SANDIA LABNEWS
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A quieter tire for electric vehicles

SOUND CHECK — Sandia and The Goodyear Tire & Rubber Co. have developed a virtual way to test how noisy a tire will be on the road before any physical testing, pictured, occurs. **Photo courtesy of Goodyear**

Noise modeling researchers' latest project in 30 years of Sandia and Goodyear collaboration

By **Kristen Meub**

Sandia and The Goodyear Tire & Rubber Co. have developed a virtual way to test how noisy a tire will be on the road without the need for physical testing, leading to quieter tires for electric vehicles.

This project is the latest to come from Sandia and Goodyear's 30-year partnership, formalized through a Cooperative Research and Development Agreement,

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Sandia switches to hydrogen weather balloons

On-site hydrogen production reduces shipping costs, carbon dioxide emissions

By **Mollie Rappe**

Hundreds of miles north of the Arctic Circle, Sandia researchers ensure the collection of important weather and climate data. By switching the gas used in their weather balloons, they have reduced their metaphorical footprint on the fragile Arctic ecosystem.

More than three years ago, the Sandia-operated atmospheric measurement facility in Alaska switched from launching helium-filled weather balloons to launching weather balloons filled with hydrogen produced on-site. Since then, they have launched nearly 5,000 hydrogen balloons with minimal issues.

This switch greatly reduces the transportation cost and emissions of shipping helium to Utqiaġvik, formerly known as Barrow, the northernmost city in the U.S. and site of the North Slope of Alaska atmospheric measurement facility.

The observatory, operated by Sandia for the DOE Office of Science's Atmospheric Radiation Measurement user facility, has collected weather and climate data, including specialized data on Arctic clouds, for more than 25 years. ARM's data are freely available to researchers

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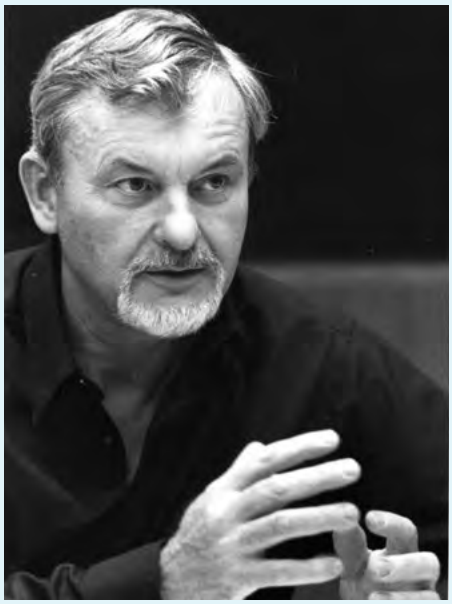

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Protecting canisters against corrosion

Researchers test coatings to protect against corrosive sea air, cracks

COMBATTING CORROSION — Sandia researchers Rebecca Schaller, left, and Erin Karasz discuss the results of a stainless-steel corrosion test. **Photo by Ruth Frank**

By **Mollie Rappe**

As anyone who has lived near the ocean can attest, metal and sea mist are a recipe for corrosion. A nuisance of coastal life, the consequences of these common chemical reactions become far more serious when they take aim at the stainless-steel canisters that contain spent nuclear fuel.

To shield steel from the corrosive threats posed by sea air, Sandia researchers tested a variety of nickel mixtures as protective coatings on stainless steel. The researchers found that the specific material applied, and the specific application process used, impacted the properties of the coating, including how protective it was against corrosion. Their **results were published** recently in the scientific journal Frontiers in Metals and Alloys.

Spent nuclear fuel is stored in quite a few coastal areas, where sea breezes can buffet canisters and deposit corrosive chloride salts such as sodium chloride, or more commonly known as table salt. Given enough time, the brine formed by these salts can corrode and pit stainless-steel canisters.

"Through our research, it became clear that it would not be easy to completely eliminate the possibility of a type of corrosion known as stress-corrosion cracking," said Charles Bryan, an expert on the storage of spent nuclear fuel and co-lead on the project. "Stress-corrosion cracking is likely to eventually occur at some interim storage sites. It might take hundreds of years, but it could happen, so people started thinking about mitigation and repair technologies. We started looking at cold spray, which is a technique industry is very interested in, and at corrosion-resistant polymer coatings."

Storing spent nuclear fuel

Nuclear fuel rods that no longer produce enough heat for a nuclear power plant — the U.S.'s leading source of carbon-neutral electricity — are first transferred to a pool of water at the reactor site. After several years in the pool, the spent nuclear fuel, in a rack called a fuel assembly, is cool enough that it is removed from the storage pool and placed inside a stainless-steel canister with many other fuel assemblies. Each fuel rod has solid uranium oxide pellets inside a zirconium-based tube. The solid zirconium can break down if exposed to oxygen and moist air, so the canisters are filled with helium, an inert gas, to protect the rods.

These dry storage canisters are highly radioactive, and often are surrounded by additional layers of concrete or steel called overpacks. These overpacks protect workers from radiation while allowing air to circulate around the canisters, cooling them off, Charles said.

Originally the spent nuclear fuel dry storage canisters were licensed to store spent nuclear fuel for up to 20 years before being transported to a deep geologic repository for permanent disposal, Charles said. However, development of such a repository in the U.S. has proved politically challenging. Since the spent nuclear fuel dry storage canisters are remaining in use for longer than expected, in 2012, industry scientists and regulators began to explore potential issues facing aging canisters. They identified one type of corrosion called stress-corrosion cracking as posing a potential risk, Charles said.

Decoding stress-corrosion cracking

Ten years ago, Sandia collaborators at the **Electric Power Research Institute**, working with nuclear power plant operators, began collecting samples of dust from the outside of dry storage canisters at a variety of sites, Charles said. Sandia analyzed these samples and **found chloride salts** in every sample. Canisters stored near an ocean had a lot more salt, but even inland canisters had a bit of chloride from road de-icing salts and sodium chloride used to soften water for steam-based power generation, such as nuclear power plants.

Sandia researchers also carried out a large experiment to ascertain if the welds used to manufacture the dry storage canisters produced enough stress to allow stress-corrosion cracking to occur, Charles said. They found that the welds do produce enough stress.

Additionally, Sandia researchers were involved in developing computer models of the canister temperature, **ambient humidity, and the chemical composition** of the dust that impact formation and growth of corrosion pits in the steel. They also studied the process by which the pit becomes a crack and how long it takes for a **crack to grow** large enough to pose a risk. Refinement of these models is still ongoing, he added.

Over the past ten years, researchers at Sandia and other institutions have not been able to completely rule out stress-corrosion cracking of dry storage canisters over extended canister lifetimes; however, canister inspections have never detected a crack, Charles said.

Sandia engineer Sam Durbin is studying the **possibility of radioactive materials** coming out of potential stress corrosion cracks, which is key for evaluating the possible radioactive exposure risk to the general public, Charles said. Instead, the primary concern with canister stress-corrosion cracking is degradation of the fuel rods, and possibly exposing workers to radioactive material if they repackage the spent fuel for permanent geologic disposal, he added.

Studying cold spray protections

Researchers at Sandia and Pacific Northwest National Laboratory started exploring crack mitigation and repair technologies three years ago. These researchers, including Sandia engineer Erin Karasz, who started the project as a postdoctoral appointee and is now staff, have tested a variety of cold spray coatings to see if they could protect half-inch-thick pieces of stainless steel from chloride corrosion.

"We found that you have to be very cognizant of the kind of material you are spraying onto what other kind of material," said Erin, who is the lead author of the Frontiers in Metals and Alloys paper. "I was surprised at how much the porosity determined the behavior when corrosion got going in between the cold spray coating and the steel. There seems to be a specific level of porosity, below which the cold spray has enhanced corrosion resistance."

Cold spray is a process of taking small metal particles, about as wide as half of a human hair, and spraying them onto a surface using gas hotter than a commercial pizza oven, but much cooler than the temperature needed to melt metal, Erin said. The inert gas "splats" the small metal particles onto the stainless steel using pressures 10-20 times higher than the pressure of a car tire.

For this paper, the team tested three different nickel-based metal mixtures, two with known anti-corrosive properties and pure nickel as a comparison. They tried two different gases, nitrogen and helium. And they tested the effect of tapering off the coating on the metal or leaving a sharper edge between the coated area and the uncoated area.

They found that the gas used to spray on the metal particles had a strong impact on how porous, or spongy, the coating was. The porosity of the coating greatly impacted the corrosion behavior of the coating, Erin said.

To test the corrosion protection of the cold spray coating, Erin soaked the small pieces of cold-spray-coated stainless steel in a very corrosive ferric chloride bath for three days. This is a standard method to speed up chloride corrosion, but it isn't a perfect model of what would occur to spent nuclear fuel canisters over hundreds of years, said Rebecca Schaller, a materials scientist and co-lead on the project. They found corrosion on all the samples, but the location and shape of the corrosion differed, suggesting further refinement of the coatings is needed.

Now the team is moving on to testing stainless steel with cold spray as well as other polymer coatings under more relevant atmospheric conditions, Rebecca said. Eventually, the goal is to test the coatings on welded stainless steel to test them with stress and corrosion, she added.

"When we put anything on these canisters, first and foremost we're trying to make sure it's not doing any harm," Rebecca said. "What Erin was trying to establish is where we need to look at in these studies to optimize the coatings and ensure that they're not going to create more problems for us in the future. Cold spray is a newer technique and very few people have looked at it under atmospheric corrosive conditions, let alone its corrosion performance over hundreds of years."

This work was supported by DOE Office of Nuclear Energy.

Adventures in STEM

SLIMY FUN — Sandia Carlsbad technologists Joshua Minster, left, and Grace Castle made Oobleck, a slime-like material to teach children basic chemistry and about non-Newtonian fluids. The demonstration was part of Passport to Adventure, an event that offered STEM and reading activities to participants. **Photo by by Melissa Bain**

TEACHING WITH CANDY — Hydrologists Mahawa-Essa Mabossani Akara, left, and Ryan Steele modeled the rock cycle with candy to teach children about geology during Passport to Adventure. **Photo by by Melissa Bain**

Quieter tires

CONTINUED FROM PAGE 1

or CRADA, that focuses on collaboration between the national lab and the last U.S.-owned tire and rubber company in advanced mechanics, data science and rapid response tasks.

As more electric vehicles come to the market, drivers and car companies are noticing tire noise more than before, said Michael Skroch, manager for simulation and modeling science at Sandia. In gas-powered cars, noise predominantly comes from the engine, exhaust and muffler, but tires tend to be the loudest noisemaker for electric vehicles.

"Developing products for commercial, consumer and off highway segments that are equipped for the demanding needs of electric vehicles and balance the performance requirements desired from a growing audience of adopters, is a major focus for Goodyear," said Brandy Moorhead, director of Government Compliance and Product Performance at Goodyear. "Our modeling work with Sandia is enabling us to design tires to help reduce the level of interior vehicle noise while also minimizing the need to test and model multiple physical prototypes."

Modeling how much noise a tire will make when it makes contact with the road is a mathematical multiphysics problem, as are the scenarios Sandia runs for its nuclear deterrence mission, and these are complex, computationally and memory-intensive simulations, Michael said.

30-YEAR PARTNERSHIP — In November 2022, members of Sandia and The Goodyear Tire & Rubber Co. leadership gathered at the company's headquarters in Akron, Ohio, for the celebration of 30 years of partnership. Sandia staff included Mary Monson, senior manager, Technology Partnerships and Business Development; Joel Lash, director, Engineering Sciences Center; Susan Seestrom, Associate Labs Director, Advanced Science and Technology; Gregory Bunting, technical lead; and Michael Skroch, manager, Simulation Sciences. **Photo courtesy of Goodyear**

In the past, Sandia started simulating one aspect of physics at a time, such as looking at how a bomb shakes in flight, how heat moves through it or how air moves around it. This gave researchers an understanding of one element an object will experience in flight, but it didn't provide a complete picture on its own. Then researchers started linking the simulations one after another, modeling the physics step-by-step. Now, Sandia has a powerful suite of codes that can run these simulations together, providing a more holistic, multiphysics picture, which helps Sandia certify the safety of weapons and that they will never work unless authorized by the president to do so.

QUIETER TIRES — The virtual noise testing that Sandia and The Goodyear Tire & Rubber Co. developed supports quieter tires by minimizing the need to produce multiple physical prototypes for testing. **Photo courtesy of Goodyear**

30 years of successful collaboration

Sandia and Goodyear celebrated 30 years of partnership in November. The following are just a few successes:

1993: Sandia and Goodyear sign an umbrella CRADA allowing for a wide range of collaboration opportunities, including research in advanced mechanics, data science and rapid response assistance, when technology transfer from national labs was in its **nascent stage**.

2004: Sandia and Goodyear collaborate on the R&D 100 Award-winning **Assurance TripleTred**, a visually distinctive all-weather tire with a three-part tread compound. Goodyear said the tread compound could not have been produced without the modeling and predictive testing tools developed with Sandia.

2021: Sandia and Goodyear developed the **Virtual Flat Trac** to use computer simulations to test a virtual tire on a virtual test track that simulates actual road conditions, giving Goodyear performance data on tire designs before building and physically testing them. This work aligned with Sandia's interest in refining virtual testing for nuclear deterrence engineering and stockpile stewardship.

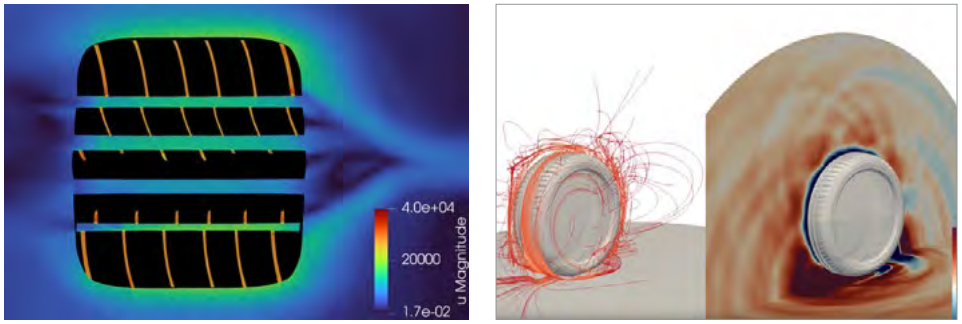
By switching out the material properties and other inputs, these same codes can model how much noise a tire tread design may produce.

Gregory Bunting, Sandia's technical lead for the Goodyear partnership, said the simulation models how the weight of the vehicle pushes the tire onto the road, causing the tire to deform. It then models the tire rolling down the road, looking at friction and airflow. As air moves around the tire, it gets squeezed in and out of the treads, which produces noise, much like a musical instrument.

"The challenge of simulating tire noise is driving us to solve new important multiphysics problems that help Goodyear virtually design quieter tires, and then those same methodologies can be applied to help Sandia do better simulations for nuclear deterrence and national security," Michael said.

Moorhead said this research has supported Goodyear in its development of tires that help minimize road noise as well as help facilitate work with car manufacturers requiring virtual tire models and modeling results in place of physical test results.

"While Goodyear and Sandia differ significantly in our missions and objectives, this partnership is a win for Sandia, a win for Goodyear, a win for national security and a win for U.S. economic competitiveness," said Mary Monson, senior manager of business development at Sandia. "This partnership has centered on the insight that advanced modeling and predictive simulation is a powerful tool for characterizing physically complex processes and can be brought to bear on a surprising range of applications."



SEE THE NOISE — Applying the same suite of codes used for Sandia's nuclear deterrence modeling and simulation, the team was able to capture the physics of tire noise. **Graphic by Gregory Bunting**

Rocket science with SWAN

CODING WITH LEGOS — Systems engineer Carmen Copeland uses Lego bricks to teach students about binary coding with colors. Students decoded an action word to create a command for a robot. **Photo by by Katrina Wagner**

3-2-1 BLAST OFF — Engineer Rebecca Bennett makes soda bottle rockets with a student during the Sandia Women Action Network's visit at Mission Avenue Elementary School. SWAN members discussed historical women in science with the students and provided fun hands-on activities for 65 fifth graders. **Photo by by Katrina Wagner**

Hydrogen balloons

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at universities and national laboratories, and is vital for refining climate models, especially those of the rapidly warming Arctic.

The switch from non-renewable helium to hydrogen was made possible by a partnership between the National Weather Service and the DOE. The National Weather Service provided the electrolysis equipment, which uses electricity to turn water into hydrogen gas and oxygen gas, and provided regular maintenance of the equipment. In exchange, the ARM facility operated by Sandia launches two weather balloons a day for the weather service.

"Between Utqiaġvik and Oliktok Point, a long-term ARM mobile deployment **that ended operations in 2021**, we were the largest users of helium in the state of Alaska," said Fred Helsel, the systems engineer who led the effort to ensure the switch was safe and smooth. "The National Weather Service has been great to work with."

Ensuring a safe launch

Now, this switch from helium to hydrogen is not without safety concerns — hydrogen is famously flammable, and helium is not — but Fred worked with the National Weather Service, his division's environment, safety and health coordinator, Sandia fire protection and pressure safety, the ARM user facility and the **automated balloon launcher manufacturer** to reduce the risks.

"Hydrogen is gaining traction as a green energy resource and is a cleaner alternative to traditional fossil fuels for transportation," said Andrew Glen, manager of Sandia's atmospheric sciences research group. "This project uses hydrogen in a different manner, utilizing its lighter-than-air properties to launch balloons. It is in the interest of the nation and the world for us to reduce our dependence on a fossil fuel byproduct, helium, and reduce our carbon footprint by not transporting helium cylinders to the site."

UP, UP AND AWAY — A hydrogen-filled weather balloon launches automatically from a Department of Energy atmospheric measurement facility in Utqiaġvik, formerly known as Barrow. About three years ago Sandia switched from launching helium-filled balloons to launching hydrogen-filled balloons to reduce costs and carbon emissions. **Photo by Ben Bishop**

One of the safety measures the team put in place includes ensuring that the hydrogen storage tank is outside the building where the electrolysis equipment operates. This reduced the amount of flammable gas available inside the building to meet national safety codes and Sandia's requirements, Fred said. Some of the National Weather Service sites that had already switched to hydrogen stored the tanks separately from the generator, but Sandia's safety analysis did encourage the service to tweak their design for subsequent site upgrades, he added.

Sandia has been using an automated balloon launcher for more than a decade, but it occasionally has technical issues. When this happens, Utqiaġvik-based observers fill the ARM weather balloons with a backup supply of helium and launch them by hand. The facility does not have safety approvals in place to manually fill and launch a balloon with hydrogen, Fred added.

Safety is also inherent within the automated balloon launcher. The balloon is filled with gas inside a launch tube that keeps the hydrogen outside of the launch building, Fred said. And the launch tube has fans that ensure hydrogen cannot build up inside it, even if a balloon leaks or bursts during the inflation process.

Saving money and the environment

The first official hydrogen balloon was launched from Utqiaġvik on December 16, 2019, at 2:01 p.m. local time, said Fred, with nearly 5,000 launches since then with only minimal issues. The original automated balloon launcher was replaced last August with a newer model.

The Utqiaġvik site launches four weather balloons a day, two for the National Weather Service and two for ARM. Each weather balloon carries a special package of sensors tens of thousands of feet into the stratosphere to collect and transmit data on atmospheric pressure, temperature and humidity. The data from the National Weather Service balloons, which are launched every 12 hours, are used for weather forecasting. The data from the ARM balloons, which are launched six hours later, are used for atmospheric and climate research, Fred said.

The facility in Utqiaġvik used to spend about $60,000 per year on helium and shipping costs for the ARM weather balloons, Fred said. However, with the current helium shortage and inflation, the total saved in the past three and a half years due to the switch could easily be more than $200,000.

Much of the bulk material shipped to Utqiaġvik comes on a yearly barge from Anchorage, Alaska, Andrew said. "One ship, once a year," he added. "If it's not on that, it has to come on an aircraft." And shipping large, compressed gas cylinders by air comes with a sizable carbon footprint on top of the emissions released from processing helium, he said.

Other ARM sites elsewhere in the U.S. are assessing whether it makes sense to also switch from helium — a byproduct of the oil and gas industry — to on-site or locally produced hydrogen, Andrew said.

"The Arctic is a very tight-knit community, so keeping those relationships between the National Weather Service, National Oceanic and Atmospheric Administration, ARM, Sandia and the Iñupiaq people of Utqiagvik together is critical for getting things done up there," Andrew said. "The Arctic is a tipping point for climate change. We're seeing four times the increase in temperature in the Arctic than in the rest of the U.S. The data from the ARM site are important for the long-term record and for climate models to take those changes into account."

Helping young women visualize their futures in math and science

By **Michael Ellis Langley**

If there was a theme to the 32nd Annual Sandia Women's Connection Math and Science Awards, it was how important the people around the young scholars are to their futures.

The Sandia Women's Connection celebrated more than 30 girls, all juniors in high school, who display a genuine love and passion for science and math. They were nominated by their teachers for the award, which includes time with a Sandia mentor. Sandia Women's Connection co-chairs Pam Lober and Kimberley Mac Donald welcomed the crowd to the Sandia California auditorium for the in-person event on April 20. Kim told the more than 70 people in attendance, including teachers and family, that each scholar had proven that they were after more than good grades.

"Many of you have demonstrated an exceptional understanding of class material through your projects, passions and desire to learn and grow," she said. "You have a deep intellectual curiosity and are persistent in the face of challenges. Your nominators have also noticed that you are leaders, team players, and kind and caring young women. They see your potential to be amazing and accomplished scientists as well as respected and valuable colleagues."

Encouraging the next generation

Sandia Women's Connection Director Champion Craig Tewell explained why the Math and Science Awards are vital to encourage the students who win each year.

"When we look at chemical and mechanical engineering, mathematics, physics and computer science, there remains a very significant gap in the number of women in these fields versus men — particularly in senior positions," Craig said. "We hope to highlight for young women their potential in the areas of science and math and introduce them to successful Sandia women scientists and engineers, as well as to our vibrant internship program. Through these introductions, we also hope to illustrate some of the many careers available in math and science."

Craig went on to explain that Sandia specifically honors young women during their junior year of high school so they can highlight the awards when they are applying for college admissions and scholarships.

GATHERED FOR GIRLS — Sandia Women's Connection celebrated more than 30 young women for their passion for STEM at the 32nd Annual Math and Science Awards, April 20, in the Sandia California auditorium. **Photo by Spencer Toy**

FOUNDATIONAL — Associate Lab Director Andy McIlroy welcomed more than 70 people to the awards, taking time to especially thank the adults who supported the young scholars. **Photo by Spencer Toy**

Blazing your own trail

Keynote speaker Raquel Hakes Weston-Dawkes traced her academic path from a teenager who wasn't sure what she wanted to do with her life and career to finding a passion for fire from a college mentor and finally joining Sandia in 2021. Raquel started her work in thermal and fluid science and engineering, using experimental data and computational modeling to understand the behavior of fire.

"When I was a sophomore in college, a new professor started in my department and his lab was doing wildfire research. I didn't really know what research entailed, but I thought wildfires were super cool, and I totally understood why studying them mattered," Raquel said. "About a year after this initial research experience in college, I was accepted into the joint bachelor's-master's program, and I had the option to do research for the master's. It was a different project, so I was willing to give it a try, figuring it might give me skills or open up opportunities to other things I liked."

Trusting yourself

Raquel told the students that she discovered just how much she liked being part of the entire research process — figuring out what the problem is, designing how to study it or solve it and analyzing the data that came from the inquiry.

"This is the biggest piece of advice I can give to you: try things," she said. "I don't mean the things you have no interest in or things you only do because you've heard that's what you should do, but all those other things that seem like they might be cool but you're really not sure. I do want to acknowledge that trying things means being uncomfortable. It means failing sometimes. It might mean you try something you thought you'd like and find you don't. But it also means that you might just find the things you didn't know really sparked something for you."

The girls got a chance to ask Raquel a few questions after her presentation. The question that struck her most came from a student who wanted to know how to learn to trust your instincts.

"It struck me for two reasons," she said. "Partially, because I think it's very difficult, and I was glad one of the students honed in on that. But also, because I think there is so much out there about the 'right' way to do things. That's a skill many of us have to practice: going against conventional wisdom and trusting yourself."

Commitment to expanding opportunities for women

Associate Labs Director Andy McIlroy told the assemblage that the Labs' commitment to the girls goes beyond the awards.

"At Sandia, we are committed to increasing our leadership and overall diversity as we move forward," he said. "One pathway for supporting inclusion and diversity at Sandia is through our educational opportunities. I'm delighted that you are hearing from several of our women leaders at Sandia tonight and that you have had the opportunity to meet some of them. I hope that their stories about their career journeys will excite and encourage you as you continue on your own paths in math and science."

Each speaker also took time to thank the educators, parents and guardians who supported, advised and inspired the scholars, recognizing that their path would be much more difficult without them.

WAYFINDER — Keynote speaker Raquel Hakes Weston-Dawkes encouraged all the young women in attendance at the 2023 Sandia Women's Connection Math and Science Awards to stay curious and bravely follow their own path. **Photo by Spencer Toy**

NEXT GENERATION — More than 70 young women, their families and mentors turned out for the Sandia Women's Connection Math and Science Awards on April 20. **Photo by Spencer Toy**

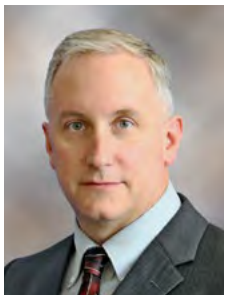
GROWING STEM — The beneficiaries of the Sandia Women's Connection Math and Science Awards received the chance to speak with successful woman Sandian scientists as part of their prize. **Photo by Spencer Toy**

WINNERS — The Sandia Women's Connection honored more than 30 high school juniors for their interest in math and science. **Photo by Spencer Toy**

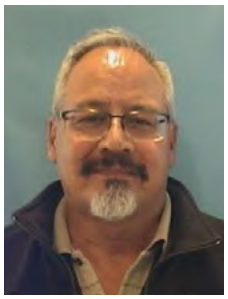
Mileposts


Greg Neugebauer 45


Tom Clark 35


Philip Heermann 30


Lance Lippert 30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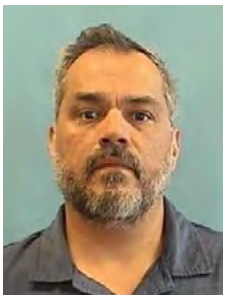
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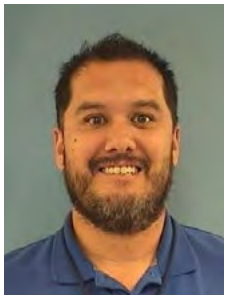
Thomas Gaffney 20


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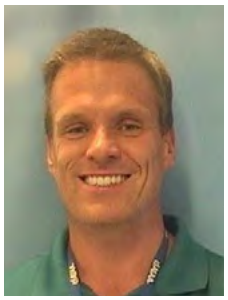
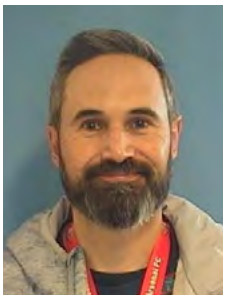

Jared Madsen 20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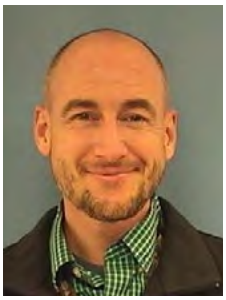
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Jerry Rouse 15

Recent Retirees

Todd Haverlock 39


Jeffrey Payne 33


Bob Burr 21

Labs adds two small businesses to Mentor-Protégé Program

Working to grow with Sandia's guidance and knowledge

By **Kim Vallez Quintana**

Sandia grew its Mentor-Protégé Program from three companies to five with the addition of Dynamic Structures and Materials LLC of Franklin, Tennessee, and Compunetics Inc. of Monroeville, Pennsylvania. The program not only helps small businesses develop and grow but also fosters long-term relationships that help Sandia achieve its mission.

"I am being asked by my customers to do things faster, better and cheaper," said Norm Padilla, senior manager of interconnects. "We already work with a lot of vendors. Protégés are different — we are partners. We are going to be working with them for years, figuring out how to meet that goal."

As part of the program, Compunetics and Dynamic Structures and Materials get on-site visits from Sandia's experts, gap analysis, workshops, outreach events and other one-on-one guidance. Another benefit is their ability to secure noncompetitive subcontracts up to $7 million from Sandia, DOE and other federal agencies.

Dynamic Structures and Materials

Dynamic Structures and Materials, which builds precision motion systems for extreme environments, has worked with Sandia before. It has also worked with the aerospace industry, military and the US ITER Project, an international collaboration of scientists and engineers to build a reactor-scale burning plasma device that can demonstrate the feasibility of fusion power.

"With magnetic fields and radiation in the reactor, the environment is not suitable for normal process valves, so we are making a custom valve that can survive and operate in that environment," said Dynamic Structures and Materials Director of Mechanical Engineering Patrick McGirt. The company is currently working to develop nonmagnetic robotic components for heart surgeries that can perform tiny motions using very little weight and power.

While it might seem like Dynamic Structures and Materials is already a success story, with only 15 employees, it's still a very small company. Leadership sees the Mentor-Protégé Program as a potential boost.

"We are excited to work with Sandia because it provides a level of manufacturing that will improve our company; we will be able to get to the next level," said Chief Financial Officer Jim Bickmore.

Compunetics

Compunetics is a leading manufacturer of rigid and flexible printed circuit boards and assemblies. They have been used in applications like nuclear control systems, guided missiles and secure communication systems, including at Sandia's Kauai test facility and by the DOD. Compunetics also produces electronics for transportation and medical equipment.

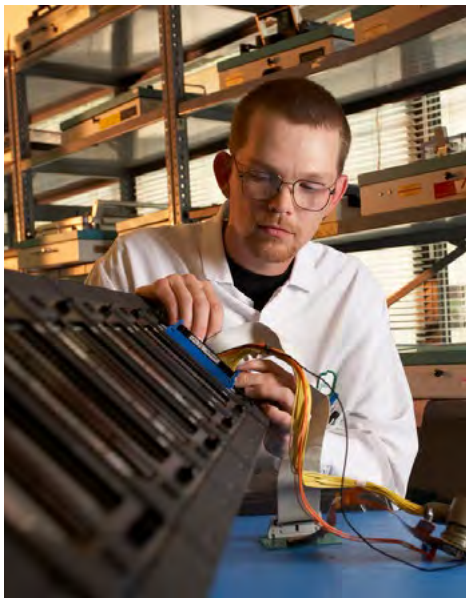
Started in 1968, Compunetics was the vision of Giorgio Coraluppi, the same man who developed teleconferencing technology that is widely used today. As an employee-controlled company, Compunetics continues to carry on Coraluppi's vision of innovative cutting-edge technology.

Compunetics sees the Mentor-Protégé Program as a potential boost.

"We are one of those hidden niches that people don't know about; being a small company, we don't have huge resources like Sandia," said John Gralewski, director of sales. "Our goal is to continue to challenge ourselves and leverage the vast knowledge at Sandia."

Sandia is currently working with Compunetics to build a flexible cable within 12 months that can fit in a small, contorted space while meeting specific standards. That's no small feat.

"A system won't work without cables, plain and simple. They are important and need to be done correctly," Norm said.



COMMUNICATING IN SPACE — An electronics technician at Compunetics tests a high-speed cable used in an aerospace application.

Photo courtesy of Compunetics

"What we do at Sandia is vital. Working with protégés helps them understand why it's so important."

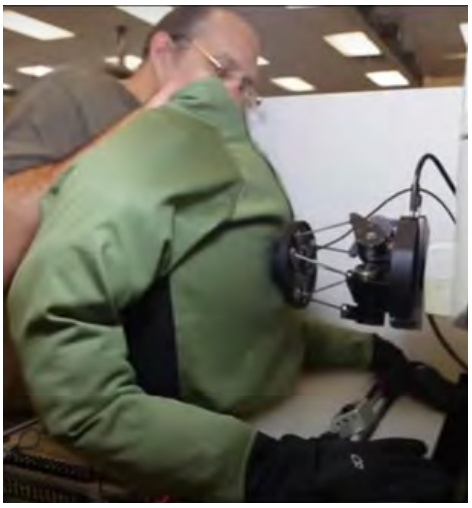
The Sandians behind the success

The Mentor-Protégé Program has become a big success in its short existence. Started in 2019 with three mentors, it has grown to 127, with the credit going to the many Sandians who dedicate their time to it. That includes program lead Royina Lopez, leadership, mentors and support personnel.

"The mentors are key; they are the ones establishing personal connections with these small businesses. They are the ones who explain what we do and how we do it, in turn making sure these businesses are successful," said Maria Galaviz, senior manager of product delivery value streams.

Maria engages protégés and mentors on the production side of the house. She said this program is helping Sandia address the supply chain challenges affecting the country.

"We need to have suppliers that can meet our schedule, quality and reliability requirements. It's a perfect example of a partnership in design, supply chain and production. It's a win-win-win situation," Maria said.



MEDICAL ADVANCES ON THE BATTLEFIELD — Dynamic Structures and Materials demonstrates the use of its compact hexapod, designed to respond quickly to movement in a patient while being examined through ultrasound in a dynamic environment like the battlefield.

Photo courtesy of Dynamic Structures and Materials

Remembering Al Narath

Former Labs leader leaves legacy of commitment to research

By **Katherine Beherec and Rebecca Ullrich**

Albert Narath, chemist and head of Sandia National Laboratories from 1989 to 1995, died May 2. Al began his career at Sandia in 1959, then briefly left and returned in 1989 to lead the Labs following the Cold War. He was the first president, a position now called Labs director, to be selected from Sandia's ranks.

Al's commitment to fundamental research defines his legacy at the Labs. After receiving a bachelor's degree in chemistry from the University of Cincinnati and a doctorate in physical chemistry from University of California, Berkeley, he joined Sandia in 1959 as part of a cohort of scientists hired to deepen its focus on research.

Al left Sandia in 1984 to join AT&T as vice president of Government Systems. "We're losing a talented manager, but — who knows? — as my own career demonstrates, people do sometimes return," said George Dacey, Sandia president at the time.

As predicted, Al returned in 1989 to lead the Labs. He outlined a new vision: to be more nimble and more responsive to customer needs. Amid the political changes and uncertainties that came with end of the Cold War, he pushed Sandia to define its core competencies and to build its research foundations on them.

He emphasized strategic planning and quality methodology, establishing a total quality program throughout Sandia, and was dedicated to maintaining vibrant research programs. Al launched the Labs' first strategic planning effort and produced the first strategic plan within DOE.

He cared deeply about Laboratory Directed Research and Development. In 1992, he converted it from an ad hoc endeavor operated by volunteers into an established office with a dedicated manager who oversaw a single process.

Al also took advantage of Congress's creation of Cooperative Research and Development Agreements in the previous decade, making technology transfer a critical part of Sandia's strategic plan.

In 1992, the U.S. conducted its last nuclear test and stopped designing new nuclear weapons for a short time. As the Soviet Union dissolved, concern grew about what might happen to its nuclear arsenal and to the scientists who designed it.

In the spring of 1992, Sandia hosted representatives from the U.S. nuclear weapons complex and Russian laboratories. The Russian labs discussed and demonstrated technologies like space nuclear reactors, railcar security upgrades, armored blankets, overpack containers, shipping containers for special nuclear material and accident response equipment.

In 1994, Al visited two warhead design centers in Russia. He signed a landmark agreement between the Russia labs and Sandia to provide $6 million to support collaborative efforts between them. That year, he also met with the deputy director of the Kurchatov Institute, a center for reactor research in Russia, and signed an agreement that enabled Sandia to provide physical security technology and procedures for the institute.

In 1993, Sandia took on neutron generator manufacturing, which continues to be part of Sandia's nuclear weapons mission work. Al's push for quality standards and practices was well-suited to the manufacturing realm, and Sandia has since sought International Organization for Standardization certification in all manufacturing activities.

Book drive success

ONE FOR THE BOOKS — More than 7,500 books and $2,500 was donated during the annual Read to Me book drive. Sandia partnered with the Sandia Laboratory Federal Credit Union to collect books at multiple branches. Credit union staff member Zachary Tafoya helped collect books that will be distributed to more than 90 schools and community groups throughout Albuquerque and surrounding counties. **Photo by by Katrina Wagner**

LDRD LEADER — Al Narath, chemist and former head of the Labs, will be known for the impact he had on fundamental research and leading Sandia at a critical point in its history. **Photo by Randy Montoya**

Asian American and Pacific Islander Heritage Festival stages immersive experience

Hundreds attend to experience Far East culture

By **Luke Frank**

A harmonious blend of sights, sounds, smells and tastes charmed more than 750 visitors at the 26th annual Asian American and Pacific Islander Heritage Festival May 6 at the Museum of Nuclear Science & History.

The event, sponsored by Sandia's Asian Leadership and Outreach Committee, along with Talin Market, drew in a robust, diverse cross-section of ages, genders and cultures to share in performances, crafts, floral arrangements and food from the other side of the world.

Guests, including Albuquerque Mayor Tim Keller and family, were captivated by the disciplined movement of martial arts, the grace of Chinese folk dance and the precision of a Pacific Island drumming troupe. Others meandered through the exhibits of origami and calligraphy, and the museum, while sampling delectable dishes from the Far East.

EDGY — Steve Barnes with Lin's Martial Arts Academy demonstrates the use of a sword at the Asian American and Pacific Islander Heritage Festival.
Photo by Craig Fritz

CAT WALK — Performers from the Chinese Cultural Center romp through the center aisle as a lion to kick off the Asian American and Pacific Islander Heritage Festival.
Photo by Craig Fritz

Some who attended knew the performers; others heard about it from neighbors or friends. "We found out about the festival on Facebook and are here for the performances and the food," said Albuquerque resident Remi Sy, flanked by a four-year-old, an elder neighbor and a close friend. "The performances are beautiful but they're also important. These events help people get to know more about Asian people and our cultures."

"This enlightening celebration of cultures gets better every year," said co-organizer Tian Ma, Sandia computer scientist and engineer and Asian Leadership and Outreach Committee chair. "People from Sandia and the community get to enjoy learning about other traditions — what people in different parts of the world value and celebrate. It's amazing to see so many different parts of Asia represented at one event."

The festival is more than just fun; it's central to Sandia's core mission, said Sandia Chief Information Officer John Zepper in his opening remarks. "Supporting all members of our diverse workforce makes us stronger, sharing unique perspectives that lead to fresh ideas and creative solutions to advance our national security mission."

Tian agreed. "Diversity makes us better. People bring their own cultures to work with them," he said. "Events like this help everyone realize that our similarities are greater than our differences. It enables us to connect with our colleagues and neighbors and better understand what's important to other cultures and people. It's a bridge for us to thrive together and be happier in our work and our lives."

REACH OUT — Albuquerque Chinese Happy Dance Group and Albuquerque Chinese Folk Dance Ensemble perform at the Asian American and Pacific Islander Heritage Festival. **Photo by Craig Fritz**

ARTISTIC ELEGANCE — Albuquerque Chinese Happy Dance Group and Albuquerque Chinese Folk Dance Ensemble perform at the Asian American and Pacific Islander Heritage Festival. **Photo by Craig Fritz**