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Sandia kicks off 75th anniversary **Page 2**

Changing the world one dimple at a time

PASSIONATE INVENTOR — Sal Rodriguez answers questions about his dimpled rocket nose from Johann Snyder during an Inside Sandia podcast recording. **Photo by Lonnie Anderson**

By **Kim Vallez Quintana**

Sandia nuclear engineer Sal Rodriguez has been working for years to prove that adding dimples to things like rockets, wind turbines, cars, even heaters, makes them more efficient.

Together with the University of New Mexico and graduate student Graham Monroe, Sal's research is propelling the future of aerospace by infusing rocket science with a touch of golf ball magic, uncovering a groundbreaking aerodynamic revelation with the potential to accelerate space exploration.

The making of the rocket nose

Sal's flashiest work by far is a 15-pound rocket nose clutched under his arm as he walks around Sandia, at

— CONTINUED ON PAGE 3

Creating the self-healing grid of the future

Sandia leads development of algorithms for resilient microgrids

By **Mollie Rappe**

Self-healing electrical grids: It may sound like a concept from science fiction, with tiny robots or some sentient tech crawling around fixing power lines, but in a reality not far from fiction, a team of researchers is bringing this idea to life.

What's not hard to imagine is the potential value of a self-healing grid, one able to adapt and bounce back to life, ensuring uninterrupted power even when assailed by a hurricane or a group of bad guys. Together a team from Sandia and New Mexico State University is making this vision possible — not with tiny robots, but rather a cutting-edge library of algorithms. By coding these algorithms into grid relays, the system can quickly restore power to as many hospitals, grocery stores and homes as possible before grid operators can begin repairs or provide instructions.

"The ultimate goal is to enable systems to self-heal and form these ad hoc configurations when things go really bad," said Michael Ropp, Sandia electrical engineer and the project lead.

RESILIENT GRID — Sandia electrical engineer Michael Ropp and his team have created a library of codes to improve the resilience, reliability and self-healing nature of the electric grid. **Photo by Craig Fritz**

"After the system is damaged or compromised, the system can automatically figure

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EDITOR'S NOTE: Please send your comments and suggestions for stories or for improving the paper. If you have a column (500-800 words) or an idea to submit, contact the Lab News editor at labnews@sandia.gov.

Hungry for history

TIME TO CELEBRATE — Labs historian Rebecca Ullrich talked to a packed crowd at the Steve Schiff Auditorium last week about the importance of carrying forward Sandia's 75 years of exceptional service. **Photo by Craig Fritz**

Overflow crowd rapt at tales of times Labs stepped up

By **Jim Danneskiold**

"Sandia is always there" when the nation needs to meet extraordinary challenges, Labs historian Rebecca Ullrich told an overflow crowd in Albuquerque and online last week as the Labs launched its yearlong 75th anniversary celebration.

"The future of Sandia Labs is in your hands," Labs Director James Peery told the nearly 500 Sandians in the Steve Schiff Auditorium and more than 3,000 online and at California and other sites.

"I see the effort you make every day to innovate, to improve and to move our country forward — just like the generations of Sandians before you." James said that he believed it was the

largest crowd he'd seen since before the COVID-19 pandemic smothered in-person gatherings.

He urged his audience to learn more about Sandia's history and said he was "proud and honored to reflect on our institution's enduring legacy of service to this nation."

Sandia's origin in the Manhattan Project "set the stage" for 75 years of responsibility and excellence, he said, and today's Sandians carry on that rich history through their work.

Energy crisis solutions

Associate Labs Director Andy McIlroy, speaking from California, recounted the 40-plus-year history of the Combustion Research Facility and its role in improving transportation efficiency worldwide. Its origins actually go back farther, he said, to Sandia "visionaries" who realized during the energy crisis of the early 1970s how the Labs' expertise in laser diagnostics and the science of gas transfer systems, based on its nuclear deterrence mission, could be applied to internal combustion engines.

In her talk, "What it means to be a national lab, historically," Rebecca recounted the many times Sandia stepped up to meet an important national challenge — "beyond mission or assigned milestones" — either when asked or when it volunteered because of its broad portfolio of research and engineering know-how.

She pointed out that innovation is much more than simply one of the Labs' current goals. "I would say that innovation is actually an observation, a description — it is what Sandia has done and does best."

Tracing the Labs' institutional origins in concert with the push by federal science adviser Vannevar Bush for national labs that would keep science "on tap" for the postwar nation, Rebecca explained why Nov. 1, 1949, is Sandia's birthday to set the stage for her stories of Sandia stepping up.

"I want to give you an idea of the way opportunity looks when it's standing there knocking," she said. "Yes, as our grandparents would tell us, it looks like work."

Stepping up to challenges

The three examples she chose were radically different from each other, but all shared the theme of Sandia taking on challenging projects in unexpected circumstances.

Her first story was how the Labs' pioneering work with Los Alamos National Laboratory developing sensors to peer down from the Vela satellites or feel vibrations in the Earth to detect nuclear explosions expanded into myriad sensor designs to bolster counterinsurgency during the Vietnam Conflict. A suggestion about the multiple uses for seismic sensors to the Advanced Research Projects Agency led to the growth of sensor expertise into an "ongoing business within Sandia," she said.

After the USS Iowa gun explosion in 1989, Congress and the Government Accounting Office asked Sandia to investigate the highly publicized incident. A team of more than 40 got to work quickly, discovered a likely cause for the explosion and materials chief Dick Schwoebel presented their findings to Congress, "good science hair" and all, Rebecca quipped.

"The team became evidence that various experts could be pulled together to solve a new problem without a lot of mess," she said, despite the fact that some hadn't even met before work began.

Her final example was an investigation of a 2006 explosion at the Sago coal mine in West Virginia. The U.S. Mine Safety and Health Administration asked the Labs to probe whether lightning could have caused the disaster, based on its expertise in electrostatic discharge for stockpile safety.

The team concluded that lightning indeed could have traveled underground to spark a blast in methane gases in the sealed mine shaft, she said.

Sandia through history

Rebecca listed more than a dozen other moments in history where Sandia stepped up, including research for the Strategic Petroleum Reserve and nuclear waste storage, the Unabomber and shoe bomber investigations, the Deepwater Horizon oil spill, the Fukushima disaster and the post-9/11 anthrax attacks.

She peppered her talk with a variety of little-known facts. For example, it wasn't until 1979 that the three NNSA weapon labs received congressional designation as national laboratories, 32 years after Argonne National Laboratory was chartered as the first national lab.

In conclusion, Rebecca said that being a national lab means that Sandia can apply its decades of research to a panoply of problems that range far beyond its core mission areas.

"It means, the nation can turn to Sandia. That as close to crisis as we all come, somebody — by which I mean you — will be able to bring their minds and tools to bear," she said.

"I'm just a historian. I'm not selling the place or trying to convince you it's great," Rebecca said. "Its greatness is up to you, both in what you contribute and what you judge to be important."

Watch the entire 75th anniversary launch event here and learn more at the Labs' external history site. This brand-new website will be updated throughout the year with 75th activities and news.

Dimple

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conferences and schools.

"I think this will be game-changing," Sal tells people.

The "this" are tiny dimples, like those on a golf ball, that cover the bright red, cone-shaped rocket nose.

"I was always interested in aerodynamics. I was working on my bachelor's in engineering degree in 2019 when I took part in the Lobo Launch at the Spaceport America Cup," Monroe said. "Meanwhile, Sal was researching some dimpling projects. We started talking and came up with the idea of dimpling the nose cone of a rocket."

The experiment turned into Monroe's master's thesis project.

They started with the dimpling program that Sal created in 2014 and copyrighted in 2017.

"The program includes a specific set of equations that allows the user to look at an object's geometry, add the velocity and the fluid it's traveling through. You put that into the program, and it outputs the required dimple pattern," Sal said.

Monroe 3D printed the nose cone while UNM's Lobo Launch team created the accompanying rocket and a smooth nose cone that was identical, minus the dimples.

Then, they waited.

Due to the Covid-19 pandemic and fact that the Lobo Launch team needed their rocket for the upcoming Spaceport

America Cup competition, launching the rocket became a challenge. It was finally put to the test in November and December of 2022. The results were better than they expected.

"We were overjoyed when we found that the dimpled rocket had 22% less frictional drag compared to a smooth rocket. At its peak, it reduced drag by 39.1%. So that's less fuel you need, and it produces less CO2, which is good for the environment," Sal said.

Monroe is proud to have been part of the project. "It's been really neat to be part of this research. To be part of something that could be used in the real world," he said. "When we look at the day and age that we are in, as far as space exploration, the effect this could have on energy savings is really significant."

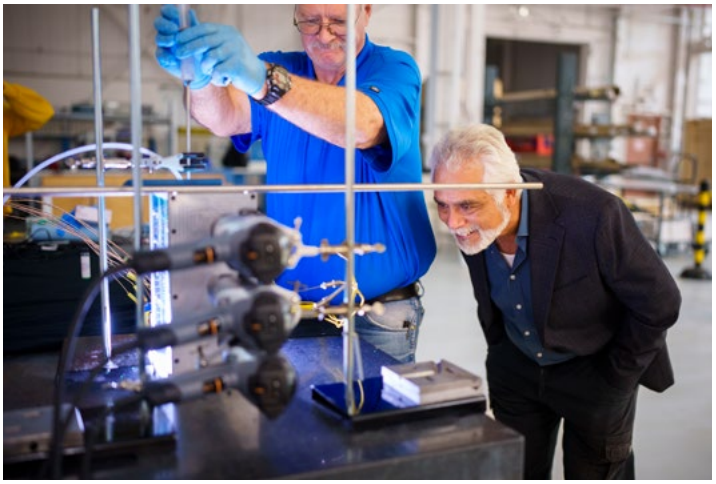
How dimples work

"Dimples generate turbulence, redistribute the turbulent energy, accelerate the flow in the dimpled regions, and reduce the boundary layer thickness," Sal said.

He said a good analogy is an Olympic diving competition.

GREAT MINDS — Graduate student Graham Monroe, left, and Sandia nuclear engineer Sal Rodriguez display the dimpled rocket nose they built as part of a collaboration between Sandia and the University of New Mexico. **Photo by Jennifer Plante**

"The diver who plunges into the water with the smallest splash gets extra points because only a very small amount of resultant water flow is generated by the more aerodynamic dive," he said. "The same occurs with dimples. They generate a flow pattern that is so aerodynamic, that only small, disorderly flow currents are generated by the dimpled objects — a gold medal dive."



AN AMAZING SIGHT — Sandia nuclear engineer Sal Rodriguez looks on in amazement as technologist Robin Sharpe injects dye into the dimpled model they built, showing the way dimples accelerate heat transfer in water. **Photo by Craig Fritz**

Bring in the Mustang

But it's not just rockets that can benefit from this dimpling. Sal has been exploring other ways to use dimples. In a little-known project with Bobby Unser Jr., Sal dimpled the hood of a Ford Mustang.

"It was so exciting because he was so enthused about racing and race cars," Sal said of Unser. "I told him about my copyright and that I could dimple his sports car and make it go faster. He was very excited."

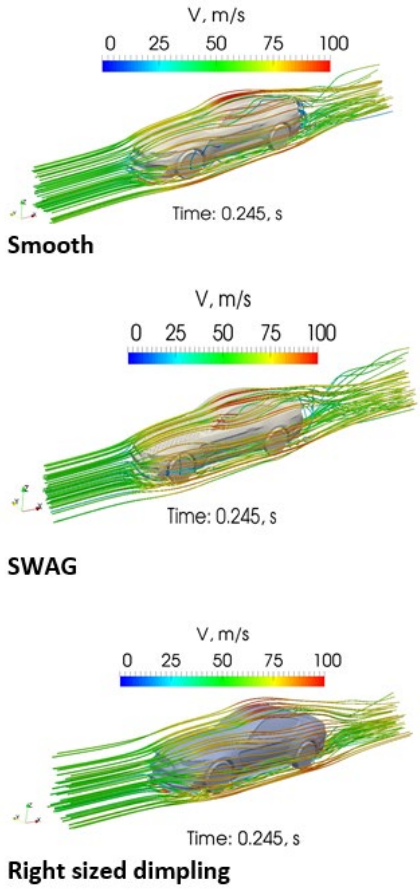
So, Sal did.

He used his program to narrow in on the ideal size and placement of the dimples on the car's hood. Like the rocket, the results were significant. They showed a minimum 25% reduction in airflow drag compared to a car with no dimples. The experiment also included a car with tennis-ball-sized dimples, to prove that while all dimpling helps, precision with dimples is key.

Whether or not consumers would prefer dimples on their car is another question the pair hoped to explore. Unfortunately, Unser died before the project went any further.

Not just for aerodynamics

One of Sal's latest projects is using dimples in heat transfer. With the help of funding from the New Mexico Small Business Assistance Program, Sal has built an apparatus that shows how dimples can speed up the heating process.



WHAT A DRAG — Fluid dynamic computations showing drag in different scenarios. **Image by Sal Rodriguez**

A box with three sides of Plexiglass and one side of dimpled aluminum is filled with water and then connected to a heat source. "We put beads and dye in there to see how they move along the dimples. We witnessed them accelerate, twice the velocity than outside the dimple area," Sal said. That proves that the dimpling accelerates heat transfer.

Sal said the technology can be used with solar water heaters. Something that could be life-changing for places that don't have easy access to electricity, such as rural areas, remote parts of Indian reservations or developing nations.

Sal said a company in another country is already exploring the commercialization of a product like this.

The road ahead

Sal's dimpling work is far from done. He's already dreaming up new ideas.

"Any dimple will have a beneficial effect on aerodynamics. We will be able to design rockets that can carry a much heavier payload in space and make space exploration more affordable by at least 10-20%," Sal said. Sal's team recently submitted a non-provisional patent application for dimpled wind turbines.

"We can apply to rockets, aircraft, cars, electronic vehicles, submarines, drones, even wind turbine blades. We can extend the distance that they can travel or the energy they harvest," he said. "Maybe we could do speedboats, jet skis, even frisbees."

Self-healing grid

CONTINUED FROM PAGE 1

out how to get to a new steady state that provides power to as many customers as it possibly can; that's what we mean by 'self-healing.' The key is that we're doing it entirely with local measurements, so there is no need for expensive fiber optics or human controllers."

The electrical grid of the future, as envisioned by Michael and many others, will have more renewable energy supplies such as rooftop solar panels and wind turbines, along with local energy storage systems such as banks of batteries. Many of these systems will have the ability to form microgrids — small "islands" of power around hospitals, water treatment plants and other critical infrastructure even if the main grid is down. This Sandia project enables those microgrids to automatically heal themselves when damaged and connect with one another to share power and serve as many customers as possible.

While microgrids can increase the resiliency of the grid, they need to automatically perform certain critical functions like balancing energy production with energy consumption and reconfiguring if part of the system becomes damaged or unavailable. This self-healing capability must also avoid connecting microgrids in a way that causes problems — for example, by forming an unintentional loop in the circuit. Today, to achieve all of this in microgrids using power inverters, devices that convert the direct current produced by renewable energy sources into alternating current the grid can use, operators must install expensive high-speed communications that can be unreliable during disasters and vulnerable to cyberattacks. The purpose of this project, Michael said, is to support self-healing using only the measurements that each individual device can make, reducing cost while increasing reliability.

Resilient grids with lots of renewables

One key function that microgrids with lots of inverters need to do is to shut off a few customers when the demand for electricity becomes larger than the supply. In grids powered by natural gas, coal or nuclear power plants, when this demand-supply imbalance occurs, the frequency of the grid drops. When the existing relay algorithms detect this, they disconnect power to portions of the grid. However, inverters designed to power microgrids, when they become overloaded, stop regulating the voltage of the power supply, Michael said. The Sandia-led team developed an algorithm to use this decrease in voltage to tell relays when to disconnect power to less vital customers.

During the wake of a natural disaster such as a hurricane or earthquake, hospitals, assisted living facilities and water treatment plants are especially vital and thus critical to keep powered. Banks, grocery stores, and recreation centers or schools that serve as evacuation centers are also quite important for the functioning of a community. Individual homes and neighborhoods often aren't as vital.

The team also developed algorithms that allow the system to self-assemble in ways that avoid damaged areas. The team used computer-aided-design software to model a small system of three interconnected microgrids and showed how even without communications, their algorithms allowed the system to balance power production and consumption, isolate certain issues such as tree-downed lines or a damaged power plant and work around the issue to restore power to important facilities, Michael said. The researchers shared their results in a paper published as part of the 2022 North American Power Symposium.

"A lot of good work has been done on how to protect circuits, equipment and people from issues on the grid, which is why our electric grid is very safe and reliable," said Olga Lavrova, an associate professor of electrical engineering and former Sandia employee involved in the project. "However, when we have a lot of renewables, solar and wind, we need to make some changes to this logic, which is the focus of the project."

Avoiding microgrid loops

Most of North America's grid infrastructure has single power lines with one-way power flow to houses, offices and other average customers. Thus, the grid is not designed to be stable when operated in a loop, said Michael and Matthew Reno, another Sandia electrical engineer involved in the project. Only certain custom-designed portions of the system can operate as a loop.

Microgrids and distributed resources like rooftop solar increase overall resiliency but also allow the chance for the grid

to assemble into an unstable loop. Matthew said, "We were trying to come up with possible measurements to figure out if the two sides were already connected so that closing the switch would form a loop."

The team looked at some mathematical methods a breaker could use to determine whether the portions of the grid on either side of the breaker are powered by the same power supply and determined that two such methods worked for this purpose. The researchers shared a comparison of these methods in a paper published in the scientific journal IEEE Transactions on Power Delivery.

The team is also working on a solution to a similar problem: what to do when a power line that normally is at the end of the system finds itself supporting more current than it is rated for. They've developed a Morse-code-like method where an overloaded line relay modulates the voltage by opening and closing in a specific pattern, and the relays for lower-priority customers can detect this pattern and disconnect themselves until the line is no longer overloaded, Michael said.

While this could be considered communication, it doesn't need a separate system, which might be vulnerable to hackers, or a human operator — it uses the power line itself to transmit the signal. The researchers plan to share this method in a paper soon.

The researchers have been working on ways to improve the performance of these methods. For example, they have developed a method to quickly divide the microgrid into smaller sub-microgrids when an issue is detected. The hope is that this would isolate the issue to just one sub-microgrids, allowing the others to operate normally. The team's initial testing suggests that this method of defining microgrid boundary points works sometimes, but not all the time, so there is more work to do.

Future work testing and expanding the library

Michael and the team would like to work with manufacturers of line and load relays to incorporate their library of algorithms into the companies' products, first to test them in a hardware-in-the-loop testbed and then possibly in real life at test facilities such as Sandia's Distributed Energy Technologies Laboratory or at a similar medium-voltage facility at New Mexico State University, Lavrova said.

"We definitely want this to become something that people can really use, especially low-income communities that can't afford fiber optic communications at every single point on every single electrical circuit," Michael said. "You can actually get very good performance and very good resilience using our library of algorithms. And if you do have the communications, this can be a backup."

Sandia's Laboratory Directed Research and Development program and the DOE Office of Electricity's Microgrid Program funded the research project. At New Mexico State University, one undergraduate student and three master's students have been involved in the project, principally working on the computational modeling. Two additional graduate students, one from the Georgia Institute of Technology and one from Duke University, have been involved as Sandia summer interns.

LAMP lights way for next era of weapons development

By **Michael Ellis Langley**

Two new buildings on the California campus promise cutting-edge working facilities, feature more cost-efficient component designs and demonstrate Sandia's commitment to environmental responsibility.

The Limited Area Multi-Program, or LAMP, buildings consist of a 27,000-square-foot office space and a 17,000-square-foot high-bay facility. Teams with the W87-1 nuclear weapon modernization program will be the first to occupy the complex.

"LAMP will house state-of-the-art capabilities that are critical to our role as a design agency and lead systems integrator for nuclear weapons. It will allow us to streamline design activities and reduce our cycle time so that we can deliver on our commitments to the nation," Deputy Labs Director Laura McGill said at the Nov. 30 ribbon-cutting ceremony. "It will also house world-class manufacturing capabilities, including advanced prototyping for rapid development of key components."

LAMP LEAP FORWARD — Guests, including Labs Director James Peery and the Sandia Board of Managers, tour the Limited Area Multi-Program high-bay building during a Nov. 30 ribbon-cutting ceremony. **Photo by Spencer Toy**

LAMP LIT — Labs Director James Peery, joined by, from left, Livermore Mayor John Marchand, Deputy Labs Director David Gibson, Associate Labs Director Andy McIlroy and Deputy Labs Director Laura McGill, cuts the ceremonial ribbon for the new LAMP complex in California.

Photo by Spencer Toy

NEXT GENERATION — Associate Labs Directory Andy McIlroy greets greets dozens of guests during the LAMP ribbon-cutting, reminding them about how NNSA's partnership helped realize the new buildings, which were built with fiscal, scientific and environmental priorities in mind.

Photo by Spencer Toy

Associate Labs Director Andy McIlroy highlighted Sandia's dedication to fiscal responsibility while continuing to safeguard the nation's nuclear arsenal.

"We have found tremendous partnership with the NNSA in funding these new capabilities in a time when we are really trying to watch the taxpayer's money and make the most of the dollars that we have from the federal government," Andy said, adding that the complex is helping the Labs realize several goals. "The LAMP high-bay building is the first to leverage the Standardization and Recapitalization Initiative in NNSA. We're trying to pioneer here a standardized design that we can use across the Laboratories, and I hope across the national security enterprise, to provide more efficient construction and work things in a more modular fashion."

Laura said the LAMP enhances the California site's importance to Sandia and the national nuclear security enterprise network of labs.

"There is such a rich history at this site going back to March 8, 1956, and it's fostered our close partnership with Lawrence Livermore National Laboratory," she said. "It enables our exceptional teams to successfully execute our joint modernization programs."

Labs Director James Peery, the Sandia Board of Managers and local dignitaries, including Livermore Mayor John Marchand, attended the ceremony to dedicate the buildings.

"Some of the most difficult problems in the world come to Livermore to be solved because much of the big science work that is done here can be done nowhere else in the world," the mayor said. "Sandia continues to be a great asset, not only for our community but for our country. Thank you for the work you do for the community, the nation and the world."

Andy pointed out to the assembled crowd that over the last several years the work done at the California site has expanded greatly, and the LAMP facilities are a direct response to that growth and the importance of Sandia's work here. He also said the buildings support site sustainability and reflect Sandia's goal of being a good steward of the environment.

"Since 2010, the site population in California has roughly doubled, paralleling the growth we have seen in the Laboratories. This has really pushed our infrastructure to its very limits," he said. "It is important that we have energy efficiency to go with the renewable energy future that we see. We're really proud to get cost-effective buildings that are good for the site, good for the environment and that allow us to accomplish the very important missions the nation depends upon us for."

Laura echoed Andy's sentiment, saying she is proud of the work done on behalf of the nation and the people who give their lives to serve Sandia's missions.

"I know our teams are going to thrive here."

Sandians honored for delivering excellence in the national interest

NNSA recognized those who went above and beyond

NNSA honored 200 Sandians with the prestigious Defense Programs Award of Excellence. Established in the early 1980s, these annual awards recognize individuals and teams for their exceptional contributions to Stockpile Stewardship.

"The mission areas that we serve at Sandia are as important today as in any time in our history, and the nation needs us," Deputy Laboratories Director Laura McGill said during an October ceremony. "You've all contributed significantly to our success in delivering on these missions, and you represent the very best of us."

The 2022 awards of excellence recognition include:

- Three individual awards.
- Seven multiteam awards. NNSA normally allocates five awards to Sandia in this category, but because of exceptional service in 2022, it allocated two additional awards.
- Two technology transfer awards.

INDIVIDUAL AWARDS

Patrick Roney

Patrick demonstrated exceptional leadership in the development of the Mk4B UID. Patrick led a team of engineers from Sandia and Kansas City National Security Campus to overcome a developmental challenge and implement a design solution in time for the process prove-in build. The process was completed in a few months, preventing potential schedule impacts to the first production unit.

John Schwartz

Over the last 39 years, John has worked on nearly every weapon system of the time and has proactively and tirelessly improved how Sandia develops and executes the nuclear weapon surveillance programs. John developed the design for surveillance methodology that has been used in developing the alteration and life extension surveillance programs. The significant surveillance improvements provide the data Sandia needs to perform the annual stockpile assessment effectively and confidently.

Pin Yang

Pin has created an invaluable resource for future generations of scientists and engineers working with ferroelectric materials. His research spans a broad range from establishing a fundamental physics understanding of ferroelectrics' functionality to nuclear deterrence application-driven development efforts. His research can be utilized to shorten product realization timelines. Pin has enabled this through a combination of peer mentoring, information dissemination through publications and SAND reports, and presentations to Sandia's senior leaders, creating an invaluable resource for future generations.

TEAM AWARDS

W80-4 Joint Test Assembly Telemetry Product Realization Team

The team successfully designed, tested and delivered a module on time in support of a flight-test unit critical to the success of the W80-4 program. Seventeen units were delivered for system-level testing in 2022. In addition to fabricating, building and testing the 17 units, the team successfully held their baseline design review and preproduction engineering gate in summer 2022.

B61-12 Life Extension Program, Energetic Component – Internal Product Launch Team

Sandia's Energetic Production Team established a new internal production capability delivering the first in-house production unit of B61-12 latch indicator and spin rocket motor ignitors. In-house production strengthened the supply chain for nuclear weapon production, sustaining the defense program's ability to rapidly respond to future deterrence needs. Team members from across Sandia provided leadership, expertise and analysis to provide deliverables on time and under budget.

W80-4 Warhead Controller Unit Embedded Software Team

The team implemented the first software-based controller in the modern stockpile and the first nuclear safety device using software in U.S. history. The team addressed the challenges of software in such critical applications, including the use of formal methods to mathematically prove the correctness of the software and hardware implementation. The team worked across divisions, centers and geographic locations, while staying on schedule and budget. The value of the software-based approach has already been proven by adapting to issues and requirements changes that have occurred during development.

Plastic Ball Grid Array Application-Specific Integrated Circuits

To improve the manufacturability of plastic ball grid array application-specific integrated circuits, the team undertook significant design, manufacturing and execution enhancements. It updated the existing design to overhaul manufacturability, validated a new vendor for greater production capacity and executed against an aggressive production schedule to recover from frequent stoppages between 2013 to 2021.

A record number of parts were delivered in fiscal year 2022 and in the first quarter of fiscal year 2023, significantly reducing delivery gaps. The team's unwavering commitment to producing the highest quality parts and delivering them on time has enabled Sandia's Microsystems Engineering, Science and Applications Complex to fulfill its core mission needs.

W80-4 Electromagnetic Test Team

The team capitalized on an opportunity to provide critical baseline design characterization information for W80-4 Systems years ahead of schedule. The team collaborated with multiple partners and stakeholders during a tight two-week window to support NNSA's mission to design and deliver the nation's nuclear stockpile.

Annular Core Research Reactor Fissile Material Experiments Team

A cross-organizational multidisciplinary team performed the first series of plutonium experiments at the Annular Core Research Reactor in 20 years. The experiments measured the effects in plutonium samples from pulsed neutron-gamma environments. Sandia, Los Alamos National Laboratory and an external partner designed and executed sophisticated experiments in support of weapon survivability research. The experiments took more than four years to complete and reestablished a modern plutonium test capability for the nuclear security enterprise.

Air Force NNSA Demonstrator Initiative Team

Knowledge gained and technology matured through the initiative will position Sandia and its partners to respond to future national security needs. It was a system-level technology maturation demonstrator that integrated early development activities with a delivery platform for the first time, emphasizing the highest priority interfaces. The demonstrator was delivered in February 2022.

TECH TRANSFER AWARDS

Nanoporous-Based Sensors for the Electrical Detection of Gaseous Pollution

The nDETECT sensor was developed to detect a range of gases for a variety of sponsors, including the Department of State, DOE and DOD. When nDETECT is integrated with traditional surveillance and maintenance processes, it will enable a more predictive approach to stockpile management. It will reduce costs and ensure the safety and reliability of weapon systems over their lifecycles. A patent was issued for the sensor on Feb. 7. The technology is highly tunable to different gases of interest, exhibits stable and selective performance over a wide temperature range and requires very little power to operate.

LAUDABLE WORK — Deputy Labs Director Laura McGill congratulates the recipients of the 2022 Defense Program Awards.

Photo by Lonnie Anderson

The nDETECT team is interested in successfully transitioning and integrating the technology to applicable government sponsors. Integrating the sensor technology into DOE and DOD systems and processes would proactively identify risks and improve overall safety and reliability of weapons. Additional applications could include detection of chemical warfare agents for government partners and monitoring environmental and atmospheric pollutants in the commercial market.

Product Transition for Common-Hypersonic Glide Body

Sandia's Common-Hypersonic Glide Body is a first-of-its-kind technology essential to national security. Commercial industry partners are mass producing it to meet time-sensitive DOD priorities. Sandia partnered with industry through U.S. Army and U.S. Navy collaborations to transfer their build design knowledge. In turn, industry partners helped Sandia make the glide body's design more manufacturable. This collaboration has improved the flow of technology transfer and designs. Common-Hypersonic Glide Body best practices could be implemented into technology transfer processes for other mission areas across the nuclear security enterprise, supporting rapid development of technologies.

* Sandia staff can view lists of team members on the Around Sandia section of Inside website.

Nominations accepted soon

It's time to start thinking about Sandia's greatest defense programs contributions in 2023. Nominations for the 2023 Defense Programs Award of Excellence open in February and will be open for four weeks.

National achievement awards go to two Sandia engineers

Society of Asian Scientists and Engineers recognizes top talent

By **Luke Frank**

Sandia scientists Patrick Feng and Thushara Gunda recently were honored with national achievement awards by the Society of Asian Scientists and Engineers. The awards recognize recipients' leadership and accomplishments in STEM.

Patrick, a materials scientist, received a Professional Achievement Award, 10-plus years, for his leadership in developing radiation-detection materials. Patrick has guided several innovative technologies from early-stage research and development to commercial availability. His prolific advancements in radiation-detection materials and devices have resulted in 10 U.S. patents.

Specifically, Patrick's work on neutron and gamma-ray detection has extended the reliability and lifespan of radiation detectors used in nuclear nonproliferation applications addressing performance and environmental aging issues through a chemistry approach. He also has served as a project lead and contributor for end-to-end design, qualification, production and deployment of multiple sensor-architecture systems.

LAUDABLE LEADERSHIP — Materials scientist Patrick Feng received a Professional Achievement Award from the Society of Asian Scientists and Engineers for his leadership in developing radiation-detection materials. **Photo courtesy of Sandia Labs**

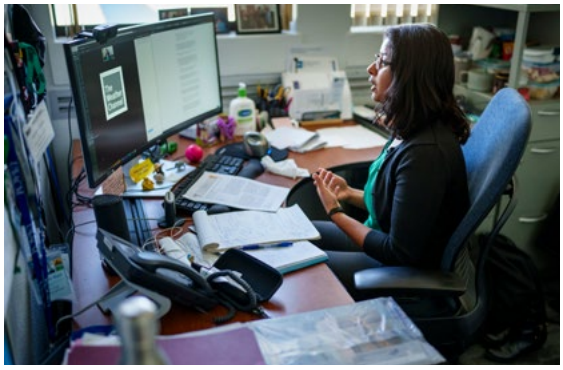
Currently, Patrick leads a team of 15 technical staff members and has mentored nine undergraduates, two graduate students and two postdoctoral researchers. In addition to his work at the Labs, he shares his passion for science by volunteering with the Quest Science Center in Livermore, California, and participating in local science outreach activities with children.

"When you're lucky enough to enjoy your work and those you work with, good things happen," Patrick said. "Developing solutions to complex engineering challenges takes an interdisciplinary team that values everyone's perspective equally. To be recognized by SASE for our great teamwork in solving national security challenges is truly fulfilling."

Thushara, a systems research analyst, earned a Promising Professional Achievement Award, 2-10 years, for her advances in water security, energy resilience and anticipatory science.

Combining social science insights with physical sciences and engineering activities, Thushara advances tools and techniques to discover patterns and knowledge made possible by her innovative approach integrating disciplines and data. Her novel approaches have generated collaborations with government agencies, national laboratories, industry partners and universities.

Thushara also led the establishment of a Sandia community of practice focused on analytics for climate and earth sciences and co-leads a multilaboratory effort focused on water-energy information exchanges. She serves as the New Mexico Water Data Initiative's technical working group lead, is an external advisory board member for the Hantush-Deju National Center for Hydrological Innovation at New Mexico Tech and is an American Geophysical Union committee member for diversity and inclusivity initiatives. She generously shares her knowledge through peer-reviewed papers, technical reports, conferences, workshops and seminar presentations.



PROMISING PROFESSIONAL — Thushara Gunda earned a Promising Professional Achievement Award from the Society of Asian Scientists and Engineers for her work in water security, energy resilience and anticipatory science. **Photo by Craig Fritz**

Outside of her robust work efforts, Thushara mentors early career STEM hopefuls, volunteers at the New Mexico Future City Competition — a national STEM competition for middle school students — and is a leader in the Asian employee resource group, working to help build a more inclusive culture at Sandia.

"Having the flexibility and support to explore integrating ideas across disciplines with data help advance solutions at the nexus of social, environmental and engineering puzzles," Thushara said. "This award helps underscore the many creative minds working together on these projects. Being at Sandia truly helped us all connect with each other around a common purpose."

"In addition to honoring two of Sandia's enterprising and hardworking researchers, these SASE awards highlight the power of belonging in developing smart solutions to complex engineering matters," said Larry P. Thomas, Sandia's chief diversity officer. "Bringing together diverse ideas and experiences delivers real results at the highest levels."

Off-site work has little bearing on promotions

By **Stephanie Hobby**

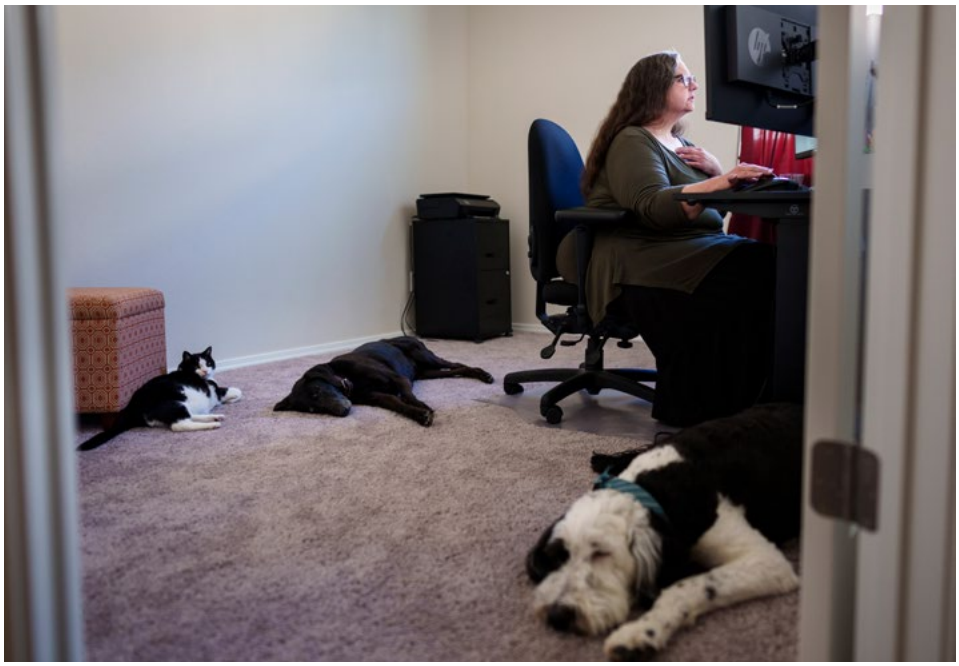
When it comes time for promotions and raises, remote and hybrid workers nationwide might wonder if their managers have unintentionally labeled them as "out of sight, out of mind." It's a growing concern, as fewer employees nationwide are physically in the office, but managers at Sandia say they have safeguards in place to ensure that everyone is considered equally.

Tracy Ray, now principal-level solutions architect in Information Technology, is one such example. Originally a contractor for the desktop computer support unit 23 years ago, Tracy handled trouble tickets before being hired as a member of laboratory staff in 2015. By 2018, she was working for the office of the Chief Information Officer as a solutions architect and was in the same role during the fateful month of March 2020, when IT had to manage a smooth transition to work from home for nearly the entire workforce.

"It was bananas!" Tracy said. "We did a lot of intensive work to transition all of Sandia to remote work. IT departments everywhere were very busy, but it was quite an experience. In those very early days, we really learned a lot about moving fast."

Tracy facilitated a core team who jumped into planning and prep mode as soon as there were signals that workers around the globe might be sent home. "We had very little time to react, but we were lucky to have a couple of insightful managers who could see it coming. They pulled together a core team one evening and within hours the next day, our team was in solution mode."

Multiple brainstorming sessions led to highlighting things that absolutely had to be addressed right away, including available hardware, remote access and passwords, and sufficient bandwidth to ensure Sandia systems could handle the skyrocketing volume of people needing to use virtual private networks. "We went from a couple hundred or thousand connections a day to more than 15 thousand connections at once. Our networking team had to upgrade some systems to handle that workload, and they did it in record time."



A JOB WELL DONE — Tracy Ray, principal solutions architect in IT, works from her new home office that she set up over winter break. Her pets, left to right, Oliver, Sugar and Kobe keep her company. Tracy, who works remotely full-time, recently received a promotion after stepping up to help staff work from home at the beginning of the pandemic. **Photo by Craig Fritz**

Getting Sandia set up for remote work was a huge accomplishment for the core team, but as the facilitator, Tracy's role in that success did not go unnoticed. By 2021, her manager, Jessica Montoya, contacted Tracy to let her know that she had earned a promotion during the transition to at-home work.

Tameka Huff, manager of the User Experience Solutions department, who works regularly with Tracy, rejects the idea that promotions are based on being seen in the office. "Before the pandemic, I had staff who worked remotely and staff on-site. I never considered who was remote and who was on-site. Promotions are always about whether or not someone is performing at that next level. We focus on results, behaviors and if our department has a need for someone at that next level. It's based on performance."

Although more than half of the Sandia workforce has returned to on-site offices, Tameka's entire staff is now off-site, herself included. She left New Mexico to live on the East Coast, where she continues to manage her team remotely.

Staying visible from afar

There are things you can do to stay visible if you aren't on-site.

"When I was on-site as a manager, people could walk by my office, see that I'm in, and stop by. At the same time, I had full-time telecommuters that would randomly ping me on Microsoft Teams. Don't be afraid to reach out on Teams, even if you don't have a meeting scheduled," Tameka said. "I'm always surprised by people who aren't having frequent conversations with their managers, so make sure you are talking often with your manager. If you feel you aren't getting that one-on-one time, schedule a meeting with them; if you're giving a presentation, invite your manager so they can be there to support you. Some people are matrixed to other organizations, and your manager in your group might not always see what you're doing, so make sure to include them."

Some teams also conduct intentional, 30-minute, informal meetings throughout the month to socialize and catch up with one

another, which can help the group function as a cohesive unit. Now that the urgency of the pandemic is in the past, and organizations are settling into more routine work, intentionally staying connected is vital.

What to do if you're interested in a promotion

If you are interested, ask your manager about Sandia's promotion charts within your job category, which will spell out the eligibility requirements. Don't be afraid to have a conversation with your manager about your efforts, and revisit those requirements during your performance discussions, along with concrete examples of your accomplishments.

"It looks different for remote workers than in-person. It can sometimes feel like there's an empty space between when you're updating status with your manager or collaborating with your team versus when you're doing work solo. It can feel a bit lonely. Whereas in-person, there are more opportunities for spontaneous dialogue and idea-bouncing," Tracy said. "It's important to stay visible and connected.

"Check in with your manager and teams frequently and don't be afraid to share your ideas and contributions. Our department's weekly check-in meetings and maintained tier boards have been really helpful for capturing and sharing individual and team successes as they occur. We try to encourage each other to take credit for and acknowledge our efforts."

Early-career researcher represents Sandia at inaugural National Research SLAM

CONNECTING SCIENCE AND POLITICS — National SLAM participants meet with Sen. Ben Ray Lujan of New Mexico. **Photo courtesy of Blaise Douros, Lawrence Livermore National Laboratory**

By **Sophia Horowitz**

In three minutes and armed with a single slide, postdoctoral researchers have the opportunity to explain their motivation, their results and the significance of their research to a nonspecialty audience and a panel of judges.

The group of 17 early-career research finalists gathered in the Congressional Auditorium in Washington, D.C., on Wednesday, Nov. 15, 2023, to present their innovative research at the inaugural National Lab Research SLAM.

Finalists presented in four research categories: Energy Security, National Security, Environmental Resilience and Scientific Discovery, representing each of the 17 DOE national labs.

Rep. Chuck Fleischmann of Tennessee and Sen. Ben Ray Luján of New Mexico opened the inaugural event with remarks. Jean-luc Doumont, a renowned expert in research communication, served as the evening's emcee.

Megan Dahlhauser, a postdoctoral researcher in quantum computer science, represented Sandia with her

National SLAM fosters a long-lasting network for researchers

Tracie Durbin, postdoctoral program lead, said the event builds long-lasting community for researchers.

"We have been carrying out multilab SLAMs with other laboratories in California and New Mexico for the past three years. We built cohorts of postdocs across these labs that are still communicating with each other today," she said. "It is important for researchers to have a diverse network that they can pull on in the future. These cohorts of postdocs built strong relationships based on a shared goal that should pay off for our nation in the future."

The National Lab Research SLAM was **livestreamed** for audience members. Learn more about the SLAM event, finalists and judges at the **National Lab Research SLAM site**.

presentation on when computers fail. Megan described the SLAM event as an unforgettable experience and encourages others to participate.

"The most rewarding part was the wonderful group of people I got to meet as part of the event. I learned so much from everyone, from infinitely cool science being done by amazing scientists, to fascinating details about how Congress really works in practice," Megan said.

When computers fail

Quantum computers are a proposed solution to computational challenges that modern computers fail to solve. Quantum computers, however, are currently in early stages of development and experience lots of failures of their own. Megan and her team focus on tracking and understanding those failures.

"This work helps us learn more about quantum computers and leads us to discover ways to help progress quantum computers to the next generations," Megan said.

TAKING CENTER STAGE — Postdoctoral researcher Megan Dahlhauser presents her research at the inaugural National Lab Research SLAM.
Photo courtesy of Blaise Douros, Lawrence Livermore National Laboratory

EMBRACING THE SPOTLIGHT — National SLAM participants stand before judges and the audience.
Photo courtesy of Blaise Douros, Lawrence Livermore National Laboratory

Mileposts


Robert Martinez 35


Cindy Serna 35


Christopher Evans 30


Michael F Lopez 30


Christian O'Gorman 30


Norman Baca 25


Erik Boman 25


John Debassige 25


John Gonzales 25

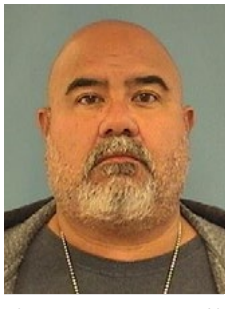

Chris O'Malley 25


Joe Carney 20


Talbot Smith 20


Mark Taylor 20


Nicholas Teske 20


Nick Vargas 20

Recent Retirees


Tom Swiler 26


Mary Ann Córdova 18