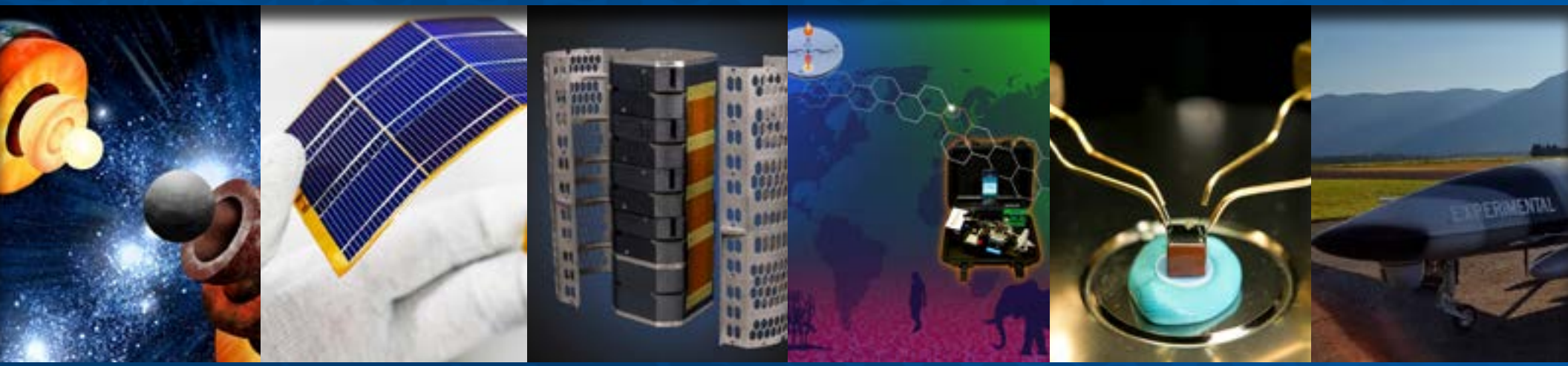
Technology Transfer at NNSA



2022

CALENDAR

National Nuclear Security Administration

NNSA Technology Transfer Program

The National Nuclear Security Administration (NNSA) is a semi-autonomous agency responsible for carrying out the national nuclear security responsibilities of the Department of Energy, including: (1) the maintenance of a safe, secure, and reliable stockpile of nuclear weapons, including associated special nuclear materials, capabilities and technologies; (2) defense nuclear nonproliferation; and (3) naval nuclear propulsion. The NNSA's enterprise consists of its Headquarters, field offices, national security laboratories, plants, and sites. As shown in the national map, NNSA conducts research, development, and technology transfer programs at the national laboratories – Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), and Sandia National Laboratories (SNL), as well as plants and sites within the NNSA Nuclear Security Enterprise – Nevada National Security Site (NNSS), Pantex Plant (Pantex), Kansas City National Security Campus (KCNSC), Y-12 National Security Complex (Y-12), and Savannah River Site. Under the National Nuclear Security Administration Act, the NNSA Administrator is given authority over all programs, activities, and contract administration duties for our Nation's nuclear security organizations.

The Stevenson-Wydler Technology Innovation Act of 1980, enables Federal laboratories to participate in, and budget for, technology transfer activities. These technology transfer activities refer to the processes and mechanisms by which knowledge, intellectual property, or capabilities developed at NNSA's national security laboratories, plants, sites, single-purpose research facilities, and other facilities are transferred to other entities, including Federal agencies, private industry, academia, and state or local governments. Technology transfer lies at the intersection of science and technology development, intellectual property law, and business practices. The unique convergence of science, business, and law requires supporting organizations (e.g., the Office of the General Counsel) and activities within DOE/NNSA to provide solutions to the modern challenges of technology transfer and commercialization.

"The Office of Strategic Partnership Programs (NA-10.1), plays a crucial role in ensuring the NNSA can fulfill and comply with congressional mandates pertaining to the safe, secure and effective execution of national and international technology transfer. Additionally, the headquarters office and the tech transfer activities conducted at the labs, plants and sites, are central to supporting the partnership and policy priorities of both the Secretary of Energy and the NNSA Administrator. To operate at a level commensurate with the Call to Action issued by the Administrator for internal and external partnerships as well as the edict to "Innovate. Collaborate. Deliver.", our office commits to structuring NA-10.1 to better leverage key partnerships and strengthen interfaces; building and maximizing team strengths to deliver on key commitments; working from a consistent, comprehensive, and measurable program framework; and consolidating information from reporting, data, and statistics collected from sites and institutions to build a compelling narrative for NNSA's Whole of Government partnerships."

- Dr. Njema Frazier
Assistant Deputy Administrator for Strategic Partnership Programs, NNSA

The Office of Strategic Partnership Programs (NA-10.1) is the NNSA office that conducts the mandated Federal oversight of the technology transfer activities; ensuring that labs, plants, and sites to deliver the benefits of this taxpayer-funded work in cutting-edge science and technology research and development (R&D) back to the American people. NA-10.1 operates under a number of USG laws and statutes, as well as DOE Orders, and is guided by a strategic framework consisting of six goals to promote technology transfer: (1) technology development, commercialization, and maturation; (2) workforce development, recruitment, and retention; (3) policy, evaluation, and economic development; (4) public branding; (5) outreach and collaboration; and (6) protection of American technologies.

NNSA's national security laboratories, LANL, LLNL, and SNL, account for the largest accumulation of patents that have been issued to the Federal Government. These technologies have revolutionized the lives of the American people and provided great impact to the global community. The technologies in this calendar highlight a few of the groundbreaking technologies developed within the Nuclear Security Enterprise.

National Security Laboratories, Plants, and Sites

Success Story

COVID-19

Scientists at Lawrence Livermore National Laboratory (LLNL) have determined that heating N95 respirators up to 75 degrees Celsius for 30 minutes deactivates a surrogate coronavirus without compromising the device's fit and its ability to filter airborne particles.

This temperature (equivalent to 167 degrees Fahrenheit) is easily achieved in hospitals and field settings allowing for the N95s to be reused once decontaminated. This heat treatment can be applied at least 10 times on an N95 respirator without degrading its fit. The research appears in the Annals of Works Exposures and Health.

Previous studies have reported that the filtration efficiency of N95s is not negatively impacted by these heating conditions.

LLNL scientist Kyle Fuhrer prepares an N95 mask for a fit test. Photo by Sam Paik/LLNL.

"These results suggest that thermal inactivation of coronaviruses is a potentially rapid and widely deployable method to reuse N95 respirators in emergency situations where reusing the respirators is necessary and sterilization is unavailable," said LLNL electrical engineer Travis Massey, lead author of the paper.

N95 respirators are protective devices that filter airborne particles. The "N95" designation means that the respirator blocks at least 95 percent of very small (0.3 micrometers or larger) test particles. They are typically used a single time in health care settings because the respirators can be contaminated when treating infected patients, thereby posing a risk to caregivers who continue wearing a contaminated device, as well as other patients treated by the provider. Limited supply and crisis conservation strategies made reuse a common practice.

Scientists at Lawrence Livermore are decontaminating N95 masks for reuse

Lawrence Livermore National Laboratory

"We found that this heating method decontaminates N95s without affecting the overall fit," said LLNL material scientist Sal Baxamusa, a senior author on the paper. "But overall wear time and the number of times put on and taken off are important factors that likely degrade N95 respirator fit and must be investigated further."

The team used a mouse coronavirus that does not cause disease in humans as a surrogate for SARS-CoV-2.

To test the heat treatment of N95s, the team enlisted two volunteers. Prior to heat treatment, each volunteer participant briefly fitted a new, unused N95 to their faces and noses to simulate a first-time use. 3M Model 8210 N95s were used for all the heat treatment tests. This particular model is one of the most widely recognizable, is used in the industry and is available in one size as it was designed to seal effectively against most human faces.

Since a goal of the study was to determine how fit from an initially well-fitting N95, as quantified by fit testing, would be affected by single or multiple heat treatment cycles, and not how different N95 models, at different sizes, would perform for a variety of face structures (other studies have investigated this), only one model of N95 was used for the test in the study. After the initial donning/doffing cycle and prior to heating, the N95s were loaded into sterilization pouches.

"These results suggest that thermal inactivation of coronaviruses is a potentially rapid and widely deployable method to reuse N95 respirators..."

Once in pouches, the masks were put into a laboratory oven set at 75 degrees Celsius for 30 minutes. They heated the masks from one to 10 times under dry and humid (90 percent relative humidity) conditions and found that the dry heating decontaminated the mask while maintaining fit for further use. Previous studies have shown that humid heating for these times/temperatures will inactivate SARS-CoV-2.

"Our study provides further evidence that virus dried on N95 filter material can be inactivated by heating," Massey said.

Other Livermore researchers involved in the study include Monica Borucki, Samuel Paik, Kyle Fuhrer, Mihail Bora, Staci Kane and Razi-ul Haque. The research was funded by internal LLNL grants.

Source: Decontaminating N95 masks for reuse | Lawrence Livermore National Laboratory (llnl.gov)

Exploring Planetary Interiors with Giant Lasers

A team of researchers led by Lawrence Livermore National Laboratory aims to reveal the interior composition of extrasolar planets. Using giant lasers, the team squeezed an iron oxide sample to nearly 7 million times the Earth's atmospheric pressure – mimicking those expected in the interiors of rocky exoplanets approximately five times larger than Earth. Learning more about their interior structure could provide important clues about their potential habitability. An artistic rendering of the interior structure of Earth (left) compared to a large rocky exoplanet (right).

Image Credit: John Jett and Federica Coppari/Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory

January 2022

National Nuclear Security Administration

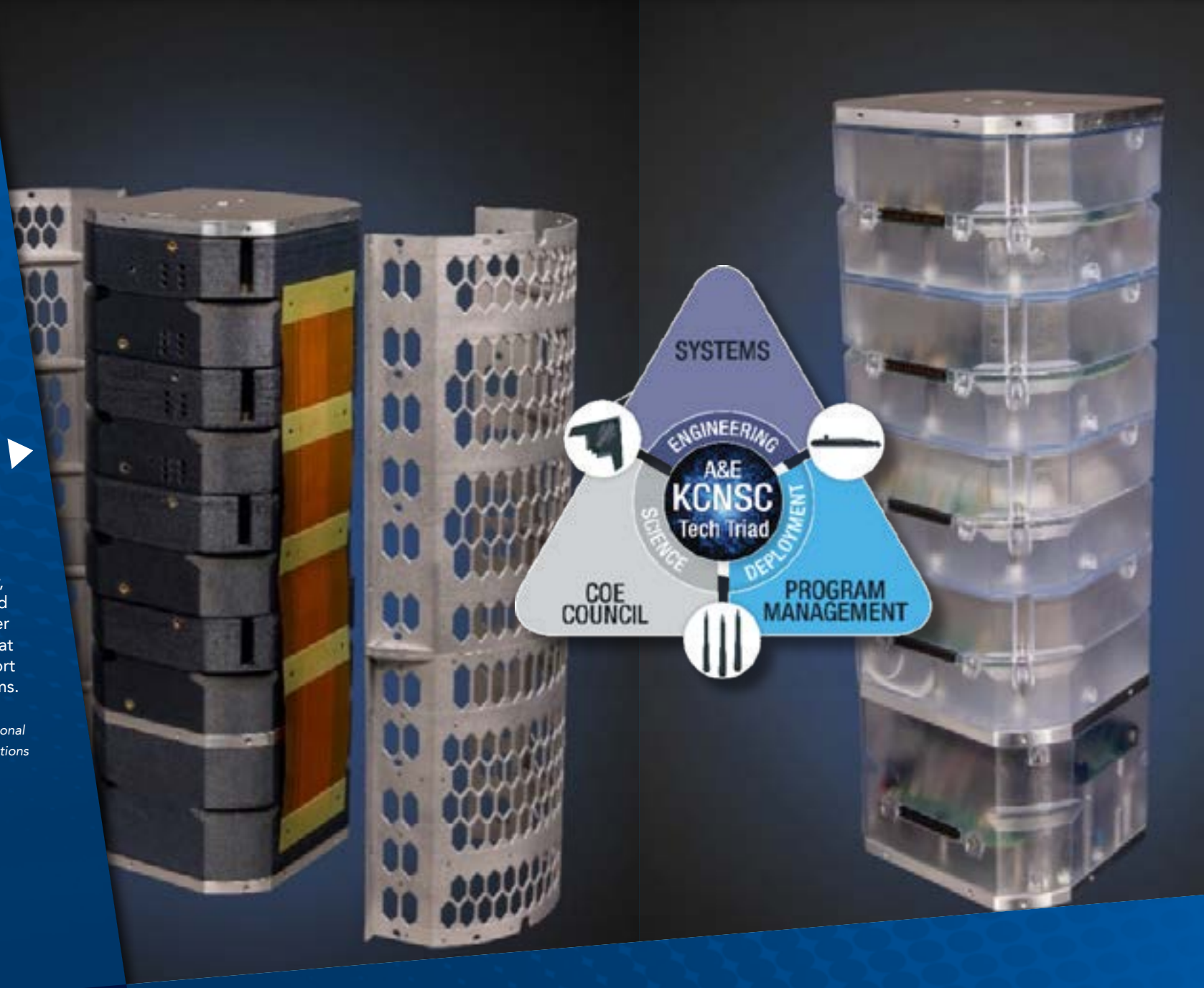
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
December 2021 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28					1 New Year's Day
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17 Martin Luther King Jr. Holiday	18	19	20	21	22
23 30	24 31	25	26	27	28	29

"You can't use up creativity. The more you use, the more you have." ***- Maya Angelou***

Modular Payload System

The Kansas City National Security Campus (KCNSC) is working diligently to identify new opportunities, processes, and technologies to shorten the cycle time of weapon development, manufacturing, and deployment to assure the successful support of the nation's deterrent capability. KCNSC's Advanced & Exploratory organization developed an internal, modular production science demonstrator for use with our Research and Sounding Rockets (RASR) process. Together, the modular payload system and RASR will accelerate the number of experimental payloads that the KCSNC can launch to support evolving programs.

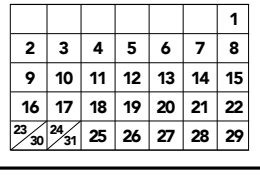
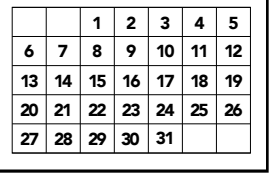
Image Credit: Kansas City National Security Campus, Communications



KANSAS CITY NSC National Security Campus

February 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14 	15	16	17	18	19
20	21 Presidents' Day	22	23	24	25	26
27	28				January 2022 	March 2022 

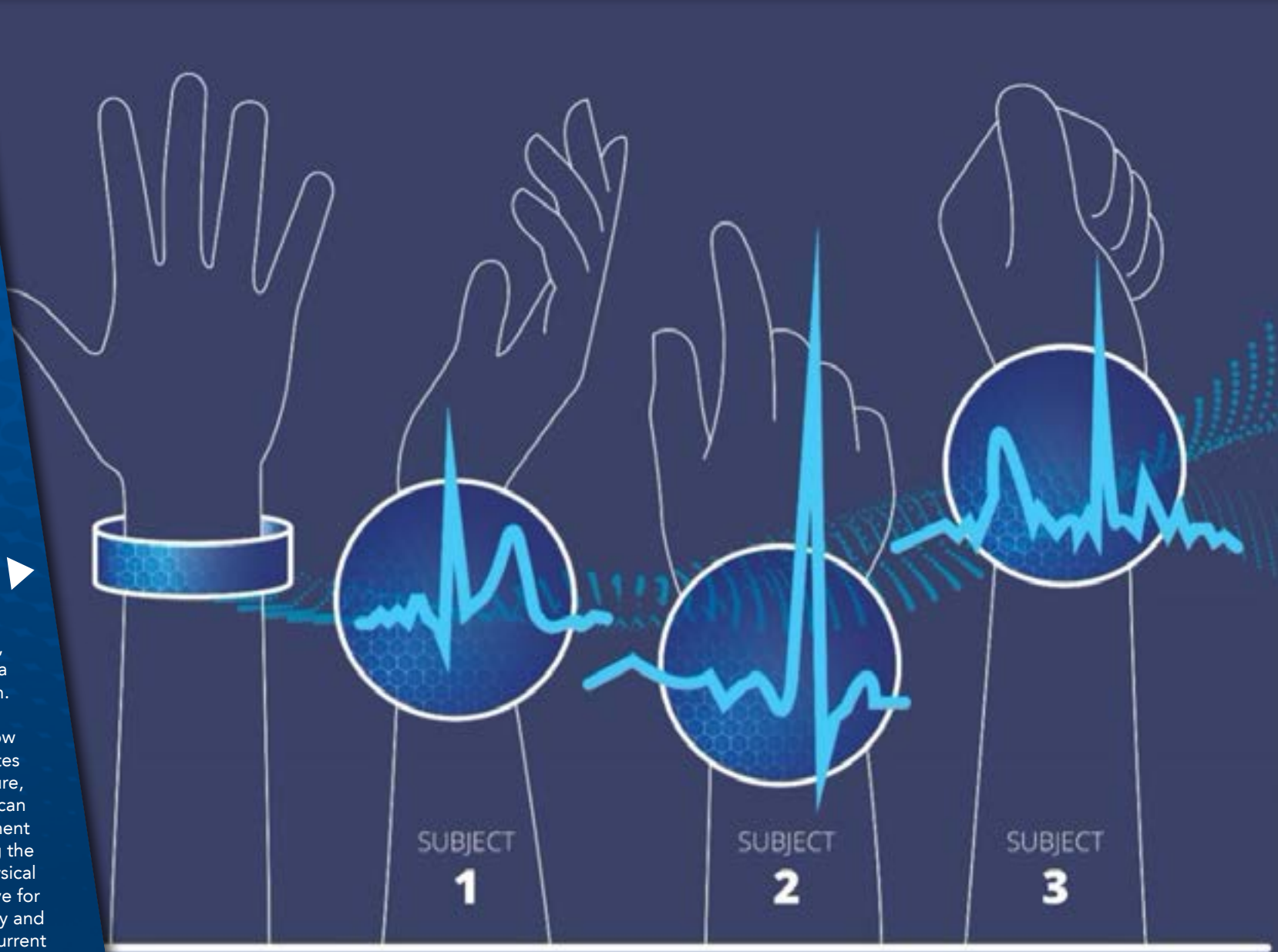
"Once you have an innovation culture, even those who are not scientists or engineers - poets, actors, journalists - they, as communities, embrace the meaning of what it is to be scientifically literate. They embrace the concept of an innovation culture." ***- Neil deGrasse Tyson***

A Biometric Security System Based on the Human Heartbeat

When attempting to confirm the identity of a person for security purposes, alternatives to access-control methods, such as fingerprint and iris readers, could be useful in specialized environments, such as in a laboratory, where gloves or eye protection may be necessary. Sandia is collaborating with a New Mexico small business to test and develop a biometric security system based on the human heartbeat. Through a Cooperative Research and Development Agreement, Sandia and Aquila Inc. will develop and test a wearable prototype that can recognize the wearer's individual electrocardiogram signature and transmit a signal in real-time, allowing the user access to a specific location.

The initial tests will evaluate how the wearable device communicates with access-control architecture, and additionally if the system can effectively track a person's movement within a facility. Evaluating the system on Sandia's own physical security facilities, the objective for the new system is to operationally and economically meet or exceed the current methods for access control and position tracking purposes. The system could be impactful for Sandia in supporting its national security mission as well as for other industries and applicable facilities, such as hospitals.

Image Credits: Illustration by Michael Vittitow



Sandia National Laboratories

March 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5 Non-Proliferation Treaty (1970)
6	7	8	9	10	11	12
13 Daylight Saving Time begins	14	15	16	17	18	19
20 Spring begins	21	22	23	24	25	26
27	28	29	30	31		

February 2022

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27	28					

April 2022

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"Exploration is the engine that drives innovation. Innovation drives economic growth. So, let's all go exploring." ***- Edith Widder***

Smart Tensors AI Platform

The software uses unsupervised machine learning to sift through massive datasets and identify hidden trends, mechanisms, signatures, and features buried in large high-dimensional data tensors (multi-dimensional arrays). Applications include analyses in medicine, disease spread and prediction, energy extraction, carbon sequestration, climate change, economics, infrastructure stability, anomaly detection, and national security.

Image Credit: Sarah Tasseff, Boian Alexandrov, David Woodfin, Allen Hopkins, Los Alamos National Laboratory

Los Alamos NATIONAL LABORATORY EST. 1943

April 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
March 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	May 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				1	2 Ramadan begins at sundown
3	4	5	6	7	8	9
10	11	12	13	14	15 Passover begins at sundown	16
17 Easter	18	19	20 Los Alamos 1943	21	22	23
24	25	26	27	28	29	30

"If you want to have innovation, you have to give permission to fail" ***- Bob Eiger***

Success Story

Airport Decontamination

In the wake of the global COVID-19 pandemic, many public spaces and businesses were closed or restricted to admitting only a percent of their normal capacity. A critical component to reopening the economy is the ability to quickly and thoroughly disinfect these spaces, especially large, heavily used areas such as schools. Traditionally, disinfection is time- and labor-intensive work that requires the space to be closed for long periods of time and could expose cleaning crews to harsh chemicals. To kill the SARS-Co2 virus, Build with Robots, a New Mexico company, and Fetch, a California company, have collaborated to create the Breezy One disinfecting autonomous mobile robot. The Sunport, the largest commercial airport in New Mexico, is using Breezy One to conduct nightly sanitizing runs to ensure the airport is as safe as possible for passengers and employees.

Image Source: Fetch Robotics

Innovation Edge

Most disinfecting robots either do not have the high rate of elimination of harmful pathogens or require up to 24 hours before entry back into the disinfected space. The disinfectant used in the Breezy One was originally developed by Sandia for mitigation and decontamination of chemical and biological agents. This EPA-registered

disinfectant, which is one of the strongest disinfectant agents commercially available, leaves no harmful residue and impacted spaces can be entered as soon as two hours after cleaning. It has been tested by nine government agencies and over 10 independent laboratories and is effective against viruses, bacteria, and spores. It also meets nationwide hospital requirements for pathogen disinfection.

Using this disinfectant, Breezy One is able to decontaminate spaces over 100,000 square feet in 1.5 hours, and the space can be re-entered in as little as two hours. The quick turnaround means that businesses will not have to sacrifice more time than necessary to ensure their facilities are clean. The cleaning staff are also able to focus on providing services across the facility rather than spending time on extra sanitization procedures.

"... one of the strongest disinfectant agents commercially available, leaves no harmful residue and impacted spaces can be entered as soon as two hours after cleaning."

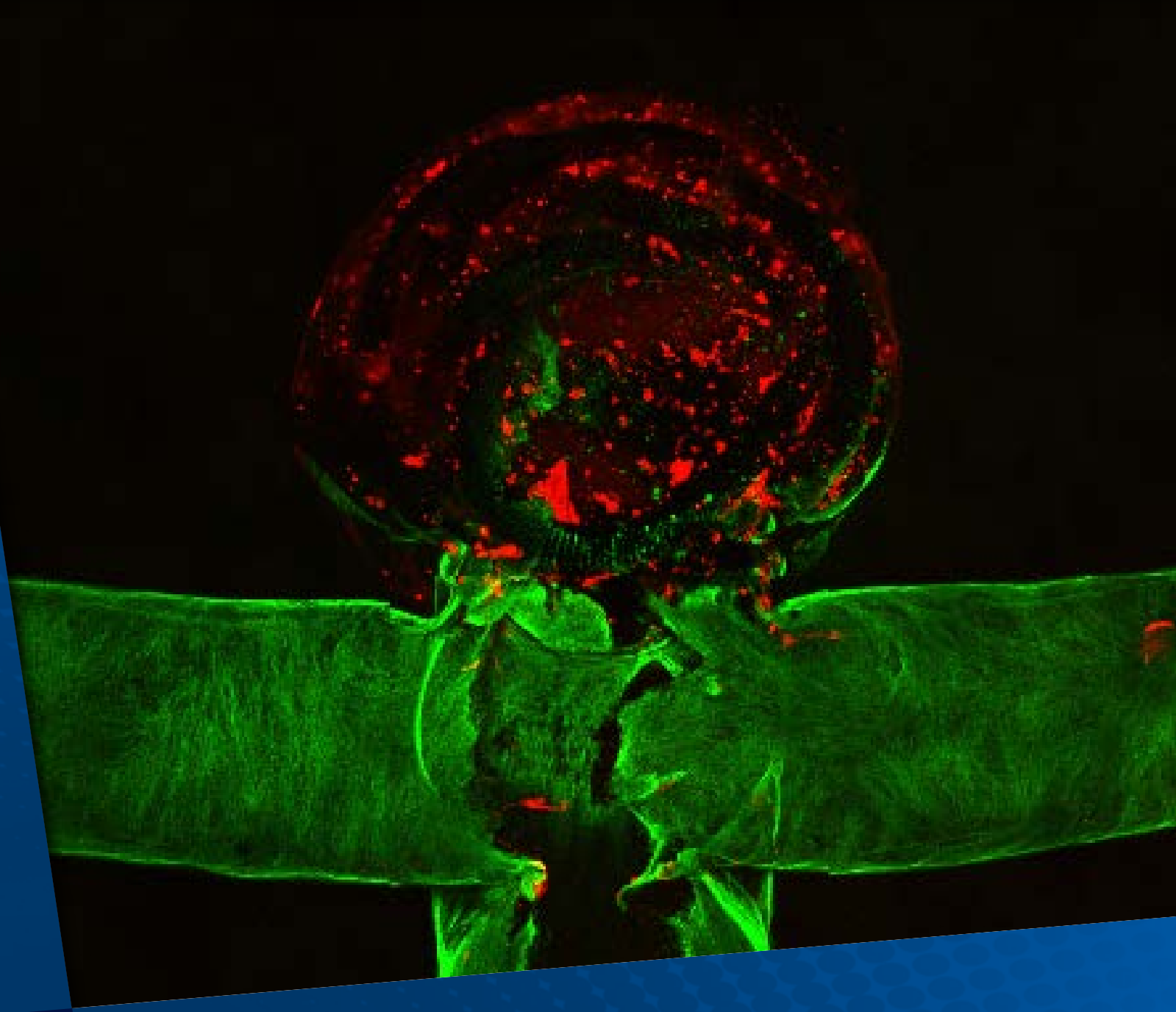
Commercialization and Industry Impact

Similar robotics manufacturers have joined the fight against coronavirus by adapting their technology to meet new demands. In Denmark, Blue Ocean Robotics recently created the "UVD" bot to support human cleaning staff in large facilities by moving along the floors while emitting ultraviolet light to kill harmful microorganisms. In China, retail giant JD.com is developing robots to prevent the spread of coronavirus by automatically using disinfectant gas and liquid sprayers or ultraviolet lamps. Given the success at the Albuquerque airport, the partners plan to distribute Breezy One units across a variety of sectors, including event spaces, schools, and warehouses.

Bioprinted Human Cerebral Aneurysm Bioreactors

LLNL researchers bio printed the first living aneurysm outside of the human body and performed an endovascular repair procedure by inserting a catheter into the blood vessel and tightly packing platinum coils inside the aneurysm sac. The team introduced blood plasma into the aneurysm and observed a blood clot form where the coils were located. With this platform, medical practitioners may be able to improve treatment methods, develop new personalized approaches, and perform "test runs" of procedures before attempting them on patients. The green areas depict the endothelial cells and the red indicates the formed clot.

Image Credit: Photo by Elisa Wasson



Lawrence Livermore National Laboratory

May 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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29	30 Memorial Day	31				

April 2022

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June 2022

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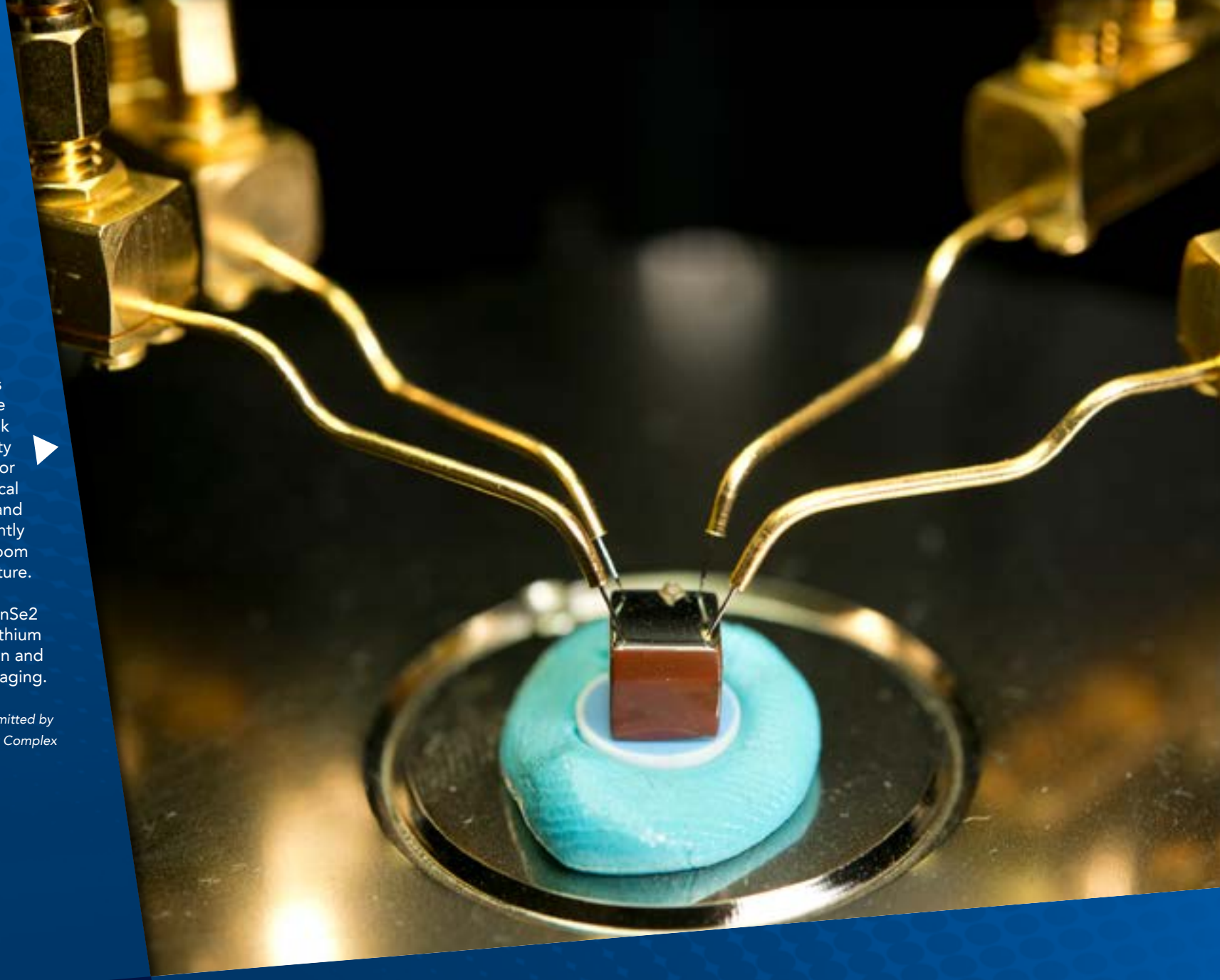
"Innovation is the new competitive advantage." ***- Julie Sweet***

LISe™ Crystals/ Ceramics/NAND

LISe™ Crystals/Ceramics/ NAND, is a suite of patents for a Li-containing compound semiconductor thermal neutron detector based on the LiInSe2 single crystal. These Li-containing chalcopyrite-type semiconductor crystals exhibit the appropriate electrical bandgap, high-bulk resistivity and current stability which can be designed for applications including medical imaging, non-linear optics, and radiation detection to efficiently detect thermal neutrons at room temperature.

Image: One centimeter cube LiInSe2 single crystal provides high lithium sensitivity for neutron detection and neutron imaging.

Image Credit: Photo(s) submitted by Y-12 National Security Complex



Y-12 National Security Complex
Managed and Operated by Consolidated Nuclear Security, LLC

June 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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5	6	7	8	9	10	11
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19 Juneteenth	20	21 Summer begins	22	23	24	25
26	27	28	29	30	May 2022	July 2022

May 2022

1	2	3	4	5	6	7
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22	23	24	25	26	27	28
29	30	31				

July 2022

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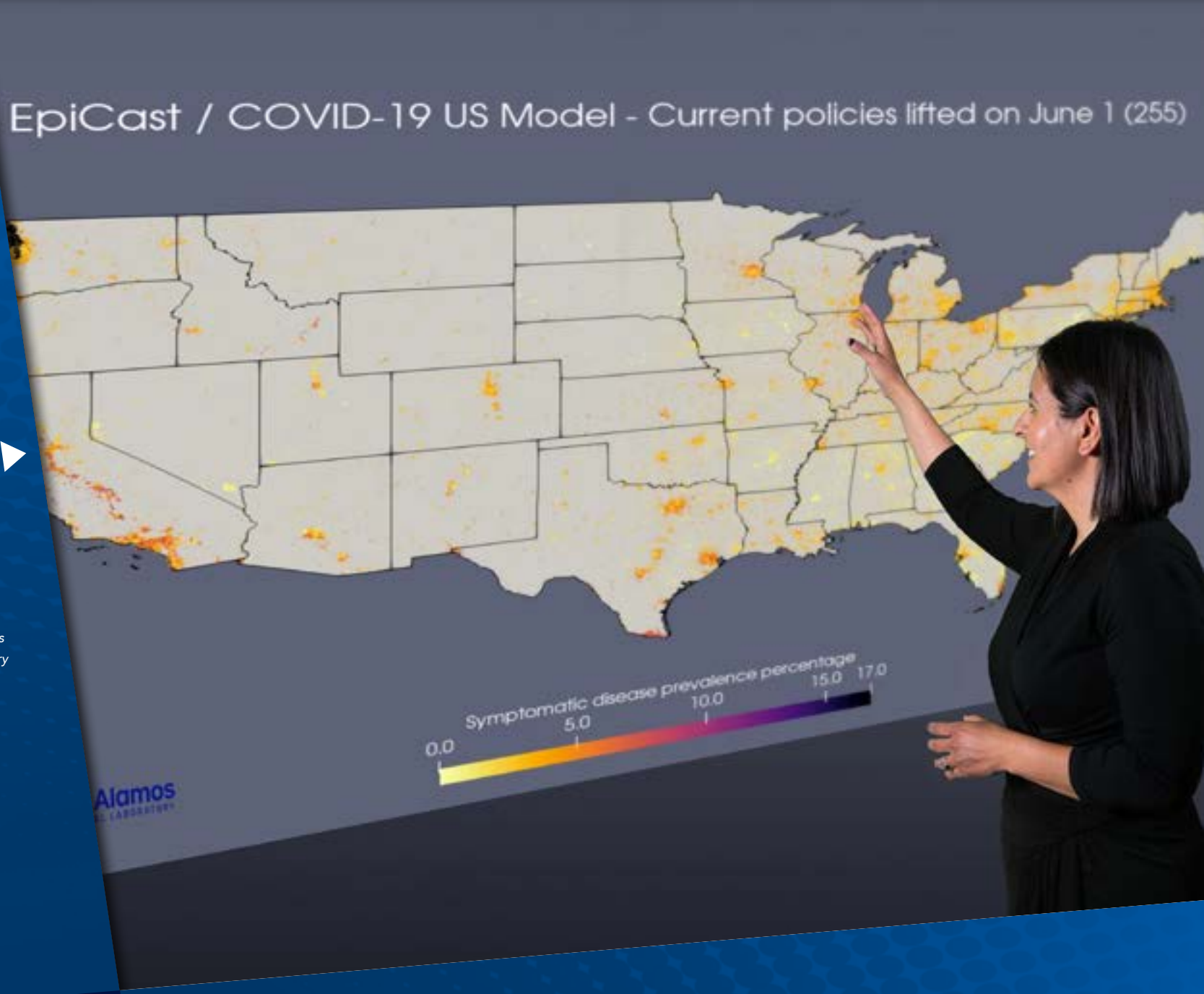
24 31	25	26	27	28	29	30

"The secret of change is to focus all of your energy, not on fighting the old, but building on the new." - ***Socrates***



EpiCast

The software generates synthetic, representative populations that simulate infectious disease transmission in the United States in extreme detail. EpiCast models human behavior combined with community-specific information to provide a fine-grained preview of the effect of potential mitigation strategies for decision makers.

Image Credit: David Woodfin, Los Alamos National Laboratory

Los Alamos
NATIONAL LABORATORY
EST. 1943

July 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
June 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	August 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				1	2
3	4 Independence Day	5	6	7	8	9
10	11	12	13	14	15	16 Trinity Test Day (1945)
17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

"Never tell people how to do things. Tell them what to do and they will surprise you with their ingenuity." ***- George Patton***

Entrepreneurial Success in Safe and Reliable Batteries

Reliable, quality power sources are integral to national security missions. Both private consumers and government entities need efficient power sources that are capable of being continuously monitored. Sandia spinoff company Advanced Manufactured Power Solutions (AMPS) provides custom, high-quality, and high-reliability battery packs for the defense and space industries. Its battery packs power high consequence, demanding applications with missions in extreme environments. AMPS focuses on rapid product realization of high-reliability power sources and teaming with the customer for accelerated cycles of learning to deliver better value (higher quality, shorter development cycles, lower cost, etc.). The company, which supports several defense contractors, is also a Sandia supplier and creates high-paying jobs that help stimulate the local economy. The three-year-old company reached a significant growth milestone recently with its first out-of-state contract, a project for NASA's Jet Propulsion Laboratory in Pasadena, California.

Image Credit: Randy Montoya, Sandia National Laboratories

Sandia National Laboratories

August 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

July 2022

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3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

September 2022

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4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

"If you look at history, innovation doesn't come just from giving people incentives; it comes from creating environments where their ideas can connect." - ***Steven Johnson***

Success Story

Three-mirror reflective telescope and sensor

When the U.S. Space Force's Tactically Responsive Launch-2 (TacRL-2) mission launched from Vandenberg Space Force Base on June 13, it carried a payload designed and built in record time by Lawrence Livermore National Laboratory (LLNL).

LLNL provided a three-mirror reflective telescope and sensor for the payload, which they designed, integrated, tested and delivered within four months of the word "go." The Lab delivered the payload to its partners at Space Dynamics Laboratory (SDL) and the Air Force Research Laboratory (AFRL).

"We needed a novel design in order to meet the program objectives," said LLNL project leader John Ganino. "The payload system required a set of three LLNL monolith optics, auto-focus capability and an electronic control module to interface with the spacecraft bus."

A LLNL team provided a three-mirror reflective telescope and sensor in record time for the payload of a June 13 U.S. Space Force launch called the Tactically Responsive Launch-2 (TacRL-2) mission. The mission took off on a Northrop Grumman Pegasus XL rocket from Vandenberg Space Force Base, delivering a technology demonstration satellite to Low Earth Orbit.

LLNL's Tactically Responsive Launch-2 payload launched into orbit

Lawrence Livermore National Laboratory

TacRL-2 was the first mission led by U.S. Space Force's Space and Missile System Center's (SMC) new Space Safari Program Office. Space Safari rapidly integrates mature technology and systems to quickly respond to specialized space needs.

LLNL delivered the payload to SDL for integration 100 days after the SMC Space Safari Program Office initiated the project. Together, the team delivered a complete technology demonstration satellite for launch in 11 months, significantly faster than the two to five years historically required.

Tactically responsive launch, as a concept, seeks to introduce speed, agility and flexibility into the space enterprise to respond to dynamic changes in the space domain or an operational theater and insert or replace assets on orbit much faster than standard timelines to meet emerging combatant command requirements.

For TacRL-2, the Space Safari office successfully demonstrated their end-to-end approach to tactically responsive missions by acquiring and integrating the space vehicle, launch vehicle, payloads and ground elements in record time, as well as conducting on-orbit planning and operator training.

"The Tac-RL-2 project was a huge success for LLNL and our partners... We proved that a motivated and agile interdisciplinary team can design, build and launch spacecraft on tactically responsive timelines..."

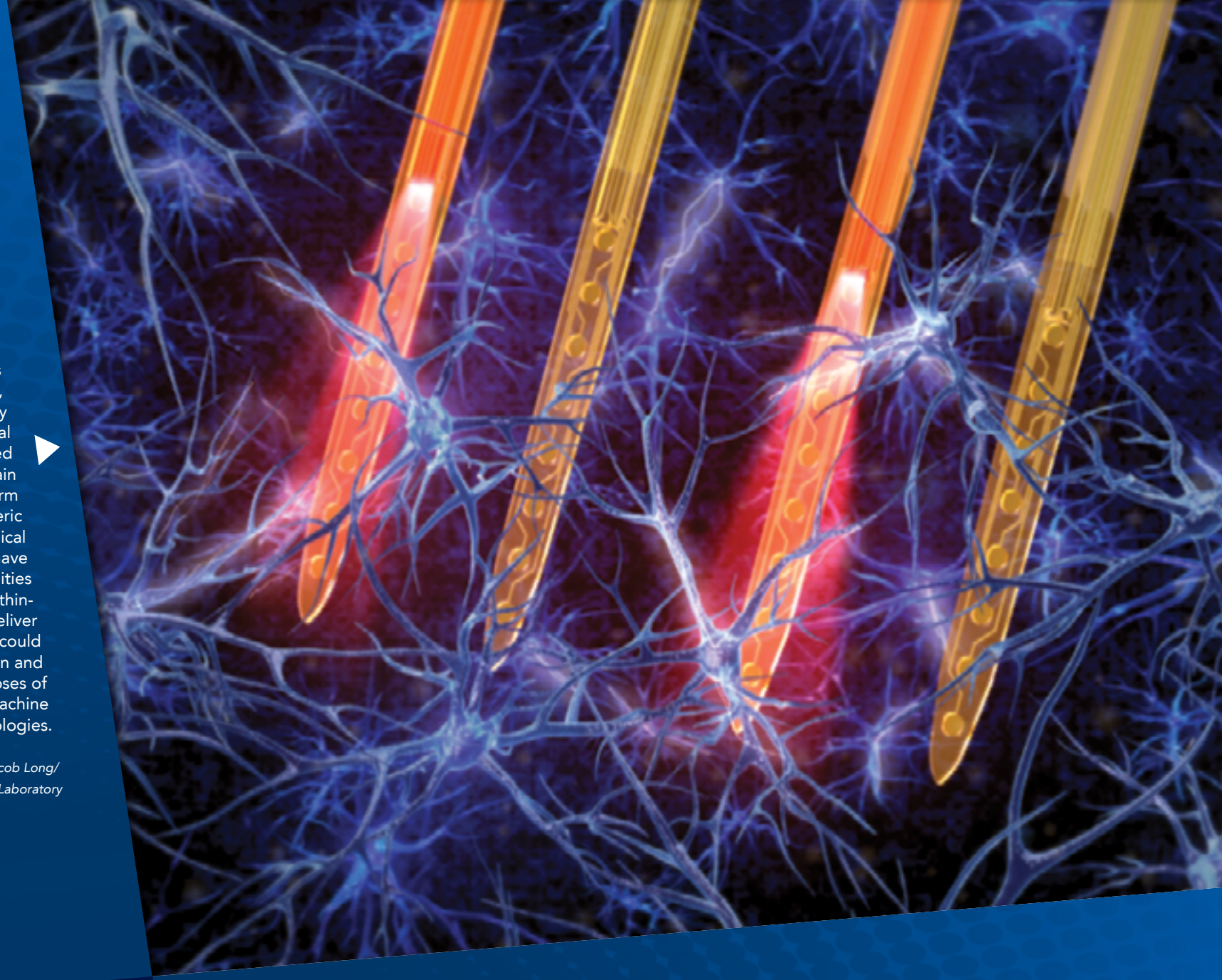
"The Tac-RL-2 project was a huge success for LLNL and our partners at SDL, AFRL, and SMC," said Ben Bahney, the Lab's Space Program leader. "We proved that a motivated and agile interdisciplinary team can design, build and launch spacecraft on tactically responsive timelines to support the warfighter's need for new mission capabilities."

The June 13 Tac-RL-2 launch represents the second payload designed and built by LLNL scientists to go into space within the past 45 days. Two space telescopes, known as GEOStare2, were integrated into a Tyvak nanosatellite that flew into orbit on May 15 aboard a SpaceX Falcon 9 rocket launched from NASA's Kennedy Space Center.

POEMS (Polymeric Opto-Electro-Mechanical Systems)

Combining hybrid polymer materials with microfabrication and 3D printing, Lawrence Livermore National Laboratory (LLNL) has developed an ultra-compact, lightweight and minimally invasive optoelectronic neural implant that could be used for long-term studies of brain activity. Built on a new platform known as POEMS (Polymeric Opto-Electro-Mechanical Systems), researchers have integrated optical capabilities into their patented flexible thin-film neural implants. It can deliver light for neural activation and could be used for high resolution and minimally invasive diagnoses of brain disorders, in human-machine interfaces or wearable technologies.

Image Credit: Jacob Long/ Lawrence Livermore National Laboratory



Lawrence Livermore National Laboratory

September 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	August 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	October 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 30 24 31 25 26 27 28 29		1	2 Lawrence Livermore National Laboratory 1952	3
4	5 Labor Day	6	7	8	9	10
11	12	13	14	15	16	17 PanTEX 1942
18	19	20	21	22 Fall Begins	23	24
25	26	27	28	29	30	

"When the winds of change blow, some people build walls and others build windmills." ***- Unknown, An ancient Chinese proverb***

PEGASUS: Portable Engineered Sensor with Automated Sampling

The miniaturized, fieldable biosensor analyzes complex samples to detect a variety of important biomarkers, including bacterial signatures, viral genetic material, toxins, and potential biothreat agents. The simple to operate system makes laboratory-quality analysis available in remote or resource-poor areas.

Image Credit: David Woodfin, Donald Montoya, Los Alamos National Laboratory

Los Alamos NATIONAL LABORATORY EST. 1943

October 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
September 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	November 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30					1
2	3	4	5 NNSA National Nuclear Security Administration 1999	6	7	8
9	10 Columbus Day	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

"The uncreative mind can spot wrong answers, but it takes a very creative mind to spot wrong questions." ***- Antony Jay***

Miniature, Flexible, Solar Panels

Current solar technologies are considered inflexible, costly, and require substantial installation time. These barriers prevent solar technologies from large-scale adoption by a myriad of industries, including applications in outer space. New creative solutions are compacting, simplifying, and substantially reducing the overall cost of solar technologies and are expanding application areas available to industry. Sandia National Laboratories contributed to overcoming these critical limitations in existing solar cell technologies by developing Microsystems-Enabled Photovoltaics (MEPV) cells: small, portable, and flexible solar panels that are often referred to as Solar Glitter.

Image Credit: Rendering courtesy of GGZEM

R&D 100 AWARDS

Sandia National Laboratories

November 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Sandia National Laboratories 1949	2	3	4 Y-12 1943	5
6 Daylight Saving Time ends	7	8 Election Day	9	10	11 Veterans Day	12
13	14	15	16	17	18	19
20	21	22	23	24 Thanksgiving Day	25	26
27	28	29	30		October 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	December 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

"The value of an idea lies in the using of it." - ***Thomas Edison***

Detection of Radioactive Sources

A partnership between NNSS and H3D (Ann Arbor, Michigan) is improving the ability to detect and identify radioactive sources. This partnership holds promise for using unmanned aerial systems (UAS) to measure radioactivity in places where manned aircraft access may be a challenge. Mission Support and Test Services, the M&O contractor for NNSS, and H3D have entered into a cooperative research and development agreement (CRADA) to test H3D's high-efficiency radiation detector on UAS provided by NNSS.

Image Credit: Hovig Yaralian

NEVADA NATIONAL NNSS SECURITY SITE

December 2022

National Nuclear Security Administration

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
November 2022 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	January 2023 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18 1950 Hanukkah begins at sundown	19	20	21 Winter Begins	22	23	24
25 Christmas Day	26 Kwanzaa begins	27	28	29	30	31

"The best way to predict the future is to create it." - ***Alan Kay***

Success Story

Quantum Random Number Generator (QRNG)

The Los Alamos Quantum Random Number Generator (QRNG) is a hardware-based, high-performance Random Number Generator capable of generating 200 Mbit/s or more of true random numbers. Like flipping a coin, it is very much random and essential for information security like encrypting data on the internet, checking email, or purchasing something from an online vendor. The device harvests entropy from fluctuations in an optical source that arise from quantum mechanical properties of light. Qrypt, Inc., a company launched in 2017, began making strategic investments and developing partnerships to advance cutting-edge quantum hardware solutions. One of those key investments was licensing QRNG from Los Alamos and subsequently collaborating with advanced quantum materials and technology researcher Dr. Raymond Newell to create high-quality random keys at scale.

LANL's hardware-based, high-performance Random Number Generator is capable of generating 200 Mbit/s or more of true random numbers.

Technology Advancement

The Los Alamos QRNG can meet the demands of even the highest-performance crypto-systems. This device can be used as a dedicated random number generator or deployed as the core component of an entropy-as-a-service network device. Qrypt's goal is to enable secure encryption for the modern age. Qrypt is leveraging cloud infrastructure, new algorithms, and high-rate QRNGs. The company has built the first generation of Entropy-as-a-Service using the same global infrastructure, which makes QRNGs available to any internet connected device. Qrypt distributes those random numbers via cloud services, enabling more secure cryptography for all applications and clients like banking and critical infrastructure. In order to implement this at scale, Dr. Newell is working closely with the Qrypt engineers testing and validating the circuit and optical devices.

> **"I think it's essential that as the technologies we develop reach a certain level of technical maturity, we need to have a path forward out of the Laboratory."**
>
> *- Raymond Newell, Los Alamos National Laboratory*

Impact

Qrypt licensed the Triad, LLC QRNG technology to commercialize it for its cloud-based Quantum Entropy-as-a-Service platform. Los Alamos continues to work with Qrypt under a Cooperative Research and Development Agreement (CRADA) to test and validate the QRNG technology to support its deployment into the marketplace. Together Qrypt and Los Alamos are working to make the QRNG technology a practical device that will be located inside a computer within a data center. Qrypt has started to build its first prototype and is seeing early progress and success. The goal is to begin scaling and commercializing the technology by the end of the year.

February 2020

Qrypt, Inc. Signed an agreement with Los Alamos to license specific Triad, LLC QRNG intellectual property.

November 2020

Los Alamos entered into a Cooperative Research and Development Agreement with Qrypt to further develop and transition the QRNG technology to the company.

Timeline

National Security Laboratories, Plants, and Sites

The desperate need for munitions to fight World War II led to the creation of the **Pantex** Ordnance Plant, built on 16,000 acres of land east of Amarillo, Texas. Operations began on September 17, 1942, only nine months after the commencement of construction. Pantex continues its key role of ensuring the safety, security and reliability of the nation's nuclear stockpile by dismantlement of excess weapons, conducting surveillance on the stockpile, and maintaining aging weapons through Life Extension Programs.

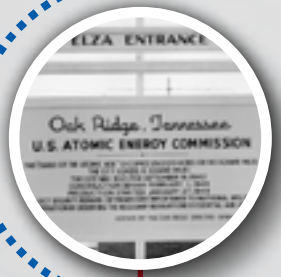
September 17

1942

The first week of April, the **Los Alamos National Laboratory (LANL)** hosted its first, major technical conference: The Los Alamos Primer Conference. The proceedings were transcribed and became LA-1, the Lab's first report. On April 20, 1943, the University of California signed the contract to operate the Los Alamos Laboratory with a single mission: to design and build an atomic bomb. Today, different research programs at the Lab directly and indirectly support the current mission: maintaining the safety, security and reliability of the nation's nuclear deterrent without the need to return to underground testing.

April 20

1943



In the midst of the second World War, ground was broken in rural East Tennessee for the first production building at the **Y-12** Electromagnetic Separation Plant and operations began on November 4, 1943. The plant's job was to make enough enriched uranium for a new kind of bomb, an atomic bomb. Thirty months later the success of Y-12's mission was announced to the world when two atomic weapons were detonated, the Empire of Japan surrendered, and World War II ended. Today, Y-12 processes and stores special materials vital to our national security and contributes to the prevention of the spread of weapons of mass destruction.

November 4

1943

The Kansas City Division became a reality on February 14, 1949, after the Bendix Corporation, a subsidiary of Honeywell International Inc., was selected by the Atomic Energy Commission to perform "certain operations; the exact details of which are classified." The employees guarded the nature of the mission so well that, for many years, the community assumed the plant made washing machines. Today the **Kansas City National Security Complex's (KCNSC)** primary focus is manufacturing 85 percent of non-nuclear components that go into the nuclear stockpile and developing advanced solutions for complex national security issues, ranging from prototype simulations to production to quality.

February 14

1949

Sandia National Laboratories began in July 1945 as the "Z Division" of Los Alamos National Laboratory. On November 1, 1949, Sandia Corporation took over its management as it separated from Los Alamos. A second site was opened in California's Livermore Valley in 1956. Although Sandia originated as a single-mission engineering organization for nonnuclear components of nuclear weapons, today, under National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., it is a multiprogram laboratory engaging in research supporting a broad spectrum national security issues.

November 1

1949

On December 18, 1950, President Harry Truman authorized a 680-square mile section of the Nellis Air Force Gunnery and Bombing Range in Southern Nevada as the Nevada Proving Grounds, and on January 27, 1951, the first atmospheric nuclear test was detonated at the Proving Grounds. Following a few name changes and an international ban on nuclear testing the **Nevada National Security Site (NNSS)** reflects a current mission of planning, experimentation and training to prevent and counter global and homeland security threats.

December 18

1950

On September 2, 1952, the Atomic Energy Commission granted the request of Los Alamos National Laboratory scientist, Edward Teller, to establish a laboratory as a branch of the Berkeley-based University of California's Radiation Laboratory (UCRL). Located at a deactivated naval air station, **Lawrence Livermore National Laboratory (LLNL)** addressed urgent national security needs by advancing nuclear weapons science and technology at the height of the Cold War. Over its history, LLNL has strengthened national security by developing and applying world-class science, technology and engineering that enhances the nation's defense, reduces the global threat from terrorism and weapons of mass destruction, and responds to scientific issues of national importance.

September 2

1952

On October 5, 1999, President Bill Clinton signed the National Defense Authorization Act, bringing the **National Nuclear Security Administration (NNSA)** into existence. The NNSA operates as a semi-autonomous agency within the U.S. Department of Energy (DOE) and is responsible for the management and security of the nation's nuclear weapons, nuclear nonproliferation, and naval reactor programs. It also responds to nuclear and radiological emergencies in the United States and abroad and provides safe and secure transportation of nuclear weapons and components and special nuclear materials.

October 5

1999

January

February

March

April

May

June

July

August

September

October

November

December

National Nuclear Security Administration