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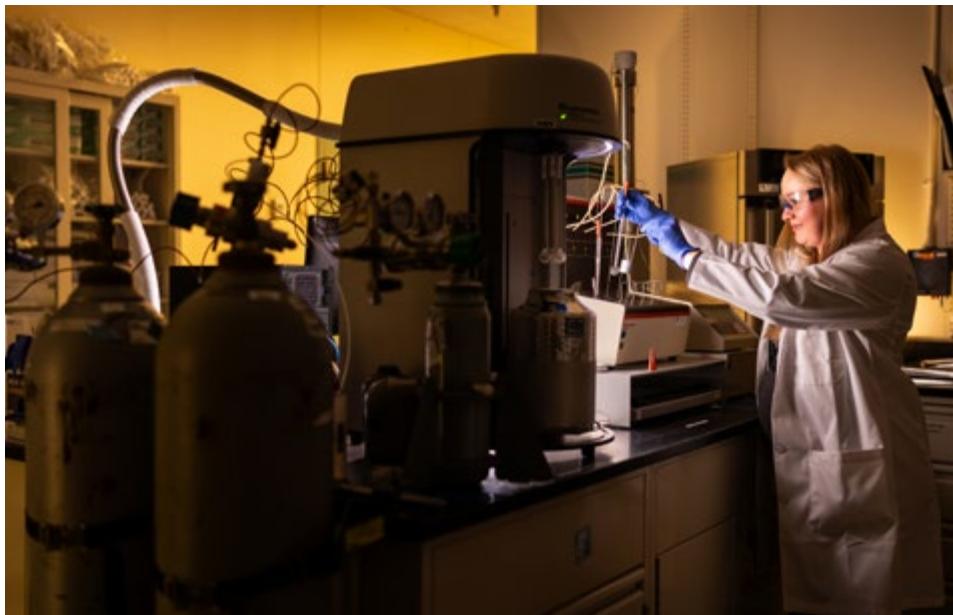
LAB NEWS

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Pore choices: A new twist on gas capture



PERFECT BLEND — Melissa Mills prepares sample tubes for degassing by heating the sample to remove anything in the pores. She will place the tubes in an instrument with the liquid nitrogen bath to measure gas adsorption and gather surface area and pore size distribution data.

Photo by Craig Fritz

Sandia researchers design liquids to selectively trap methane from manure and food scraps

By Kristen Meub

Jessica Rimsza, a materials engineer at Sandia, sees untapped potential in what most people see as waste.

Food scraps, manure and sewage are natural byproducts of the U.S. agricultural industry. They are also rich in biogas, a mixture that contains methane and other valuable chemicals. Jessica and a team of researchers at Sandia are developing

— CONTINUED ON PAGE 4

Defense Programs Award of Excellence winners: 'Your achievements carry great meaning'

By Kenny Vigil

Dozens of Sandians received NNSA's most prestigious award: the Defense Programs Award of Excellence.

"The work recognized today is being performed at a time of great evolution of our global threat landscape. These threats come from adversaries, both new and old," said Steve Girrens, associate Labs director for Nuclear Deterrence Components and Production. "We must rethink the ways we respond to our most complex issues and challenge the status quo."

Steve told those gathered in New Mexico and California for the award ceremony on Dec. 11 that their work is making a difference.

"These awards recognize extraordinary achievement in 2024," he said. "Your achievements carry great meaning."

NNSA said that Sandia is demonstrating it can move at a pace that responds to new threats.

"I continue to be impressed by the passion shown by our engineers, scientists, technologists and analysts and how they're responding to the call to accelerate," NNSA Assistant Deputy Administrator for Stockpile Modernization Rob McKay said. "We cannot succeed without your continued passion and drive."

McKay went on to emphasize the importance of ensuring the stockpile is safe, secure and effective, while delivering new capabilities for future security needs of our nation and our allies.

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CELEBRATION TIME — Electrical engineer Susan Esfahani shakes hands with Associate Labs Director Steve Girrens at NNSA's Defense Programs Award of Excellence ceremony on Dec. 11 at Steve Schiff Auditorium. Susan received an individual award for her work on the Mobile Guardian Transporter.

Photo by Craig Fritz



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

What Sandians are saying about the future of AI at work

By **Troy Rummel**

When Energy Secretary Chris Wright visited New Mexico last February, he described artificial intelligence as having the same urgency as the Manhattan Project. Then in November, President Trump signed an executive order launching DOE's Genesis Mission to advance the technology for government work.

The White House's commitment is clear. But how much of this AI fervor has made its way through the rank and file of the Labs?

Sandia polled members of its workforce in August with a single question, asking their feelings about using the technology at work. An astounding 8,573 people responded, 79% saying they saw at least some benefit to AI. The Lab News asked AI leaders from around the Labs for their reactions to the poll results, and about trends, opportunities and challenges they see surrounding AI in our workplace.



AUDIBLY IMPRESSIVE — Danny Gomez, a former applied machine intelligence expert at Sandia, coaches Yucca Middle School teacher Laura DeBusk through a demonstration of JARVIS, a virtual reality environment that uses AI to answer users' questions with real-time, audible answers in natural language.

Photo by Bret Latter

Tina Nenoff, Sandia Fellow, Labs AI strategy lead

I think positive reinforcement from leadership at all levels to the staff is helping drive the strong response to AI at the Labs. Adding top cover from management to staff for the incorporation of AI into mission work is vital, as is covering risks that might arise for bringing this new technology into the workflow.

Sandia's leadership is fully committed to incorporating AI into the Sandia enterprise in a safe and secure manner. To help teams scale up AI workflows into mission-critical work, Sandia's Senior Leadership Team has made an AI investment area in FY 26 that is working toward a minimum viable capability that includes Sandia's inclusion into the Venado/OpenAI collaboration venture at LANL, the Sandia toolkit and SandiaAI Chat.

Furthermore, Sandia's AI Board of Directors and our leadership teams for the DOE-sponsored Genesis work and the NNSA-sponsored AI for National Security program are working to introduce AI research and development into mission work through demonstration projects, use cases and lighthouse problems, especially difficult tasks that fold back into the Genesis Mission.

I often tout that Sandia is the premier engineering lab for national security. But I think in just a couple of years, when we've fully incorporated AI into our mission workflow, that designation will be unquestioned.

Dan Turner, AI for Nuclear Deterrence lead

While these are positive poll results, what would be more interesting would be the number of people who could testify to transformational impacts from AI.

In some cases, I've seen the initial excitement over what AI could do subside as people realize how hard it is to achieve transformational results. Many pilot projects are showing progress, but they struggle to scale when the pilot is over. What we need are sustained efforts that can overcome these challenges by leveraging the tools we have in creative and effective ways.

One way Sandia is moving through this challenge is through our involvement with Genesis Mission, the large DOE investment in AI. This will provide the AI platform and models we need to scale to an enterprise AI capability.

However, it all boils down to focusing on what will lead to the highest return on investment. There are lots and lots of things that could be done based on how interesting they are from a technical perspective, but the efforts that will win the day will be those that pay for themselves and then some.

Gregory Butler, Facilities and Infrastructure AI champion

In a time when we're all being asked to do more with less, AI, when used correctly, is proving to be a valuable tool.

In Facilities, we utilize a containerized chatbot with a visual language model to extract and analyze fire protection data from scanned forms, which helps to eliminate a considerable amount of administrative time.

We have plans to take advantage of chatbots even more in the future as retrieval-augmented generation, or RAG, tools improve. There's a lot more we'd like to do, but there are a lot of moving parts we have to consider before we can jump into them.

When determining what role AI should have in our processes, our goal is to start with asking, "What is the problem we are trying to solve?" In some cases, we'll discover that an AI tool is what could best meet the need. In others, we may discover there's another IT solution or process update that could meet the need even better. We want to avoid starting with the cool AI tool and just trying to think of where we can use it.



WORK BUDDIES — Single-board computers run a neural-network AI developed at Sandia. Staff and leadership around the Labs are exploring how artificial intelligence can transform the way Sandia delivers on its mission.

Photo by Bret Latter

Siva Rajamanickam, BANYAN Generative AI Institute

I am an AI optimist, and I am not surprised by the 79% number. I would like that number to be 100%.

In terms of computing research, we are focused on approaches that are critical for our mission. For example, learning how to integrate AI agents with our modeling and simulation tools, experimental capabilities, data sets, prototyping and manufacturing capabilities are all important research problems.

We are also starting to explore federated training and inference approaches at the tri-labs and at the complex level. We are working toward building an AI platform that will become a foundation to transform the future of science and security.

AI will allow us to do our jobs far more efficiently than we have ever done. I also believe the way we will do our work will be vastly different. Imagine being a designer and having a suite of customized AI agents that can help create new questions, generate hypotheses, generate a set of designs that match the hypotheses, evaluate those designs and present our designers with multiple choices over a weekend.

This might sound like Iron Man and JARVIS, but it is not too far-fetched. 

Gas capture

CONTINUED FROM PAGE 1

chemistry that could help capture methane from biogas and separate it from other gases so it can be put to good use.

"We are creating new types of porous liquids that can selectively capture methane and other gases," Jessica said. "This could provide a supplemental domestic energy source to support U.S. energy independence."

The technology could one day support biogas capture at places like wastewater treatment plants, agricultural operations and other facilities that already generate biogas but may not have efficient ways to separate and upgrade it.

A liquid with built-in empty space

A porous liquid is a liquid solvent combined with a porous solid material — a combination that essentially creates a liquid full of tiny cavities. Those cavities create empty space inside the liquid, allowing it to absorb and store gas molecules.

The porous solids can range from traditional materials such as zeolites or newer, highly tunable structures such as metal-organic frameworks, covalent organic frameworks and porous organic cages. By mixing different solids and solvents, researchers can tailor how the liquid behaves.

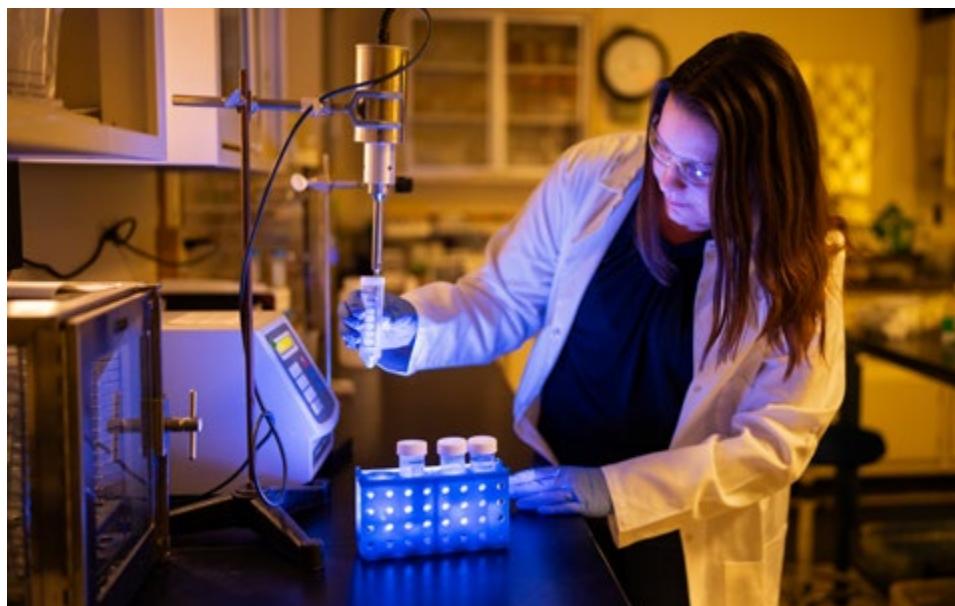
"Gases dissolve in liquids all the time. As I like to say, that's why fish can breathe," Jessica said. "There's dissolved oxygen in the water. With porous liquids, we are adding a solid material with free space into the liquid, and when we preserve that free space, dissolved gases get into the material."

The team has created dozens of different porous liquids so far, and many more combinations with varying properties are possible.

"There are hundreds of thousands of porous materials and there are tens of thousands of solvents, so there's a vast untapped number of possible combinations from which to form porous liquids," Jessica said. "Even if a vanishingly small fraction of those end up being useful, that could still be thousands and thousands of potential good combinations."

Separating methane from the mix

Jessica's current focus is porous liquids



IN THE MIX — Jessica Rimsza uses a sonication probe to thoroughly mix powder in a solvent to make porous liquid for further testing.

Photo by Craig Fritz

that can selectively capture methane from biogas, separating it from carbon dioxide and other impurities.

"The gas needs to get from the air into the solvent, and then it has to go from the liquid into the empty space inside the pores," she said. "That gives you a lot of different options to select what gets captured. It's like having levels of sieves on top of each other."

After capture, methane can be released from the porous liquid and used for electricity generation, heating, steel and glass production and other residential, commercial and industrial applications. It can also serve as a feedstock to produce hydrogen, methanol, ammonia and acetylene — chemicals used in fertilizers, plastics and other products.

In earlier research, the team designed porous liquids capable of selectively capturing carbon dioxide, which can be used in soft drink manufacturing and other applications.

Jessica said the liquid form could make the technology easier to integrate into existing infrastructure.

"As a liquid, they can be used in existing piping, unlike solid porous materials that would require specialized handling and setup," she said.

From theory to today's research

Porous liquids are a relatively recent discovery. Jessica said they were first

theorized in 2007 and proven in 2015.

Sandia's research has focused on expanding the possibilities of these materials for energy applications by characterizing their behavior and studying new combinations targeted for high gas absorption capacity and selectivity.

The researchers are also studying how much gas porous liquids can capture. The team has found that in some formulations, porous liquids can hold more gas than either component typically would on its own.

For example, Jessica said a typical solvent may have space for about 1% gas and a porous solid may have room for up to 80%. When the two combine into a porous liquid, the material can capture far more gas than expected based on a simple linear calculation, even when only 10% of the weight of the porous liquid comes from the solid material. In some cases, up to 40 times more gas can be dissolved in the porous liquid than expected. Jessica said that effect can multiply the gas capacity of the solvents.

The team has submitted a broad [patent](#) covering the definition and design principles of porous liquids and has published [journal articles](#) on many facets of the research.

The DOE Office of Science [Basic Energy Sciences](#) program and Sandia's [Laboratory Directed Research and Development](#) program fund the research. 

DPAE

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Susan Esfahani

NNSA recognized 10 teams from Sandia, one individual and two NNSA-led teams with the Defense Programs Award of Excellence.

Sandia Fellow Susan Esfahani's efforts to rescope the Mobile Guardian Transporter electrical system earned her the Defense Programs Award of Excellence in the individual category. The Mobile Guardian Transporter trailer is a critical element for the nuclear deterrence mission. Susan led a technical team to design a new electrical architecture in less than three months and completed the electrical system baseline design review nine months later.

Throughout the redesign effort, she placed equal emphasis on mentorship while using her decades of expertise in electrical design and product development. She fostered new relationships with both internal and external partners and navigated challenging decisions with customers. Her leadership and technical expertise transformed the electrical system. The new architecture was a key enabler for the Mobile Guardian Transporter Program to move forward.

B61-12 Electronic Neutron Generator Reacceptance Team

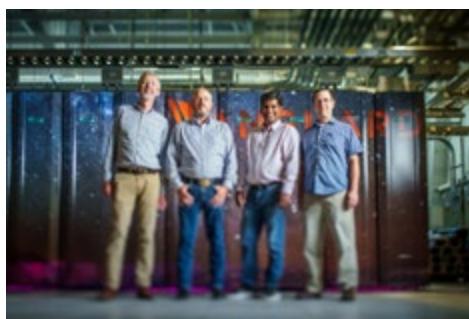


The B61-12 Electronic Neutron Generator Reacceptance Team received authorization to implement a new reprocessing and reacceptance process for electronic neutron generators that's projected to save \$32 million. The primary goal of the reprocessing initiative was to reduce the overall number of electronic neutron generators produced.

NNSA approved the product realization team's request to increase sampling rates of neutron generators for environmental testing. Increasing the number of units sampled from production lots means those additional units can be incorporated into the electronic neutron generator shelf-life plan. With more units entering the shelf-life plan, field return units can be reprocessed for reacceptance. The project required strong collaboration from across Sandia, particularly between the design and production agencies. Changes included generating new requirements, implementing new workflows and developing collection plans, among other activities. The methodology is expected to be deployed to additional programs for additional cost savings.

Tri-lab Cerebras Advanced Memory Technology Program Team

Exceptional Achievement Team Winners



A partnership between Sandia, Lawrence Livermore and Los Alamos national

laboratories and Cerebras Systems is increasing stockpile stewardship capabilities. The partnership delivered on NNSA's Advanced Simulation and Computing program's goal of exceeding the application performance of current exascale platforms by 40 times. The Advanced Memory Technology Program exceeded the goal by achieving a 745-times improvement.

The work broke a longtime simulation timescale barrier in the field of molecular dynamics. Molecular dynamics simulations of materials are crucial for stockpile stewardship because they allow scientists to study certain microscopic behaviors of materials within nuclear weapons, such as plutonium, which are difficult or impossible to study through experimental observations and engineering simulation codes. This accomplishment was also selected as a finalist for the Gordon Bell Prize, which recognizes outstanding achievement in the field of high-performance computing.

W87-1 Ferroelectric Neutron Generator Development Annular Core Research Reactor Test Team



Following a four-year effort with contributions by 11 departments across Sandia, an essential component test for the W87-1 was completed at the Annular Core Research Reactor. Testing of the W87-1 Ferroelectric Neutron Generator took place in 2024, providing critical qualification data and reinvigoration of explosive testing capabilities at the Annular Core Research Reactor.

To conduct the test safely and successfully, the team had to overcome many challenges without a predefined roadmap. Two major challenges were the development and rigorous certification of a containment vessel and radiation-hardened firing set. These developments expanded test capabilities and are already benefiting other programs.

Additionally, an extensive modeling and simulation effort was undertaken to support the project. The modeling and simulation results in combination with the experimental data enabled the generation of high-quality evidence to support qualification of the component.

High-Temperature, Radiation-Resistant, Refractory High-Entropy Alloys for Hypersonic, Electronic and Fusion Applications

Tech Transfer Winner



Sandia has added new features to refractory high-entropy alloys that enable them to withstand severe conditions, including extreme neutron radiation and high temperatures associated with fusion and hypersonic vehicles.

Engineers at Sandia and Westwind Computer Products have found an innovative way to transition the refractory high-entropy alloys into the commercial market using an advanced manufacturing process that creates the machinable alloys on a larger scale, currently the world record with respect to size. Producing large-scale alloys on a commercial level had been challenging prior to this collaboration. Roadrunner3D provided fast prototyping, spark plasma sintering and binder jet guidance.

The new, high-yield-strength refractory high-entropy alloys have potential to enhance radiation-resistant electronics, hypersonic applications and energy reliability. In addition, they can self-heal or self-repair when exposed to radiation, making them an instrumental advanced material among the NNSA resources for security and deterrence missions. The alloys — which can be used for fusion-related components, radiation-resistant electronics and hypersonic components — are the result of Sandia's dedication to cutting-edge science and research.

Quality Evaluation Requirements Tracking System and Logistics, Accountability, Planning and Scheduling Application Modernization



Modernization of the NNSA stockpile evaluation requirements tracking software suite has led to integration with additional databases. This has improved communication and processes across the nuclear security enterprise. The Quality Evaluation Requirements Tracking System application plays a pivotal role in ensuring operational efficiency, specifically for design agency testing requirements, production agency planning and testing and federal funding approval tracking.

Integration of the software with other databases, such as the Logistics, Accountability, Planning and Scheduling application, has significantly minimized data redundancy and reduced manual data entry. The successful completion of this project lowered future maintenance costs by approximately 50% and also enhanced overall communication within the nuclear security enterprise from both programmatic and technical perspectives. This update and integration removed the need to manually enter data from one application to the other, which resulted in a vast number of hours saved annually by application users.

Component-Scale and High-Throughput Radiation Testing on Z



Understanding survivability to warm X-ray insults is a critical enabling capability for qualification of new materials

and components for future stockpile use. In calendar year 2024, a Sandia team successfully developed a new capability called the Non-Orthogonal Testing for Large-Area Threats, or NOT-FLAT. The new enclosure protected experiments at the Z machine from machine-related environmental insults to conduct the first component-scale warm X-ray tests since the cessation of underground testing in 1992. The NOT-FLAT enclosure was also used to demonstrate high-throughput X-ray materials testing, quadrupling the data return rate for testing at the Z machine — the world's most energetic X-ray source.

Developing this capability for large objects reestablished experimental competence for component and subsystem qualification in X-ray environments, important for avoiding technical surprise during qualification, which will accelerate assessment and reduce qualification costs. Rapid assessment of material and design options in X-ray environments will benefit multiple future programs of record.

W80-4 Explosive Actuator Component Team



The Explosive Actuator Component Team successfully redesigned the explosive actuator component to meet W80-4 requirements, delivering the first W80-4 Actuator War Reserve lot in an impressive 15 months, avoiding production impacts at the Kansas City National Security Complex and the Savannah River Site.

The culmination of these efforts was the successful acceptance of two lots of the W80-4 Actuator delivered in 2024. These successful deliveries were ahead of schedule on a fast-turn project resulting in cost savings of over \$10 million through improved operational efficiencies,

reducing the overall cycle time by approximately 30% and streamlining production processes, which contributed to enhanced performance and reliability.

As summarized by the W80-4 peer panel and echoed by the federal program office, “There was a problem, you solved it, and you did it ahead of schedule.”

Mk21 Fuze Modernization Team



Sandia and the Kansas City National Security Campus completed the first production unit of the Mk21 Modernization Fuze in 2024. The fuze interfaces with the W87-0 warhead for deployment onto the Minuteman III and eventually the Sentinel Intercontinental Ballistic Missile.

The Mk21 Fuze, an integrated assembly of Sandia-designed logic and sensing devices, directs the warhead to initiate firing sequences at the correct point in targeting parameters. The Mk21 Fuze Modernization Program is a Strategic Partnership Program effort with the U.S. Air Force. Sandia worked closely with the Kansas City National Security Campus to ensure the design was producible and it was delivered ahead of schedule.

NNSA-led team winners NA-12 Digital Engineering Transformation Team

The Digital Engineering Transformation Team played a pivotal role in cross-site efforts to begin to establish and mature the digital thread for the nuclear security enterprise. The

Nominations for calendar year 2025 NNSA Defense Programs Award of Excellence will be accepted until Wednesday, March 4. This prestigious award recognizes individual or team contributions that constitute significant or exceptional achievements in quality, productivity, cost savings, safety or creativity in support of the NNSA nuclear weapons program.

team's contributions included delivery of the Product Data Management System and the Requirements Management System in 2024 for nuclear deterrence systems, laying the groundwork for the future of digital engineering.

These two new capabilities are helping codify consistent product information and requirements and simplifying collaborations, ultimately improving how nuclear deterrence work is completed across the enterprise.

Saturn X-ray Accelerator Refurbishment Phase 1 Team



The Saturn accelerator, a critical nuclear deterrence facility for component



PROUD MOMENT — Now-retired nuclear engineer Sal Rodriguez shows his team's award to his former manager, Rodney Keith, at the NNSA Defense Programs Award of Excellence ceremony.

Photo by Craig Fritz

qualification in a short-pulse, intense, hot X-ray environment, underwent a major refurbishment. It included redesigning and replacement of the triggered megavolt gas switches, vacuum insulator and power feed sections and the X-ray generating load.

The effort was a culmination of four years of activity that included simulation-based redesign and fabrication of parts followed by assembly, installation and testing.

Following an 11-month shutdown to install critical components, Saturn resumed operations as planned and provided excellent performance for the first scheduled nuclear deterrence customer.

WATCH a video that celebrates the winners.
Video by Arianna Andreatta



HEARTS & SOLES

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FEBRUARY 9-20

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.

Eight wins for Sandia at the 2025 R&D 100 Awards

By Kristen Meub

Sandia earned eight honors in the 2025 R&D 100 Awards, including seven technology awards and the program's Researcher of the Year professional award. Hosted by **R&D World**, the awards recognize 100 of the year's most significant technological advancements worldwide.

"This is a big for Sandia," said Doug Kothe, associate laboratories director and Sandia's chief research officer. "The R&D 100 Awards are sometimes called the 'Oscars of invention' because they are so competitive. Winning eight in one year is incredible. It's a new record for the Labs."

The 2025 honorees reflect a research portfolio built for hard environments and high consequences. Several winning projects focus on sensing, measurement and detection, tools that can improve decision-making when conditions are extreme, time is limited or safety is at stake. Others advance materials and diagnostics that help scientists better understand how systems behave under intense heat, pressure or electrical stress.

Together, the projects offer a snapshot of the kinds of problems Sandia is tackling now and the solutions teams are pushing toward next.

Sandia's 2025 R&D 100 Award winners



ELECTRO-EXPERT — Israel Owens was the principal investigator for the award-winning Electro-Optical Sensor. **Photo by Bret Latter**

Electro-optical sensor for high-energy environments and applications

Sandia's electro-optical sensor measures voltages up to 20 million volts without physical contact, using a dime-sized crystal and a compact laser system. The sensor is designed to improve safety and reliability for high-energy environments. Applications range from lightning and high-energy physics research to electrical utility monitoring. [Watch the video](#).

Colorized Hyperspectral X-Ray

Imaging with Multi-Metal Targets, or CHXI-MMT

CHXI-MMT combines nanopatterned metal X-ray sources with advanced detection methods to deliver high-resolution X-ray images and precise material characterization. The process reduces reliance on costly accelerator facilities and could expand options for biomedical imaging, transportation security, nondestructive testing and advanced manufacturing.

[Watch the video](#).



MULTI-METAL POWER — Noelle Collins sets up for an X-ray CT scan of a circuit board as part of the Non-Destructive Evaluation group at Sandia.

Photo by Craig Fritz

Fentanyl Analog Independent Detector, or FAID

FAID is a portable device designed to identify fentanyl and its analogs, even in trace amounts or mixed substances. Unlike traditional detection systems, the device recognizes chemical patterns without relying on extensive reference libraries. The technology could benefit military personnel, emergency responders and law enforcement. [Watch the video](#).



DETECTOR TO GO — A team of researchers from Sandia won an R&D 100 award for their hand-portable Fentanyl Analog Independent Detector.

Photo courtesy of Sandia

Low coefficient of thermal expansion molecules for polymers

Sandia researchers developed a molecule designed to reduce thermal expansion mismatch in polymers, which can help prevent failures in harsh environments where temperature swings cause materials to expand and contract at different rates, leading to stress and potential damage. By incorporating this molecule into the polymer, manufacturers could eliminate fillers, lower costs, make processing easier and improve durability for bonded materials. Potential applications include industrial settings and the aerospace, automotive and electronics industries. [Watch the video](#).

Hafnia gate dielectrics for energy conversion

The material improves energy efficiency in power semiconductors by minimizing

energy losses, which is critical amid growing demand from AI, data centers and global electrification. Hafnia gate dielectrics can be used cost-effectively in many applications, including transportation and smart grids. [Watch the video](#).



CLOSER LOOK — Examination of record-setting hafniagnated GaN MOSFETs under an optical microscope.

Photo by Craig Fritz

Bleeding materials and enclosures

Sandia researchers developed tamper-indicating enclosures using affordable materials that irreversibly [change color if tampered with](#). The materials



BLEEDING REVEAL — A container protected with Sandia's "Bleeding Materials and Enclosures" product indicates a tamper attempt. In this image, silicone is used to encapsulate the air-sensitive beads.

Photo courtesy of the team

Learn more

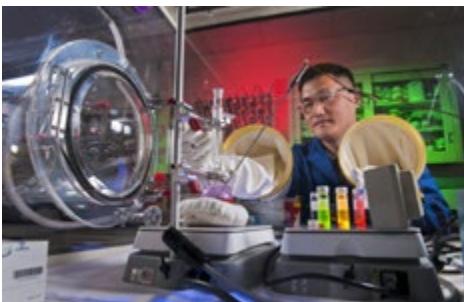
The team has received NNSA tech maturation grant funds and is refining a prototype enclosure for a potential transition pathway to industry. Watch short videos and read project summaries at [Sandia's R&D 100 Awards webpage](#)

support rapid, conclusive inspections and enhance security for applications ranging from medication packaging to national security containers. The team has received NNSA tech maturation grant funds and is refining a prototype enclosure for a potential transition pathway to industry. [Watch the video](#).

Time-resolved diffraction for the National Ignition Facility

Sandia developed hybrid sensors that enable precise measurements of materials under extreme conditions such as high pressures and temperatures. The innovation supports high-energy-density research, including fusion ignition and Earth core studies.

2025 R&D 100 Researcher of the Year: Hongyou Fan



RESEARCHER OF THE YEAR — Sandia's Hongyou Fan works with nanocoatings in his lab.

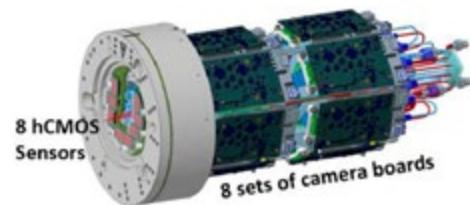
Photo by Randy Montoya

Sandia materials scientist Hongyou Fan was named [Researcher of the Year](#) for contributions to chemical science, nanoscience, and materials science. His work has driven advanced in nanoelectronics, energy and materials separation. He has earned 24 patents, six previous R&D 100 awards and recognition from multiple professional societies.

Laboratory Directed Research and Development drives innovation

Awards recognize results, but the work behind them typically spans years. For many R&D 100 winners, early progress begins with a small, high-leverage investment that lets teams test an idea quickly, prove feasibility and decide whether it is worth scaling.

That's where Sandia's [Laboratory Directed Research and Development](#) program often comes in. LDRD provides seed funding for early-stage research so teams can explore promising concepts, reduce technical risk and build the foundation for follow-on investment through



STRONG SENSORS — FIDDLE, short for Flexible Imaging Diffraction Diagnostic for Laser Experiments, is one of the most complex diagnostics ever fielded at the National Ignition Facility, housing all the electronics, cables and water lines to support up to eight hybrid CMOS sensors and an X-ray streak camera. The sensors were developed at Sandia and widely used in National Ignition Facility Inertial Confinement Fusion experiments.

Photo by Randy Montoya



CHEMISTRY AT WORK — Sandia chemist Chad Staiger uses a separatory funnel to remove byproduct from the synthesis of a molecule.

Photo by Craig Fritz

mission programs, sponsor funding or partnerships. Sixty of Sandia's seven 2025 R&D 100 awards were rooted in research supported by LDRD.

"Creativity and innovation are really the lifeblood of research and development," said Dan Sinars, director of the Chief Research Office, which runs Sandia's LDRD program. "We support over 500 LDRD projects each year, spanning every mission area of Sandia, and our impact assessments reveal that exploratory LDRD ideas from over a decade ago have matured into amazing technologies and capabilities today. This year's R&D 100 awards are a great exemplar of that."

Since 1965, Sandia has earned 169 R&D 100 awards, including this year's winners.

"When Sandia began, scientists and engineers were charged with transforming visionary concepts into meaningful outcomes and that work is still very much alive at the Labs today," Doug said. "In a rapidly evolving world, our spirit of resourcefulness remains critical to the mission and to society as a whole. I'm so proud that our teams continue to push the forefront of research and technology." 

Tackling food waste for a better world

Sandia hosts New Mexico Future City Competition

By Faith Schifani

Nearly 40% of food produced in the U.S. is wasted and accounts for 28% of the world's agricultural land use and 25% of agricultural water use, according to the U.S. Department of Agriculture and the Environmental Protection Agency.

New Mexico students stepped up to address these challenges at the Future City Competition on Jan. 17. Hosted by Sandia, middle school students imagined a world where food was not only abundant, but also sustainably managed from farm to table.

Participants designed cities to address the entire food lifecycle, from cultivation and packaging to consumption and disposal.

"This competition was a fantastic opportunity for students to think critically about real-world problems and apply engineering and science to create innovative solutions," said Justin Teo, a fleet manager at Sandia and co-regional coordinator for the New Mexico event.

Justin is one of many Sandians who volunteer each year, guiding workshops, leading technical talks and mentoring participants.

"I first got involved seven years ago when my daughter participated," said Sandia volunteer Chi Yang, optical engineer and incoming co-regional coordinator. "Seeing her excitement and the joy of learning inspired me to continue volunteering. It was rewarding to help the next generation explore the world of science."

This year, 11 schools and 23 total teams from across the state showcased their creative solutions, and judges selected a finalist: Tierra Selkora from Mandela International Magnet School in Santa Fe.

"Volunteering as a national competition special award judge was an incredible experience," said Lili Xiao, Sandia electrical



ANTICIPATION — The winning team Tierra Selkora from Mandela International Magnet School in Santa Fe awaits the results of the New Mexico Future City Competition. The event is a chance for students to envision and build cities 100 years from now.

Photo by Craig Fritz

engineer and incoming co-regional coordinator. "I got to see the amazing work and ideas from students across the U.S. and the world. It's incredibly rewarding to hold a successful event and inspire students to learn."

Tierra Selkora defends their state championship title and qualifies to compete in the national competition Feb. 14-17 in Washington, D.C.

Since Sandia began hosting this competition in 2013, more than 1,300 students have participated, tackling themes ranging from floating cities to age-friendly urban designs.

"As I reflect on my journey as the regional coordinator for the Future City Competition, I am filled with a profound sense of passion and purpose," Sandia research and development manager Junko Mondragon said. "My involvement began nearly a decade ago as a judging coordinator, a role I accepted out of a desire to support the committee and help foster student engagement. As I pass the baton to the incoming coordinators, I am confident that the Future City Competition will continue to thrive, igniting passion for STEM fields and empowering students to envision a sustainable future." 



ON DISPLAY — From left, Isaiah Rodriguez, Elizabeth Hsu and Falco Bonner from Taos Municipal Charter's Team Kibo present their model to judges at the New Mexico Future City Competition on Jan. 17.

Photo by Craig Fritz

National Engineers Week 2026

The Future City Competition is affiliated with National Engineers Week 2026, a celebration of engineering and its contributions to society that occurs Feb. 22-26. Established in 1951 by the National Society of Professional Engineers, it aims to raise awareness of the engineering profession and encourage young people to pursue careers in the field. This weeklong event highlights the importance of engineers in solving global challenges and emphasizes the role of innovation in shaping a sustainable future.

Sandia is proud to support initiatives like the Future City Competition, encouraging young minds to explore STEM fields and envision solutions to real-world problems that create a better tomorrow for everyone.

NNSA principal deputy administrator tours Labs



NA-2 VISIT — Catherine Green, senior manager for Microsystems Engineering, Science and Applications Sustainment, right, briefs NNSA Principal Deputy Administrator Scott Pappano during a visit to the Labs on Feb. 3. During his visit, Pappano received briefings on MESA, the Annular Core Reactor Research facility, AI and quantum research, hypersonics and satellite space programs and more. He toured the Counterfeit Detection Center, the Consolidated Overhead Ground System and the Weapons Display Area.

Photo by David Lienemann

Hackathon inspires future innovators

By Amanda Armenta

More than 50 high school students gathered at Explora Science Center and Children's Museum for Sandia's annual hackathon Thunderbird Hacks on Jan. 31. The event, organized by Community Involvement, introduced Albuquerque students to artificial intelligence models and STEM careers during a full day of learning about computer science, coding and AI.

Jennifer Gaudioso, director of Sandia's computing research center, kicked off the day with a presentation. Kevin Dixon, director of Sandia's applied information sciences and chair of Sandia's AI Board of Directors, gave a keynote presentation during lunch. Both shared insights into the history of AI at the Labs and its transformative impact on our world.

In addition to educational sessions, the event offered hands-on experience as students competed in three hacking challenges.



SANDIA FUTURES — Kevin Dixon, director of applied information sciences and chair of Sandia's AI Board of Directors, presents on AI work happening at Sandia during lunch at the Thunderbird Hacks event.

Photo by David Lienemann

Organized in small teams, participants tackled prompt-engineering challenges designed to outwit advanced AI agents through a series of timed tasks. Twenty Sandian volunteers supported the event, including ten technical mentors who helped the students refine creative solutions and sharpen their skills. Representatives from Sandia's Student Intern Programs offered students a glimpse into internship opportunities.

Teams were scored on their ability to outsmart the AI models, with top performers winning prizes and recognition. The event highlighted real-world applications of AI, fostered a spirit of collaborative problem solving and demonstrated Sandia's commitment to nurturing the next generation of tech innovators. 



AI ASSIST — From left, Sandia volunteers Nathan Brown, Catherine Apbley and Ben Feinberg work with Katherine Dahringer, a junior at Explore Academy, during Thunderbird Hacks on Jan. 31.

Photo by David Lienemann



REAL ONES — Scott Jolley, a sophomore at Valley High School, left, watches Spencer Jensen, a senior at Valley High School, work during the event.

Photo by David Lienemann



OUTSMART THE AGENT — Spencer Jensen, a senior at Valley High School, works on a laptop during Thunderbird Hacks at Explora.

Photo by David Lienemann

USSTRATCOM commander visits Labs



STRATEGIC SUPPORTER — From left, Sandia Deputy Labs Director Rita Gonzales; NNSA Sandia Field Office Manager Daryl Hauck; U.S. Army Command Sgt. Maj. Jo Naumann, command senior enlisted leader of U.S. Strategic Command; USSTRATCOM Commander U.S. Navy Adm. Rich Correll; Labs Director Laura McGill; and USSTRATCOM Capability and Resource Integration Director Robert Taylor pose for a photo during a Feb. 11 visit and tour of the Labs.

Photo by Craig Fritz

Mileposts



Ron Brightwell 30



Adam Cook 25



Chad Davis 25



Mario Delgado 25



Armando Fresquez 25



Scott Maruka 25



Dale Zschiesche 25



Val Payton 20



Anne Rimbert 20



Justin Weaver 20



Michael Beabout 15



Craig Bennett 15



Susan Byrnes 15



Michelle Castro 15



Steven Fillmore 15



Sungtae Kim 15



Michael Lawton 15



Melissa Mills 15



Major Monochie 15



Kathy Pehrson 15



JT Perry 15



Van Thu Pham 15



Brenda Pohl 15



Loretta Rankin 15



Rudy Sandoval 15



Russell Shiplet 15



Lauren Shreve 15



Lonnie Martin 35



John Van Scyoc 26