBIR) awards have come from NIST, and four have come from the National Science Foundation and the Department of Energy. N-STEP companies have raised money from investors, Maryland small-business funding sources (including TEDCO) and a corporate bank loan. Some start-ups have also developed strategic partnerships with international corporations.

TEAM MEMBERS: *Dr. Donald Archer, Paul Zielinski, Dr. Willie May, Ron Kaese*

ANNUAL TECH SHOWCASE STRENGTHENS PUBLIC-PRIVATE CONNECTIONS THAT SUPPORT REGIONAL ECONOMY

NIH NATIONAL CANCER INSTITUTE

Frederick National Laboratory for Cancer Research
sponsored by the National Cancer Institute

Department of Health and Human Services – National Institutes of Health
National Cancer Institute, Frederick National Laboratory

A regional event conceived in 2016 by the National Cancer Institute's Technology Transfer Center (NCI TTC) is now an annual opportunity to showcase federal technologies to prospective partners and strengthen public-private relationships that support the regional economy.

TTC staff recognized the need for a new, unique event to encourage collaboration and licensing of inventions developed by NCI and its government-owned, contractor-operated Frederick National Laboratory (FNL) to regional technology developers and other stakeholders. By 2017, with the NCI Frederick Office of Scientific Operations and the FNL Partnership Development Office on board, the Technology Showcase concept evolved to also help researchers better understand how to commercialize their work. Hosting the event at FNL provided an opportunity to engage the economic development offices of the City and County of Frederick and the Maryland Technology Development Corp. (TEDCO) to leverage their regional knowledge, resources, relationships and expertise.

Under TTC leadership, the organizations entered into a co-sponsorship agreement; members of each group contributed to event planning and execution. The NCI and FNL identified technologies to highlight and researchers to present. Frederick city and county coordinated an off-site networking event to follow the main event. TEDCO provided a planning schedule. All worked to market the conference and recruit a relevant audience.

At the first Technology Showcase in June 2017, 10 NCI investigators presented their technologies to an audience of regional technology development stakeholders. Representatives from the NCI Technology Transfer Ambassadors Program — composed of postdoctoral scientists seeking unique professional/career education opportunities — developed posters highlighting the commercialization potential of 10 additional National Institutes of Health technologies. The founder and CEO of a Frederick-based biotech company shared his success in partnering with the federal government and why he chose to base his business in Frederick County.

The event was a success. The organizers recognized the value of a recurring event, including the opportunity to nurture key relationships over time. The annual NCI

Above: Dr. Norman Sharpless, NCI director, delivers the keynote address at the 2018 NCI-FNL Technology Showcase.

and FNL Technology Showcase has grown in size and stature, culminating in a virtual event in 2020 that allowed potential collaborators and licensees from outside the region to attend. Over four years, 86 cancer technologies were highlighted, several regional biotech companies shared their experiences with federal partnering, and 34 investigators gained valuable experience presenting their innovations to a commercial audience.

Connections made at the events led to the NCI executing a Commercial Evaluation License in May 2019, and the FNL entering into a Cooperative Research and Development Agreement (CRADA) with a company in June 2020. Several Confidential Disclosure Agreements were also signed.

Importantly, the awareness and outreach provided by the Technology Showcase means that regional stakeholders now understand they can turn to the NCI and FNL when looking to collaborate with an expert or license an innovation.

TEAM MEMBERS: *Victoria Brun, Mary Ford-Naill, Heather Gramm, Richard Griffin, Mary Ellen Hackett, Dr. Walter Hubert, Ron Kaese, Michele Newton, Dr. Vladimir Popov, Dr. Laura Prestia, Helen Propheter, Dr. Michael Salgaller, Dr. Maggie Scully, Dr. Thomas Stackhouse*

ANTI-BIOTERRORISM TECHNOLOGY FROM LLNL AND BIO-RAD HELPS IMPROVE EARLY COVID-19 DETECTION

Department of Energy
Lawrence Livermore National Laboratory

An analytical technique developed at Lawrence Livermore National Laboratory (LLNL) to combat bioterrorism is also a powerful weapon in the fight against COVID-19. The technology's capacity for early detection, whether used for biosecurity or for pandemic response, can be the difference between life and death.

A team of LLNL researchers developed the Digital Droplet™ Polymerase Chain Reaction (ddPCR) technology as an anti-bioterrorism detector to meet the laboratory's strategic mission in national biosecurity.

Polymerase chain reaction (PCR) is a well-established technology for molecular and genetic analysis that allows scientists to amplify a small amount of DNA in a sample for detailed study. Unlike other conventional PCR techniques, the ddPCR approach allows partitioning of each sample into tens of thousands of droplets, each of which can be independently amplified.

Simply put, ddPCR enables thousands of data points from a single sample, which leads to higher precision, accuracy and sensitivity. Other advantages include cost-effectiveness, ease of use and integration into clinical research and life science workflows, increased signal-to-noise ratio and simplified quantification.

LLNL's ddPCR technique was patented and licensed co-exclusively to start-up QuantaLife Inc. and RainDance Technologies Inc. Additional licenses were executed with Bio-Rad Laboratories when that company acquired QuantaLife and then RainDance. In February 2019, Bio-Rad received Food and Drug Administration (FDA) approval for a liquid-biopsy test kit, featuring ddPCR technology, for early detection of chronic myeloid leukemia.

Licensing the ddPCR technology has enabled ddPCR's commercial use by international researchers and medical professionals to delve deeper into a wide range of genetic mysteries, from sequential mutations and cancer progressions to pathogen adaptations and personalized

Above: Bio-Rad ddPCR System

treatments based on a patient's unique genetic needs. Research published in more than 5,100 studies has drawn on ddPCR technology to pave the path to scientific breakthroughs.

In May 2020, Bio-Rad's SARS-CoV-2 ddPCR test kit received emergency use authorization from the FDA for COVID-19 applications. The test's high degree of sensitivity makes it more effective than other PCR tests for identifying individuals in the early stages of infection and for detecting minimal residual disease in people recovering from COVID-19. The ddPCR technology will continue to transform medicine and promises to prompt innumerable discoveries within diagnostics and beyond.

The commercialization of ddPCR has had a regional economic impact as well. When co-inventor Bill Colston founded QuantaLife, he shared his entrepreneurial experience with a number of other LLNL researchers who became QuantaLife employees. Many former QuantaLife employees went on to establish their own, equally successful, companies with significant impact to life science research and the health care market. Supported by the success of QuantaLife and the ddPCR technology, Bill Colston went on to found HealthTell, RubrYc Therapeutics, iCarbonX and an R&D incubator, Sestina Bio.

TEAM MEMBERS: *Dr. Yash Vaishnav, Dr. Josh Shinoff*

ORNL AND PARTNERS HELP ADDRESS URGENT NEED FOR N95 MASKS TO PROTECT COVID-19 RESPONDERS

Department of Energy
Oak Ridge National Laboratory

A collaboration among Oak Ridge National Laboratory (ORNL), two industry partners and a renowned scientist-inventor helped fill an urgent national need for N95 respirator masks during the COVID-19 pandemic.

As the virus spread rapidly in the early months of 2020, health care workers began to fall short on personal protective equipment (PPE) to protect themselves from the virus and minimize its spread. One crucial piece of PPE is the N95 respirator mask, which filters out 95% of airborne particles. This sets it apart from many other masks and face shields that simply provide a barrier against droplet transmission.

The N95 respirator mask features interwoven microfibers of a thermoplastic polymer called polypropylene. That material is then passed through an electrostatic charging device — invented in 1992 by Dr. Peter Tsai, then a University of Tennessee researcher — that gives it a permanent charge, making it 10 times more effective for filtering without affecting air flow.

With advice from Tsai, who came out of retirement to help with the pandemic response effort, the Carbon Fiber Technology Facility (CFTF) at ORNL adapted its capabilities in less than five weeks to produce the material for N95 masks, which it supplies to several other national labs for COVID-19 research and development.

To help scale up domestic production of N95 masks, ORNL sought to transfer its methodology to a commercial manufacturer. With Tsai's help, ORNL worked with Tennessee-based Cummins Filtration to adapt the company's facilities, create the material, install electrostatic charging devices and test their production. Cummins now produces enough filter material for more than 1 million N95 masks per day.

ORNL later connected with DemeTECH, a medical supply company in Florida looking to expand its product line to include face masks. ORNL, Cummins and DemeTECH adapted ORNL's filter material for DemeTECH's face mask production process. DemeTECH's supply chain is 100%

Above: Dr. Merlin Theodore, director of ORNL's Carbon Fiber Technology Facility, and Dr. Peter Tsai hold a sample of the melt-blown filter media produced at the facility. ORNL researchers recognized the potential to recalibrate melt-blown machines used to produce textiles, filters or carbon fiber to help address the shortage of highly protective N95 masks.

American, and production takes place entirely in Florida.

With 15 production lines, DemeTECH is now producing 3 million surgical masks and a half-million N95 masks per day. The company has also hired 500 new employees and expects to bring on 600 more.

Several unique and creative technology transfer mechanisms facilitated the urgency of ORNL's response, notably the employment of a user agreement with both Cummins and DemeTECH. User agreements were a quicker pathway to commercializing ORNL's technology than a Cooperative Research and Development Agreement (CRADA). Seven user agreements are in place with other industry partners seeking to make filter material or face masks.

ORNL also executed 11 Material Transfer Agreements to universities, industry partners and other national laboratories in less than two weeks, several in less than 24 hours. Getting these agreements in place allowed for rapid testing and evaluation of ORNL's innovative material.

TEAM MEMBERS: *Dr. Merlin Theodore, Susan Ochs, Dr. Peter Tsai, Alan Franc, Dr. Lonnie Love, Dr. Craig Blue, Dr. Scott Smith, Christopher Holm, Luis Arguello Jr.*

Impact Award

USGS EARTHQUAKE EARLY-WARNING SYSTEM LETS AT-RISK PEOPLE TAKE STOCK BEFORE FEELING A SHOCK

U.S. Department of the Interior
U.S. Geological Survey National Laboratories

The U.S. Geological Survey (USGS) National Laboratories is taking some of the surprise out of experiencing an earthquake, with an early-warning technology that can provide valuable time to protect people and infrastructure from earthquake shaking.

The ShakeAlert® Earthquake Early Warning System uses earthquake science and technology to detect significant seismic motion quickly so that alerts can reach many people, up to tens of seconds before they feel an impact. ShakeAlert is operated by the USGS but is the result of a partnership with state agencies, universities and private funders in California, Oregon and Washington.

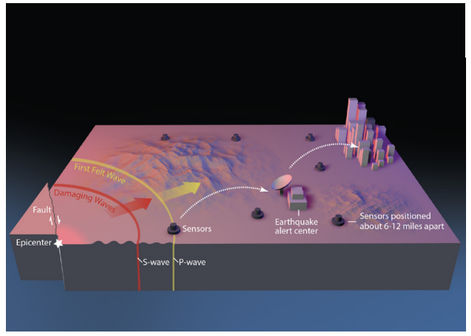
A few seconds of warning may not seem like much, but ShakeAlert can trigger automated actions that can prevent injury or death, reduce immediate damage and speed recovery from earthquakes. Fire station doors can be opened to prevent jamming, which traps equipment inside. Heavy equipment like trains, elevators and cranes can automatically stop or park in safe positions.

A few seconds of warning also enables people to take protective actions, especially if they have received advance training. ShakeAlert can be particularly valuable after a large earthquake, when aftershocks shake weakened structures and endanger rescue and repair workers.

ShakeAlert's growing network of more than 1,100 seismic sensors (the goal is 1,675 sensors) works with the Advanced National Seismic System, California Integrated Seismic Network, Pacific Northwest Seismic Network and other partner organizations to detect real-time continuous ground motion measurements as early as possible.

The system's software quickly estimates the earthquake's magnitude and intensity, and uses high-speed computing and distributed networks to send the information to local devices made by licensees. These devices then initiate a protective action.

The USGS has more than 60 licensees providing or developing applications in various sectors. For example, Google and the University of California, Berkeley, have their License to Operate (LTO) and are delivering alerts to Android and iOS phones, which provide earthquake early-warning notifications to millions of users on the West Coast.



Above: Image of ShakeAlert process.

Licensing options include:

- An Evaluation Agreement, allowing a partner to only see a display of the system's alerts.
- A Pilot Agreement, giving a partner access for a limited time to develop a proposed application.
- An LTO that permits public release and sale of a partner's tested product. The pilot license includes a conversion clause that changes it to an LTO when milestones are met.

The USGS cooperates with state and local governments to promote licensing opportunities for additional developers to use the ShakeAlert information to trigger automated actions.

Future uses could include integrating ShakeAlert into employee emergency notification systems to provide, for example, surgeons and other hospital personnel with alerts in the event they are in the operating room and need to protect a patient or shut down equipment.

TEAM MEMBERS: *Robert de Groot, Douglas Given, Stephen Hickman, Esther Eng, James Mitchell*

NIAID-FACILITATED CLINICAL TRIAL SPEEDS AVAILABILITY OF REMDESIVIR FOR TREATMENT OF COVID-19 PATIENTS

Department of Health and Human Services – National Institutes of Health
National Institute of Allergy and Infectious Diseases

A clinical trial of remdesivir for COVID-19 patients, sponsored by the National Institute of Allergy and Infectious Diseases (NIAID), wasn't just the first trial of its kind in the U.S. In fact, findings from that trial led directly to two emergency use authorizations (EUAs) from the Food and Drug Administration (FDA) and ultimately to the FDA's first approval of a COVID-19 therapy without an emergency use qualifier.

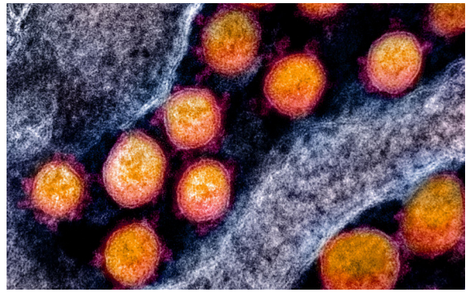
Within weeks of the COVID-19 outbreak in Wuhan, China, the Division of Microbiology and Infectious Diseases (DMID) at the NIAID began collaborating with companies to clinically assess existing therapies for treating COVID-19, using networks supported by the National Institutes of Health as well as other sites.

Remdesivir, an investigational antiviral drug developed by Gilead Sciences Inc., emerged as a promising early therapeutic candidate for COVID-19 based on preliminary studies involving other types of coronaviruses.

On Feb. 21, 2020—before the World Health Organization had declared a pandemic—the DMID and NIAID initiated the Adaptive COVID-19 Treatment Trial (ACTT), a randomized, controlled clinical trial to evaluate the safety and efficacy of intravenous remdesivir in hospitalized adults diagnosed with COVID-19. This NIAID-sponsored trial was the first clinical trial in the U.S. to evaluate an experimental treatment for COVID-19.

The Technology Transfer and Intellectual Property Office (TTIPO) at the NIAID worked with the DMID to negotiate a Clinical Trial Agreement (CTA) with Gilead to obtain remdesivir and draft template agreements to expedite expanded testing within the United States and internationally. The creative technology transfer solutions and expeditiously negotiated agreements enabled initiation of the ACTT trial less than two months after identification of the virus responsible for the initial Wuhan outbreak.

The FDA issued an EUA on May 1, 2020, for the emergency use of remdesivir to treat hospitalized patients with severe COVID-19, and on Aug. 28 expanded the EUA by no longer limiting its use to patients with severe disease.



Above: Transmission electron micrograph of SARS-CoV-2 virus particles, isolated from a patient. Image captured and color-enhanced by NIAID scientists at the Integrated Research Facility (IRF) in Fort Detrick, Maryland.

On Oct. 22, the FDA approved remdesivir for the treatment of most COVID-19 patients who require hospitalization—the first therapy to receive a non-EUA approval for COVID-19 use.

The ACTT trial has progressed to test remdesivir in combination with other existing therapies. ACTT-2 began on May 8 to test remdesivir plus Eli Lilly's anti-inflammatory drug baricitinib. ACTT-3 began on Aug. 5 to assess remdesivir plus Merck's immunomodulatory drug interferon-beta 1a. For those two trials, the NIAID TTIPO successfully negotiated CTAs with Eli Lilly to obtain baricitinib and with EMD Serono (d.b.a. Merck) to obtain interferon beta-1a.

The NIAID is pursuing testing of potential compounds in combination with remdesivir under the NIH's Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) program, and the successful combinations will be further evaluated in larger clinical trials, potentially leading to additional robust and effective therapies for COVID-19.

TEAM MEMBERS: *Dr. Yogikala Prabhu, Ahsen Khan, Dr. Richard Williams*

U.S. ARMY DEVCOM T2 TOOL SUITE CAN HELP FEDERAL LABORATORIES ASSESS POTENTIAL OF NEW DISCOVERIES

U.S. Department of Defense – U.S. Army
U.S. Army Combat Capabilities Development Command (DEVCOM)
DEVCOM Army Research Laboratory, DEVCOM Soldier Center

Government scientists and engineers can now more easily determine the practical viability of a new technology using assessment tools similar to those used in industry, thanks to the Very Early Product Realization (VEPR) technology transfer tool suite developed by the U.S. Army Combat Capabilities Development Command (DEVCOM) Army Research Laboratory (ARL) and Soldier Center (SC).

The problem the Army and other federal research laboratories often face is not generating new, world-class scientific knowledge, but demonstrating the value proposition and competitive product potential of these new discoveries early on.

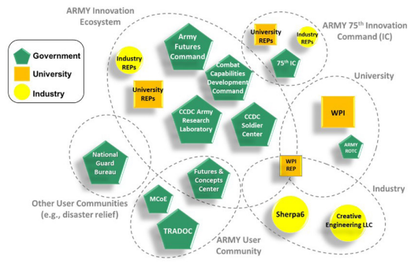
The VEPR tool suite modified and synchronized the following familiar tools and approaches to address the gap between new laboratory discoveries and potential product relevance:

- Team of Teams approach to collaboration
- Mission Model Canvas
- Minimum viable product (MVP)
- Technology Readiness Pathway Matrix
- Early user touchpoints

As a case study, DEVCOM ARL and SC, Worcester Polytechnic Institute, Sherpa 6 and Creative Engineering used the VEPR tool suite to reveal and assess the "unknown unknowns" associated with transforming a "nanogalvanic alloy" discovery into a potential product: Soldier Nanogalvanic Alloy Power, or SNAP.

The nanogalvanic alloy can safely generate hydrogen from water, snow and ice without any environmentally unfriendly catalysts or toxic byproducts. The hydrogen produced by the nanogalvanic alloy's reaction with water can be converted into electricity by means of a fuel cell.

Hypothetically, this could enable new ways to provide "on-demand" power for soldiers in the field to keep critical mission devices and systems operational longer. It could also potentially enable a new and safer emergency power source for people affected by floods, hurricanes and other crises.



Above: Graphic illustrates a highly integrated "Team of Teams" network of diverse and synchronized expertise, created using the VEPR tool suite.

Use of the VEPR tool suite resulted in three generations of MVPs. The first demonstrated the novel ability to rapidly and safely generate hydrogen from the new nanogalvanic alloy using a manually operated system for initiating the nanogalvanic reaction. The second- and third-generation MVPs included much more complex, electronically controlled and automated devices that could be assessed by soldiers.

Based on the use of VEPR tools, the original product design criteria and recommendations were significantly revised to better exploit the hypothesized nanogalvanic alloy potential. After the assessment, the use of the nanogalvanic alloy revealed a much narrower field of potential soldier-portable applications than originally hypothesized, but could provide significant competitive benefits in the target applications.

TEAM MEMBERS: *Dr. David Darkow, DEVCOM SC, Dr. Kristopher Darling, DEVCOM ARL, Paul Dowd, Creative Engineering, Dr. Anit Giri, DEVCOM ARL, Lt. Col. Adam Heppe, Military Science – Worcester Polytechnic Institute (WPI), Al LeCounte, Sherpa 6, Wendy Leonard, DEVCOM ARL, Anthony Roberts, DEVCOM ARL, Spencer Tess, Army ROTC Cadet and WPI student, Dr. Shawn Walsh, DEVCOM ARL*

NSWC CRANE OFFSETS PANDEMIC'S IMPACT ON HEALTH AND ECONOMY WITH RAPID LICENSING PROGRAM

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

An accelerated technology licensing program has helped the Naval Surface Warfare Center, Crane Division (NSWC Crane), simultaneously address two seemingly opposing forces that have characterized the COVID-19 pandemic: the need for commercial activity to support economic growth and the equally critical need for health and safety precautions.

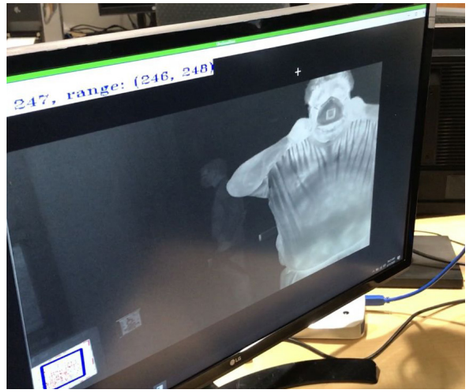
Just weeks after the pandemic began, NSWC Crane introduced the Rapid Response Licensing Program (RRLP) to rapidly transition federal research and development into the commercial sector to aid in the fight against the pandemic and stimulate the economy.

Under the RRLP, any U.S. company or entrepreneur can obtain an 18-month non-exclusive license to use an NSWC Crane technology for applications to combat the coronavirus pandemic, or a one-year non-exclusive license for any commercial application. There are no upfront fees or royalty payments for the duration of either license.

NSWC Crane also streamlined standard language for the patent license agreement and the Commercial Development Plan (CDP), which is required to show how the prospective licensee intends to take a laboratory innovation to a commercial market. These efforts have ensured rapid access to laboratory technologies for U.S. businesses and entrepreneurs and have decreased license processing time for the lab to two to three weeks from one to two months.

The RRLP originated with Jenna Dix, technology transfer director, and Annie Bullock, technology transfer and intellectual property specialist, at NSWC Crane. They expanded on an example from a peer laboratory to build the RRLP. Dix and Bullock established the NSWC Crane T2 Program as the central point of coordination for the RRLP, providing interface and coordination with external partners, prospective licensees and internal stakeholders, including laboratory leadership, scientists and engineers.

Eric VanWiltenburg, in the NSWC Crane Office of Intellectual Property, and Sean Patten and Austin Leach, both from T2 intermediary TechLink, provided critical expertise on intellectual property protection and licensing



Above: NSWC Crane's fever detection technology in use at Greene County General Hospital in Indiana.

to establish and execute the program. This included helping to verify that the streamlined licensing terms and the CDP template were agreeable to the government and beneficial to prospective licensees.

After just seven months, the program had already resulted in a local pitch competition, expanded support to Department of Defense accelerator and entrepreneurship programs, and a record number of calendar-year license agreements for NSWC Crane — an 80% increase.

In one notable example, NSWC Crane transferred a thermal sensor-based fever detection system to Greene County General Hospital in Indiana, where it is being used to screen incoming patients and staff. This has helped to facilitate physical distancing for screeners, reducing their coronavirus exposure and limiting quarantine-related interruptions to normal hospital operations.

If the successes to date are any indication of future impact, NSWC Crane could see another record number of partnerships facilitated by the RRLP in the coming year.

TEAM MEMBERS: *Jenna Dix, Annie Bullock, Sean Patten, Eric VanWiltenburg, Dr. Austin Leach*

PNNL'S FLYWHEEL PROGRAM GIVES PROSPECTIVE T2 PARTNERS EASIER ACCESS TO SAMPLES AND DATA

Department of Energy
Pacific Northwest National Laboratory

Pacific Northwest National Laboratory (PNNL) has introduced a novel Licensing Flywheel Program that facilitates technology transfer (T2) by making it easier for prospective licensees to quickly and easily obtain evaluation samples and data related to PNNL available technologies.

The Flywheel Program is named for the mechanical flywheel effect, in which energy is stored and released when needed. In PNNL's T2-specific version, "stored" licensing revenue can be rapidly released to power additional licensing momentum with new companies. The unconventional program has already helped multiple companies assess PNNL-developed chemistries for lithium batteries, and it will soon be used for assessment of advanced cements, fertilizer injection devices and superhydrophobic coatings.

Commercializing energy, environment or national security solutions developed at PNNL often involves the difficult task of disrupting established markets. For many companies, it can be too great a leap to immediately execute a full-blown commercial license while they still have outstanding questions. They desire additional information and materials to evaluate the invention in the context of their own business, systems and products.

However, it often takes companies significant time and money to independently generate evaluation samples and data based solely on published information. Alternatively, companies can sponsor research at PNNL through the Strategic Partnership Projects program (SPP) or the Agreement for Commercializing Technology (ACT) mechanism. These are powerful technology transfer tools, but they can be overly complex for the simple task of obtaining items such as a sample or a piece of specific data.

To address these challenges and facilitate industry engagement, PNNL's Flywheel Program initiates a Department of Energy (DOE)-approved project that draws on the lab's royalty revenues to cover its time and materials for generating the samples or data on behalf of a commercialization manager.

Commercialization managers then include the samples or data as a part of a technology transfer package including a fee-bearing, research-use license. The royalties from these licenses then generate additional Use at Facility Funds (UAFF) revenue. The revenues can provide a source of funds for follow-on projects and technology transfer activities.

Above: Ji-Guang (Jason) Zhang (from left), Allan Tuan and Lindsie Canales form the Licensing Flywheel Program team. The program helps private companies "test-drive" federally developed technology by using past licensing revenue to fund new licensing opportunities.

As with a flywheel, an initial input generates a better result by leveraging the interactions that the initial activity creates and recouping itself.

This creates a win-win-win for all stakeholders. The company gets to test-drive a technology, paving the way to commercialization. The cost of developing the samples for prospective partner evaluation is funded and approved by DOE. The commercialization managers facilitate the transfer of lab technologies in a timely manner, while stewarding the lab's UAFF budget.

The program has already expedited evaluation samples for PNNL's Localized High Concentration Electrolytes (LHCE) technology among three companies. PNNL anticipates extending the mechanism to evaluation samples for other technologies, including its self-healing cements, superhydrophobic foul-release coatings, agriculture nutrient injection devices and solid nitride fertilizers.

TEAM MEMBERS: *Allan Tuan, Ji-Guang (Jason) Zhang, Lindsie Canales*

FREE LICENSING FACILITATES GLOBAL USE OF JPL'S SIMPLE, SCALABLE VENTILATOR FOR COVID-19 PATIENTS

National Aeronautics and Space Administration
Jet Propulsion Laboratory

After Jet Propulsion Laboratory (JPL) engineers and scientists conceptualized and developed a simple and scalable ventilator for COVID-19 patients in just over a month, the laboratory's tech transfer team took the pandemic response baton and ran with it — making licenses available for free to maximize the device's availability and impact.

On April 30, 2020, the Food and Drug Administration (FDA) issued an emergency use authorization (EUA) for JPL's VITAL (Ventilator Intervention Technology Accessible Locally). By early November, there were 29 licensees from six continents.

When the pandemic began in March 2020, JPL tapped more than 50 engineers and other professionals to develop and test a low-cost ventilator design that could be made quickly and in volume to bolster scarce stocks of traditional hospital ventilators during the COVID-19 pandemic.

Just 37 days later, the JPL team had designed, built and tested VITAL, a breathing aid to help COVID-19 patients and to preserve the full-featured hospital ventilators for the most critical patients.

This timeline is nearly unheard of in medical device development. In JPL terms, the team would say it crammed an entire planetary flight mission — from formulation to launch to landing — in just over a month.

The ventilator had to provide specific high-pressure oxygen flow rates used to treat COVID-19 patients battling acute respiratory distress syndrome; it had to be made of fewer parts than a typical hospital ventilator to keep costs down; and parts had to be widely available in the U.S. supply chain and differ from parts used in traditional ventilators so that manufacturing VITAL wouldn't block the production of other ventilators.

A second VITAL design is tailored for use in field hospitals being set up across the country and around the globe. Intended to last three or four months, the new device does not replace current hospital ventilators, which can last years and are built to address a broader range of medical issues.

JPL and the California Institute of Technology (Caltech) offered a non-exclusive, time-limited, free license for VITAL to maximize the number of licensees around the world. A thorough proposal and vetting process ensured that licensees would be capable of manufacturing the ventilator.

Above: Some of the VITAL team members pose with a prototype of VITAL.

At the time of award submission in early November, the 29 licensees included nine U.S. companies and 20 international companies. A Brazilian licensee is in detailed negotiations with the ministries of defense and health in Brazil for 3,000 units under that country's EUA equivalent, which was granted on Aug. 24.

A crucial part of the licensing strategy was to monitor the performance of the VITAL licensees, which report quarterly on their progress. At the end of the second reporting period on Oct. 31, 43% of licensees were developing products, 12 had prototypes developed and eight were putting together regulatory submissions.

LEAD TEAM MEMBERS: *Dr. David Van Buren, Rob Manning, Dr. Leon Alkalai, Michelle Easter, Dr. Stacey Boland, Dan Broderick, Sarah Hovsepian, Michael R. Johnson, Arbi V. Karapetian, Rafael Martinez, Brett A. Kennedy, Brandon C. Metz, Dr. Jonathan Sauder, Carey L. Weisberg, Chris Yahnker*

NASA'S AIRBORNE REMOTE-SENSING INNOVATION INSPIRES NATIONWIDE EDUCATIONAL NETWORK

National Aeronautics and Space Administration
Goddard Space Flight Center

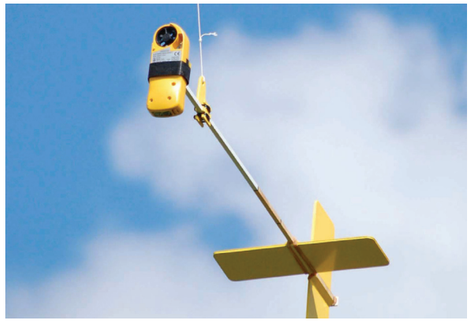
National Aeronautics and Space Administration (NASA) engineer Geoffrey Bland has long been interested in simple, inexpensive devices to keep cameras and other sensors airborne. Thanks to a school project in Wayne County, Michigan, that interest has facilitated an educational partnership that has benefited thousands of students nationwide and is helping to shape the next generation of scientists.

In 2010, the Wayne Regional Educational Service Agency (RESA) contacted Bland, looking for a way to monitor ponds and streams where students were collecting water samples. Bland, who works at Goddard Space Flight Center's Wallops Flight Facility in Virginia, had worked on other educational programs that incorporated remote sensing and Earth observation data.

Bland had found that the tool traditionally used to stabilize a camera on a windblown kite didn't provide the stability needed and tended to get tangled. So he and NASA technician Ted Miles developed an Aeropod device that is aerodynamically stabilized and is not attached directly to the kite but to a line that hangs from a ring suspended between ball bearing swivels on two segments of a kite string. It was patented in 2012. Aeropods can be equipped with the same sensors as drones, require far less training and use much less power.

Wayne RESA's leadership, with Bland's collaboration, was granted a small two-year NASA Cooperative Agreement Notice (CAN) award and piloted the Investigating Climate Change and Remote Sensing (ICCARS) Project. The program used Aeropod data to help middle and high school students understand the science of climate change and its relationship to changes in land use and land cover.

In 2016, NASA granted RESA a new five-year CAN award to expand the program into what is now the AEROKATS and ROVER Education Network (AREN). AEROKATS, or Advanced Earth Research Observation Kites and Atmospheric and Terrestrial Sensors, refers mainly to the Aeropod portion of the program. ROVER, or Remotely Operated Vehicle for Education and Research, is a remote-controlled watercraft for collecting in-water measurement systems that was also developed by Bland and Miles, in collaboration with the University of Maryland Eastern Shore.



Above: Aeropods can be equipped with the same sensors as drones, require far less training and never run out of power.

Multiple public and private organizations — from as far away as Fairbanks, Alaska — have joined AREN. Dozens of schools in Wayne County participate, along with students and teachers from coast to coast.

NASA's rigorous operations procedures are part of the curriculum. Like a rocket launch, each flight or mission is a team effort in which all participants have specific roles, checklists are developed and followed, risks are assessed and mitigated, and operations are preceded and followed by comprehensive briefings.

"I hope the young people participating today turn into the next generation of NASA engineers, scientists, professionals and support staff, people who will help us continue to understand our own planet and explore the universe," Bland said. "And, hopefully, the program is fun, too."

TEAM MEMBERS: *Geoffrey Bland, Ted Miles, Andy Henry, Kay Rufty, Sallie Smith*

RYAN ADAM DAVIS: ENHANCING VA TECH TRANSFER TO IMPROVE VETERANS' HEALTH AND INDEPENDENCE

Department of Veterans Affairs

Though only in his third year as a technology transfer (T2) professional, Ryan Adam Davis is establishing best practices and rapidly moving life-changing technologies to market in an organization that is just becoming fully engaged in T2.

As a T2 specialist for the Department of Veterans Affairs (VA) Office of Research & Development, Davis consistently performs at a high level. He leads the office in productivity metrics and seamlessly handles additional responsibilities beyond the traditional scope of his T2 role.

In the past year, Davis executed three exclusive patent licenses that will move VA intellectual property (IP) into the marketplace. Technologies covered by those licenses include a smart bandage, a prosthetic ankle that is adjustable for shoes with different heel heights, a standing wheelchair, an arm cycle ergometer to improve strength and conditioning for bedridden or wheelchair-using individuals; and a hand-held wand with a Bluetooth-enabled camera on its end to allow those at risk for diabetic ulcers to properly examine body parts that are difficult to see.

While Davis' efforts directly benefit his 10-state territory and the entire VA T2 community, they don't end there.

> "Mr. Davis brings a fresh perspective to a vast federal agency established nearly 100 years ago. He uses innovation and creativity to improve Tech Transfer Program outcomes," said Dr. John Kaplan, VA Tech Transfer Program director.

"Mr. Davis is an outside-the-box thinker who brings a fresh perspective to a vast federal agency established nearly 100 years ago. He uses innovation and creativity to improve Tech Transfer Program outcomes," said Dr. John Kaplan, director of the VA's T2 Program.

In addition to maintaining close ties to the 14 affiliates and 13 VA medical centers in his territory, Davis also manages administration of all the IP in the VA patent portfolio, leads coordination with external patent counsel, and conducts internal audits to identify unreported patent disclosures and outstanding royalty payments. He has improved multiple internal business processes, from modifying template agreements and policies to automating routine tasks, reducing administrative workload for the office.

Using innovation and a creative approach, without reinventing the wheel, Davis championed multiple successful efforts to establish partnerships with groups that have had success aiding other federal labs with their commercialization efforts, including TechLink and FedTech. TechLink is a longtime partner of the Department of Defense (DOD), helping with its marketing efforts, which it now also does for the VA, while FedTech has helped the VA and other labs transition federal inventions into the marketplace via start-up studios and accelerator programs.

In addition to his regular duties, Davis is leading the VA's adoption of the first externally facing cloud-based technology transfer portal and database to streamline information sharing and coordination among key internal and external stakeholders. Navigating the VA's IT infrastructure to obtain the necessary approvals for putting the system into operation has been an enormous task, but one that is expected to be achieved in the spring of 2021.

DR. BOB WESTERVELT: BRINGS EXPERIENCE IN SCIENCE AND BUSINESS TO HIS LICENSING EXECUTIVE ROLE

Department of Energy
Sandia National Laboratories

Bob Westervelt brings a unique background as both a laboratory scientist and a business executive to his role as licensing executive at Sandia National Laboratories — expertise that is evident in his ability to craft licensing agreements that benefit all parties.

With a PhD in nuclear physics, Westervelt worked as a physicist at Los Alamos National Laboratory before leaving to help commercialize lab-developed control system software at Vista Control Systems — his introduction to technology transfer.

At Peerless Systems Corp., a digital imaging company, he learned even more about licensing and intellectual property (IP). As chief technology officer, he worked closely with the business development team negotiating licenses with customers. As vice president of engineering, he worked closely with the chief financial officer on revenue recognition. Peerless' assets and IP were sold, and Westervelt was heavily involved in the negotiations.

Westervelt came to Sandia National Laboratories to work in licensing in 2012, using his skills to transfer a wide variety of Sandia technologies to the private sector. His creative licensing solutions have included licenses to allow companies to provide training for free emergency response software, a license focused on royalties for an enabling technology for medical isotopes, and a capacity-based licensing plan for a company planning to sell on-site hydrogen production units.

Westervelt has developed many of the licensing templates used for Sandia's technology transfer program and trained the T2 staff on best practices. These include novel ways to handle licensing to start-up companies and more effective ways to compensate the lab and its inventors without taking equity. Westervelt also has been involved in a large number of inter-laboratory collaborations to improve tech transfer practices.

A concept Westervelt developed called High Value Licensing now helps licensing staff to analyze and articulate the value of licensing efforts. Value is not only measured as income to Sandia; benefits to the public and the U.S. economy are also important.

> High Value Licensing, which Westervelt developed, now helps Sandia's staff analyze and articulate the value of licensing efforts. Value is not only measured as income to the lab; benefits to the public and the U.S. economy are also important.

For the technology transfer of Microsystems Enabled Photovoltaics (MEPV) to mPower Technology (see page 18 for more details), Westervelt decided some flexibility was needed to handle the large IP portfolio. The License Option Agreement (LOA) included business milestones that mPower had to achieve to be able to exercise the option and a longer than normal time to reach these milestones. Uniquely, among the 20 patents in the LOA was a group that Sandia agreed to not license for six months while mPower determined whether it needed them. A full commercial license for 17 patents was executed in January 2017, just four months after mPower elected to exercise the LOA — a very short time for a license of this complexity.

For collaborations involving Sandia's academic partners, Westervelt has worked to create commercialization paths for jointly developed IP. Many agreements have involved joint projects between Sandia and the University of New Mexico (UNM) and its commercialization organization, UNM Rainforest Innovations.

DR. WALTER COPAN: CURATING A T2-FOCUSED LAB CULTURE, FROM THE GREEN PAPER TO NIST ON A CHIP

Department of Commerce
National Institute of Standards and Technology

As under secretary of commerce for standards and technology and the director of the National Institute of Standards and Technology (NIST) from October 2017 to January 2021, Dr. Walter Copan shaped the culture at NIST to a workforce heavily focused on technology transfer (T2).

As NIST director, Copan's many T2 achievements ranged from increasing external collaborative efforts to creating internal programs to discover and develop the most innovative technologies.

One of Copan's premier projects and greatest examples of T2 leadership at NIST was his Return on Investment (ROI) Initiative for Unleashing American Innovation, the largest stakeholder engagement effort for federal and federally funded T2 in its 40-year-plus history. This initiative culminated in the 2019 publication of the ROI Initiative's Green Paper, which contains 15 findings identifying stakeholder concerns and possible short- and long-term actions to modernize the U.S. system of technology transfer and innovation. Since its publication, NIST has led the interagency charge to address findings in need of legislative or regulatory changes for implementation.

> One of Copan's premier projects was his Return on Investment Initiative for Unleashing American Innovation and the resulting Green Paper, which contains 15 findings related to modernizing tech transfer and innovation in the U.S.

Copan oversaw the growth of an innovative technical support program for Manufacturing Extension Partnership (MEP) centers across the country through the MEP-Assisted Technology and Technical Resource (MATTR) service. During his tenure at NIST, the MATTR service initiated its first two Cooperative Research and Development Agreements (CRADAs) between NIST personnel and MEP centers around the country, opening the doors for formal partnerships and collaborative efforts to advance manufacturing for small and medium-size U.S. manufacturers.

Copan has promoted and championed collaborations with the Federal Laboratory Consortium (FLC) and the Licensing Executives Society (LES). Notably, he supported NIST's work with the FLC on a 2019 federal T2 event in Puerto Rico, as well as NIST's participation in the development of intellectual property licensing standards through the LES Standards Development Organization.

Recognizing that some of the greatest T2 opportunities were in the communities surrounding two NIST campuses, Copan also supported regional innovation ecosystem efforts locally in Gaithersburg, Maryland, and Boulder, Colorado.

Copan has actively encouraged participation of laboratory staff in the technology transfer activities coordinated by NIST's Technology Partnerships Office, as well as encouraged NIST staff to engage in T2-related training. Copan's innovative roadmap-based strategy for the "NIST on a Chip" T2 effort, which focused on quantum-based measurement technologies, has already resulted in six CRADAs and several licenses, and additional marketing efforts are underway.

During Copan's tenure, a new electronic process was implemented for NIST staff to submit invention disclosures and approve technology transfer agreements, leading to a 20% increase in the number of invention disclosures and a 50% reduction in the average time to execute a license. The number of licenses issued to small businesses doubled, and more than two dozen new research consortia were created, including the Quantum Economic Development Consortium — which represented NIST's first use of Other Transaction Authority under the National Quantum Initiative Act of 2018.

Laboratory Director
Of The Year

DR. DAVID PITTMAN: FOUNDATIONAL LEADERSHIP HELPS ERDC THRIVE DESPITE COVID-19 CHALLENGES

Department of Defense - U.S. Army Corps of Engineers
Engineer Research and Development Center

Of the three years that Dr. David Pittman has served as director of the U.S. Army Corps of Engineers (USACE) Engineer Research and Development Center (ERDC), 2020 perhaps best illustrates his profound impact on the lab, the agency and technology transfer (T2). Despite numerous challenges created by the COVID-19 pandemic, Pittman and his team did much more than survive 2020 — they thrived.

Pittman oversaw the formation of an enormous new teleworking initiative that kept researchers working on crucial projects, even as the number of on-site staff dropped to 6% of its standard workforce. As the year drew to a close and 65% of the workforce was still working remotely, ERDC continued to deliver numerous lifesaving solutions as part of its COVID-19 response.

Of the many technologies employed in ERDC's COVID-19 response, the rapid development of alternate care facilities (ACFs) for coronavirus patients is a prime example of a particularly successful T2 effort, one that Pittman actively oversaw. ERDC's work on ACFs — transforming convention centers and other buildings into temporary hospitals — allowed the Federal Emergency Management Agency (FEMA) to provide 15,000 additional hospital beds in 17 states as well as Puerto Rico and the U.S. Virgin Islands.

Successes like these would not be possible without the firm foundation that Pittman has established by personally investing in his team and making effective technology transfer a top priority for the organization. During his tenure as director, ERDC has greatly extended its reach and paved the way for its innovations to make an even greater impact on the military and the world.

Pittman has taken numerous concrete steps to transform the culture at ERDC, leveraging its dynamic, creative workforce through innovative processes and initiatives that foster communication and collaboration.

He applied his philosophy that "our people are our greatest source of strength" using a twofold approach. First, he sought new ways for the lab to recruit, retain and invest in the world's most exceptional researchers and engineers. Second, he guided the creation of an infrastructure that promotes open communication and opportunities for cross-pollination.

> The rapid development of alternate care facilities (ACFs), which allowed FEMA to provide 15,000 additional hospital beds for coronavirus patients, is a prime example of ERDC's pandemic response efforts—one that Pittman actively oversaw.

The new approaches inside ERDC were mirrored by external initiatives as well. These included adding new types of partner agreements (Partnership Intermediary Agreements in particular) to the lab's portfolio, establishing innovation and enterprise centers, mining academia vigorously for productive partnerships, participating in industry groups, investing in local communities, hosting conferences and other events, and pursuing new avenues for international agreements.

The changes Pittman introduced have led directly to a remarkable increase in engagement and partnerships, with more than 700 partner agreements worldwide. These include 155 Cooperative Research and Development Agreements (CRADAs), 74 Educational Partnership Agreements and 12 international agreements involving seven countries. Since 2017, Pittman has overseen a 33% increase in license agreements and exceeded all small-business contracting goals by an average of 37%.

DR. BRIAN J. ANDERSON: USING TECH TRANSFER TO ELEVATE NETL'S PROFILE WITH ENERGY STAKEHOLDERS

Department of Energy
National Energy Technology Laboratory

In May 2019, just six months after becoming director of the National Energy Technology Laboratory (NETL), Dr. Brian J. Anderson signed a 10-year, $100 million technology transfer (T2) agreement with two other Department of Energy (DOE) laboratories and energy giant ExxonMobil. That was just the beginning of Anderson's success in raising the lab's profile as a key player in tech transfer.

Anderson's institutional vision and intentional leadership have spurred NETL to intensify its focus on shepherding research and development into the marketplace. Outside the lab, Anderson has convincingly communicated to industry stakeholders clear and compelling messages of NETL's technical research capabilities and the lab's vision for technology development, deployment and transfer.

Under Anderson's leadership, NETL's production of intellectual property and related requests for licenses and other development agreements has been exceptionally fruitful.

> Under Anderson's leadership, NETL's technology transfer efforts have been exceptionally fruitful. By 2020, 100% of the laboratory's estimated licensing income was used to support technology transition activities, compared with 47% in 2019.

During 2019, NETL's internally funded research resulted in 33 invention disclosures submitted, 34 patent applications filed and 14 patents issued. By 2020, 100% of NETL's estimated licensing income was used to support technology transition activities, compared with 47% in 2019.

NETL executed 49 agreements, including NDAs (Non-Disclosure Agreements), MOUs/MOAs (Memorandums of Understanding/Agreement), CRADAs (Cooperative Research and Development Agreements), CFAs (Contributed Funds Agreements), IIAs (Inter-Institutional Agreements), IAAs (Interagency Agreements) and NAAs (Non-Analysis Agreements).

Anderson has fostered a culture of excellence at NETL that is both proactive in addressing emerging challenges and committed to building systems that can power the future. His emphasis on learning through exposure led to the Technology Transfer Researcher Liaison pilot program, designed to expose more researchers to the technology transfer experience. NETL researcher liaisons assist fellow researchers in identifying potentially patentable inventions, assist first-time inventors with invention disclosure, help researchers prepare for engagements with prospective industry partners, present T2-related briefings in staff meetings, and disseminate information about technology transfer opportunities at NETL and DOE.

Externally, Anderson has fostered strategic relationships with coal, utility and academic institutions as well as state and local governments along with important carbon management stakeholders, such as the Carbon Utilization Research Council (CURC), the Electric Power Research Institute (EPRI), the Lignite Energy Council, the Southern States Energy Board, the Environmental Protection Agency and the Department of the Interior.

The 2019 deal with ExxonMobil Research and Engineering (EMRE) — an agreement that also included the National Renewable Energy Laboratory and Idaho National Laboratory — has generated commercialization interest with EMRE for several NETL technologies.

NETL projects covered by the agreement include:

- $1.77 million to create a fundamental understanding of the fracture-matrix interface in tight oil production.
- $1.7 million to evaluate the feasibility of chemical looping for generating the synthetic fiber olefin.
- $1.5 million to explore the potential benefits of direct air capture technologies.

AWARDS

SPECIAL RECOGNITION

COVID-19 RESPONSE DISTINCTION

Federal laboratories' contributions to the ongoing fight against the COVID-19 pandemic extend beyond the official FLC National Award categories. The FLC extends its sincere thanks and appreciation to the following recipients of the 2021 COVID-19 Response Distinction.

DEPARTMENT OF HOMELAND SECURITY

SCIENCE AND TECHNOLOGY, CHEMICAL SECURITY ANALYSIS CENTER

DHS SIMULATIONS INFORM RISK MITIGATION STRATEGIES FOR AIR TRAVELERS

Technology developed by the Department of Homeland Security Science and Technology's Chemical Security Analysis Center helped improve air traveler safety during the COVID-19 pandemic.

The technology simulates the flow of airborne droplets — the type that transmit the virus that causes COVID-19 — under various conditions. Simulation variables include the amount of virus that might become airborne because of passengers talking, coughing and sneezing, as well as the size of the resulting droplets.

The Federal Aviation Administration, the Airlines for America trade association and the Department of Defense's Transportation Command are using the technology to better understand how strategies like filtration, air management and masking can help reduce COVID-19 risk.

U.S. ARMY CORPS OF ENGINEERS

ENGINEER RESEARCH AND DEVELOPMENT CENTER

CONTAINERIZED MEDICAL SOLUTIONS (CMS) OFFSET HOSPITAL OVERCROWDING

Makeshift hospital rooms developed by the U.S. Army Engineer Research and Development Center and a multidisciplinary team of public and private sector partners helped accommodate the huge influx of patients needing medical care during the COVID-19 pandemic.

Known as Containerized Medical Solutions (CMS), this technology offers a low-cost, easily manufactured alternative to conventional patient care facilities. The CMS design accommodates locally sourced construction materials and crews, which allows for mass production of the rooms across the U.S. and the world if needed.

After successful demonstration of nine CMS units, the Federal Emergency Management Agency (FEMA) purchased multiple units. Three were delivered to Dallas for storage as a future resource, and six were delivered to the United Medical Center in Washington, D.C.

DEPARTMENT OF DEFENSE – U.S. ARMY

COMBAT CAPABILITIES DEVELOPMENT COMMAND CHEMICAL BIOLOGICAL CENTER

STREAMLINED T2 FACILITATES 30 COVID-19 USE AGREEMENTS IN 7 MONTHS

The technology transfer (T2) team at the Combat Capabilities Development Command Chemical Biological Center (DEVCOM CBC) implemented an innovative approach to expediting T2 agreements responsive to the COVID-19 pandemic, forming more than 30 such agreements in seven months. The agreements covered access to DEVCOM CBC testing equipment and the transfer of biological material for COVID-19 research.

The T2 efficiencies included:

- Forming overarching or standardized agreements where possible.
- Forming some agreements with industry consortia.
- Streamlining the review process for receipt and use of the
- SARS-CoV-2 biological material samples.
- Identifying high-priority agreements when routed for staff review.

The combined effect of the T2 team's handling of COVID-19 agreements resulted in a fourfold time savings in agreement formation while still performing robust reviews for quality control.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JOHN H. GLENN RESEARCH CENTER

NASA BRINGS DECONTAMINATION INNOVATIONS TO PANDEMIC RESPONSE

The Office of Technology Incubation and Innovation at the National Aeronautics and Space Administration Glenn Research Center (NASA Glenn) helped to bring two decontamination technologies to the fight against COVID-19.

AMBUstat™, developed by Emergency Products and Research (EP+R) in collaboration with NASA Glenn, is a small, portable device that uses atomic oxygen to decontaminate small spaces quickly and inexpensively. Now NASA is conducting research to maximize the effectiveness of this device on the virus that causes COVID-19.

NASA Glenn and University Hospitals in Cleveland have collaborated to develop two new methods for decontaminating personal protective equipment (PPE) for aerospace and COVID-19 applications. Results of tests on both methods are promising, and the Food and Drug Administration (FDA) is reviewing one of the methods for an emergency use authorization.

DEPARTMENT OF ENERGY

SANDIA NATIONAL LABORATORIES

PROACTIVE LICENSING POSITIONS DF-200 TECHNOLOGY FOR COVID-19 USE

Sandia National Laboratories' DF-200 decontamination technology, originally developed for use on chemical and biological agents encountered by the military and first responders, is now a tool in the fight against COVID-19.

To make sure adequate product would be available for the initial users, Sandia licensed the technology to multiple companies. Those licensees created a broad range of products based on DF-200 to expand markets and applications.

The COVID-19 pandemic created a need for high-efficacy cleaners and sanitizers, and the licensees' efforts to make the disinfectant available worldwide proved to be fortuitous.

The DF-200 technology is now protecting the health of people around the world. With EPA approval for use against emerging pathogens, DF-200 is expected to continue to protect citizens during future outbreaks of infectious diseases.

DEPARTMENT OF VETERANS AFFAIRS

HUMAN ENGINEERING RESEARCH LABORATORIES

VA AND PARTNERS USE 3D PRINTING TO MEET MEDICAL SUPPLY DEMAND

The Department of Veterans Affairs (VA) Human Engineering Research Laboratories is helping meet the demand for VA medical supplies triggered by the COVID-19 pandemic, using 3D printing to make items like face shields, desk shields and nasal testing swabs.

Together with the National Institutes of Health (NIH), Food and Drug Administration (FDA) and America Makes, the VA's 3D printing team has tested 61 personal protective equipment (PPE) designs and has rallied makers nationwide to submit 685 designs to the NIH 3D Print Exchange for review.

VA medical centers are also collaborating with the same partners to make 3D-printed protective equipment and other supplies that support the VA's COVID-19 response. Clinical evaluations of 3D-printed device designs are available on the NIH 3D Print Exchange COVID-19 response website.

ENVIRONMENTAL PROTECTION AGENCY

EPA DISINFECTANT TESTING HELPS KEEP MASS TRANSIT PASSENGERS SAFE

The Environmental Protection Agency (EPA) is helping mass transit organizations address concerns with the potential COVID-19 transmission risk on public transportation.

Public fears of viral transmission made travel by subway, bus and railway almost nonexistent during the pandemic. The Los Angeles Metro, New York City Transit, Metro-North Railroad and Long Island Rail Road were inundated by vendors of disinfectants, application devices and other antimicrobial technologies — but the effectiveness of these products in reducing COVID-19 risk was unclear.

Material Transfer Agreements allowed EPA experts to test 18 such decontamination products to help the transit agencies choose the most appropriate products for reducing passengers' coronavirus risk. EPA researchers also are supporting transit agencies on two federal grant proposals related to COVID-19 response.

RIC CHARLES TROTTA: EXPANDED AWARENESS OF FLC AND TECH TRANSFER IN TWO DECADES AS NAC CHAIR

Trotta Associates

Outgoing Chair, FLC National Advisory Council

Ric Charles Trotta's 22 years with the FLC National Advisory Council (NAC) — including two decades as its chair — were dedicated to broadening awareness of the consortium and its mission.

In fact, the FLC Laboratory Director of the Year Award, which the NAC established in 2000, evolved from that mindset. As NAC vice chair, Trotta lobbied for the creation of the award.

"I thought that the FLC was not well known by both industry and labs and that the lab director award would help to expand awareness and improve relations with directors, whose support is needed for the FLC to get things done," he said.

Trotta's leadership and guidance have significantly raised the profile of the FLC, its interaction with industry and its strategic approach.

> Trotta's passion for the federal laboratory technology transfer mission, coupled with his visionary leadership of the NAC over two decades, significantly raised the profile of the FLC, its interaction with industry and its strategic approach.

Trotta studied electrical engineering at the University of Virginia, received a degree in physics from New York University, and started at Grumman Aerospace as an engineer in 1966. His career at Grumman followed a steady upward trajectory; ultimately, as corporate director of development resources, he reported to the office of the chairman of the board and was responsible for managing research and development and proposal funds across all divisions to develop new business. Trotta also earned an MBA in marketing from Hofstra University, was named Grumman Manager of the Year, and was selected to attend Carnegie Mellon University's Program for Executives.

With 25 years of corporate strategic and technology management experience, he founded Trotta Associates Inc. in 1994. There, he has served as president and senior consultant working with government, industry and academic clients on technology-related initiatives.

In 1998, Trotta was recruited to the NAC by Dr. Jag Mathur, who was then the chair, after the two were connected by colleagues at the Office of Naval Research; they discussed the extraordinary technologies being developed in federal laboratories and the need to expand technology transfer (T2) with industry to enhance U.S. global competitiveness. Soon after joining the NAC, Trotta was elected vice chair and then chair.

As chair, he recruited senior industry executives from organizations like GE, Ford, Cisco, Boeing and IRI to expand the FLC's interaction with industry. His recommendations included hiring an FLC executive director, locating an office in Washington, D.C., and forming a Laboratory Director Network to exchange best practices across agencies.

The Laboratory Director of the Year Award has recognized more than 40 laboratory directors who facilitated outstanding T2 accomplishments. Trotta moderated sessions with award recipients at FLC National Meetings, where his wife, Carey, accompanied him to welcome the recipients and their spouses. He helped organize industry sessions at National Meetings, worked on FLC strategic plans, and collaborated with other NAC members on studies that included evaluations of the Technology Focus Area initiative and the structures of organizations like the FLC.

Trotta's passion for federal laboratory technology transfer, coupled with his visionary leadership of the NAC over a sustained period, contributed immeasurably to the FLC's mission and effectiveness.

2020 Regional Award Winners

2020 REGIONAL AWARD WINNERS

Congratulations to the 2020 Regional Award winners, many of whom also won National Awards. The regions will be issuing calls for 2021 award submissions soon, so it's time to start thinking about the T2 success stories you plan to submit. Contact your Regional Coordinator for more information.

FAR WEST

Outstanding Commercialization Success

NOAA, National Weather Service Alaska Field Office
"iGage River Level Sensor Commercialization"

Outstanding Partnership

Lawrence Livermore National Laboratory
"SuppleVent™ Emergency Ventilator"

USDA, Agricultural Research Service, Plains Area
"Delta Region Areawide Aquatic Weed Project (DRAAWP)"

Outstanding Technology Development

Sandia National Laboratories
"Ducted Fuel Injection for Clean, Sustainable Diesel Engines and Fuels"

Naval Facilities Engineering and Expeditionary Warfare Center
"Geoffrey Kemmerer"

Technology Transfer Professional of the Year

Susan Simpkins, Director of SLAC's Proposal Advancement Office
SLAC National Accelerator Laboratory

MID-ATLANTIC

Excellence in Technology Transfer

National Cancer Institute
"Zotiraciclib, FDA and EMA Orphan Drug Designation for Glioma"

USAMRDC Medical Technology Transfer Office
"U.S. Army Medical Research & Development Command's Body Cooling System"

Educational Institution and Federal Laboratory Partnership Award

National Center for Advancing Translational Sciences
"Technology Transfer of Anti-Leukemia Product Candidates to Kurome Therapeutics"

NASA Goddard Space Flight Center
"Geoffrey Bland and the Aeropod Team"

Interagency Partnership

Department of Homeland Security (DHS) Science and Technology Directorate (S&T) Chemical Security Analysis Center (CSAC)
"CBRN Canister Protection Capabilities against Emerging Chemical Hazards"

State and Local Economic Development Award

National Institute of Standards and Technology
"NIST Science and Technology Entrepreneurship Program (N-STEP)"

MID-CONTINENT

Excellence in Technology Transfer

Sandia National Laboratories
"Small Solar Cells Transform Space Power and Other Commercial Markets"

Sandia National Laboratories
"Modular Technology Moves Hydrogen Production to Where It's Needed"

USDA, Agricultural Research Service, Plains Area
"VIPR System for Removing Plastic Contamination During Cotton Ginning Process"

Notable Technology Development Award

National Renewable Energy Laboratory
"Dynamic-Hydride Vapor Phase Epitaxy"

Los Alamos National Laboratory
"Oleo-Furan Surfactant"

NASA Johnson Space Center
"Human Powered Ventilator"

Partnership Award

Sandia National Laboratories
"Sandia and UPRM Partnership on Safe, Secure, and Sustainable Energy"

USDA, Agricultural Research Service, Plains Area
"Application of Interspecies Cross to Improve Efficiency of Genome Assembly"

National Renewable Energy Laboratory
"National Laboratory Partnership with ExxonMobil Research & Engineering"

Outstanding Technology Transfer Professional

Bob Westervelt
Sandia National Laboratories

Regional Laboratory Award

Sandia National Laboratories
"Sandia COVID-19 Response Combats Medical and Economic Effects of Pandemic"

MIDWEST

Interagency Partnership

U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory
"Sustainment Management System (SMS) for Government Commercial Facility Management"

Excellence in Technology Transfer

USDA, Agricultural Research Service, Midwest Area
"Tools for Identifying Host Microbes for Viruses and Antimicrobial Resistance"

NORTHEAST

Excellence in Technology Transfer

MIT Lincoln Laboratory
"Sync Computing"

SOUTHEAST

Excellence in Technology Transfer

Oak Ridge National Laboratory
"Licensing ORNL's Large-Scale Additive Manufacturing Build Platform to MVP"

USDA, Agricultural Research Service, Southeast Area
"Recovery of Ammonia from Waste using Gas-permeable Membranes"

The FLC expresses its gratitude to the members of the Awards Subcommittee and other volunteer judges for their tireless efforts in making the 2021 National Awards program a success.

Whitney Hastings
Food and Drug Administration
(Awards Subcommittee Co-Chair)

Lisa Marianni
Centers for Disease Control and Prevention
(Awards Subcommittee Co-Chair)

Mojdeh Bajar
National Institute of Standards and Technology

Sharon Borland
U.S. Geological Survey

Andy Burke
National Institutes of Health

Sabarni Chatterjee
National Institutes of Health

Ellen Cline
ellenwrites.com

Vince Contreras
USDA Agricultural Research Service

Stephen Deese
U.S. Navy

Jenna Dix
Naval Surface Warfare Center, Crane Division

Sevim Z. Erhan
USDA Agricultural Research Service

Hannah Farquar
Lawrence Livermore National Laboratory

Steve Ferguson
National Institutes of Health

Suna Gulay French
National Institutes of Health

Suzanne Frisbie
National Cancer Institute

Anna Ganelina
National Institute of Allergy and Infectious Diseases

Fizie Haleem
Montgomery College

Neche Harris
U.S. Army Medical Research and Development Command

Lydia Hierl
National Security Agency

Amanda Horansky-McKinney
Naval Research Laboratory

Marianne Lynch
Department of Energy

Christopher Meyers
Los Alamos National Laboratory

Michael Pollack
National Institutes of Health

Maria Restrepo-Hartwig
USDA Agricultural Research Service

Holly L. Ricks-Laskoski
Naval Research Laboratory

Michael Salgaller
National Institutes of Health

Johnette Shockley
U.S. Army Engineer Research and Development Center

Karen Surabian
National Institutes of Health

Mary Sylvia
Naval Undersea Warfare Center, Newport Division

Dawn Taylor
National Institutes of Health

Joseph Teter
Naval Surface Warfare Center, Carderock Division

Sabra Tomb
Air Force Research Laboratory

Patricia Tomczyszyn
Minority Business Development Agency

Thai Tran
U.S. Navy

Joseph Vaerewyck
U.S. Navy

Jeff Walenta
USDA Agricultural Research Service, Plains Area

It's time to start thinking about nominations for the 2022 FLC National Awards!

The calendar year for the national awards program runs from August/September, when the call for nominations is issued, to the following April, when the award winners are recognized at the National Meeting. 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
- Impact Award
- Technology Transfer Innovation 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
Award winners review their profiles, prepare posters and videos supporting their work, and register for the National Meeting.

April/May
Awards presented at FLC National Meeting.

FLC

Federal Laboratory Consortium
for Technology Transfer

111 West Jackson Blvd., Suite 1412
Chicago, IL 60604
federallabs.org

@federallabs #FLCawards