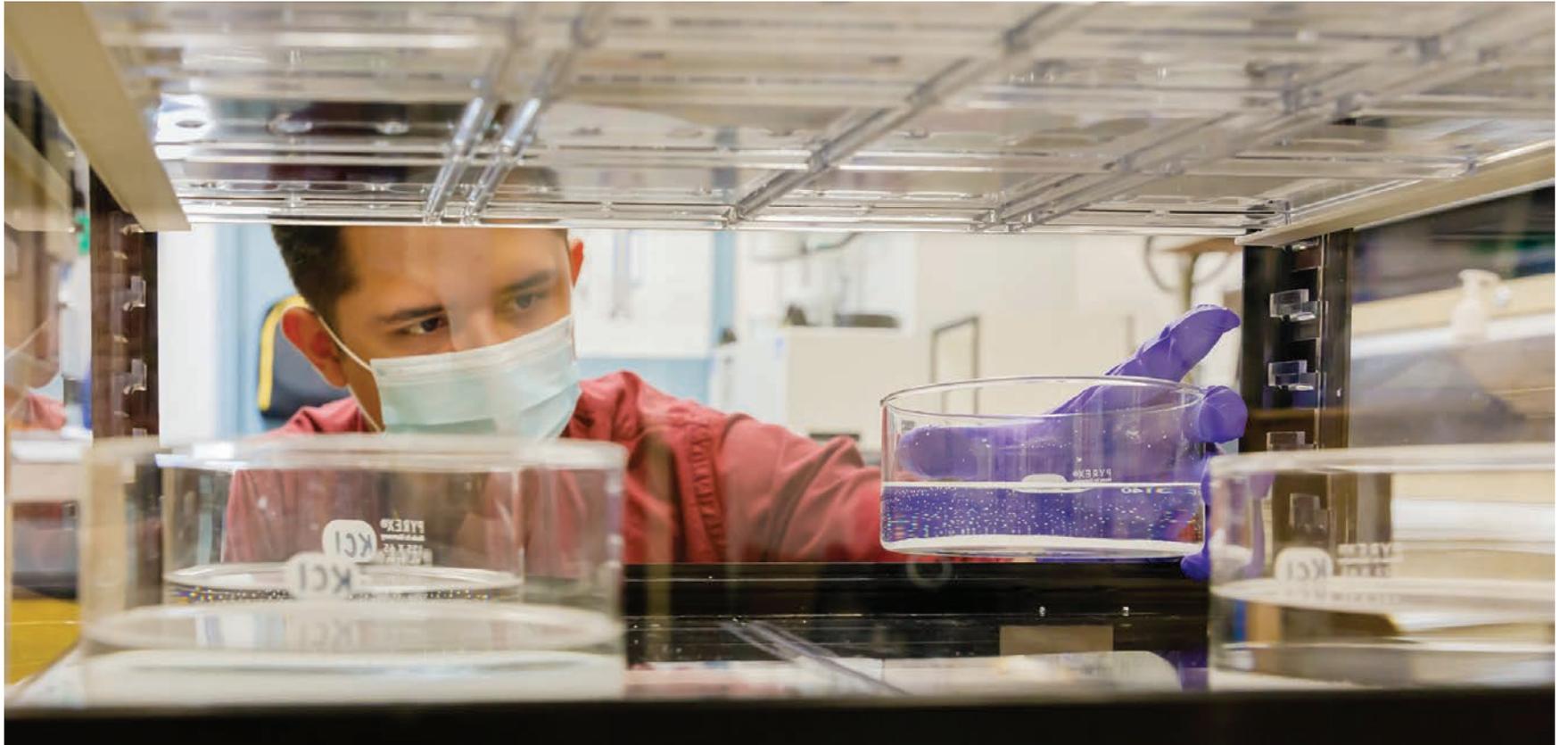




Helping protect medical professionals

Sandia researchers work with NM small businesses to test new respirator materials



TESTING MATERIALS — Sandia principal investigator Michael Omana inserts a solution into a small chamber used to increase humidity on samples. Michael and a team of researchers tested materials for Albuquerque companies looking to manufacture N95-like respirators. **Photo by Bret Latter**

By **Manette Newbold Fisher**

A media comprised of a sandwich of materials, tested by Sandia, is being manufactured into N95-like respirators that could be used in local medical facilities. The project originated from the urgent need for personal protective equipment when the COVID-19 outbreak began.

“I can almost assure you that no one else in the country is making respirators the way we’re making them,” said Dave Mayberry, technical lead for Marpac, Sierra Peaks and Sew-EZ, the companies that worked with Sandia on materials testing.

“We didn’t want to research the same materials already used in the typical N95 supply chain due to availability issues, so we looked into other materials we could get ahold of that seemed most likely to meet the filtration requirements.”

Marpac, Sierra Peaks and Sew-EZ were matched with Sandia scientists through the **New Mexico Small Business Assistance program** that pairs Sandia and Los Alamos national laboratories with companies seeking help to solve technical problems. Sandia worked on a project with each company.

“It’s been very satisfying to see NMSBA, a state program, help New Mexico businesses address

COVID-19 issues,” said Jackie Kerby Moore, manager of technology and economic development at Sandia. “It was also rewarding to see the Sandia team jump on the opportunity to help these three businesses with their respirators.”

Adapting to meet a need

Marpac specializes in manufacturing medical tube securement devices and works closely with engineering and manufacturing companies Sierra Peaks and Sew-EZ.

— CONTINUED ON PAGE 7

COVID-19 can’t stop these kids

Sandia, R4 Creating team to teach teens software, coding skills



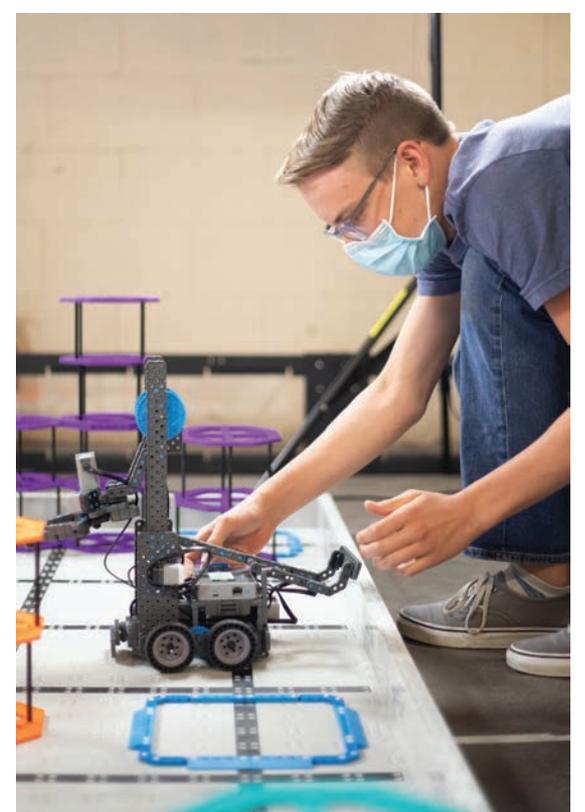
CREATING SOLUTIONS — A camp participant focuses on a challenge during the Robotics Training Institute competition. **Photos by Makenzie Gruenig**

By **Manette Newbold Fisher**

For a while, it seemed like COVID-19 canceled everything, and for that reason, it was unknown whether Sandia would be able to collaborate with local nonprofit R4 Creating for the third annual Robotics Training Institute for teens, a weeklong

event that has become a summer highlight for the Labs’ robotics group. However, using creativity and lots of video chat, leaders and instructors found a way to create an engaging curriculum and a competition for the camp, which took place July 6-10.

Students joined video sessions instructed by Sandia computer scientist Bryce Eldridge, summer



NEW SKILLS — During the third annual Robotics Training Institute, a week-long robotics summer camp, teens learned introductory coding and software programs that are compatible with robots they built at home.

intern Alex Miera and year-round intern John Krukar. Lessons explored introductory software programming, coding and platforms that are compatible with robots the teens built at home during the week.

— CONTINUED ON PAGE 7

 LABNEWS Notes

Digital strategy boosts Labs recruiting efforts

Sandia recruiting team employs digital platforms to meet hiring needs during pandemic

By **Mike Burt**

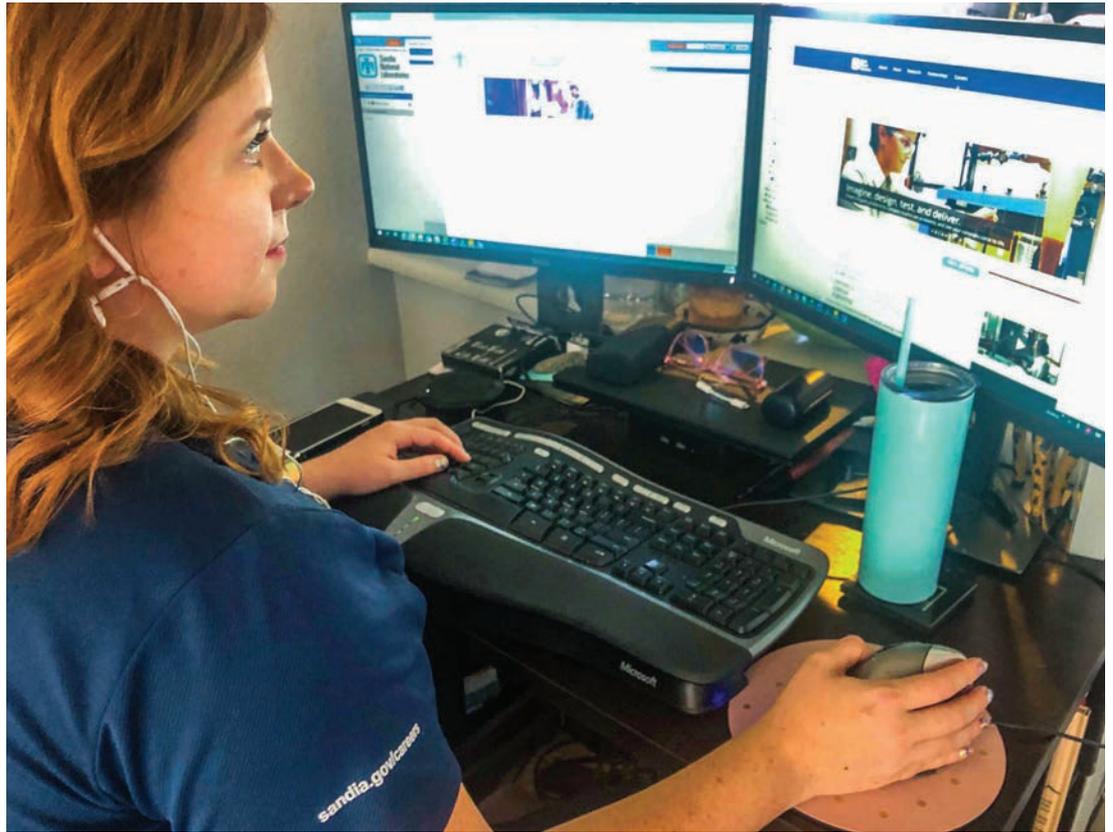
Sandia's recruiting team started preparing to locate and hire talent in the midst of a pandemic long before anyone had heard of social distancing or COVID-19. Under the direction of David Martinez, recruiting manager, the team has employed a largely digital strategy that includes implementing a new candidate relationship management tool, Yello, which allows for Sandia's recruiters to collect resumes and connect with candidates digitally.

Before Yello, the recruiting team had been employing career tech companies like LinkedIn, Glassdoor and Indeed to advertise, find and engage with candidates who might be interested in employment at Sandia. In the last year, the team also added Fairygodboss, a career site dedicated to professional and technical women, to expand Sandia's hiring strategy in the space of inclusion and diversity.

"The icing on the cake was Yello," David said, "which catapulted us into contemporary times and really helped us to begin to think more digitally and engage with added speed."

Transition to virtual

Erin Chandler and Ana Garcia, both recruiting specialists, got ahead of the pandemic restrictions by exploring opportunities to access candidates through virtual career fairs and digital platforms. The team said it's important to have options that include a wide range of events to cover Sandia's critical hiring needs while also maintaining a strict commitment to an inclusive and diverse workforce.



VIRTUAL RECRUITER — Sandia recruiting specialist Nicole Streu participates in an online career fair while working from home, communicating with job candidates about opportunities at the Labs.

Photo courtesy of Nicole Streu

Transitioning to a virtual platform presented the challenge of navigating security concerns and training for a new process. Crediting the use of Yello and other digital tools for a smooth transition, Erin said, "I think because we had the CRM (candidate relationship management tool) in place, it went pretty smoothly."

The virtual experience varies based on the event, but each platform requires the recruiter to coordinate communication with interested candidates. In some cases, the platform may have a virtual booth that will allow recruiters and candidates to interact through video and audio. Other events may offer a chat-room-like experience where the interaction is strictly a back-and-forth text engagement. The text-only option presents a new obstacle, as recruiting has long been an in-person exchange.

Future of recruiting

The virtual pivot has presented a learning opportunity that has prepared the team for the upcoming fall recruiting season. Given the restrictions brought on by the COVID-19 pandemic, David's recruiting teams are expecting it to be a virtual experience.

"We are all watching, listening and leaning in to assess the direction of colleges, national conferences and affinity institutions — that direction has influenced our approach this year," he said.

Erin said the annual Grace Hopper Celebration has already moved to a virtual platform. In preparation, David and his team have developed two plans for upcoming events. The first plan is strictly virtual and the second is a hybrid of in-person and digital events. That process gives Sandia a recruiting future that continues to build talent pipelines, where they can access candidates virtually and in person, based on the needs of Sandia, as well as the size and scope of events.

While traditional recruiting has been put on hold for now, Sandia's recruiting team has remained committed to finding and hiring the best and brightest candidates. The tech savvy approach that the talent acquisition team adopted prior to the arrival of the pandemic has Sandia well positioned, with a model that will serve the needs of the Labs for the foreseeable future. 



Managed by NTESS LLC for the National Nuclear Security Administration

Sandia National Laboratories

Albuquerque, New Mexico 87185-1468

Livermore, California 94550-0969

Tonopah, Nevada | Nevada National Security Site

Amarillo, Texas | Carlsbad, New Mexico | Washington, D.C.

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Classified Ads 505-844-4902

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Published on alternate Fridays by Internal, Digital and Executive Communications, MS 1468

LAB NEWS ONLINE: sandia.gov/LabNews

 LABNEWS Notes

EDITOR'S NOTE: Lab News welcomes guest columnists who wish to tell their own "Sandia story" or offer their observations on life at the Labs or on science and technology in the news. If you have a column (500-800 words) or an idea to submit, contact Lab News editor Tim Deshler at tadeshl@sandia.gov.

Eric Wollerman visit



WOLLERMAN WELCOME — Kansas City National Security Campus President Eric Wollerman, left, met with Labs Director James S. Peery during his visit to Sandia on July 17. During the visit, Wollerman, who became president of KCNSC in April, met with Sandia leadership and received an introduction to technologies related to the Labs' nuclear weapon work with KCNSC. The visit included briefings and tours of some of Sandia's facilities.

Photo by Bret Latter

NNSA Administrator Gordon-Hagerty thanks Sandia during B61-12 recognition event

Event was part of administrator's Labs tour July 15

By Michael J. Baker

Lisa E. Gordon-Hagerty, DOE under secretary for nuclear security and NNSA administrator, touted the work of Sandia and the entire Nuclear Security Enterprise during a B61-12 team recognition event, part of a tour of Sandia on the eve of the 75th anniversary of the Trinity Test.

"I want you to know that your work did not go unnoticed — what we have done throughout, and in spite of, COVID," she said during the July 15 live-streamed event at the Steve Schiff Auditorium. "That is amazing, because remember, the nuclear weapons stockpile does not wait for COVID to pass."

Gordon-Hagerty and Labs leaders were all quick to point out that the success of the B61-12 team is only possible because the entire nuclear weapons enterprise has risen to the challenge presented by the new coronavirus.

"The B61-12 project alone is a momentous task, but now we've thrown a lot of obstacles in their way with the pandemic, but that has not slowed them down, and they continue to stay on schedule," said Labs Director James S. Peery. "What they've done is nothing short of truly amazing."

During the recognition event — mostly watched via online streaming as social-distancing measures prevented all but a small group from attending — James and Gordon-Hagerty noted the appropriateness of celebrating the nuclear deterrence mission accomplishments on the eve of the world's first atomic blast.

"Look at where we are 75 years later," Gordon-Hagerty said. "Can you just imagine the scientific discoveries that will continue to take place over the next 75 years as a result of what happened 75 years ago tomorrow?"

"Probably the greatest scientific experiment ever known to man" unleashed an era of scientific discovery that continues now as the nuclear weapons enterprise pushes forward in trying times, she said. "We're allowing you to unleash your mind, and you're doing it for the love of your country and the love of your families and the love of keeping peace around the world. The B61-12 team is indicative of that."

B61-12 team successes

Before the NNSA administrator spoke, Jim Handrock, New Mexico weapon systems engineering director, presented specific ways that the B61-12 team had excelled while confronting the challenges of the COVID-19 pandemic.

Among the highlights Jim presented was a critical B61-12 flight test on the F-35A jet fighter at Edwards Air Force Base made possible because the Sandia team completed virtual training of personnel at the California base.

"In the COVID-19 environment, travel and getting people to the facilities is much more difficult," Jim said. "(The virtual training) allowed us to get the flight test done on time, minimize the risk to employees both at Edwards Air Force Base and at the different organizations, and get the test completed successfully."

Jim also pointed to the success of the weapon modernization lab responsible for assembly and disassembly operations, saying it led the way for developing and implementing COVID-19 safe practices for Sandia laboratory work during the COVID-19 pandemic.

"Through the process of the Weapons Modernization Lab figuring out how we can do work with technologists in the lab safely and securely, a lot of those lessons learned were used throughout the rest of the laboratories," he said. "So, they really blazed a path."

Also, part of the success was a normal and abnormal environments testing team that completed



KEEPING THE DISTANCE — NNSA Sandia Field Office manager Jeff Harrell, left, NNSA Administrator Lisa E. Gordon-Hagerty, center, and Labs Director James S. Peery practice their social distancing in front of the Innovation Parkway Office Center before touring Sandia on July 15. **Photo by Randy Montoya**

all baseline system-level ground testing under COVID-19 restrictions, keeping the B61-12 testing program moving forward.

In addition, the success of the First Production Capability Unit in completing critical work with the Kansas City National Security Campus, Los Alamos National Laboratory, Pantex and NNSA was also highlighted, along with the B61-12 systems team coordinating important reviews with Sandia/California, LANL, NNSA and the Air Force in the midst of COVID-19 restrictions.

"All of our weapons programs are faced with COVID-19 challenges. What Sandia and the entire nuclear security enterprise has done is work through those challenges," Jim said. "This is not just a Sandia, but a complex-wide recognition and accomplishment."

A day full of accomplishments

After a morning tour of the construction site for NNSA's new Albuquerque complex and before the B61-12 recognition event, Gordon-Hagerty began her day at Sandia in the parking lot of the Innovation Parkway Office Center getting her temperature taken and answering COVID-19 screening questions.

From there, the NNSA administrator's Sandia tour included updates on several national security programs, speaking at the B61-12 event, a walkthrough of a poster session on the Labs' COVID-19 research work and then an NNSA 20th anniversary event, also at the Schiff Auditorium.

At the 20th anniversary event, Gordon-Hagerty had a message for those who would bet against NNSA and Sandia accomplishing their critical national security mission.

"I believe that the people who are betting against us are challenging the ingenuity and commitment of the Sandia workforce, and that's a bet I will gladly accept," she said. "On behalf of a grateful nation, thank you. Thank you for your service and your commitment to our



POSTER DISCUSSION — NNSA Administrator Lisa E. Gordon-Hagerty reviews some of Sandia's COVID-19 work during a walkthrough of a poster session in the lobby of Steve Schiff Auditorium. The session was part of her tour of Sandia on July 15. **Photo by Lonnie Anderson**

wonderful country; helping keep our freedoms every single day by maintaining our nuclear deterrent and those of our friends and allies."

Mileposts

New Mexico photos by Michelle Fleming
California photos by Randy Wong



Rick Pike



Kyu Paek



Kim Haulenbeek



Hongyou Fan



Rush Inlow



Shayne Dilworth



Amanda Espinoza



Joseph Olguin

Building Sandia: Home of the MESA Complex

The buildings and structures at Sandia reflect a rich and varied 70-year architectural history. This is the third in a series of articles that explore the built environment of the Labs and the people who laid its foundation. See also [Building Sandia: 1940s to 1960s](#) and [Building Sandia: Late 1960s to mid-1990s](#).



WATER FEATURE — The water fountain in the middle of the MESA Complex was designed as an abstraction of silicon wafer production. Its water source is the wastewater from the water purification process used in production. Photo by Randy Montoya



CLEANROOMS — The Microelectronics Development Lab (circa 1989) was designed with north and south wings, with the cleanrooms on the first floor. The main mechanical space (center) that houses the high-efficiency particulate air filter system makes the cleanrooms possible. Photo courtesy of Sandia National Laboratories



GREEN BUILDING — The campus-like design of the MESA Complex connects the original 1980s-era facilities with newer, greener building construction from the mid-2000s. Photo by Lloyd Wilson



VIEW FROM THE TOP — Aerial views of Sandia's Albuquerque campus show the MESA Complex in the center of Tech Area 1.



Photos by Lloyd Wilson



NIGHT SHIFT — Crews at the MicroFab (circa 2009) worked around the clock on solid-state lighting initiatives to meet demand.

Photo by Randy Montoya

By **Karli Massey** and
Rebecca Ullrich

Sandia's **Microsystems and Engineering Sciences Applications** Complex is set apart aesthetically and functionally from other buildings and sites at the Labs. The complex is characterized by open spaces, community areas, pedestrian walkways and a unique water feature, elements that are intended to emphasize the integration of nuclear weapons design and microsystems manufacturing.

This intentional campus-like design connects 1980s-era facilities with newer, greener building construction. As the complex has taken shape over the decades, its architecture has maintained the same state-of-the-art quality as the facility's microelectronics capability that has influenced nearly every mission area at Sandia.

The idea for MESA facilities has its origins in the 1970s, when weapons designers at Sandia recognized the potential for large-scale integrated circuits to combine increased complexity with higher reliability — all in a smaller, lighter package. However, nuclear weapons design required that the components also be radiation-hardened and produced in relatively small lots.

This was difficult to come by in commercial production, so the Labs pursued in-house capabilities and, by 1975, was delivering custom, radiation-hardened microelectronics. The development of many satellite and space applications, such as the NASA Galileo space probe, were facilitated by Sandia's advances in this area.

This early pioneering work was performed in various buildings and small laboratories across the site. The Semiconductor Development Laboratory in Tech Area 1 housed cleanroom technology enabled by Willis Whitfield's 1960 laminar flow cleanroom design (the building has since been extensively renovated and is now home to neutron generator production). Also, as a result of this early work, the Radiation-Hardened Integrated Circuits process and components were adopted more broadly by the semiconductor industry.

CSRL and MDL

In 1987, Sandia added the Compound Semiconductor Research Lab, which included a Class 100 cleanroom space and was used for early device research based on strained layer superlattice research pioneered at Sandia. Designed with a five-year life expectancy, CSRL operated for 20 years, until its research was absorbed into the MESA Complex.



WHITFIELD KEEPS WATCH — A statue honoring Sandia researcher Willis Whitfield, who pioneered the laminar flow cleanroom design, adorns the MESA Complex. Several of the MESA facilities include cleanrooms based on his designs.

Photo by Randy Montoya

In 1988, the Microelectronics Development Laboratory was built to support Sandia's primary research role for strategic radiation-hardened, silicon-based microelectronics and manufacturing efforts. It was the most advanced, flexible and responsive facility for microelectronics research at that time. The MDL was the first purpose-built facility constructed specifically for silicon microelectronics mission work, its configuration accommodating a Class 1 cleanroom. Jack DeBartolo Jr. of Tucson, Arizona, a specialist in high-tech facility design, served as lead architect.

The three-story MDL building is steel framed with a substantial pedestal foundation to manage manufacturing equipment weights and vibration sensitivity. From an aerial perspective, the MDL site looks like an integrated circuit — the "pins" are the air circulation elements of the cleanrooms, which change the air five to six times per minute in the constant airflow of the cleanrooms.

Breaking new ground

In August 2003, Sandia broke ground on the new MESA Complex to expand, enhance and combine its microelectronics work. The MESA Complex construction effort was completed in 2007, with the addition of the MicroFab and the MicroLab, along with the Weapons Integration Facility. This multi-phase construction project was led by architects from Carter Burgess, a Dallas firm. A feature of the architectural

design is the polished stone and steel curvilinear walls that lead to the main entrances of the buildings. Wings off the buildings are accented by ribbons of windows with unique, louvered sunshades.

Like the MDL, the MicroFab building is a three-story microsystems design, development and production facility with a state-of-the-art Class 10 cleanroom. This facility has a more modern configuration that provides flexibility in the types of materials and applications used for research, facilitating the ability to develop microsystems technologies that Sandia pioneered both here and at the Center for Integrated Nanotechnologies.

The 400,000-square-foot MESA Complex stands as the largest capital project at Sandia funded by Congress, as well as Sandia's largest construction project since the first permanent buildings were constructed in the 1940s. Other features of the project are the shared utilities with other production facilities.

Construction of the MESA Complex was completed ahead of schedule and under budget, earning kudos from DOE. Sandia was permitted to reinvest unused funds from the project into the development of its new Ion Beam Lab.

The MESA Complex represents a crucial cross-road in the history of Sandia's architecture: a time when building aesthetics and innovations fully combined with functionality. 

Quantum computing expert honored by DOE

Kevin Young admitted to Office of Science Early Career Research Program

By **Michael Ellis Langley**

Sandia computer scientist Kevin Young believes that he can improve the performance of modern quantum information processors, and now the DOE Office of Science has named him to its **Early Career Research Program**, awarding him a grant to continue his work.

The program, now in its 11th year, is designed to bolster the nation's scientific workforce by providing support to exceptional researchers during the crucial early career years, when many scientists do their most formative work.

Under the program, researchers based at 17 DOE national laboratories will receive grants of at least \$500,000 per year. The grants fund research for five years and will cover salary and expenses.

Kevin is one of 76 researchers across the nation to receive the award this year and among 26 colleagues from the national labs who have participated in the program, including three who work at the three NNSA labs.

"I am gratified by the confidence in my work expressed by the DOE Office of Science," Kevin said. "Sandia has a long history of investment in quantum computing research, and I would not be able to pursue this work without the support of the many excellent scientists here at the lab."

Kevin co-leads Sandia's quantum performance laboratory and performs research focused on modeling, assessing and improving the performance of quantum computers. His winning proposal was titled, "Quantum performance enhancement."

"I am very excited to see DOE's investment," said Sandia senior manager Amanda Dodd. "His research to enable reliable quantum computation is a crucial step on the path towards transformative improvements in scientific computing."

Solving quantum computer failures

Kevin explained that the power of modern quantum computers is constrained by hardware errors that inevitably crash quantum programs.

"Quantum computers are fragile. And when they break, they can do so in diverse and complicated ways," he said. "We need to characterize exactly how they fail, then we use that

information to fix the system — or even design a better one."

Although some of the errors in quantum systems are inevitable, many of the worst errors result simply because the hardware is improperly calibrated.

"There are materials properties that limit how well a given quantum computer could possibly perform," he said. "But those limitations are almost never met in practice. Instead, it's our inability to tune the system correctly that is holding quantum computers back. And this problem only gets harder as quantum systems grow larger. We need new classes of protocols and methods that can tune these devices and prevent them from drifting off their optimal performance."

Kevin's work will encompass four main directions: using advanced quantum characterization methods to build robust calibration protocols, developing adaptive methods that maintain performance despite drifting environments, customizing these methods to disparate quantum computing platforms, and building these tools into the lowest levels of a quantum computer's control infrastructure.

"Quantum computing is a completely different paradigm of computing, and it's only now coming into its adolescence," he said. "This field thrives on daily interactions between pen-and-paper theorists and wrench-swinging

experimentalists. We are constantly faced with diverse, challenging problems, and the Early Career Research Program ensures this work will move forward."

"The Department of Energy is proud to support funding that will sustain America's scientific workforce and create opportunities for our researchers to remain competitive on the world stage," said Paul Dabbar, DOE under secretary for science. "By bolstering our commitment to the scientific community, we invest into our nation's next generation of innovators." 



QUANTUM COMPUTING — Sandia computer scientist Kevin Young has been selected by the DOE Office of Science for its Early Career Research Program.

Photo courtesy of Sandia National Laboratories

SANDIA CLASSIFIED ADS

NOTE: The classified ad deadline for the Aug. 14 Lab News is noon Friday, Aug. 7.

AD SUBMISSION GUIDELINES

AD SUBMISSION DEADLINE: Friday noon before the week of publication unless changed by holiday.

Questions to Michelle Fleming at 505-844-4902.

Submit by one of the following methods:

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Due to space constraints, ads will be printed on a first-come, first-served basis.

MISCELLANEOUS

RECLINING LOVE SEAT, leather, tan, 5'L x 3'W, excellent condition, \$300; portable generator, Champion, 3100-W, slightly used, \$500; photos available, in East Mountains. Willmas, djwillmas@gmail.com.

BEDROOM SET, 5-pc., Mediterranean, dresser w/twin mirrors, 2 nightstands, queen bed frame (no mattress), chest w/drawers & doors, beautiful, like new condition, \$300. Garcia, 505-839-2311.

VINTAGE AIRCRAFT PRINTS (5), by Charles Hubbell, includes: B-17, B-29, F-104A, F-80 & German rocket fighters, \$25 OBO. Morning, 505-463-3241.

PORTABLE ICE MAKER, electric, new, cobalt blue, never used, makes 26 lbs./24 hrs., paid \$179, asking \$125. Sowko, 505-385-4593.

PANCAKE COMPRESSOR, 6-gal., 100-pc. air tool set, framing & brad nailers, extra nails, air hoses, \$330. Glaser, 505-228-6742.

WROUGHT IRON GATE, arched top, nice, 16'W x 6'T, single swing, brown color, w/mounting post, \$1,000, delivery available. Mihalik, 505-816-8469.

TV STAND, glass/metal, 60"W x 20"H x 22"D, 3 glass tiers, \$25; microwave oven, \$15; ice chest on wheels, 42 qts., \$10. Achyuthan, 505-216-1858 or keaama@juno.com.

POWER TOOTHBRUSH, Braun, Oral-B, battery-operated, w/2 3D unopened brush heads, great for travel, \$19. Wagner, 505-504-8783.

RUBBER FLOOR MATS, manufacturer, fits '15-'18 Honda Fit, like new, \$50 OBO. Kilbane, 505-715-7681.

GYPSUM BOARD, full sheet, moisture resistant, primed, painted; OSB; tile adhesive; grout sealer; all \$20. Malcomb, 505-400-9029.

TRANSPORTATION

'12 **TOYOTA CAMRY L,** 70K miles, single owner, maintenance records, very good condition, \$10,000. Reinholz, 505-506-0705.

'16 **CHEVROLET TAHOE LT SPORT,** fully loaded, low miles, excellent condition, \$38,995. Martin, 505-379-5683 or jerelm1974@gmail.com.

'07 **TOYOTA CAMRY CJS,** 4-dr., 6-cyl., silver, new tires, great condition, 1 owner, always garaged, \$6,500. Sanchez, 505-515-5997, ask for Rosa.

RECREATION

'06 **LANCE 1191 MAX TRUCK CAMPER,** w/ slideout, self-contained, new carpet/mattress, garage kept, excellent condition, \$16,500. Horton, 505-280-4202.

'16 **TREK DOMANE 2.3,** large road bike, 62 cm frame, setup w/Tuffy tire liners & sealant-filled tubes, \$700. Rodgers, 573-356-8914.

'15 **WINNEBAGO VISTA,** 27-ft., gas, all options, 3 slide-outs, auto-leveling, onboard generator, 1 owner, only 2,090 miles, \$75,000. Saladin, 505-881-2219.

REAL ESTATE

5-BDR. HOME, 2-1/2 baths, Ridgcrest area, ~5KW solar PV, minutes to SNL, hardwood floors, granite, MLS#964949, FSBO, \$439,000. Dinge, dcdphysics@pobox.com.

3-BDR. HOME, 3-1/2 baths, 2,952-sq. ft., built in Feb. 2015, single story, front/backyards fully landscaped, Tres Colinas, gated community, Loma Colorado, Rio Rancho, \$440,000. Rodriguez, 505-379-8273.

WANTED

VOLUNTEERS, help with rescued cats, Fabulous Felines charity, fabulousfelines.org. Stubblefield, 505-263-3468.

MICROSCOPE, Bausch and Lomb, stereo zoom, for inquisitive 5-yr.-old grandson. Plut, 505-933-0333.

GOOD HOME, female Yorkie, 9 yrs. old, 3-lbs., might do better as only dog, can share photos. Padilla, 505-974-8097, call or text.

AD RULES

1. Limit 18 words, including last name and home phone (web or email address counts as two or three words, depending on length).
2. Include organization and full name with ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. The same ad may not run more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce and retired Sandians only.
10. Housing listed for sale is available without regard to race, creed, color or national origin.
11. Work wanted ads are limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in poor taste.

Helping medical workers

CONTINUED FROM PAGE 1

Mayberry reached out to Sandia after receiving an inquiry from a local hospital to see if the company could help address the potential shortage of N95 respirators. Certified N95 respirators are worn like masks and protect users from 95% of airborne particles and liquid contamination.

Sandia has the equipment and expertise to help, and within a few days after Marpac reached out, a team of scientists began working on the challenging task of modifying systems to make sure samples were tested properly.

Sandia principal investigator Michael Omana said the team modified aerosol and filtration systems typically used for nuclear nonproliferation work. They had to reduce the systems' airflow significantly to mimic the rate that humans breathe. They also modified existing test boxes to quickly mount and seal the samples inside prior to running them through the testbed.

"We were tapped about the first project with Marpac on a Thursday and drafted the scope of work and contract by Friday," Michael said. "By Monday or Tuesday, we had finished all system modifications. Initial testing of the first set of materials was completed by the end of the week, and data was provided to Marpac."

Initial test materials underperformed, with the best sample coming within 10% of the desired filtration levels. Within a couple of weeks, the researchers started seeing promising results from new material compositions. Creativity in combining materials resulted in samples with protection levels comparable to N95 respirators.

Marpac manufactured 500 N95-like respirators using the materials Sandia tested, and Mayberry

said they passed fit tests at a local hospital. They're also looking into additional medical facilities that could use the product.

"We feel fortunate that the local hospital provider came to us after seeing our capabilities," said Mayberry. "This definitely stretched us out of our comfort zone, and certainly without the technical support from Sandia Labs, this would have been hard to validate all the types of materials that would be likely constructed into a respirator."

Jumpstarting a solution

Working quickly was critical for the projects, Sandia distinguished technologist Dora Wiemann said, and the team put in long hours — including on weekends.

The projects with each company built upon each other. For the first project with Marpac, researchers tested sheets of composite materials provided by the company in the large, modified filtration system.

For the second project with Sierra Peaks, additional test-box modifications enabled the scientists to mount and seal samples cut in respirator geometries, and to complete comparison studies against certified N95 respirators.

The third project with Sew-EZ, which is ongoing, involves further sample testing using the filtration system and an additional commercial-off-the-shelf system, which is typically used by industry to certify products like N95 respirators.

"Sandia is not a certification lab, but the joint use of the systems enabled us to provide data that may be compared against products which have been certified through traditional avenues," Michael said. "This data will help the company if it chooses to seek certification of its product through the proper organizations."

Michael and a couple of other researchers test the materials in the lab, then forward data to be



NMSBA PARTNERSHIP — Sandia distinguished technologist Dora Wiemann uses this system to test materials for Albuquerque companies through the New Mexico Small Business Assistance program. **Photo by Bret Latter**

processed into quantitative results. The timeline on all projects has been tight, but the researchers said promising tests have been rewarding, especially because the result has the potential to help people during a time of crisis.

"I'm glad to be in the position I am so that I can help with this really big issue with characterizing materials that can be used for N95 replacements," Dora said. "By the end of the initial modifications and testing, we were a very close-knit team, solving an important problem. It was exhausting and exhilarating." 



COMPETITION MODE — Two teens compete during the final event of the virtual robotics camp. To allow for social distancing, only one member of each team participated in person, adding the challenge of communicating remotely with other teammates during the event.

Virtual robot camp

CONTINUED FROM PAGE 1

"A lot of the time, what happens is a team of kids builds a robot and there's one kid that does all the programming and knows how it works. To everybody else, it's a big mystery," said Bryce. "One of the things that we tried to do with this particular group was make sure that everybody has some programming skills so that when they go on, they can teach other kids. Or, if they work together on a team, there won't be one person that does the mysterious programming that nobody else understands."

Virtual teamwork, career education

Teams were formed for the competition that took place on the last day of camp in Rio Rancho. One teen from each team competed in person while collaborating with their teammates at home. This provided a way for the group to socially distance during the competition, and it added an additional challenge of communicating remotely while working together to drive robots successfully across an arena using coding and software they learned.

Another component of the camp was career education. Throughout the week, Sandia employees in a variety of positions at the Labs presented to students about their jobs. Shelly Gruenig, who heads R4 Creating, said in addition to the robotics training, the careers element teaches the teens about what they can work toward in the future, and that job opportunities at Sandia are wide and varied, extending beyond STEM to management positions, business and human resources.

One student in the camp said the weeklong virtual experience was an incredible opportunity to work with Sandia employees who are professionals in their field, and he appreciated the hands-on experience, even from far away.

This was the third annual Robotics Training Institute held in collaboration with R4 Creating. Last year, [students built 3D printers](#) and competed to win the best original 3D print using modeling software programs. Earlier this year, the same 3D printers were used by the teens to [make thousands of face shields](#), which were donated to medical facilities in New Mexico to help protect workers from exposure to COVID-19. In 2018,



ACROSS THE ARENA — A camp participant holds an image of the arena used during the camp competition.

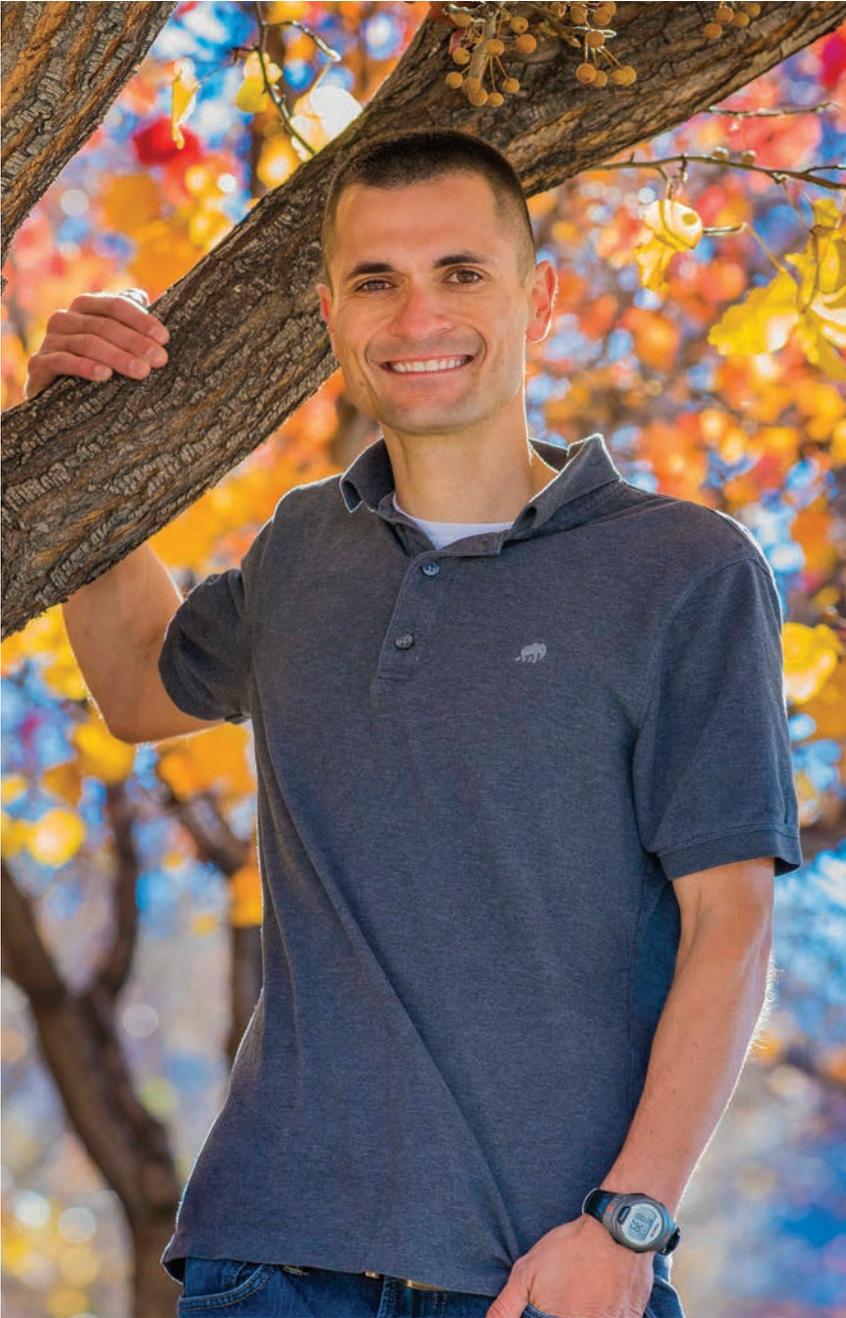


CAMP COLLABORATION — The robots for the camp were purchased by R4 Creating with a grant from National Technology and Engineering Solutions of Sandia. Sandia has collaborated with the nonprofit organization on the camp for three years.

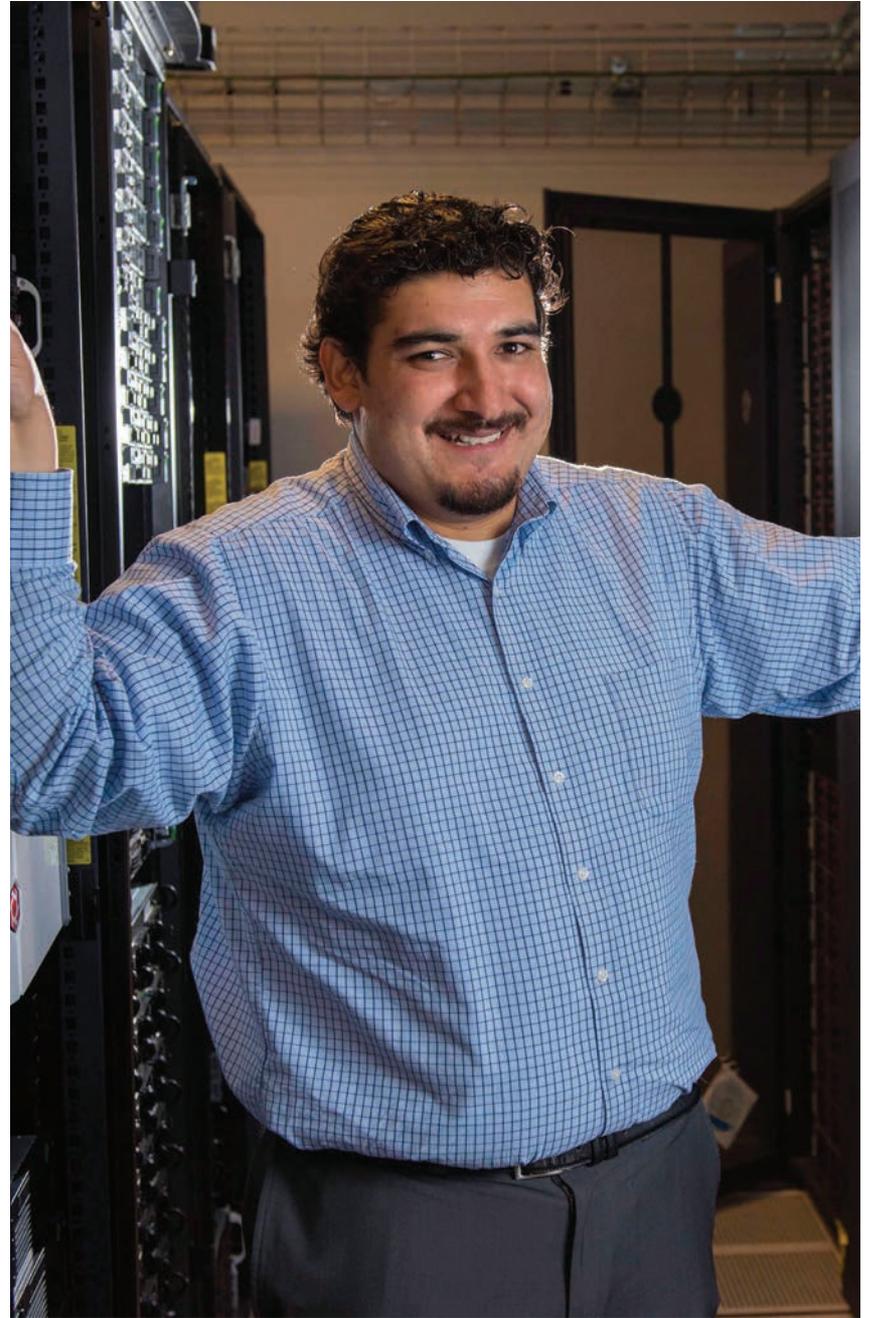
the camp took place during Sandia's Robot Rodeo, and the students were able to use robots in various challenges, including competing against professional bomb squads from across the U.S. that were visiting the Labs for the week-long event.

This year, R4 Creating received a grant from National Technology and Engineering Solutions of Sandia, which helped make the camp possible. The grant went toward purchasing all of the robots for the teens who participated. 

Cybersecurity researchers take spotlight at national showcase



ZERO DOWNTIME — Sandia computer scientist Adrian Chavez pitched two cybersecurity tools, CAPSec and ADDSec, to potential investors at the DOE-sponsored Cybersecurity Technology Virtual Showcase in July.



MASTER OF DECEPTION — Sandia computer scientist Vince Urias pitched two cybersecurity tools, CHIRP and HADES, to potential investors at the DOE-sponsored Cybersecurity Technology Virtual Showcase in July. **Photos by Randy Montoya**

By **Troy Rummler**

Two Sandia computer scientists are earning national recognition for cybersecurity platforms they conceived. Adrian Chavez and Vince Urias were invited to pitch their software to investors, entrepreneurs and prospective customers at a special virtual event sponsored by DOE to accelerate the commercialization of federally developed technologies.

Combined, Adrian and Vince led the development of four of the technologies showcased.

“We’re developing tools to even the playing field between cybersecurity analysts and hackers,” Vince said. “Analysts are outnumbered, and hackers only need one vulnerability to get into a system and hide.”

Adrian describes some of these tools as “frameworks for automated defenses that respond at machine speed instead of human speed,” empowering defenders.

Cyber Capital Partners, a Washington, D.C.-based investment and consulting firm made the final selection of technologies and hosted the event in support of DOE.

The Cybersecurity Technology Virtual Showcase ran July 21-30.

CAPSec: Containerized Application Security for Realtime Software Upgrade and Patching

In an iconic scene from the movie *Raiders of the Lost Ark*, treasure hunter Indiana Jones deftly attempts to replace a small statue with a counterfeit, without disrupting a sensitive array of booby traps.

Security upgrades for power grids, oil refineries, water pipelines and other critical

infrastructure systems sometimes can be just as perilous. Taking software offline for updates can incur costly service disruptions, but putting off updates until maintenance is scheduled leaves systems vulnerable to attack.

Sandia has created an ability to continuously update software without any downtime, making these systems more secure without affecting the availability of critical systems.

Called Containerized Application Security for Realtime Software Upgrade and Patching, or CAPSec, the platform runs multiple copies of software simultaneously. One runs while another is updated. Then they seamlessly swap places without dropping any information.

ADDSec: Artificial Diversity and Defense Security

Critical infrastructure environments are increasingly connected to the internet, creating new risks for cyberattacks. Yet they continue to use predictable communication paths, static configurations and unpatched software, all of which benefit adversaries.

Sandia has developed **Artificial Diversity and Defense Security**, or **ADDSec**, which automatically detects threats within industrial-control-system computing environments in real time. Machine-learning algorithms recognize anomalous behavior and then classify these anomalies into categories of attacks. The response approach randomizes IP addresses (numbers that identify the system’s location on the internet), application port numbers and communication paths between computers, rendering useless any knowledge the hacker might have gained about the network when they return to deploy an attack.

CHIRP: Cloud Hypervisor Forensics and Incident Response Platform

Businesses that use cloud-based services lose some degree of control over their cybersecurity because they don’t have access to every part of the system.

One method to restore this visibility is the **Cloud Hypervisor Forensics and Incident Response Platform**, or **CHIRP**, a cloud-based platform that enables analysts to track and record attacker actions for forensic analysis. The platform also may be used to disrupt malicious copying, deleting, encrypting and relocating of data in a cloud-based environment.

A hypervisor is a link between a cloud service and its users.

The platform collects evidence when adversaries attempt to gain access to unauthorized information through malicious online activity and provides information to incident responders in real time, without disturbing the user’s work or alerting the intruder.

HADES: High-fidelity Adaptive Deception & Emulation System

Rather than simply blocking a discovered intruder, Sandia technology can ensnare them in an alternative reality. The **High-fidelity Adaptive Deception & Emulation System** feeds a hacker not what he needs to know but what he wants to believe.

The discovered hacker is led unobtrusively into **HADES**, where cloned virtual hard drives, memory and data sets simulate reality. Certain artifacts have been deliberately, but not obviously, altered.

When hackers discover the deception, they aren’t in any better shape. The value of all their data is thrown into question as they attempt to unravel how long they’ve been misled and which assets are real. They expose themselves and their techniques as they try to discern truth from fiction. 