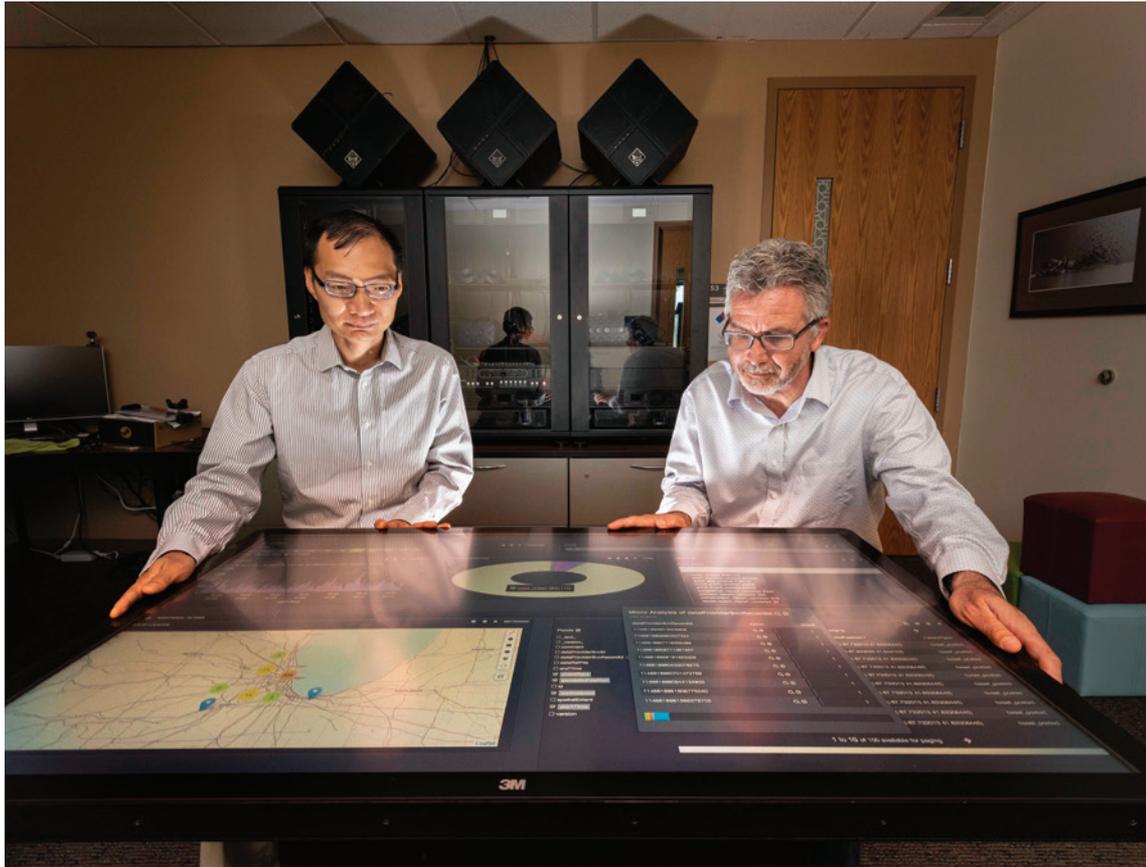




Wrangling big data into real-time, actionable intelligence



WRANGLING DATA — Computer scientists Tian Ma, left, and Rudy Garcia led a project to deliver actionable information from streaming data in nearly real time. Photo by Randy Montoya

By Kristen Meub

Social media, cameras, sensors and more generate huge amounts of data that can overwhelm analysts sifting through it all for meaningful, actionable information to provide to decision-makers such as political leaders and field commanders responding to security threats.

Sandia researchers are working to lessen that burden by developing the science to gather insights from data in nearly real time.

“The amount of data produced by sensors and social media is booming — every day there’s about 2.5 quintillion (or 2.5 billion billion) bytes of data generated,” said Tian Ma, a computer scientist and project co-lead. “About 90% of all data has been generated in the last two years — there’s more data than we have people to analyze,” he said. “Intelligence communities are basically overwhelmed, and the problem is that you end up with a lot of data sitting on disks that could get overlooked.”

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Steve Younger signs annual stockpile assessment letter

Laboratories Director Steve Younger signed Sandia’s annual nuclear weapons stockpile assessment letter in late September. Completion of this annual assessment letter is required by law, and is one of the principal responsibilities of the Labs director.

The annual assessment encompasses the safety, reliability and performance of the elements of the nation’s nuclear weapons stockpile for which Sandia is responsible. The assessment process involves a set of exhaustive internal and external expert reviews on each weapon system, and represents the culmination of many months of work engaging every division at Sandia.

The directors of NNSA’s three nuclear weapons laboratories (Sandia, Los Alamos and Lawrence Livermore) and the commander of the U.S. Strategic Command each provide an annual assessment letter to the secretaries of energy and defense and the chair of the Nuclear Weapons Council. The letters are then submitted to the president along with the secretaries’ comments, conclusions and related information about the state of the nation’s nuclear deterrent.



Photo by Rebecca Gustaf

Hate to wait? Hruby Fellow looks to speed up climate research

Early-career researcher to lead project

By Troy Rummler

Presumably, Leonardo da Vinci could have saved a lot of time on his Mona Lisa if he had just slapped on two dots and a swoosh for a smiley face. But details take time. The same goes for running computer models and simulations. If you want oceans of calculations to study something as complex as Earth’s climate, you’d better be prepared to wait.

That can be a problem for a couple reasons. If your wait drags on for days or weeks, you might have to find a better computer, which isn’t always possible, or ask a simpler question, which could defeat the point of the research.

Sandia has awarded Kelsey DiPietro a Jill Hruby Fellowship, named for the first woman to direct a U.S. national security laboratory, to tackle this issue. The applied mathematician has proposed a way to make computer models more efficient — improving accuracy without increasing time or resources to run them.

Kelsey’s technique changes how often a model makes calculations. If a model using her algorithms were predicting the thickness of an ice sheet over a large area, it would sprint through areas where there’s little change from one



HRUBY FELLOW — Sandia has awarded Kelsey DiPietro a Jill Hruby Fellowship for her work in applied and computational mathematics. Photo courtesy of Ira Satinover

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HENAAC awards

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AISES award

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Active shooter exercise

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Hispanics and STEM education at Sandia

By **Ken Armijo**

The population of Hispanics/Latinos in the United States is expected to grow by approximately 40% by 2045, although only approximately 14.4% have bachelor's degrees or higher and 7% are employed in science, technology, engineering and mathematics industries.

Since 1990, STEM employment in the United States has grown 79% (9.7 million to 17.3 million), whereas computer technology-based jobs have seen a very significant 338% increase over the same period.

Presently at Sandia, Hispanics and other minorities make up a significant 34% of the overall workforce. That number is expected to increase, thus promoting diversity at our sites.

Inspired by parents and mentors

As a second-generation Hispanic growing up on a rural New Mexico farm, I was inspired by my parents and mentors to seek a college education. They understood the importance of education and the positive impact this would have on our culture and future agriculture in the community. Studies from the Pew Foundation have shown that second-generation Hispanics have a higher attainment of college degrees by 36% versus 29% for their first-generation parents, due in part to increased encouragement from their parents and access to educational resources throughout their entire education.

During my upbringing, I became acutely aware of the challenges and hardships that my relatives, friends and migrant workers (with whom I worked while at the University of California, Berkeley, conducting SEGURO research in California's Central Valley) had to face when trying to attain the American dream here in the United States. As a result, I realized that education was the only way forward to a better and more successful career. My focus became clear: I needed an education to help inspire and mentor other Hispanic students as my parents did for me.



HOMBRE DE CIENCIAS — Ken Armijo at Sandia's National Solar Thermal Test Facility.

Photo courtesy of UNM Alumni Association

When I received my doctorate in mechanical engineering from University of California, Berkeley, I was elated. However, at the same time, I was disappointed by the very low percentage of science and engineering doctorates that were awarded to Hispanics and other minorities from the top 10 universities that year. This elucidation encouraged me, at the end of my UC Berkeley program, to make changes that were direly needed to promote diversity. I began facilitating STEM outreach programs to students in middle and high schools with high minority enrollment. This experience had positive outcomes, enabling me to bring these educational programs to New Mexico when I started my tenure at Sandia.

Commitment to 'Noche de Ciencias'

My colleagues and I at Sandia and other institutions (Intel, General Mills and the University of New Mexico) have created "Noche de Ciencias" (Science Nights) events for K-12th-grade students and their parents, to teach them about the value of getting an education, particularly a college degree in a STEM field. Many of these events have also brought together middle and high school students to interact with Hispanic engineering college students from UNM, Central New Mexico Community College and the New Mexico Institute

of Mining and Technology, stimulating pipeline learning and inspiration. These events provide students with activities to encourage and excite their interest in STEM. At the same time, we conduct bilingual workshops for parents, emphasizing the value of college education for their children and how to receive financial assistance so that they can graduate with college STEM or vocational degrees.

Sandia for years has promoted diversity and STEM outreach. The resources provided by Sandia's community involvement program have truly made a remarkable impact, ensuring that all populations, including Hispanics, women and other minorities from pre-K to doctorate, will receive the same opportunities in obtaining STEM degrees here in New Mexico.

Our consortium of industry and academic partners, led by Sandia, has also facilitated other STEM programs, giving students more opportunities than their families previously had. The group also sponsors activities that connect the sciences to students' Hispanic heritage in unique ways.

Overall, it is vitally important that these efforts continue. They not only help to enrich our cultural heritage, but they also enhance the quality of our scientific community. 

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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 tadesh1@sandia.gov.

Weapon Intern Program graduates 24th class



CLASS OF 2019 — The Weapon Intern Program recently celebrated the graduation of its 24th class. Participants come from throughout the Nuclear Enterprise to learn about the challenges of maintaining the nation's nuclear deterrent for the future.

Photo by Lonnie Anderson

Strategic Priority No. 6

Visionary research and engineering for future national security challenges

By **Susan Seestrom**

Chief Research Officer and Associate Labs Director for Advanced Science and Technology

Sandia is unique in the national laboratories complex for our ability to combine foundational science and science-based engineering to solve national security challenges. We thrive in Pasteur’s Quadrant, the term writer Donald Stokes coined for use-inspired science that bridges purely foundational science and purely applied science. Use-inspired science brings together the quest for fundamental understanding of our universe with ideas for deploying that research to solve specific problems.

		Considerations of use?	
		No	Yes
Quest for fundamental understanding?	Yes	Pure basic research (Niels Bohr)	Use-inspired basic research (Louis Pasteur)
	No		Pure applied research (Thomas Edison)

Strategic Priority No. 6, “Deploy outstanding engineering, science and technology to our mission,” is about actively supporting research at Sandia that takes full advantage of our strength in Pasteur’s Quadrant to develop creative, cutting-edge solutions to emerging national security challenges that would have been unimaginable only a few years ago.

Our ability to bridge between foundational science and applied engineering has had profoundly important results, from the development in 1960 of the clean room, which provides the assembly environments required to produce high precision switches for nuclear weapons, to the Z machine, a science and engineering accomplishment that today is used for national security and foundational physics tests not even envisioned when the machine was designed.

Strategic Priority No. 6 is essential because of the increasing complexity of our national security landscape. We must begin now to address the threats coming in the next several decades as the pace of technological change and the potential for technology surprise continues to increase, and international relations gain more players and more points of conflict.

Because of this fast-changing landscape, work on Strategic Priority No. 6 began by assembling a multidisciplinary team of early, mid and late-career subject matter experts to brainstorm and identify research areas that could dramatically enhance Sandia’s national security impact over the next 20 to 30 years. We then selected visionary research themes emerging from this brainstorming that merited additional exploration. In September, we presented the six most promising visionary research themes to the Sandia leadership team:

- From bits to brilliance – Creating a computing ecosystem that is ubiquitous, integrated across our missions and all scales of the computing technology stack, and uses emerging and undiscovered technologies and architectures to meet mission needs.
- Assessing the impact of geo-engineering – Evaluating efforts to mitigate the impact of climate change, and detecting efforts by adversaries to use geo-engineering as a weapon.
- Inherently safe, resilient, modular nuclear weapons – Research for nuclear weapons in the 2050s and beyond.



Chief Research Officer and Associate Labs Director for Advanced Science and Technology
Susan Seestrom
Photo by Lonnie Anderson

- Human augmentation – Ethical research and development on human augmentation for defensive purposes.
- Mission impact of Z-Next beyond nuclear weapons – Assuring institutional participation and benefit across the Labs’ national security missions from the proposed Z-Next facility.
- Non-nuclear strategic weapons – Providing options for strategic strike without using nuclear weapons.

The visionary research themes that emerged from this process target emerging existential threats to or opportunities for national security that make full use of Sandia’s expertise. They will either use or extend existing capabilities or allow us to create new capabilities via research partnerships. They will involve divisions and centers across the Labs, and they will motivate and attract top-level talent. They build on strengths widely recognized by our stakeholders and offer a path to future sponsorship. Finally, these visionary research themes address “Sandia-hard” problems that require discovery science and ultimately groundbreaking engineering.

Even if individual projects in these visionary research themes fail, they will succeed by generating knowledge to reach their immediate goals, knowledge that we can use to guide subsequent ideas.

To ensure these visionary research themes have traction at Sandia, the selected themes will have an associate laboratories director sponsor who will be responsible for building a business strategy and actively supporting the development of proposals to fund related activity. My organization will help by providing an interface to the Laboratory Directed Research & Development program and our Office of Science and Weapons Science & Technology portfolios, and our partnerships organization. Sponsorship decisions will be made during an upcoming Sandia leadership team meeting in the context of the needs of all six strategic priorities.

During my time as a practicing physicist, I routinely turned to engineers to help make my experiments a reality. This experience has given me a great respect for what foundational science and applied research can accomplish when they work together, and I anticipate our implementation of Strategic Priority No. 6 will produce amazing contributions to national security challenges. I also strongly believe our work on this strategic priority will unleash new opportunities for staff across the Labs to propose and participate in exciting research that will shape the future of science and engineering.



CONGRESSIONAL VISIT — From left, Labs Director Steve Younger, U.S. Representative Deb Haaland and NNSA Sandia Field Office Manager Jeff Harrell.
Photo by Rebecca Gustaf

U.S. Rep. Deb Haaland visits Sandia

U.S. Representative Deb Haaland visited Sandia’s Albuquerque campus Oct. 1 to learn more about Sandia’s mission and receive briefings on topics that are likely to come before her as a member of the House Armed Services Committee, which she joined in January. Rep. Haaland has served as an honorary commander of Kirtland Air Force Base since 2016.

During her visit, Rep. Haaland toured several Sandia facilities, including the Nuclear Deterrence Display Area and the Microsystems and Engineering Science Applications facility, where she learned about the important work MESA does to support Sandia’s nuclear deterrence and space missions. She also received briefings on hypersonics development and space-based monitoring programs.

National Hispanic science and engineering organization honors two Sandians

By **Troy Rummler**

Photos by **Lonnie Anderson**

Materials scientist Nic Argibay and ES&H senior manager Rafael Gonzalez were honored at the 31st annual Hispanic Engineer National Achievement Awards Conference by Great Minds in STEM, a nonprofit organization that recognizes Hispanic leadership and achievement in science, technology, engineering and math. Nic received a Most Promising Scientist or Engineer award and Rafael received a Luminary award during the conference in late September.

HENAAC awards represent Hispanic contributions at the highest levels of academia, government, military and industry. Luminary honorees are professionals who lead key programs within their companies and who have made significant contributions to the Hispanic technical community as leaders and role models.

Nic Argibay

Nic has made outsized contributions to the scientific field of tribology, the study of interacting surfaces in relative motion, including the principles of friction, lubrication and wear. He has received more than \$7 million in scientific grants and awards leading to groundbreaking discoveries such as the in-situ formation of diamond-like carbon on platinum-gold substrates and one of the most wear-resistant materials ever tested.

“Ultimately, we developed an alloy that is insensitive to remarkable amounts of temperature and mechanical stress,” Nic said.

Nic’s work with high-entropy alloys, metals that blend similar proportions of several elements, has led to multiple invitations to speak at conferences, colloquia and seminars worldwide.

He currently serves on the board of directors of the Society of Tribologists and Lubrication Engineers, a position he was elected to in recognition of his many contributions to the tribology field and his service to the society.

The son of a computer programmer and a physicist, Nic moved to Miami, Florida, from Montevideo, Uruguay, when he was nine.

“They sold everything they owned, with the exception of the contents of a few suitcases. My parents were nuts. So courageous. I’m so grateful they did what so many wouldn’t dare to try,” Nic said.

That same year, Hurricane Andrew, one of



LUMINARY— Rafael Gonzalez received a 2019 Luminary award from Great Minds in STEM.

the most destructive hurricanes ever recorded in Florida, struck their new home. Nic’s parents were undaunted in starting their new life despite the immediate upheaval.

One of Nic’s early mentors was a prep school physics teacher who formed a physics club and organized a trip to watch a space shuttle launch. “I remember thinking, ‘this is what I want to spend my life working on,’” he said. Nic pursued a career in aerospace engineering. Unsurprisingly, he is now an airplane enthusiast and has a pilot’s license.

Nic came to Sandia in 2011, immediately after receiving his doctoral degree in mechanical engineering from the University of Florida, transitioning from a postdoctoral researcher to a permanent member of the R&D staff in 2013.

His manager, Cole Yarrington, said, “Nicolas has also demonstrated, without expectation of recognition, his commitment to giving back to the community through his public school and university outreach.”

This outreach has included coaching a National Science Bowl team and helping high school students craft experiments for a STEM outreach program.

Rafael Gonzalez

As a child, Rafael loved spending time in his grandfather’s carpentry shop, where he gained

mechanical skills and learned life lessons that proved equally useful in life.

“Mi abuelo was the wisest individual that I have ever met, even though he only completed primaria (elementary school),” Rafael said. “He taught me that working hard with integrity and doing your best with purpose was the most important thing in life — whether you were a *barrendero* (street sweeper), engineer or a carpenter like himself.”

Rafael’s hard work in school paid off when he unexpectedly met the president of the University of Texas at El Paso, who was visiting Rafael’s high school to promote a financial assistance program for Mexican students. Rafael, who grew up in Chihuahua, Mexico, had wanted to study at an American university but could not afford to do so. The morning after graduation, he took the SAT exam, scoring high enough to qualify for the support and acceptance to UTEP, where he ultimately received bachelor’s and master’s degrees in electrical engineering.

“Rafael is known for his passion and boundless energy,” said MESA director Dave Sandison. “Given that I see how much effort he puts into his work, I’m always amazed (no longer surprised) to learn how much he does in the community.”

Deeply committed to STEM education for Hispanics, Rafael initiated the first *Noche de Ciencias* (Science Night) in New Mexico in 2016, which has led to 800 middle school students participating in science and technology activities and 150 parents attending bilingual workshops.

Rafael has served in many community organizations, including the United Way Hispano Philanthropic Society, where he helped establish a mentoring program, and the Middle School Initiative Fund for low-income, Hispanic middle school students. He is a past president of the Society of Hispanic Professional Engineers and the New Mexico Society of Professional Engineers. He is currently deputy co-chair of Sandia’s Hispanic Outreach for Leadership and Awareness organization and serves on the boards of directors for New Mexico Mathematics, Engineering and Science Achievement — a group that helps prepare students for college and careers in STEM fields — and the New Mexico Museum of Natural History and Science Foundation.

In 2015, Rafael joined Sandia as an R&D manager in MESA, where he oversaw research programs and production operations for radiation-hardened microsystems technologies. His work enabled new and increasingly powerful technology for critical national security programs, the nuclear weapons stockpile and nuclear deterrence. Rafael is currently a senior manager for performance assurance and engineered safety to ensure efficient, effective and safe operations across Sandia. 



PROMISING SCIENTIST — Nic Argibay received a 2019 Most Promising Scientist or Engineer award from Great Minds in STEM.

Associate Labs Director a 'humbling' position for McIlroy

New ALD Andy McIlroy talks about inclusiveness, pride and leadership

By **Michael Ellis Langley**

Andy McIlroy plans to keep the people of Integrated Security Solutions and Sandia's mission at the core of his decision-making process as the new associate labs director.

By the end of this year, Andy will have spent 25 years of his career at Sandia, finishing 2019 in a position he said he could not have imagined he would have as a young researcher.

"When I think back when I was a postdoc here, I'm not even sure I knew at the time who the vice president was," Andy said with a smile, as he looked back at his path to becoming the leader of Integrated Security Solutions. "As a staff member here, it seemed like the directors were awfully lofty people, and that wasn't something that I even thought I could aspire to."

Andy, the former energy and homeland security center director, was appointed as the acting ALD when Dori Ellis became deputy labs director on June 28.

"I had 250 people in my previous center. We have 1,900 people in the division," Andy said. "I had this moment when I realized, 'Wow, I'm ultimately responsible for all of this.' It's a bit humbling, I would say."

Andy said he believes he can add value to the role.

Historically high work level

"One of the real challenges of the Integrated Security Solutions ALD position is that we cover the full breadth of what Sandia does, both operationally and in the mission space," he said. "We have a historically large amount of work going through the division right now. We're certainly as busy as we have been in several decades. We're at an all-time high in terms of the number of employees and our budget. The nation is looking to us to deliver on a number of fronts that are critical to our national

security. That's an awesome responsibility."

Andy said being "all about the people is a well-worn cliché," but is actually true in this case.

"At the end of the day, we can't do the national security work that we do without the professionals that make it happen across the entire division," he said, adding that he learned years ago that diversity and inclusion are a vital part of realizing success in our mission.

Andy said he wants to help everyone at Sandia's California site understand how their contributions are part of exceptional service in the national interest.

"It really does require everyone to be all in for us to be successful for a lot of what we do," he said. "That includes solid buildings and good lighting, to state-of-the-art computational infrastructure and the best colleagues to sit down next to you — which means you need a solid HR department. You've got to be able to buy that equipment, so you need a procurement team behind you. You've got to be able to do the work securely, and we've got to do the work safely so we can go home to our families and loved ones each day."

Pride in Sandia's purpose

Most of all, Andy said, he wants everyone to feel the same pride he does in being a Sandian.

"I am an introvert in a social sense, but I do enjoy showing off Sandia because it is a fabulous place where amazing people work," he said.

Andy said that Integrated Security Solutions performs much of the cutting-edge science and security work that Sandia is tasked with — particularly in nuclear deterrence.

"The W80-4 program is nearing its peak," he said. "It's the largest single program at Sandia. That program spends \$1 million a day, every day, 365 days this year. That's the scale, which makes the program something that's really important for the nation. Being proud of being part of an



Associate Labs Director Andy McIlroy

Photo by Michael Padilla

organization that is doing something so fundamentally important is something that everybody — support staff, scientists and engineers — should genuinely feel."

Andy said he has some work to do: filling three director-level vacancies and making sure the people and facilities are ready to handle the influx of work and responsibilities. One of the first things he intends to do is hold forums to explain how every center contributes to the success of the division.

But he stressed that he wants the work to be a rewarding element in the well-rounded lives of 1,900 people.

"I do appreciate the ability to have a balanced life, and I want to make sure our folks have the bandwidth to do that," Andy said. "It's one of the things that makes Sandia an attractive place to work. It's something that I valued as part of my Sandia experience, and I hope that others do as well. I hope to continue to be a role model in that aspect." 

Lisa E. Gordon-Hagerty signs first-ever NNSA LDRD Strategic Framework

By **Amy Treece**

Under Secretary for Nuclear Security and NNSA Administrator Lisa E. Gordon-Hagerty signed the first-ever Laboratory/Site-Directed Research & Development Strategic Framework in August.

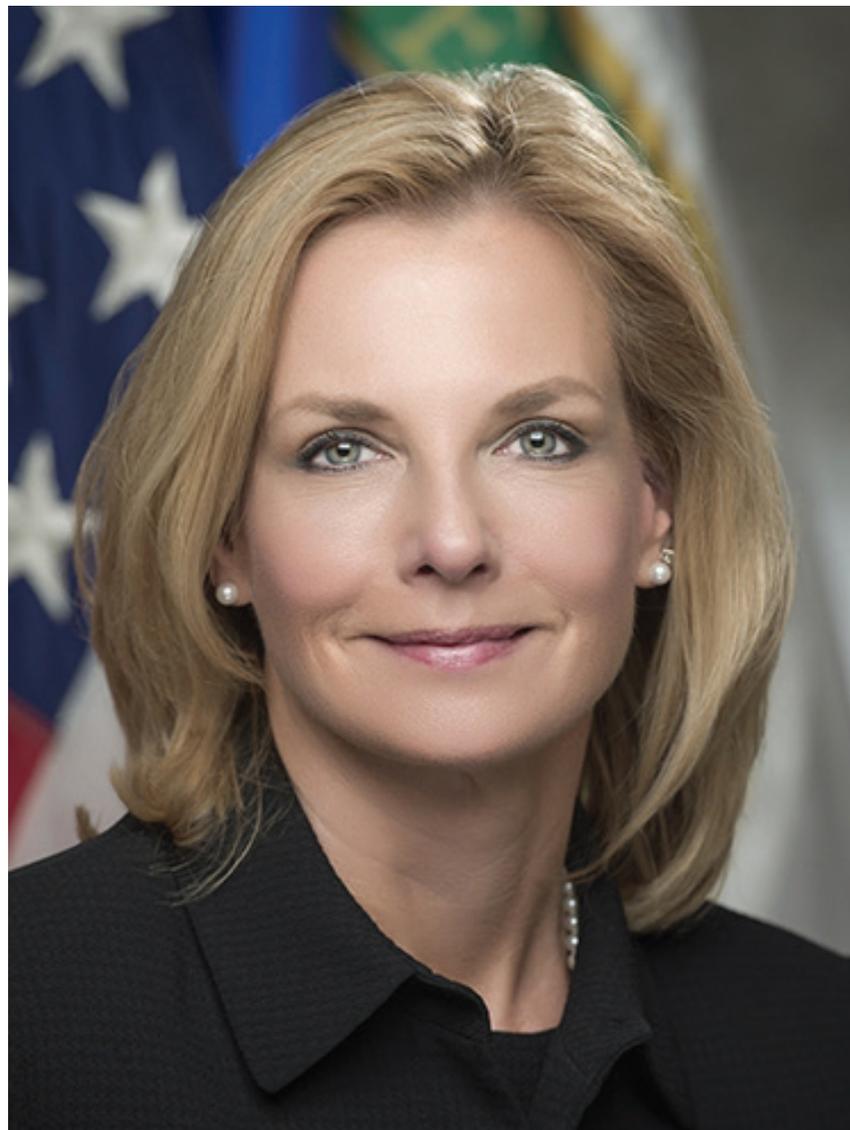
Sandia National Laboratories Director Steve Younger, Lawrence Livermore National Laboratory Director William Goldstein, Los Alamos National Laboratory Director Thomas Mason and Nevada National Security Site President Mark Martinez also signed the framework, which highlights the critical role LDRD/SDRD plays in attracting and developing a world-class technical workforce and meeting four national security challenges.

These challenges include providing an agile, flexible and effective nuclear deterrent, protecting against all weapons of mass destruction threats, deterring and defending against threats in multiple domains and strengthening our energy and environmental national security. When Gordon-Hagerty added her signature to the document, it formalized NNSA's belief that LDRD/SDRD is essential to meeting current and future DOE/NNSA missions.

Sandia LDRD projects involve high-risk research and development, provide potentially high-payoff results, enable national security missions and advance the frontiers of science, technology and engineering. Congress established LDRD as an initiative in 1991 to ensure the laboratories' scientific and technical vitality and serve as a proving ground for new R&D concepts that align to mission priorities.

LDRD funding is discretionary, which means top scientists and engineers from Sandia, LLNL, LANL and NNSA can propose creative and revolutionary projects that explore the forefront areas of science and technology. At Sandia and the other sites, cross-cutting teams review proposals and fund the projects most likely to enable agile responses to national security challenges and/or advance the frontiers of science, technology and engineering. It can take many years before the strategic impact of LDRD on the mission is seen, but when it is realized, NNSA and congressional leadership comprehend the true value of the R&D being done.

The signing of the framework confirms that the return on investment for our country is being demonstrated. We are safer because of the top R&D scientists and engineers who, through their valuable work, quietly reduce the risk of technological surprise and prepare America for an uncertain future. 



DOE Under Secretary for Nuclear Security and NNSA Administrator, Lisa E. Gordon-Hagerty
Photo courtesy of the National Nuclear Security Administration

Autonomy New Mexico interns build drones to test hypersonic tech

By **Troy Rummler**

Sandia is developing autonomy and artificial intelligence for flight systems soaring at more than 3,800 mph. The technologies to get there will initially be tested on drones that shuffle around at about 5 mph.

“We want to ensure success before we test technologies on hypersonic flights,” Sandia manager Jay Brown said.

A team of college interns contributed to the hypersonic goal this summer by completing the first two drones the Labs will use to try out new algorithms for autonomous navigation, guidance and control and target recognition.

The internships were provided by Autonomy New Mexico, a Sandia-led academic coalition to achieve autonomous hypersonic flight.

“The AutonomyNM drones provide Sandia an agile platform to quickly evaluate our abilities,” Jay said.

Each drone — a quadcopter and a hexacopter — passed a final flight test before students returned to school for the fall semester. The vehicles demonstrated an ability to position themselves, update their position coordinates and recognize and land on a target.

Vehicles designed for a variety of experiments

These drones are built for flexibility. Users upload and update algorithms remotely, in a variety of programming languages, over a Wi-Fi connection. A USB camera can be popped out and replaced to experiment with different sensors.

Each vehicle is equipped with two onboard computers — a smaller one that controls the rotors and a more powerful one that processes visual information from the camera. Both computers,

however, had strict size and weight constraints to keep the drones light enough to fly. This limitation challenged the team to come up with efficient programming strategies.

“The algorithm has to be able to run fast enough to give usable results,” said Sandia scientist Logan Wright, who served as an adviser to the team. “An obstacle detection algorithm isn’t very useful if it detects an obstacle after you’ve already run into it.”

The group tested their vision algorithms by walking through a test space with a camera, taking pictures. They uploaded the pictures to the drones along with an algorithm to assemble the images into a 3D map. Then the team sent instructions to the drones to move to specific coordinates. The drones oriented themselves by comparing what they saw through their cameras with their internal maps and then flew to the correct spots.

Autonomous flight a multidisciplinary challenge

Hypersonic vehicles fly miles above the ground, so engineers have enormous creative latitude when developing and programming vehicles for open skies. But this freedom can also be a challenge.

“When you’re dealing with self-driving cars, you’re dealing with a very constrained set of rules because there are rules of the road,” said AutonomyNM intern Lauren Risany, a sophomore



AUTONOMOUS DRONES — Sandia interns have built and programmed drones, similar to the quadcopters seen here, to study autonomy and artificial intelligence for hypersonic flight.

Photo by Vince Gasparich

at Purdue University in Lafayette, Indiana. “You stop at a stop sign. You go when the light turns green. But when you’re dealing with a quadcopter, you don’t necessarily have those rules.”

To build the drones and create the algorithms, students pooled diverse experience levels and backgrounds, ranging from aerospace engineering to computer engineering and machine learning.

“My main wheelhouse is probably in mechanical design,” said Jared Li, a member of the team and a graduate student at Georgia Institute of Technology in Atlanta, Georgia. “That’s what I’ve worked on in multiple jobs in the past, but it’s never let me actually expand my skill set or learn something new or even be excited about what I’m doing. But here, it’s different. And I like that a lot.”

AutonomyNM research is managed by Sandia’s Autonomy for Hypersonics mission campaign — a seven-year, \$35 million initiative started in 2017 — and is funded through the Laboratory Directed Research & Development program. 

Sandia debuts small-business partnership program

By **Michael J. Baker**

Photos by **Lonnie Anderson**

Sandia launched a mentor-protégé program on Oct. 1 to assist small-business development and enhance a company’s ability to build a solid foundation to compete for larger and more federal and industry opportunities.

Sandia’s mentor-protégé program was unveiled during a small-business forum at the University of New Mexico Lobo Rainforest. More than 50 small-business representatives attended.

“Sandia believes in small businesses and their importance to the community and the nation,” said Jolyn A. Maheras, director of Sandia’s Integrated Supply Chain Management. “A robust mentor-protégé program fits in perfectly with Sandia’s efforts to work with small businesses. It’s a great opportunity for small businesses to take advantage of our expertise and increase their competitiveness.”

Sandia will pick up to two protégés from this first round of applications, said Sandia’s small-business program manager Paul Sedillo, adding that more will be selected as the program develops. The mentor-protégé agreements will be for two years, with the option of an additional year.



PROTÉGÉS WANTED — Small-business program manager Paul Sedillo presents Sandia’s new mentor-protégé program to small-business representatives and owners during a forum at the University of New Mexico Lobo Rainforest on Oct. 1.

To be protégés, companies must qualify as small businesses, which includes historically black colleges and universities and other minority higher-learning institutions; have been in business for at least two years; have not been a previous participant in a DOE mentor-protégé program; be a U.S.-owned business; have a good safety record; and meet product and service needs for Sandia. Other qualifications will be listed on Sandia’s business opportunities website.

“Sandia is excited to be offering its expertise and allowing small business to grow and develop under these agreements,” Paul said. “In addition, the protégé will be eligible to receive noncompetitive subcontracts from Sandia, DOE and other national labs and federal agencies, with thresholds of \$6.5 million for construction subcontracts and \$4 million for other subcontracts.”

Assistance can include developmental and technical help aimed at allowing small businesses to better compete for DOE contracts. Program benefits for mentors and protégés can be viewed at the energy department guidelines webpage.

“We’re looking for companies that want to grow and take that next step,” Paul said. “By helping these small businesses, it should expand what those businesses can offer to not only Sandia but to its industry as a whole.”

Sandia’s mentor-protégé program is yet another opportunity for small businesses looking to work with the Labs. Sandia already hosts public forums with suppliers and civic leaders to discuss subcontracting opportunities and lists opportunities on its website. Sandia also offers a 5% pricing preference for qualified New Mexico small businesses.

In fiscal year 2018, Sandia added more than 460 new small businesses to its supplier base. Small businesses represented 65% of all Sandia suppliers, and U.S. small businesses received \$656 million of all Sandia subcontract spending.



MENTOR OPPORTUNITY — Supply Chain Integration senior manager Delfinia Salazar said Sandia’s new mentor-protégé program offers small businesses a chance to work with a federal lab and learn from that experience.

During the last fiscal year, Sandia increased spending in several small business categories, including Woman-Owned Small Business, Historically Underutilized Business Zone company, Small Disadvantaged Business, Veteran-Owned Small Business and Service-Disabled Veteran-Owned Business.

“The mentor-protégé program is an important, proven way to assist small businesses,” said Delfinia Salazar, senior manager of the Labs’ supply chain integration department. “The program gives small businesses a chance to experience working with a federal lab, the ability to compete for larger contracts and an opportunity to benefit from our expertise.” 

30 days to apply

Applications will be posted on Sandia’s business opportunities website before the end of the year, and will be available for 30 days. Small businesses wishing to apply for the mentor-protégé program should review the requirements and process on the website.

Nuclear Deterrence strategy responds to a changing world

All-hands meeting lauds accomplishments but keeps the vision looking ahead

By **Michael J. Baker**

A reflection on past successes and a look at future challenges in a changing geopolitical world were highlighted at Sandia's Sept. 26 Nuclear Deterrence all-hands meeting, "2020 and Beyond."

"The ND portfolio scope of work is enormous, and sometimes we're so busy we forget to take time to recognize or realize the really great place we work," Associate Labs Director and Chief Engineer for Nuclear Weapons Steve Girrens said about the reason for the all-hands.

Steve and other Sandia leaders in Nuclear Deterrence touched on accomplishments, the division's reorganization and the evolving stockpile stewardship mission of the Labs during the hour-long meeting at a full Steve Schiff Auditorium. More than 500 others watched online.

Accomplishments and challenges

"We're here to celebrate a little bit," Steve said, noting numerous group and individual accomplishments, including, among many others, the high number of first production units across all weapons systems; multiple test flights at Tonopah Test Range in Nevada; and the successful High Operational Tempo Sounding Rocket Program, or HOT SHOT, campaign in August.

Steve also discussed overcoming challenges, including heightening safety and security vigilance, the need for increased communication among Sandia and National Security Enterprise partners and the largest most complex nuclear weapons design, development and qualification workload in more than 30 years.

"Great work isn't great if there's not challenges," Steve said. "But, given the challenges, we're delivering on the priorities outlined."

Steve thanked Kent Meeks, program director for Sandia's Nuclear Deterrence portfolio, who is retiring after 33 years of national service, and introduced two new directors and a new center.

Brad Boswell is the new director of the realigned Nuclear Deterrence Program Management Center, and Ernie Wilson is the director of the new Office of the Chief Engineer.

"The reason for this change is, in my mind, pretty straight forward," Steve said. "The programmatic, operational and technical duties in (Nuclear Deterrence) just continue to increase, and (we) don't see an end to it in the foreseeable future."

Ernie's group will focus on technical integration, and Brad's group will focus on programmatic portfolio management.

Before detailing how the Program Management Office will work to seamlessly integrate the Nuclear Deterrence program, Brad joked a bit about Kent's plans for retirement:

"I am jealous of the time he gets to spend at Disneyland, so my goal is to make the program office into a Disney-like experience," he said to an amused crowd.

Rethinking how to care for the stockpile

Colin Smithpeter, a senior manager for Advanced Systems and Surety, described the opportunity to provide input to NNSA to explore how the nation thinks of stockpile stewardship, a program developed in the mid-1990s with a goal to preserve nuclear weapons systems in the absence of underground testing.

"As witnessed by the 2018 Nuclear Posture Review, times are changing," Colin said. "Our adversaries are actively developing both new offensive and defensive systems, and it has now reached the point where we can no longer just rely on the weapons systems we have today."

The Labs has a chance to contribute to a new stockpile stewardship vision that includes better integration of design development and production capabilities throughout the nuclear weapons enterprise.

"In the future, we may need new capabilities," Colin said. "We may need them on the timeframes of months and years instead of years to decades. So how do we accomplish that in the coming decades to better respond to national security needs?"

Innovative approaches are needed in attracting



POINTING FORWARD — Associate Labs Director and Chief Engineer for Nuclear Weapons Steve Girrens addresses a full Steve Schiff Auditorium on Sept. 26 during the Nuclear Deterrence all-hands meeting, "2020 and Beyond." **Photo by Lonnie Anderson**

and training a new workforce, ensuring we have the facilities that meet future needs and improving work efficiency to sustain national security, he said.

Discovery Science and initiatives such as Laboratory Directed Research & Development campaigns will play a part, as will changing the paradigm for advanced system technology readiness, Colin said. A big part will also be accelerating Sandia's development cycle, such as has been done with the HOT SHOT program.

Ending with a HOT SHOT

Olga Spahn, manager of Advanced and Exploratory Systems, spoke about the agile technology maturation platform to accelerate development cycles from 15 years to three to five years.

HOT SHOT's third campaign occurred with two rocket launches on Aug. 28 at the Kauai Test Facility in Hawaii. The two payloads were launched 90 minutes apart, 99.8% of data packets from the flights have been received and analysis is ongoing, Olga said.

"This is a fabulous program for training a workforce to respond quickly," she said. "Our payloads get integrated over months, not years."

The complete all-hands meeting video is available internally on the Corporate Streaming Library. [f](#)

American Indian Science and Engineering Society recognizes early-career Sandian

By **Melissae Fellet**

Geoscience engineer Dylan Moriarty has been named the 2019 Most Promising Engineer or Scientist by the American Indian Science and Engineering Society. The award is given to an American Indian, Alaska Native, Native Hawaiian, Pacific Islander, First Nations or other indigenous person of North America with less than five years of work experience since his or her last degree. The award will be presented at the society's annual conference Oct. 12.

A member of the Navajo Nation, Dylan joined Sandia's team of geoscientists in 2014. He specializes in spatial statistics and data analytics, a field he first learned about during his undergraduate internship at the Labs. "It's a toolset that can be used for various engineering problems," he said.

Dylan's main project at Sandia involves monitoring ongoing site integrity of the Strategic Petroleum Reserve, created in 1977 to hold the country's emergency oil reserves and ensure energy security. Dylan has also applied his skills to analyze water distribution and traffic infrastructure networks, as well as describe multiphase fluid flow important to groundwater contamination and oil and gas extraction. "My goal is to use statistics to tell the most accurate story of a situation given the data," he said.

When describing spatial statistics, Dylan cites a common application of weather prediction. To create a forecast map, meteorologists gather

data about temperature, pressure, wind speed and other conditions from weather stations mounted at specific locations. Then they use spatial statistics to forecast conditions for the areas between weather stations and fill in the gaps on the forecast map.

Although Dylan does not predict weather, the same concept applies to his work monitoring the Strategic Petroleum Reserve, a collection of man-made salt caverns in Texas and Louisiana that holds the world's largest supply of emergency crude oil.

The reserve's four sites, each hosting a collection of underground salt caverns, were created by pumping water into the salt formations, letting the water dissolve the salt and extracting the salty water from the resulting cavities. The combined volume of the caverns equates to a storage capacity of more than 700 million barrels.

The caverns are about a mile underground and filled with crude oil, so no human will ever enter them and observe their structure. One way scientists determine the caverns' structure is by measuring the subsidence, which is how much the ground above the caverns moves up and down.

Dylan analyzes ground movement data collected by surveyors and satellites to determine if the movement is typical for day-to-day operation or a signal of cavern instability. He also uses statistics to combine that information with pressure data and information collected by sound wave measurements of the cavern shape. "This gives me a cohesive and comprehensive story about what's happening in a cavern," Dylan said.

If the analysis reveals a need for a closer look at a cavern, Dylan and Sandia geoscience colleagues recommend an engineering solution to operators at the reserve. This work also gives Dylan an opportunity to use his background in civil and subsurface engineering.

Dylan attended high school in St. Michaels, Arizona, graduating in 2007 as one of 30 students. He completed a bachelor's degree in civil engineering at the University of Arizona in 2012. During that time, he interned at Sandia, working with researchers detecting fugitive emissions of carbon dioxide, often from leaks or unintended releases from industrial equipment. In 2014, he finished a master's degree in energy resources engineering from Stanford University, sponsored by a Sandia fellowship. [f](#)



AISES AWARD — Sandia geoscience engineer Dylan Moriarty has been awarded the 2019 Most Promising Engineer or Scientist by the American Indian Science and Engineering Society. **Photo by Randy Montoya**

Marc Kniskern elected AIAA Fellow

By **Luke Frank**

The American Institute of Aeronautics and Astronautics has recognized Marc Kniskern for his outstanding and sustained contributions in aerodynamics, flight mechanics and flight safety of unique flight demonstration systems supporting broad national security applications by electing him a 2019 fellow. Marc, who earned his master's degree in aerospace engineering from North Carolina State University, works in Sandia's aeronautical engineering research and development program.

An AIAA Fellow is a person of distinction in aeronautics or astronautics and who has made notable and valuable contributions to aeronautics or astronautics arts, sciences or technology. With more than 30,000 individual members from 88 countries and 95 corporate members, AIAA is the world's largest technical society dedicated to the global aerospace profession. [f](#)



Marc Kniskern

Photo courtesy of Sandia National Laboratories

Roger Showalter earns NNSA award

By **Luke Frank**

Senior manager Roger Showalter has been named NNSA's Bradley A. Peterson Contractor Security Professional of the Year. The award recognizes one federal and one contractor employee whose contributions to security programs within the enterprise exemplify the excellence and commitment for which NNSA is known.

Roger is responsible for Protective Force operations, physical security, technical security systems and technical surveillance countermeasures. He was recognized specifically for his work assembling a multi-disciplined team with experts from physical security, technical security systems and the field intelligence element to improve security with vault-type rooms. Through Roger's leadership and efforts, Sandia achieved a 95% reduction in the number of security incidents in fiscal year 2018. [f](#)



Roger Showalter

Photo courtesy of Sandia National Laboratories

Hruby Fellow

CONTINUED FROM PAGE 1

spot to the next, checking the ground perhaps every half mile, until it gets to an area that starts changing more noticeably. That's when the model slows down and examines the ground perhaps every few feet.

Conventional programming only allows researchers to choose between the big picture or the details, but it doesn't let them switch back and forth.

Kelsey will use her fellowship to first apply her method to climate research, working with DOE's supercomputer-powered Energy Exascale Earth System Model, or E3SM, which already has one of the finest resolutions ever achieved for simulating aspects of the planet's climate. She previously proved her adaptive method as a doctoral student at Notre Dame University in South Bend, Indiana. Her three-year research appointment at Sandia began Oct. 7.

In honor of Sandia's former director, the Jill Hruby Fellowship couples research appointments with leadership training, led by Associate Laboratories Director Susan Seestrom.

"Kelsey brings great technical breadth and depth in computational mathematics, combined with extraordinary curiosity and drive to learn more about Sandia applications," Susan said.

In addition to formal leadership training, the fellowship grants Kelsey a seat on a Sandia committee that makes funding decisions. There, she will evaluate and select research proposals in computer information systems funded through Sandia's Laboratory Directed Research & Development program.

"This is exactly what I want in a position," said Kelsey, who was a member of two academic

leadership organizations while at Notre Dame, the Society of Schmitt Fellows and Ethical Leaders in STEM. Kelsey believes that strong leadership leads to strong interdisciplinary collaborations. This is especially important for mathematics and computer science, she said, because many people don't see these fields as particularly collaborative.

"There's a lot of this weird stigma, or this idea, that we're all isolated and work alone," she said.

Kelsey plans to expand her research and team up with multiple research groups, not just E3SM, to enhance their work.

"National labs foster a collaboration that you don't see in the private sector or in academia," she said.

Her Sandia research mentor, computational and applied mathematician Denis Ridzal, said the impact of Kelsey's research could be two-fold. It could let researchers increase the accuracy of a model without slowing it down, and it could let them maintain accuracy while lowering the computer system requirements to run it.

"There's a strong need to reduce the size of computer models while maintaining their accuracy," Denis said. "Kelsey's work is a very important step in getting more people to use modeling and simulation tools. It helps achieve the required accuracy with limited computational resources." [f](#)

Sandia is now accepting applications for Jill Hruby Fellowships starting in the fall of 2020. The fellowship is open to early-career researchers. The application deadline is Nov. 1, 2019.

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Sandia NMSBA projects celebrated at summer event

By **Manette Newbold Fisher**

Two Sandia principal investigators were recognized for their work with small companies at a New Mexico Small Business Assistance Innovation Celebration this summer.

Materials scientist Joseph Michael was recognized for his work with Advanced Optical Technologies. Joseph and the company studied a non-destructive titanium test method developed by AOT, called crystallographic polarization-classification imaging. The method could be used as an alternative to a destructive crystallographic

testing technique known as electron backscatter diffraction. Both practices enable scientists to better understand titanium's mechanical properties, but CPCI can test titanium in a matter of minutes, rather than nine hours like EBSD.

Sandia principal investigator Luis Abeyta worked with multiple companies to research the optimal rope thickness and performance that could be used by search and rescue, police and fire departments and the military for rescue situations around the world. Through a series of tests and analysis, Sandia and private-sector researchers verified a rope thickness that is lightweight

and durable and ensures safe rescues.

A third NMSBA project recognized at the event involved a team from the University of New Mexico and a biotechnology company, NTxBio.

Sandia hosted the joint celebration with Los Alamos National Laboratory at the Center for Collaboration and Commercialization in Albuquerque. More than 50 people attended the event, including New Mexico State Sen. James White, Johanna Nelson of the New Mexico Economic Development Department and Dan Sanchez, DOE Technology Partnerships manager with the NNSA Sandia Field Office. 



TITANIUM CRYSTALLOGRAPHIC TESTING — Sandia employees were recognized for their work with Advanced Optical Technologies in July. From left, Los Alamos National Laboratory NMSBA project manager Kim Sherwood, Sandia technology and economic development manager Jackie Kerby Moore, principal investigator Joseph Michael, AOT owner Brian Hoover, AOT CEO Malini Hoover, Sandia director Kathryn Helean, New Mexico Economic Development Department director Myrriah Tomar, New Mexico State Sen. James White and DOE technology partnerships manager Dan Sanchez.



ROPE RESCUE — Sandia employees were recognized for their work on rescue ropes at an innovation celebration in July. From left, Los Alamos National Laboratory NMSBA project manager Kim Sherwood, Sandia technology and economic development manager Jackie Kerby Moore, principal investigator Luis Abeyta, Rescue Tactics and Training co-owner Dan Barela, ASK Tower Supply president Pat Barr, New Mexico Economic Development Department director Myrriah Tomar, New Mexico State Sen. James White and DOE technology partnerships manager Dan Sanchez.

Actionable intelligence

CONTINUED FROM PAGE 1

Sandia researchers worked with students at the University of Illinois Urbana-Champaign, an academic alliance partner, to develop analytical and decision-making algorithms for streaming data sources and integrate them into a nearly real-time distributed data processing framework using big data tools and computing resources at Sandia. The framework takes disparate data from multiple sources and generates usable information that can be acted on in nearly real time.

To test the framework, the researchers and the students used Chicago traffic data such as images, integrated sensors, tweets and streaming text to successfully measure traffic congestion and suggest faster driving routes around the city for commuters. The research team selected the Chicago traffic example because the data inputted has similar characteristics to data typically observed for national security purposes, said Rudy Garcia, a computer scientist and project co-lead.

Drowning in data

"We create data without even thinking about it," said Laura Patrizi, a computer scientist and research team member, during a talk at the 2019 United States Geospatial Intelligence Foundation's GEOINT Symposium. "When we walk around with our phone in our pocket or tweet about horrible traffic, our phone is tracking our location and can attach a geolocation to our tweet."

To harness this data avalanche, analysts typically use big data tools and machine learning algorithms to find and highlight significant information, but the process runs on recorded data, Tian said.

"We wanted to see what can be analyzed with real-time data from multiple data sources, not what can be learned from mining historical data," Tian said. "Actionable intelligence is the next level of data analysis where analysis is put into use for near-real-time decision-making. Success on this research will have a strong impact to many time-critical national security applications."

Building a data processing framework

The team stacked distributed technologies into

a series of data processing pipelines that ingest, curate and index the data. The scientists wrangling the data specified how the pipelines should acquire and clean the data.

"Each type of data we ingest has its own data schema and format," Rudy said. "In order for the data to be useful, it has to be curated first so it can be easily discovered for an event."

Hortonworks Data Platform, running on Sandia's computers, was used as the software infrastructure for the data processing and analytic pipelines. Within Hortonworks, the team developed and integrated Apache Storm topologies for each data pipeline. The curated data was then stored in Apache Solr, an enterprise search engine and database. PyTorch and Lucidwork's Banana were used for vehicle object detection and data visualization.

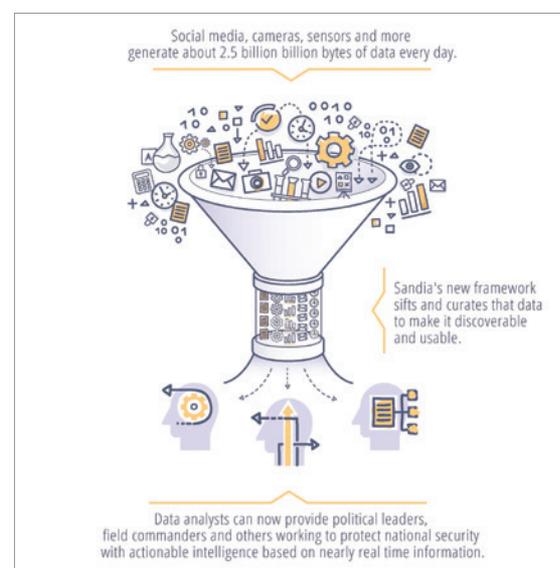
Finding the right data

"Bringing in large amounts of data is difficult, but it's even more challenging to find the information you're really looking for," Rudy said. "For example, during the project, we would see tweets that say something like 'Air traffic control has kept us on the ground for the last hour at Midway.' Traffic is in the tweet, but it's not relevant to freeway traffic."

To determine the level of traffic congestion on a Chicago freeway, ideally the tool could use a variety of data types, including a traffic camera showing flow in both directions, geolocated tweets about accidents, road sensors measuring average speed, satellite imagery of the areas and traffic signs estimating current travel times between mileposts, said Forest Danford, a computer scientist and research team member.

"However, we also get plenty of bad data like a web camera image that's hard to read, and it is rare that we end up with many different data types that are very tightly co-located in time and space," Forest said. "We needed a mechanism to learn on the 90 million plus events (related to Chicago traffic) we've observed to be able to make decisions based on incomplete or imperfect information."

The team added a traffic congestion classifier by training merged computer systems modeled on the human brain on features extracted from labeled images and tweets, and other events that corresponded to the data in time and space. The trained



DATA FRAMEWORK — Sandia researchers are working to turn big data into actionable intelligence.

Image by Michael Vittitow

classifier was able to generate predictions on traffic congestion based on operational data at any given time point and location, Forest said.

Professors Minh Do and Ramavarapu Sreenivas and their students at UIUC worked on real-time object and image recognition with web-camera imaging and developed robust route-planning processes based off the various data sources.

"Developing cogent science for actionable intelligence requires us to grapple with information-based dynamics," Sreenivas said. "The holy grail here is to solve the specification problem. We need to know what we want before we build something that gets us what we want. This is a lot harder than it looks, and this project is the first step in understanding exactly what we would like to have."

Moving forward, the Sandia team is transferring the architecture, analytics and lessons learned in Chicago to other government projects and will continue to investigate analytic tools, make improvements to the Labs' object recognition model and work to generate meaningful, actionable intelligence.

"We're trying to make data discoverable, accessible and usable," Rudy said. "And if we can do that through these big data architectures, then I think we're helping." 

Nevada Regional Test Center touts benefits to state

By **Kelly Sullivan**

Photos by **Patrick Sullivan**

An influential group of policymakers, administrators and researchers toured the Nevada Regional Test Center in Henderson, Nevada, in August. The facility is one of several sites currently managed by Sandia for DOE. Its mission is to drive technical innovation in the solar sector as part of a broader national effort to lower the cost, increase the efficiency and further the deployment of solar technologies.

The tour, hosted by the Southern Nevada Water Authority and led by Sandia principal investigator Laurie Burnham and Government Relations officer Patrick Sullivan, showcased a multitude of emerging technologies and the instrumentation and technical methodology developed by Sandia to support world-class research at the site.

One of the driving factors for the tour was a U.S. Congressional requirement issued this summer that the site (along with the other non-national laboratory RTC sites) transition to independent funding and local leadership. According to the DOE report, "Sustainability Plan for the Solar Regional Test Centers," the "Florida and Nevada RTC facilities have existing management structures that are broadly compatible with the transition toward self-sufficiency."

Sandia hopes to remain engaged once the Nevada RTC transition is complete. Laurie said Sandia will continue to coordinate industry-funded studies across the five RTC sites to enable the field validation of emerging solar technologies.

"Our role," she said, "will be to provide the technical expertise needed to ensure data quality across a network of multi-climate research sites. We also look forward to new collaborative research opportunities between Sandia and Nevada institutions, such as the University of Nevada, Las Vegas, and SNWA."

Following the tour, participants convened for an in-depth discussion of ways the site could be better leveraged to support Nevada's goals to move to a low-carbon economy.



RTC TOUR — From left, Scott Krantz, SNWA; Robert Boehm, UNLV; Vinny Spotleson, District Director for U.S. Rep. Dina Titus, Nevada; Michael Vannozzi, District Director for U.S. Rep. Susie Lee, Nevada; Nevada State Sen. Pat Spearman; Rick Hurt, UNLV; Gary Wood, SNWA; Laurie Burnham, Sandia National Laboratories; Verna Mandez, District Representative for U.S. Sen. Catherine Cortez Masto, Nevada; Jennifer Taylor, Deputy Director at Nevada Governor's Office of Energy; and Aaron Sahn, UNLV.

"We really wanted the attendees to understand the center's unique contributions to photovoltaic research and education, and we think we accomplished that," Laurie said.

SNWA provides and maintains the land on which the Nevada RTC sits, and provides installation services for new systems at no cost; UNLV currently provides the technical support needed to ensure the site matches the operations and maintenance standards of the other RTC sites.

"I was impressed at how engaged the group was during the visit, and how many questions they asked," Patrick said. "It was a good exchange with really productive conversation about next steps for the center."

Moving forward, Sandia plans to facilitate the site's transition to financial independence by making sure local stakeholders are fully engaged, Laurie said, and able to reach their own conclusions about the center's benefit to Nevada. [f](#)



CUTTING EDGE RESEARCH — The tour began with an introduction to the RTC program, which enables the cross-climate validation of emerging solar technologies, supports cutting-edge research and fosters state-of-the-art educational and training opportunities.

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MISCELLANEOUS

SEWING MACHINE, hand-stitcher/leather, Tippmann Boss, w/leatherworking books/tools, excellent condition, originally \$1,400, asking \$900. Hawkins, 505-296-8531.

TV, Panasonic 42-in. TV. albuquerque.craigslist.org/ele/d/albuquerque-panasonic-42-viera-plasma/6985746600.html \$95. Weagley, 505-385-4059.

JUICER, L'Equip model 221, all original parts, instruction manual, 2 juicing recipe books, \$50. Griffie, 505-280-0082.

ROLL-TOP DESK, fully functional, \$300 OBO; armoire, fits 32-in. TV, 2 small & 3 large drawers, \$150 OBO; text for photos. Fonseca, 505-400-5784.

TABLE SAW, 10-in., Task Force, w/stand, like new, \$50; Singer sewing machine, table model, \$15. Williams, 505-271-4902.

GARDENING TOTE BAG/ ORGANIZER, Brookstone, 12-in. long, w/8 outside pockets, green & sand color, never used, wear resistant, \$13. Wagner, 505-504-8783.

SCANDINAVIAN FESTIVAL, Nov. 2, 10 a.m.-4 p.m., Immanuel Presbyterian Church, 114 Carlisle SE, folk art, dancing, food, free. Richard-Franco, 505-294-5739.

CROSS-CIRCUIT ELLIPTICAL, Octane, w/powerbands & strength platform, excellent condition, >\$3,000 new, asking, \$750. Maheras, 505-280-5113.

RELIEFBAND 2.0, for nausea associated w/vertigo, motion/morning sickness, chemotherapy, FDA approved, used once, \$145. Kaplan, 505-270-7425.

DOG RUN CHAIN LINK PANELS, 15, 6' x 6', w/ attaching hardware & gate panel w/latch, \$400. Duran, 505-280-9600.

FIRE BRICK, 20-28 count, \$3.50 ea.; jewelry case, \$80; aluminum box w/lid, good for storing wood, ~30" x 30" x 24". Schroeder, 505-917-4516.

DINING SET, solid oak, w/6 Windsor chairs & matching elegant china cabinet. Moonka, ajoy@moonka.com.

WOOD STOVE, 2011 Hearthstone Heritage Soapstone, non-catalytic, very well maintained, photos on request, \$1,500 OBO. Furry, 505-228-4759, call or text.

JESUS CHRIST SUPERSTAR TICKETS, 2, Sat., Oct. 19, 8 p.m., orchestra seats, R117 & R118, \$132/both. Verley, 505-480-5109.

COFFEE TABLE, pine, \$80; DRZ400 accessories, rear rack, Muzzy exhaust, Corbin seat. Yazzie, 505-221-9752.

DIGITAL PIANO, Yamaha Clavinova CVP-103, excellent condition, photo available, \$500. Osokina, losokina@att.net.

ENTERTAINMENT CENTER, 3-pc., oak, solid wood, good condition, photos available, \$400. Vermeire, 505-259-8007.

TRANSPORTATION

'12 FORD TAURUS SHO, AWD, blue, all sports pkgs., transferable warranty (April 2020), 49.5K miles, \$13,900. Plummer, 505-220-5388.

'07 ACCORD SE, sedan, 4-cyl., manual transmission, white, alloy wheels, new Michelins, 68K miles, very good condition, \$5,000. Williams, 505-344-7596.

RECREATION

'04 AIRSTREAM SAFARI, 28-ft., new Goodyears, batteries, excellent interior, exterior has some hail damage, \$25,000 OBO. Bochev, 505-401-2783 or talasamin@gmail.com.

'08 MONACO CAYMAN XL 35SBD, Class A motorhome, 27K miles, well maintained, great condition, ready to go. Schindler, dhschindler77@gmail.com, or 208-515-6662.

REAL ESTATE

COMPUTER PROFESSIONAL, need help choosing new home computer & perform migration from old computer. Kaplan, 505-270-7425.

3-BDR. HOME, 2 baths, ~1,750 sq. ft., Willow Wood, beautiful landscaping, 5 mins. to KAFB, must see, \$255,000. Sanchez, 505-228-4200.

2-BDR. HOME, 1 bath, 1,200 sq. ft., 1-car garage w/storage, 1527 Hermosa Drive NE, 87110, Altura Park/UNM location, \$207,500. Ramos, 972-951-0290.

2-BDR. CONDO, 1 bath, completely remodeled, Winrock Villas, swimming pool & club house on site, \$110,000. Carr, 505-553-1236, ask for Daniel.

ANGEL FIRE MOUNTAIN CABIN, 1 bdr., 1 bath, 2-car garage, 925 sq. ft., 10 acres, 900-sq.-ft. workshop, well, generator/batteries, \$375,000. Glaser, rglaser@comcast.net.

5-BDR. HOME, 4 baths, 2 master suites, 5,000 sq. ft., solar PV & heat, 0.9 acres, fantastic views/entertaining, \$850,000 NAA. Gilbride, 505-235-3838.

WANTED

ROOMMATE, 2-bdr. home, 2-1/2 baths, gated Presidio community, ~5 min. to Eubank gate, updated home w/garage & backyard, no pets, \$650/mo. Fetterolf, aafetterolf@gmail.com.

ROOMMATE, nonsmoker preferred, pets negotiable, close to base, available Nov. 1, \$750/mo. includes utilities. Rader, 505-821-1375.

VOLUNTEERS, help rescued cats, Fabulous Felines charity, <https://fabulous-felines.org>. Stubblefield, 505-263-3468.

Mileposts



New Mexico photos by Michelle Fleming
California photos by Randy Wong



Steve Casalnuovo 35



Jann Levin 35



Jose Torres 30



Doug Vrieling 30



John Lopez 25



Gabrielle Sarfaty 25



Chad Twitchell 25



Brian Franke 20



Leanne Whittemore 20



Tara Camacho-Lopez 15



Lorena Martinez 15



Kelly O'Bryant 15



Adrienne Phillips 15



David Pollock 15



Dave Robinson 15

Recent Retirees



New Mexico photos by Michelle Fleming
California photos by Randy Wong



John Cerutti 43



J.R. Turner 40



Denise A King 18

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- Pre-Medicare retirees: Oct. 15-Nov. 15, sandiaetireebenefits.com
- Medicare retirees: Oct. 15-Dec. 7, medicare.oneexchange.com/sandia

For active employees, this year's open enrollment events offer expert advice for optimizing Sandia's benefits to fit your life. Learn from Sandia's benefits team and vendors how you can use \$25 virtual visits, vacation buy and critical illness and accident insurance to care for your family, protect yourself and enjoy life.

Employee events are Monday, Nov. 4, in California and Wednesday, Nov. 6, in New Mexico. Find out more at hr.sandia.gov, search "open enrollment."

Retiree events are on Wednesday, Oct. 30, and Thursday, Nov. 7, in New Mexico and Monday, Nov. 4, in California. Check the websites above for more information. <#>





Active shooter exercise tests Protective Force mettle

By **Luke Frank**

Photos by **Randy Montoya**

Sandia's Protective Force tested itself last month in a full-scale joint active-shooter exercise with Kansas City National Security Campus New Mexico Operations, Kirtland Air Force Base 377th security forces and the FBI, all operating within Sandia's emergency management structure.

At stake was ProForce's emergency plan and procedures in the face of an imminent threat from a simulated attack by a gunman at the Kansas City operations campus in the Old Western Command Facility, west of the Eubank gate.

The exercise was designed specifically to evaluate ProForce's tactical operations, including direct threat tactics, use of force, scene securing, casualty care and more. Although the weapons and moulage were simulated, the adrenaline was real.

"All players in the exercise absolutely performed as a single, well-trained, integrated unit," said ProForce training Lt. Norman Baca, who designed the event. "ProForce and EMS secured the initial scene and treated faux patients masterfully within minutes. It was impressive," he said. "We found a couple of areas for refinement, mostly related to exercise logistics, which these events are designed to reveal." [f](#)

