



Bruised and bleeding

Color-changing materials show where they're hurt

By **Mollie Rappe**

Every over-the-counter medication bottle sports a protective seal, usually a plastic wrap or foam layer, or both. These seals offer signs of tampering attempts. In a parallel concern, the International Atomic Energy Agency relies on tamper-indicating devices to make sure it knows if containers of nuclear material have been opened or tampered with.

However, just as a medication bottle might be opened and the tamper seals carefully reattached by a bad guy, the International Atomic Energy Agency is concerned its devices could be bypassed and repaired or counterfeited. A possible solution? Engineers at Sandia have developed a groundbreaking prototype using “bruising” materials. Their innovation doesn’t just detect tampering; the new device boldly displays the evidence, like battle scars.

“Our first idea was to create a ‘bleeding’ material where it was extremely obvious that it had been tampered with,” said Heidi



SMALL SEAL — Sandia postdoctoral researcher Stephanie White holds up a prototype tamper-indicating device. The colored speckles make each device near-impossible to counterfeit, while the solution inside turns brown if the casing is cracked or the wire is pulled, indicating attempts to access whatever is behind the device.

Photo by **Craig Fritz**

Smartt, a Sandia electrical engineer and project lead. “Then we made a new device using these materials where the damage is obvious for people to see. No one has ever done this sort of concept for international nuclear safeguards before.”

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Propelling innovation into industry



MAKING AN IMPACT — Materials scientist Hongyou Fan co-created Disinfectant 2.0, a material that kills disease when exposed to light.

Photo by **Jennifer Plante**

Sandia awarded for outstanding work in technology transfer

By **Kim Vallez Quintana**

One of Sandia’s core missions is to help the world through innovation. However, transferring some of that innovation from the Labs to industry isn’t always an easy process.

Through hard work and ingenuity, some Sandians are excelling at moving technology to market, a feat that is now being honored by the Federal Laboratory Consortium. The consortium, composed of more than 300 members nationwide, provides a forum to develop strategies and

opportunities for linking laboratory technologies and expertise in the marketplace.

Regional Technology Transfer Award: Disinfectant 2.0

The winner of the 2024 Federal Laboratory Consortium Technology Transfer Award for the midcontinent is Disinfectant 2.0. It’s a product that kills viruses, bacteria and fungi for long periods and was developed in the middle of the COVID-19 pandemic using technology developed at Sandia.

It’s the creation of materials scientist Hongyou Fan and his team, along with the company Lunano LLC, based in McLean, Virginia.

Hongyou started working with Lunano in January 2020 as part of the FedTech

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Two Sandia leaders recognized with Black leadership awards



Deputy Laboratories Director and Chief Operating Officer David Gibson.

Photo by Craig Fritz

By **Kenny Vigil**

David Gibson: Lessons from his great-grandparents

Deputy Laboratories Director and Chief Operating Officer David Gibson said his great-grandparents had a profound impact on the leader he is today.

“By the time I was born, my great-grandparents had seen the nation make tremendous progress, and they knew more needed to be done. They were optimistic and hopeful for the future,” David said. “They shaped my perspective about this nation. Their greatest gift to me was motivation rooted in the hope that I could make a difference.”

David encourages employees to have the courage to be curious, ask questions and learn about cultures other than their

own. “It’s important for employees to feel safe, and it benefits our mission when we have contributors who bring different experiences and perspectives to our work,” David said. “I think we have a lot more in common than we have differences. I think at Sandia, we’re motivated by a sense of service and wanting to make a difference.”

David’s impact has earned him a Black Leadership award from [Profiles in Diversity Journal](#).

David became deputy labs director and COO in December 2021. He’s proud of some of the changes made during that time, including improved compensation and benefits, and a revamped performance management system that focuses on employee growth. He’s also looking forward to what Sandia can accomplish with its two focused goals: to accelerate innovation and lead in modern engineering.

“Today our mission is as important as it’s ever been, giving us an opportunity to serve in ways that are significant,” David said.

David started working at Sandia as an intern in 1998, during his senior year at the University of New Mexico. He has held various positions throughout his time at Sandia. In 2017, he became the center director of Sandia’s California site operations.

He left Sandia for a couple of years to serve as senior director of Environment, Safety, Health and Quality at Argonne National Laboratory before returning to the Labs in late 2021 as the COO.

When asked what his great-grandparents would think about his accomplishments, David said, “They would be proud. We live in a country where my story is possible.” David added that stories like his are also becoming more mainstream. Referring back to what his great-grandparents would think, he said, “They would be super proud.”



Chief Diversity, Equity and Belonging Officer
Larry Thomas. Photo by Craig Fritz

Larry Thomas: Creating a sense of belonging at Sandia

At a young age, Larry Thomas knew he wanted to advocate for hardworking people at the bottom of the financial hierarchy. The son of a factory worker and an auto mechanic, Larry is now advocating to create a stronger sense of belonging at Sandia.

“The goal is to cultivate an inviting, safe, ethical,

hospitable, respectful, enjoyable and appreciative work environment and culture so our employees bond, belong and thrive,” said Larry, Sandia’s chief diversity, equity and belonging officer. “Over time, I hope we become a community that, differences aside, celebrates and honors what we have in common.”

Larry was the first in his family to attend college. He earned a bachelor’s and two master’s degrees. Now a senior manager at Sandia, Larry says his leadership philosophy centers on compassion, innovation and relationships. Larry’s work and advocacy earned him a Black Leadership award, and he’s featured in [Profiles in Diversity Journal](#).

He partners with many others at Sandia, including a belonging, equity, diversity and inclusion strategist and an affirmative action and equal opportunity specialist to ensure compliance with federal and state laws.


What is belonging?

“To thrive, Sandians need to believe they belong. To belong, Sandians need to feel bonded to one another and the organization. To bond, Sandians can’t feel like they’re struggling or barely surviving,” Larry said. “To create, enhance and maintain an environment for belonging to thrive, Sandians must believe their originality and impact is celebrated, reciprocated and appreciated by their supervisor.”

Larry pointed out that belonging and inclusion are different. He said he likes professor and author Brené Brown’s definition of belonging.

“Brown’s research found that belonging is the opposite of fitting-in or inclusion. True belonging requires every person to be who they are. Belonging honors your originality, which includes the intersections of your identity,” Larry said. He added that originality enhances a team and organization’s creative thinking, communication, collaboration and productivity.

Since joining Sandia in August 2022, Larry said one of his biggest accomplishments is engaging with external stakeholders from historically excluded populations. Those stakeholders include the New York State Collegiate Science & Technology Entry Programs, the Vivien Thomas Scholars Initiative at Johns Hopkins University, the SEED Scholars Honors Program at the University of California at Berkeley, the Chief Diversity Officer’s Forum of Disability:IN, and the Board of Corporate Affiliates for the National Society of Black Engineers.

Larry is also proud of introducing the concept of belonging and encouraging Sandians to look for the common threads that tie us together. “Belonging is Sandia’s most significant long-term priority. Getting to belonging will be quite the journey,” a journey Larry knows Sandia is ready to take on. 

Five Sandians win Black Engineer of the Year Awards

By **Maggie Krajewski**
Photos by **Lonnie Anderson**

The Black Engineer of the Year Award conference will honor five Sandians for their outstanding achievements in engineering, science and technology.

The awards include Science Spectrum Trailblazer, Modern Day Technology Leader, Most Promising Engineer in Industry and the Senior Investigator Award.

The winners' tenure at the Labs spans four to 20 years and each have made significant contributions in creative, innovative, science-based, systems engineering solutions to help solve our nation's most challenging national security problems.

The award recipients will be honored at the 2024 conference held in Baltimore on Feb. 15-17.

Science Spectrum Trailblazer



BEYA SCIENCE SPECTRUM TRAILBLAZER
— Black Engineer of the Year Awards winner Michelle Collins is an electrical engineer and product realization team lead within one of Sandia's system engineering groups.

Michelle Collins

Michelle Collins was in seventh grade,

constructing a doorbell, when she decided she was going to become an engineer. And that's exactly what she did.

Michelle will celebrate her seventh year at Sandia in April. When Michelle started, she was one of two electrical engineers who helped define the entire architecture of the system her group was developing. Today, she is product realization team lead within one of Sandia's system engineering groups. In her time at the Labs, Michelle and her teams have won the NNSA Defense Program Awards of Excellence and two Employee Recognition Awards.

Much of Michelle's education was paved by opportunities and programs that helped young women and minorities tap into their potential as future scientists and engineers, and Michelle is committed to helping pave a similar path for future generations. She plays an active role as a mentor and helps recruit at universities and colleges.

Michelle serves on the executive board of Sandia's African American Outreach Committee.



BEYA SCIENCE SPECTRUM TRAILBLAZER
— Black Engineer of the Year Awards winner Anthony Sanders is a systems engineer and R&D manager of the START Historically Black Colleges and Universities and Other Minority-Serving Institutions Partnerships Department.

Anthony Sanders

A longtime lover of music, Anthony Sanders discovered his passion for engineering while learning to record and produce music. It was here that he learned concepts such as dynamic range, clipping and quantization while creating digital recordings.

Anthony has been with Sandia for 16 years, working primarily in testing and integrating space and ground system hardware working in various roles from test engineer to manager of the Advanced Space Systems department. He developed a predictive performance statistical model that is used today to support ground-based analysis, on-orbit analysis and troubleshoot anomalous behavior.

Today, Anthony works as Sandia's Campus Partnership manager for the Labs university diversity partnerships using his vast technical background to help develop and foster key relationships between Sandia and historically Black colleges and universities and other minority-serving institutions. His work has been pivotal in building a more diverse talent pipeline and enhancing research ties between these institutions and the Labs.

Anthony is committed to helping provide educational support to disenfranchised and underrepresented youth in Albuquerque. He volunteers for a local nonprofit associated with his fraternity Alpha Phi Alpha Inc., leads a grant committee to secure funding for the Alpha Mentorship Program, works as a mentor for that program and mentors early career engineers within the Labs.

Modern Day Technology Leader Sean Harris

Sean Harris was working at a Best Buy in high school when his interest in information technology sparked. It was there that Sean was first exposed to an Oracle-based point-of-sale and back-end system.

Fast forward a few years and Sean was working with the Oracle Middleware Team at Sandia as a summer intern. Sean



BEYA MODERN-DAY TECHNOLOGY LEADER — Black Engineer of the Year Awards winner Sean Harris is deputy director of the Field Intelligence Element and is senior manager of the High Security Operations Cyber and IT organizations.

has now been with Sandia for nearly 20 years working in various capacities across Enterprise Technology Systems and cybersecurity efforts supporting the intelligence community. From 2016 to 2020, Sean served on the board of directors for the Community Association for Information Systems Security Working Groups, which helps advance the professional understanding and capabilities of cybersecurity across the intelligence community.

Sean currently serves as deputy director of the Field Intelligence Element and is senior manager of the High Security Operations Cyber and IT organization. Sean's work has been critical in leading Sandia's effort in support of the Department of Homeland Security Science and Technology Directorate cybersecurity mission.

Outside of his technical work, Sean is committed to helping create opportunities for women and minorities in the cybersecurity field and supports several nationwide diversity recruiting efforts for the Labs. He is also co-chair of Sandia's Black Leadership Committee.

Most Promising Engineer in Industry Award

Nicole Jackson

Nicole Jackson's mother was a strong supporter of the arts and encouraged a young



BEYA MOST PROMISING ENGINEER IN INDUSTRY — Black Engineer of the Year Awards winner Nicole Jackson is a systems engineer and senior member of Sandia's technical staff.

Nicole to participate in a variety of mediums from painting to dancing to taking cello lessons. Nicole credits this early exposure to helping her connect the dots and find new solutions — problem-solving that has been vital to her work at Sandia.

Nicole's work as senior member of the technical staff centers around finding ways to help communities adapt to a changing climate while sustainably developing and managing their natural resources. Her research looks at what natural hazards have occurred in the past, what is projected in the future, how these have impacted infrastructure and how we can improve decision making around these findings.

In her almost five years at Sandia, Nicole has built an outstanding professional reputation both within the Labs and the industry. In 2023, Nicole was nominated by the United States Global Change Research Program to the Integrated Hydro-Terrestrial Modeling Coordinating Group for federal and non-federal scientists, managers and their partners. This federal program coordinates research and investments to better understand forces shaping the global environment, both human and natural, and their impacts on society.

Nicole is dedicated to making the civil engineering field more diverse and inclusive by mentoring STEM students of all levels from high school to undergraduate and graduate interns working at the Labs.

Senior Investigator Award



BEYA SENIOR INVESTIGATOR — Black Engineer of the Year Awards winner Rigo Tibi is a geoscientist and principal member of Sandia's technical staff.

Rigo Tibi

Rigo Tibi joined Sandia in 2016, bringing with him an impressive background in academia and industry for his research in seismic event discrimination and local and region distances, advanced seismic data processing for automatic generation of event bulletins, seismic waveform denoising and machine learning application in seismology.

As a principal member of the technical staff, Rigo researches and develops techniques to improve monitoring of underground nuclear explosions. His research spans Technical Readiness Level 2-5, which includes everything from basic research to that which can be used in operation.

In 2021 and 2022, Rigo published two papers that demonstrated how machine-learning-based denoising was superior to both continuous wavelet transform thresholding and frequency filtering, the standard methods of noise suppression.

In Rigo's seven years at Sandia, he has authored an impressive 11 peer-reviewed publications and two technical reports. Rigo and his research are highly regarded and recognized within the international and national treaty monitoring and seismology communities.

In addition to his technical achievements, Rigo is a champion in minority communities encouraging students to pursue careers at national laboratories. [f](#)

Color-changing pucks

CONTINUED FROM PAGE 1

Color-changing chemical

Using commercially available colored water beads, a color-changing chemical reaction and 3D-printed cases, the team made puck-shaped devices that turn dark brown when damaged or the wire loop threaded through them is pulled out.

The important part of the color-changing solution is a chemical called L-DOPA, which the body uses to make several vital neurotransmitters. This chemical can react with oxygen to make melanin, the brown chemical that gives human skin, hair and eyes their color.

The research team explored several other color-changing solutions before determining that the melanin-producing reaction, somewhat like the reaction caused by tanning, was the most practical, said Cody Corbin, a Sandia materials chemist. “This has worked beautifully ever since.”

If someone drills a little hole in the device or attempts to pull out the embedded wires, oxygen leaks in. Once inside, the oxygen reacts with the color-changing solution near the damage, turning it brown. Over time, more oxygen gets in, and the “bruise” grows.

Producing speckled pucks

The Sandia prototype devices are about the size of a stack of seven U.S. half-dollar coins, the same size as the metal cup seals the agency has used since the 1960s. The International Atomic Energy Agency relies on tamper-indicating devices looped around the openings of cabinets containing vital monitoring equipment. The devices also go on the openings of containers of spent nuclear fuel to make possible diversion obvious.

However, International Atomic Energy Agency inspectors need to examine these devices and their wire loops carefully, looking and feeling for odd marks, color differences and other evidence of tampering. This inspection is time consuming and subject to human error. The purpose of the Sandia prototype is to reduce the time and subjectivity of such inspections.

To make the filling for the prototype devices, Cody’s team adds a little bit of water to a mixture of clear and colored water beads until they are squishy, he said. Then they blend the beads until they are small bits but not a fine powder. Once dry, they transfer the bits into a piece of laboratory equipment called a glovebox.

The glovebox has several pairs of thick rubber gloves that allow researchers to perform experiments in an oxygen-free environment. Once inside the glovebox, the bead bits are soaked in the color-changing solution and then a researcher pours the mixture into 3D-printed cases and seals them. Once sealed, the cases can be removed.

“The other side of tamper-indication is making sure that you have unique identification to ensure that the devices are not easy to counterfeit and replace,” Cody said. “The bead bit colors provide that anti-counterfeit aspect. If someone wanted to replicate a puck, they would have to get every single red, blue and green speckle in the same spot.”

Putting the devices to the test

The team is testing dozens of pucks under numerous different conditions that mimic various environments they could be used in, Heidi said. This includes testing them at temperatures ranging from -22 degrees to 150 degrees Fahrenheit, and under intense UV light to age the materials faster, up to the equivalent of three years.


Last year, the team filed a patent on the color-changing material and recently filed a patent continuation on the tamper-indicating device itself. The team may also pursue additional federal funding to test the devices in the field and may seek out corporate partners to license and commercialize the technology. The team has also made entire tamper-indicating enclosures out of the color-changing material as part of another ongoing project.

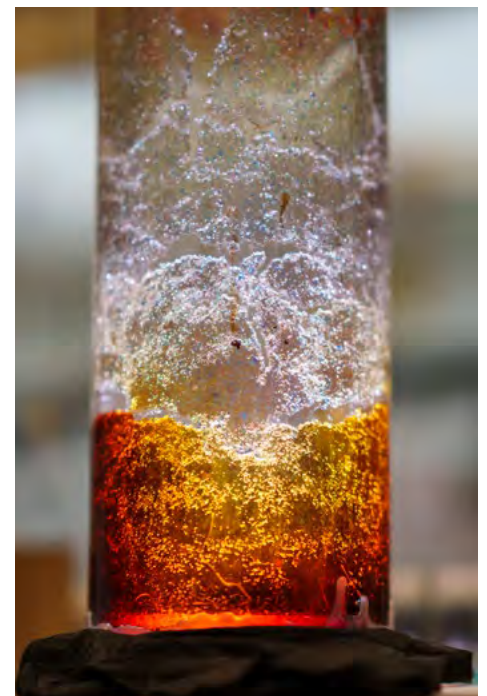


PREPPING PROTECTION — Sandia materials chemist Cody Corbin works in a glovebox, preparing a container filled with bead bits that will turn brown if someone attempts to tamper with the container’s contents.

Photo by Craig Fritz

“From the beginning of our work on these materials, we’ve seen this as really valuable for any industry that’s concerned with the tampering of their packaging,” Heidi said. “I think we can really add value in that visually obvious aspect of our devices; that’s a totally new thing. There are a lot of other possible uses for these loop seals too.”

The bruising materials research was funded by Sandia’s [Laboratory Directed Research and Development program](#). Further development and device prototyping were funded by the NNSA’s [Office of Defense Nuclear Nonproliferation](#). 



Technology transfer

CONTINUED FROM PAGE 1

Startup Studio program to explore how to use nanomaterial technology developed at Sandia for disinfectant applications. When the pandemic hit, that partnership kicked into high gear.

Lunano CEO and co-founder Bradley Duckworth said he remembers a conversation he had with a ride-hailing-service driver:

“We talked about the challenges the company was facing trying to keep their drivers’ cars disinfected for customers,” Duckworth said. “I asked him, ‘Well, if you were able to have a product that didn’t give your customers headaches and wasn’t unpleasant to smell and it worked continuously, would this be something that would be interesting for you?’ He said, ‘Absolutely.’”

That was all the convincing the team needed to get to work quickly. They reached out to more industries, including hotels, restaurants and airlines and realized the great need for such a product and how it could help everyday life.

From that point, Duckworth, Hongyou and their teams decided to pursue a process called detergent-assisted fabrication of porphyrin nanoparticle photosensitizers.

How it works

Porphyrins are photo pigments that, when exposed to light, go through a chemical reaction.

The team assembled these porphyrins into nanomaterials that can be integrated into sprays, compounds and membranes, as well as in manufactured surfaces.

When they are exposed to light, the chemical reaction is triggered, releasing a highly reactive species that kills disease cells, including E. coli, Staphylococcus aureus, staph infection, viruses, bacteria and fungi. While disinfectants generally must be reapplied to high-touch surfaces regularly, Disinfectant 2.0 has a monthslong to a yearslong life span.

“The beauty of this is that light is the trigger. You have light everywhere and it’s free,” Hongyou said. “Take a taxi, for example; in it you have customers who bring germs. You spray Disinfectant 2.0 onto the car seat’s surface, and when the light hits it, you kill the germs.”

Getting it commercialized

Creating the product is just the first step. Often, one of the hardest steps is getting it to industry. Duckworth, Hongyou and their teams worked together to get the technology licensed quickly and under extraordinary circumstances.

Both teams spent hours working together online because of the COVID-19 pandemic and health restrictions, all while still doing their day jobs.

“When they started, there were so many uncertainties,” said Robert Westervelt, a licensing executive with Sandia who worked on the project. “They went through trainings and did some 500 interviews. They found a good patent attorney and found angel investors.”

Lunano was then able to license the technology at no cost under a special license Sandia created during the pandemic.

Lunano is now conducting research with large companies to determine how to best integrate Disinfectant 2.0 technology into their products and how to produce it

on a mass scale. They’re planning to create 100 jobs in the process.

Leaving a mark on the world

This technology is poised to have a lasting effect. “I think it’s one of the top technologies that I’ve had the ability to help commercialize just because of the breadth of its impact,” Robert said.

Hongyou said he’s excited to see where it goes from here.

“Years ago, when I started this work at Sandia, I was focused only on the fundamental science side. When the pandemic hit, we realized what a huge impact our work could have on the world, especially during a time of crisis,” he said. “Now I feel so excited. You don’t know what a big a deal this science can be in the future.”

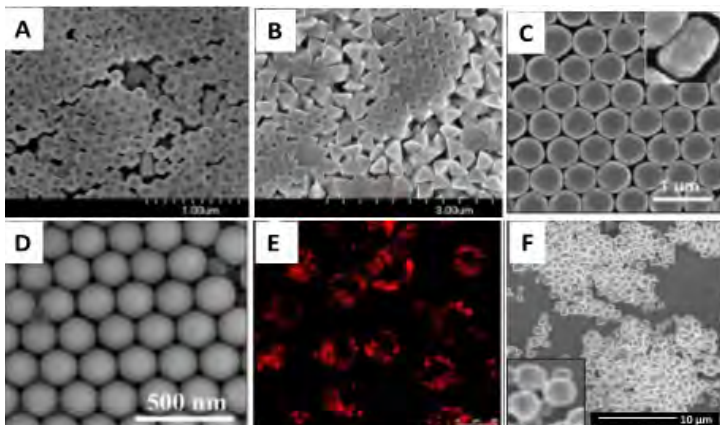
Hongyou, who was recently named a fellow of the American Chemical Society, continues to tackle new challenges over a wide range of applications including nano-electronics, energy and materials integration.

He currently manages Sandia’s Geoscience Core Program for DOE’s Office of Science Basic Energy Science. He is also the manager of Sandia’s geochemistry department, a group of scientists who are addressing national problems in CO2 reduction, hydrogen storage and critical minerals recovery to address the Bipartisan Infrastructure Law. In this work, they are helping to establish secure sustained domestic critical minerals supply chains.

Outstanding Tech Transfer Professional

The Federal Laboratory Consortium has also named Sandia’s Chief Intellectual Property/Patent Counsel Samantha Updegraff as Outstanding Tech Transfer Professional of the Year for her ability to devise creative ways to successfully accomplish Sandia’s tech transfer mission.

Samantha’s success can be credited in part to her nontraditional background. She earned a bachelor’s degree in chemical engineering and worked in the pharmaceutical industry before becoming interested in patent law through a friend and colleague. She decided to go to



DESTROYING DISEASE — Detergent-assisted fabrication helps assemble porphyrins into a controlled size and shape to be used in applications such as killing bacteria and germs.

Image courtesy of Hongyou Fan



OUTSTANDING TECH TRANSFER PROFESSIONAL — Samantha Updegraff, Sandia's Chief Intellectual Property/Patent Counsel, has been recognized for her creative ways of achieving Sandia's tech transfer mission.

Photo by Lonnie Anderson

law school at the University of New Mexico when she moved back home to Albuquerque with her husband.

"My husband began his Sandia career, and I knew I wanted to work here in some capacity in the future. It really is the gold-standard employer in the state," Samantha said. "When I was hired into the licensing group, I discovered how broad Sandia's tech portfolio is and how impactful transitioning these technologies outside the national laboratories can be to the nation."

In her time at Sandia, Samantha has led the way in updating licensing and tech transfer agreement templates, greatly streamlining the process.

She also helped create Sandia's Faculty Loan Program, which allows Sandians to work in both the Sandia and university environments under temporary loan arrangements and further develop technologies that have tech transfer opportunities.

Samantha also assisted in the negotiation of a high-value license with a major electronics company for an entire portfolio of patents and worked closely with Los Alamos National Laboratory to get the

TRGR Technology Readiness Initiative off the ground.

Among her biggest accomplishments is spearheading the creation and implementation of a copyright transfer program, which makes it easier for Sandia staff to publish their advancements and technologies for the public good. Samantha said she's delighted to be recognized but still has work to do.

"I hope to streamline or at least demystify partnership processes at Sandia, making it easier for industry, government, academia and other national laboratories to work with us. The hope is to lower the barrier to entry and ensure more technologies can be transferred to external partners, especially those who haven't partnered with Sandia or national laboratories before," Samantha said.

State and Local Economic Development Award — TRGR Technology Readiness Initiative

The Federal Laboratory Consortium is also recognizing the **TRGR Technology Readiness Initiative** and its success in moving technology developed at the national labs to market.

They've awarded it the 2024 State and Local Economic Development Award.

The program, created in 2020, allows New Mexico businesses that have licensed technology from Sandia and Los Alamos National Laboratory, or engaged in a Cooperative Research and Development Agreement, to receive up to \$150,000 in technology maturation assistance from the labs to help ready products and services for


the marketplace.

Almost \$1.5 million in lab hours have been used over the last three years to benefit New Mexico businesses. As a result, 15 licenses and three new cooperative research and development agreements have been secured.

Among the success stories is that of Kairos Power LLC, a nuclear energy engineering, design and manufacturing company. The company is commercializing a fluoride salt-cooled high-temperature reactor, with a mission of enabling the world's transition to clean energy.

Through the TRGR Technology Readiness Initiative, Kairos Power was able to access Sandia's specialized equipment and expertise to develop a necessary sensor. They are now using engineering expertise at Los Alamos National Laboratory to further the design of a new facility.

The company's testing and manufacturing facility in Albuquerque will support the design, construction and operation of the Hermes demonstration reactor in Oak Ridge, Tennessee.

The gross receipts program's success prompted the New Mexico Legislature to extend tax credits necessary for the initiative through 2027. 

JOIN THE CONVERSATION

Sandia Labs has official social media accounts on several online communities to engage in conversations about our work, update followers about the latest Labs news, share opportunities, and support the open government principles of transparency, participation and collaboration.

Visit us on your favorite networks and join the conversation.

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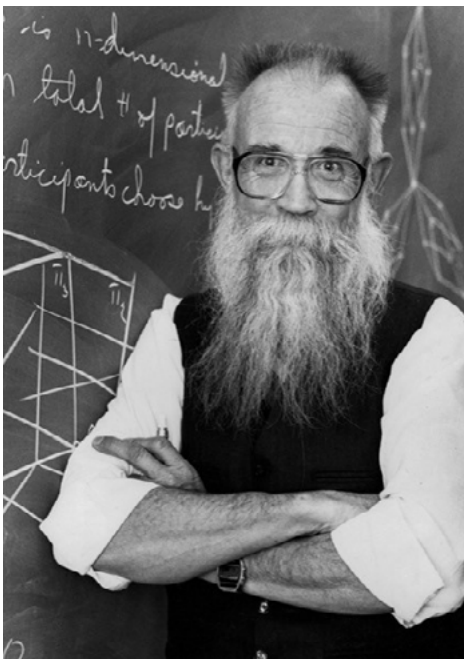
Gus Simmons: A true polymath

First Sandia Fellow talks about his remarkable career, and one problem he never solved

By **Troy Rummler**

Gus Simmons, 93, said he wouldn't believe his own story if he hadn't lived it.

Seventy years after Sandia first hired him (the Labs would eventually hire him three more times), the E.O. Lawrence Award winner and Sandia's first Fellow shared with me a far-flung career that established him as a major figure in the fields of command and



A MISCHIEVOUS SMILE — For much of his career, Gus Simmons sported a distinctively long beard, which he said Sandia President John Hornbeck called “the ugliest damn thing I’ve ever seen.” During a briefing in front of military officials, Hornbeck asked Simmons “Are you a Mennonite or something?” Simmons recalled, “I shrugged my shoulders and said, ‘Something,’ and gave the briefing.” **Photo by Russel Smith**

control, cryptology and authentication.

And although he has finally been settling into his full retirement, he also shared one unsolved national security problem he says still weighs on his mind.

Simmons, a spunky West Virginian storyteller, zips from tale to tale throughout our conversation, apologizing but not stopping when he strays from my questions. He retired from Sandia in 1993 but only stopped publishing math papers a few years ago.

“From the neck up I’m in pretty good shape,” he said.

Now living in Los Lunas, New Mexico, with his partner, Helen, and their Rhodesian Ridgeback, he said he looks back at his career with immense satisfaction.

“I was able to do just what I would have done if I were rich and could have done whatever I wished,” he said.

Here and gone again

It was 1955. Eisenhower was President. Rosa Parks had been arrested. The first McDonald’s had started selling hamburgers. And Gus Simmons, a Sandia technician, did something that would shape history, too.

He quit his job.

It was a curious career move for someone who had accomplished so much just to get where he was. Simmons was born in 1930 in a rural coal mining town, or as he described it, “The worst place in the country to be born.”

(Simmons elaborates on his childhood in his memoir “[Another Time, Another Place, Another Story](#).” Click on the first cover photo for the book.)

But Simmons was a go-getter with an insatiable curiosity and intellect. When he was 16, he was one of 40 national winners of the Westinghouse Science Talent Search, which earned him a picture with President Truman and enough prize money to move to California for college.



Making History, Shaping the Future

Unfortunately, when his plans went awry, he wound up homeless on the streets of Los Angeles. He didn’t know a soul, had no way or money to get home and no job experience to fall back on.

His ticket out of homelessness was a competitive math and science test that got him into the newly formed Air Force, beating throngs of GIs returning from World War II, many hoping to reenlist.

“Not only did it save me from being homeless in L.A., it was the entrée — my years of college-level training in electrical engineering and five years of experience in the Air Force as a radar technician — that led to me being hired at Sandia. So, the Barksdale AFB acceptance letter was the most important thing in my entire life,” Simmons said.

“I couldn’t even guess what would have happened to me if that hadn’t happened.”

Simmons joined Sandia as a technician in 1954. His position was low-paying and precarious. A scientist he was working under fired him on the spot when an experimental computer failed during a demonstration for his management. Simmons arranged with the personnel office to simply move to a different organization under the condition that the scientist could never know Simmons was still employed at Sandia.

When Simmons learned he had no hope of promotion without an advanced degree, he quit, setting in motion a remarkable



ONE TALENTED KID — Gus Simmons and fellow winners of the 1947 Westinghouse Talent Search meeting President Harry Truman. Gus is standing in the back row just to the right of the Franklin Roosevelt portrait.
Photo courtesy of Science for Society

scientific career and his impact on U.S. national security.

Innovating in satellites, weapons, mathematics and more

Simmons earned a bachelor's degree in math and physics from New Mexico Highlands University, and returned to Sandia in 1958 after completing his master's degree in physics from the University of Oklahoma.

With diplomas in hand, Simmons went to work on the Vela Hotel program, Sandia's first foray into designing satellites for detecting nuclear detonations. The program was so successful he was poached by the McDonnell Aircraft Corp. to work as a group manager on the first U.S. human spaceflight program, Mercury.

Simmons returned to Sandia again in the 1960s to lead a group mandated by President John F. Kennedy to get U.S. nuclear weapons in Europe under positive control.

"What that means is separating the possession of a nuclear weapon from the ability to use it as a nuclear weapon," said Simmons.

"For the next five years, I worked quite literally night and day on the program."

In the end, Simmons' group developed the nuclear stockpile's first permissive action link, commonly called a PAL — an electromechanical lock that stops unauthorized individuals from using a nuclear weapon.

"That's what got me the (E.O.)

Lawrence Award. That's what got me the Department of Defense Award of Excellence. In a sense, that got me the honorary doctorate (from Lund University). It was pivotal to my whole life," Simmons said.

After earning a doctoral degree in Math from the University of New Mexico, he quit Sandia a third time, in 1969 to help form a tech company, Rolamite, Inc.; returning after the company was "eaten alive" in a hostile stock takeover.

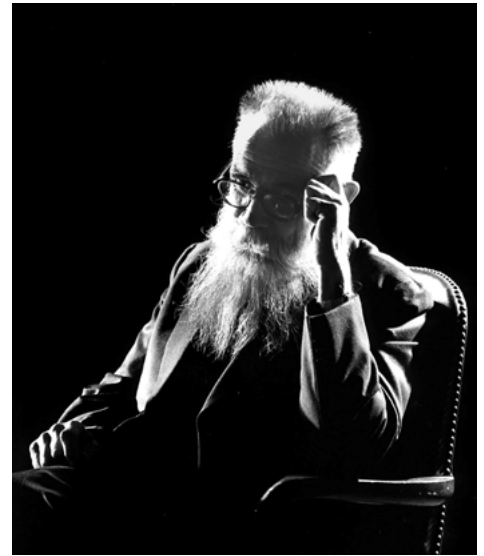
During his fourth and final stay at Sandia, he designed a Mars lander, achieved a mathematical breakthrough by factoring a 69-digit number and developed numerous authentication protocols critical to maintaining nuclear arms treaties, now used extensively for e-commerce.

A still unanswered question

In 1986, Sandia president Irwin Welber announced the creation of a new position — Senior Fellow, now called Sandia Fellow. In the Lab News, Welber was quoted saying the position was "to recognize a very limited number of technical professional staff who have demonstrated continuing contributions of truly exceptional breadth, depth, and creativity in fields impacting the technical mission of the Labs."

Simmons was recognized as Sandia's first Fellow.

"I don't anticipate many Senior Fellows



THINKER — "Photos simply do not capture the horror," Simmons said describing nuclear detonations he witnessed, mostly during Operation Dominic, a 1962 U.S. testing blitz in the Pacific. "The column of the fireball is a writhing mass of red and black, with self-induced lightning. In moments the fireball will have risen tens of thousands of feet and spread to where it is overhead."

Photo by Randy Montoya

in the future," Welber said at the time. There have been 21 in Sandia's history. In 2023, Labs Director James Peery expanded the program to include non-research and development positions.

In his new position, Simmons reported directly to Sandia's president. He focused



PADRE — The citation accompanying an honorary doctorate granted in 1991 from Lund University declared Simmons, pictured here in 2009, "the father of authentication," a title that has stuck with him ever since.
Photo by Randy Montoya

his efforts on studying how to relock unexploded nuclear weapons after some have already been used in a conflict, a problem needing technology that wasn't available during his career.

"No, I was unsuccessful. We have an enormous amount of research on how you escalate to a nuclear war and how you control the use of nuclear weapons. What I realized was there was absolutely nothing on the converse. How do you scale back?" Simmons said.

He and others did make progress in some aspects of deescalating a nuclear war. One option Simmons studied was "selective release" codes that could arm some nuclear weapons but not others, giving governments

the ability to limit warfare. But, during his time at Sandia he did not find an effective mechanism for a president to reestablish positive control on weapons that had been unlocked.

"It is an absolutely vital problem for the welfare of mankind. If we ever use nuclear weapons — actually use them — how do they step back from it? How do they scale back? How do they end it?"


Would he do it all again?

Simmons retired from Sandia in 1993 but afterward enjoyed nearly three decades of prolificacy in academia. He served in distinguished positions at Lund University in Sweden; Royal Holloway, University of London, in Windsor, U.K.; and the Karlsruhe

Institute of Technology in Germany. He was appointed the Rothschild Professor of Mathematics at the Newton Institute of Mathematics at the University of Cambridge, and Fellow of Trinity College. He also won the University of New Mexico Zimmerman Award.

"I had three papers published two years ago, math papers, and one of those is perhaps the best paper of my math career," he said.

Now, at last, Simmons says his story is coming to a close.

"Lord, I wish I were starting over. Well, not starting over, but —" for the first time in our conversation, Simmons fumbles for his words. Then he finds them. "It's been an incredible experience." 

Classified off-site hubs solidify Labs' commitment to hybrid work

Three hubs open around the country with more planned for FY24

By **Maggie Krajewski**

As many industries have pushed return-to-office policies in a post-pandemic era, Sandia has remained steadfast in its commitment to help employees execute on our mission in the most flexible way.

Recently, Sandia expanded the ability for remote workers and those who frequently travel to conduct classified

work off-site. Previously, Sandians could primarily work on classified projects on-site in Albuquerque and Livermore. Now there are three off-site hubs open around the country, with more planned for the future.

The newly opened hubs are in College Station, Texas, at Texas A&M University, Shoreview, Minnesota, and Washington, D.C.

Annie Garcia and the hub team have been at the helm of advancing a hybrid work environment at Sandia as part of the Labs 2023 Strategic Plan and as she explains, these hubs are just the beginning.


"A cornerstone of what we're hoping to do with these hubs is enable our people with the flexibility and convenience they need to be successful in furthering our mission," Annie said. "We have three more off-site hubs planned for fiscal year 2024 at Pacific Northwest National Lab, Kansas City National Security Campus and Purdue University."

Long term, Sandia hopes to partner across the federal system to make additional hubs available throughout the country. Annie says the location of these

sites is largely based on where employees are already living, working and traveling to as well as existing partnerships with local institutions.

"We want hub locations to be geographically diverse and spread out where people want to live and work," Annie said.

The effort to expand flexible work options was made possible by more than 50 experts working across Sandia, field offices, NNSA and DOE and partner institutions.

"This has been an exciting and tangible endeavor for us," Annie said. "These classified off-site hubs provide our workforce with an immediate benefit; this really solidifies our commitment to retaining and attracting top talent in service to the nation." 



EXPANDED FLEXIBILITY — Sandia's Washington, D.C., office will house some of the new classified off-site hubs available to remote workers and those who travel frequently.

Photo by Meagan Brace

How to book a classified off-site hub

Sandians looking for more information about how to book an off-site hub and the site's varying classification levels should visit the internal hybrid work website.

Winter coat drive



STAYING WARM — Transportation and receiving staff member Anthony Apodaca picks up coats for delivery to Albuquerque Public Schools. Organized by Sandia’s community involvement team, staff donated 207 coats and hoodies to help students stay warm this winter. **Photo by Craig Fritz**

KEEP UP WITH THE LABS

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every two weeks

sandia.gov/LabNews

National Security Programs embarks on ‘road trip’



Graphic by Vickie Aranda

Innovative gathering focuses on Labs and division strategy

By **Andrea Mackay**

There’s nothing like cruising down the interstate, a fresh breeze blowing through the windows, the stereo blasting and the anticipation of adventures ahead. Sandia’s National

Security Programs division recently captured this feeling during a new innovative take on an all-hands meeting by hosting a Road Trip 2024 event to help staff learn more about the Labs strategic plan, the division’s strategic plan, the Labs’ three corporate behaviors — acting courageously, being purpose-driven and connecting with others — and the new performance engagement system, all while networking with each other. The event, hosted by Deborah Frincke, associate labs director for National Security Programs,



THE RIGHT DIRECTION — Left to right, Lisa Hood, manager for the Flight Systems and Software department; Associate Labs Director for National Security Programs Deborah Frincke; and RF and Electronic Systems Director Reno Sanchez connected at the Road Trip 2024 event.

Photo by Craig Fritz

and division center directors included a coffee bar with “road trip” snacks, and informational tables representing “exits” to visit.

Of course, a road trip wouldn’t be complete without a postcard and souvenir, so staff had the opportunity to recognize their peers with customized event postcards and received a road trip sticker when finishing their journey to commemorate the event.

“We chose the Road Trip event over a typical briefing format to informally engage colleagues in a fun way. It was a pleasure seeing staff connecting with colleagues, asking great questions, and learning more about key elements of our division and Sandia.” Deborah said. “The result was a better connected

and informed division.”

The Road Trip 2024 event was organized by National Security Programs Communications Specialists Andrea Mackay and Auri Atencio and attended by staff across the division. A virtual road trip event was launched after the in-person session for staff who work remotely or were unable to attend. The event created



ROAD TO SUCCESS — Sandia Fellow Ed Cole, left, chatted with Wade Freeman, manager in National Security Programs’ Electromagnetic Spectrum Superiority department, at the Road Trip 2024 event.

Photo by Craig Fritz

a lot of buzz, and the division plans to continue to be innovative with future meetings.

UNM Cancer Center leader talks innovation in 2024 speaker series opener



BETTER CARE THROUGH INNOVATION — Yolanda Sanchez, director and CEO of the University of New Mexico Comprehensive Cancer Center, spoke to in-person and virtual audiences at Sandia Jan. 18 as part of the Labs’ National Security Speaker Series.

In her presentation “Mission and Innovation,” Sanchez shared how New Mexico’s only National Cancer Institute-designated cancer center focuses on reducing the burden of the disease and overcoming health disparities in the state and the nation.

For more than a decade, the National Security Speaker Series has invited distinguished industry, government and academic leaders to share with the Sandia workforce their perspectives on topics that touch the Labs’ mission areas. This year the series will feature speakers whose insights connect to [Sandia’s goals](#) of accelerating innovation and leading in modern engineering.

Employees can find Sanchez’ talk on the National Security Speaker Series homepage. **Photo by Craig Fritz**

HEARTS & SOLES
SHOES FOR KIDS DONATION DRIVE
FEBRUARY 1-16

The Albuquerque Public Schools' Clothing Bank works to ensure students never miss a day of school due to inadequate clothing or school supplies.

Celebrate Valentine's Day by dedicating your donation to a colleague, friend or loved one.

Your **\$25 contribution** will provide a student with a **quality pair of shoes.**

Visit the [Community Involvement site](#) for more details

A passion for community service: Uplifting diverse populations

Community relations specialist shares story of service for Black History Month

By **Michelle Walker-Wade**

I stumbled upon Sandia in December 2021 — just as I was trying to convince myself to leave public education for my third major career change.

My first career was as a staff accountant for Chevron Corp. I took accounting classes at college, but I learned the basics — journal entries, account reconciliations, medical billing — from my mother, who was a controller at a health clinic. As a child, I loved accompanying her to work.

While I was at Chevron, the company went through a major reorganization that offered early retirement packages. I wasn't even 30 yet, but it seemed like a perfect opportunity to pursue my dream of being an educator.

I took the package and went back to school intending to become a fifth- or sixth-grade science teacher. But somewhere along the way, I discovered adult education.

After graduating from Holy Names University in Oakland, California, I worked primarily with immigrant populations and other adults who needed help obtaining skills to succeed in the American workplace.

I taught for a few years and then became the program manager for career and technical education at New Haven Adult School in Union City, California. I was responsible for engaging with the community, the city and local community colleges to ensure we were meeting the ever-changing needs of adult learners.

Much of the way I approach work and leadership today is due to the wonderful people I regularly collaborated with for the benefit of this population of learners whose academic skills weren't yet suitable for community college.

Years later, I'm still connected through Facebook and LinkedIn with some of the adults who were my students in the early 2000s. It is a joy to see them living full, self-sustaining lives with jobs and careers and to watch their children graduate as first-generation college students in the United States.

A new role at Sandia

In 2021, I decided it was time to move on from public education. As a new widow, I needed greater financial stability. While searching for roles and organizations that would allow me to continue working with the community or that involved marketing and outreach for the greater good, I came across Sandia.

I had planned to apply for three positions during winter break. However, I ended up submitting just one application — to be a community relations specialist at Sandia. For some reason, I felt sure that was the job meant for me.

When I started working for Sandia in April 2022, I was charged with rebuilding California's community involvement program in our post-pandemic, permanently hybrid work environment. I worked hard to understand what had been done before, and more importantly, how it was done, what should we do now and what would be possible, given Sandia's mission and priorities.

The cultural shift from public education to a public-facing role for a DOE national laboratory often felt like walking toward a cliff that might or might not have a tightrope or zipline to help me across. Thankfully, I found that most Sandians are willing to serve as a bridge, introducing me to the Labs' culture and explaining our way of seeing and doing things.

Impacting the California site and local community

Without a doubt, the highlight of my almost two years at Sandia has been spearheading the 2023 relaunch of **California's**



GIVE, SERVE, INSPIRE — Michelle Walker-Wade represented Community Involvement at Sandia's Harvest Your Health fair in November 2023 in Livermore. **Photo by Michael Shaikh**

Kids Day, an event last held at the Livermore site in 2011. As soon as my New Mexico community involvement partners told me how much the day means to our employees, I could not pass it up. I felt like I owed it to California workforce members to give them an opportunity to show their family and their children what they do at Sandia.

This massive project could not have happened without the help of Sandians who volunteered to serve on the planning team. On the day of the event, I saw several teary-eyed adults walking around the Livermore campus with pride and joy. I shed more than a few tears myself.

I want to do all I can to help Sandia's workforce members and employee resource and networking groups serve the causes and communities important to them. As part of that effort, I have been diversifying the types of community service opportunities offered to Livermore staff. I have also expanded the Labs' reach to include south San Joaquin County and east Contra Costa County.

A family dedicated to community service

African Americans tend to get involved in the community through their local church,



ALL BUSINESS — Even at a young age, Michelle loved to help her mother at work. Photo courtesy of Michelle Walker-Wade

sorority or fraternity and other organizations that aim to unify and uplift Black people.

I have two older brothers. The eldest is a Navy veteran. In the 1980s, he spent a few years in South Africa fighting against apartheid and for the freedom of Nelson Mandela. More recently, he represented the African Methodist Episcopal Church

for eight years in Ghana on a social entrepreneurship venture, teaching locals about agribusiness and the circular economy.

My second brother is an airman and a leading voice in Las Vegas, Nevada’s 100 Black Men organization. He is a strong advocate for housing justice and the accurate teaching of Black history in schools, as well as from a religious perspective.

The three of us share a passion for encouraging the Black community to eat healthier and redefine our thoughts about comfort food. When we get together, we geek out on all the community work we’re engaged in.

Living to serve

I live to serve. This is why I am so passionate about the work I do for Sandia. It is in my DNA and part of my responsibility as a committed Christian — a responsibility that I take seriously.

I’ve been an active, ordained minister for nearly 15 years and have a lifelong history of serving in the church and the surrounding communities. I like to inspire people to find their “one thing” by asking,

“What is the ‘one thing’ you can do to serve humanity that also fills your own (proverbial) cup?”

Helping people find their purpose and supporting them in doing it well — with no strings attached other than to help build healthy communities — bring me joy. This servant-leader concept is especially applicable to Sandia, where our overall mission is impactful while quietly providing security for people in ways they cannot even imagine.

And that’s something true service does. It serves in ways that are not boastful while still making an impact. I love seeing how service makes a difference in the lives of our workforce and our collective communities.

EDITOR’S NOTE: Community Relations Specialist Michelle Walker-Wade directs community involvement activities for Sandia’s Livermore site. Associate Labs Director Andy McIlroy, executive champion of Sandia California’s African American Outreach Committee, invited Michelle to share her story as part of the Labs’ celebration of Black History Month.

Mileposts



Michael R Garcia 35



Angela Guerin 30



Heather Schrinier 30



Eric Varley 25



Gerald Garcia 20

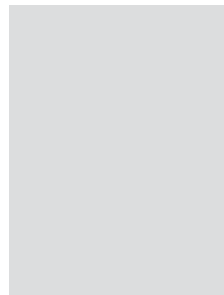


Jimmy Lloyd 20

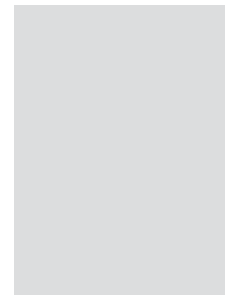
Recent Retirees



Ephraim Arquitolá 35



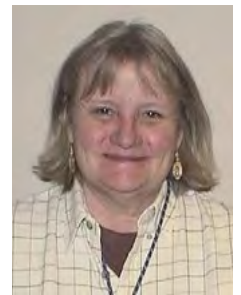
Valerie Mascarenas 33



Ted Borek 26



Tony King 22



Debbie Frinrock 22

Inaugural Thunderbird Hacks hackathon sparks innovation

By **Debra Menke**

Inspired by Catherine Appleby's experiences as a hackathon enthusiast during high school, Sandia partnered with Explora Science Center and Children's Museum's X Studio to host its first high school hackathon, Thunderbird Hacks, in January. Nearly 70 students participated, guided by 15 Sandia volunteers.

Catherine, a member of Sandia's Applied Machine Intelligence department, teamed with Community Involvement to foster a new STEM event designed to nurture young talent in the field of computer science. The hackathon had a music theme, in which

students predicted song popularity using provided datasets on music characteristics. Armed with Python Jupyter Notebooks in an online computing environment, participants were tasked with developing predictive models, which were then put to the test on unseen data.

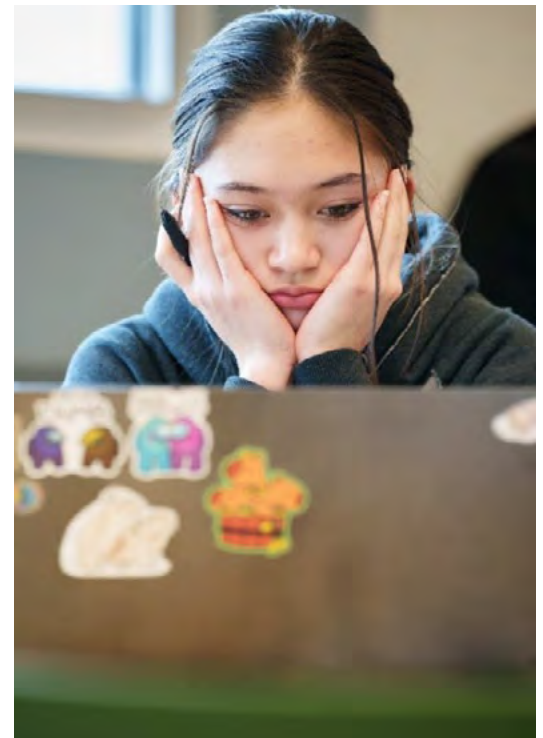
Students were given resources to prepare ahead of time, ensuring that everyone had a fair chance to showcase their skills. The day of the event, students collaborated in teams of four to dive into the world of coding and machine learning. Equipped with a base linear regression model, participants embarked on a thrilling journey of problem-solving and creativity.

"I loved how excited and hard-working the kids were. Teams were working up to the last moments to improve their error scores," Catherine said. "At the end of the hackathon, we had lots of participants coming up to us asking about internship opportunities at Sandia, showing just how motivating this event was."

The culmination of Thunderbird Hacks saw the recognition of top-performing teams, with prizes awarded to the top three winners. The prestigious "Mentor's Choice" award celebrated teams that demonstrated exceptional perseverance, teamwork, positivity and support for their peers. [@](#)



FINGERS CROSSED — O.J. Ukpedinjagba, left, hopes that a problem he and his teammate Sowmya Sankaran solve during Thunderbird Hacks works out in their favor. **Photo by Craig Fritz**



MULLING IT OVER — Maleea Moedles works through a problem during Thunderbird Hacks.

Photo by Craig Fritz