



30 years of
microchip
breakthroughs
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AI's eyes to help with component inspections

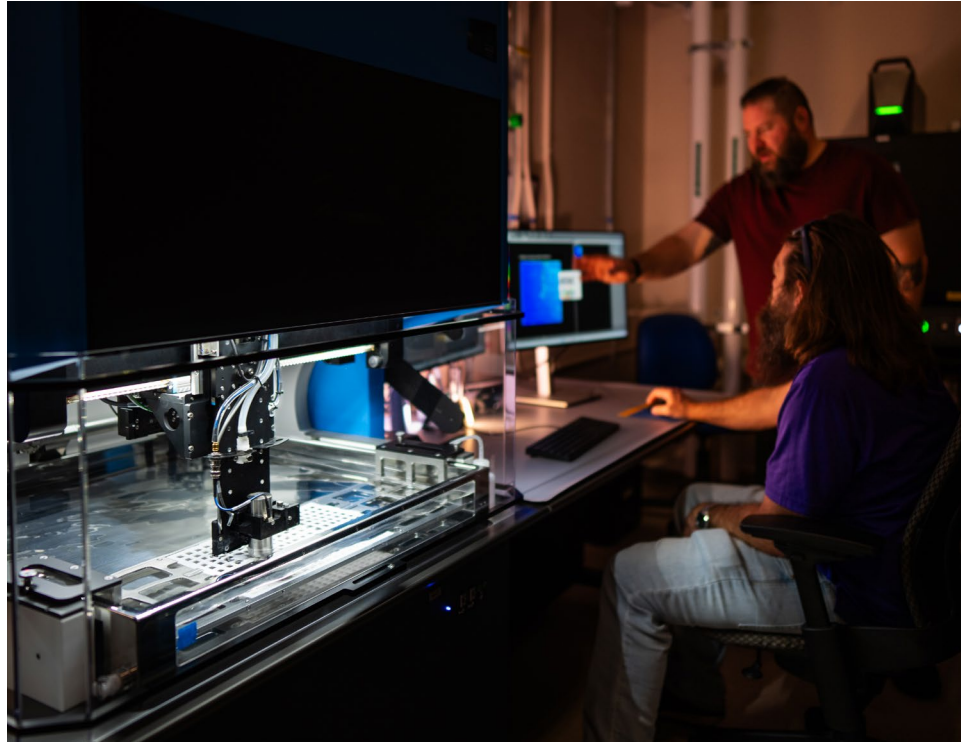
By **Kenny Vigil**

At Sandia, a new inspection workflow is taking shape that could help catch tiny defects earlier in the manufacturing process for ceramic components.

“We manufacture ceramic components for nuclear deterrence applications,” said process engineer Jesse Adamczyk, who is leading the project. “We realize there’s a big opportunity here.”

Teams from across the Labs are installing

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WITH AI'S HELP — Sandia staff work to set up a new ultrasonic tool that will use artificial intelligence to inspect ceramics components used in nuclear deterrence applications, replacing a time-consuming manual method.

Photo by **Craig Fritz**

Expanding systems integration beyond nuclear deterrence



BEYOND DETERRENCE — Carl Vanecek leads a systems integration all-hands meeting at Sandia on March 31, emphasizing that systems integration is applicable to all work at Sandia, not just nuclear deterrence. “This all-hands is our flagship event,” he said.

Photo by **Alicia Bustillos**

By **Kenny Vigil**

Sandia is showcasing how systems integration can be applied beyond nuclear deterrence programs. “Systems integration applies at any level, any component and any service at Sandia,” said Carl Vanecek, who leads Sandia’s systems integration effort. “It’s an enabling approach and a best practice that everyone should be using.”

Systems integration focuses on effective partnering and operating without bias to deliver solutions that meet end users’ needs. Sandia is the lead system integrator for nuclear weapons programs and several other national security missions.

Over the past four years, Sandia has been working to establish and enact systems integration principles and practices, and the Labs is extending these beyond nuclear deterrence programs. Elements include ensuring that key decisions are made at the

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Livermore champs take national science bowl title

High school team from Sandia-sponsored regional wins DOE Science Bowl

By **Katherine Beherec**

Students from Mission San Jose High School in Fremont, California, took home the top prize at the high school competition of the 2026 DOE National Science Bowl on Monday, May 4. Earlier this year, the team won the Sandia-sponsored regional science bowl in Livermore, propelling them to the

national competition in Washington, D.C., where they competed against 67 high schools. They won \$5,000 for their science department.

“Congratulations to the winners of the 2026 National Science Bowl and to every student who competed this week,” Secretary of Energy Chris Wright said in a DOE article. “They are the future engineers, scientists and entrepreneurs



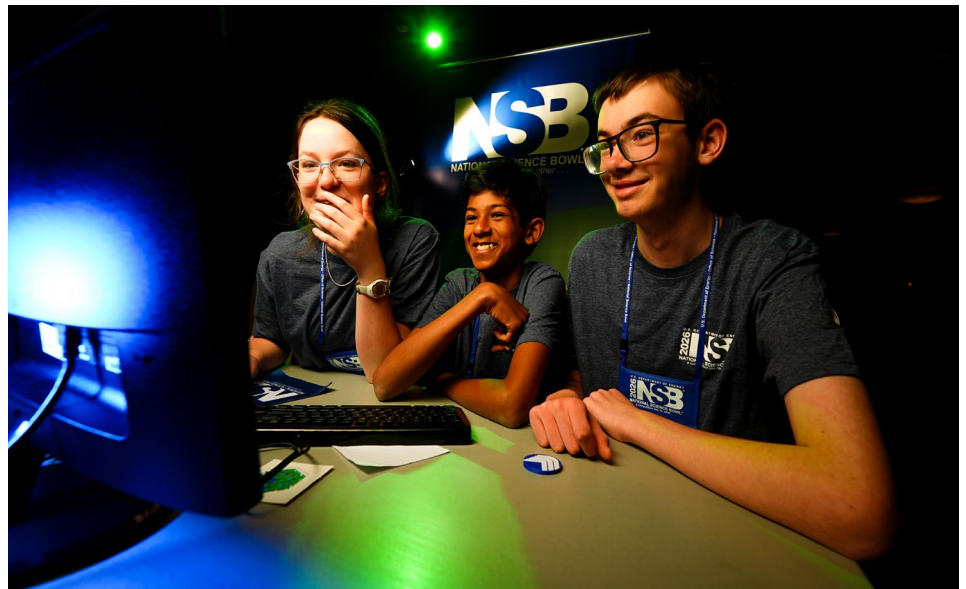
HEADED TO FINALS — From left, Mission San Jose High School team member Julian Kuang congratulates teammates Roshan Annamalai and Theenash Sengupta for advancing to the finals at the DOE National Science Bowl on May 3.

Photo by Joshua Lawton, DOE Office of Science

who will keep America at the forefront of innovation, and events like this remind me that the next generation is more than ready for that challenge.”

The Mission San Jose High School team included Roshan Annamalai, Rutvik Arora, Anish Agarwal, Advait Mopuri, Theenash Sengupta and coach Dorota Sawicka. Students from William Diamond Middle School in Lexington, Massachusetts, won first place in the middle school competition.

Additionally, teams from Los Alamos High School and Los Alamos Middle School won at Sandia-sponsored regional competitions in New Mexico in February and March, then competed at the DOE National Science Bowl over the weekend.



CYBER MATCH — From left, Los Alamos Middle School team members Norah Whitton, Muhil Sasikumar and Evan Cunningham compete in the cyber challenge at the DOE National Science Bowl on May 3.
Photo by Jack Dempsey, DOE Office of Science

Systems integration

CONTINUED FROM PAGE 1

right time, that all stakeholder equities are accounted for and that enterprise resources are used effectively and efficiently.

“My call to you, especially if this is new, is to learn more and start doing it,” Carl said during an all-hands meeting on March 31. “There are many opportunities to get involved.”

Four programs showcased how they use systems integration principles.

- The Power Sources Capability project discussed how a mission-enabling organization such as facilities uses systems integration and focuses on ensuring solutions are delivered while understanding technical capabilities.
- The W80-5 program focused on how understanding partner equities helps deliver a better solution.
- The drifter project exemplified the importance of transparent communication and trusted relationships.
- The counter-unmanned aerial systems strategy highlighted the value of engaging the right expertise, even if it is not from Sandia.

Labs Director Laura McGill provided closing remarks and encouraged Sandians to be curious.



LEADING IN SYSTEMS INTEGRATION

— Labs Director Laura McGill talks about Sandia’s role as lead systems integrator during an all-hands meeting in March. “We are uniquely situated to serve this role. Sandia is the lab that’s primarily focused on engineering in the nuclear security enterprise, and we work directly with the military services to understand their operational constraints. We’re experienced in translating leading-edge science and technology and making it work in a complex system,” she said. “It’s important to live up to our expectations as lead systems integrator in the enterprise.”

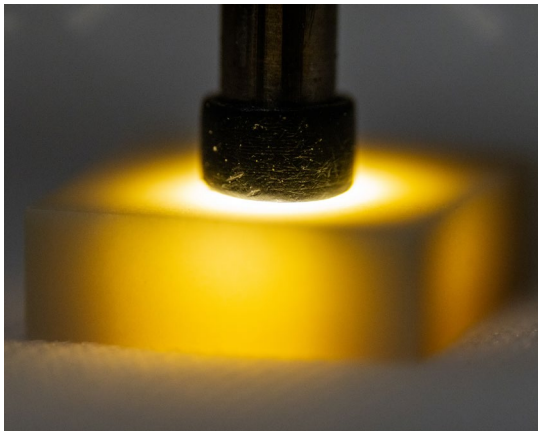
Photo by Alicia Bustillos

“Systems integration is also a mindset,” Laura said. “It’s driven by the curiosity to understand how the part or subcomponent you’re working on fits into the bigger system and how it’s all going to work together seamlessly. When we do systems integration well, we deliver better performance and capability for the nation, and we do it faster.”

Sandia employees interested in systems integration can [click here](#) to learn more.

Sandia’s systems integration principles and best practices

- Principle 1: Ensure solutions are delivered within achievable technical capabilities and programmatic constraints.
- Principle 2: Operate without bias and independently from Sandia’s internal equities and priorities.
- Principle 3: Coordinate and account for all system interdependencies across all stakeholders.
- Principle 4: Ensure timely decisions, documented and defensible, and a disagreement resolution methodology.
- Principle 5: Maintain transparent communications and trusted relationships with all stakeholders.
- Principle 6: Know and engage the right expertise, even if it’s not from Sandia.



EARLY INSPECTIONS — Technicians at Sandia use a small wand of light and a microscope to manually inspect ceramic components for tiny defects. The process is time-consuming, challenging on the eyes and requires extensive training. With the introduction of artificial intelligence and new equipment, inspections will take place earlier in the production process. **Photo by Craig Fritz**

Component inspections

CONTINUED FROM PAGE 1

new optical and acoustic imaging systems and building an AI-assisted review tool designed to speed inspections while keeping people firmly in the loop.

“We do manual inspections of all our parts. It is extremely time-consuming,” Jesse said. “These parts go into various weapon systems.”

AI inspections

The project begins by scanning ceramic billets, the starter pieces that are later manufactured into finished components, using high-throughput imaging systems that create detailed digital records of each billet.

“It’s pricey to get billets to their final component,” Jesse said. “If we can identify defects at the billet level, we don’t put all

that work into manufacturing the final component.”

The earlier inspections will save time and money.

Right now, inspectors rely heavily on manual microscopes for inspecting final components. It takes one to two years to fully train an operator on the manual inspection process, which is time-consuming and challenging on the eyes.

The new approach for final components is designed to shift that work to a digital workflow in which images can be reviewed at a workstation.

“Right now, an operator looks through a manual microscope for defects. They’re subtle, so they can be hard to find,” Jesse said. “We’re setting up software — an AI augmen-

tation interface — where operators can do anomaly detection from their desktops and have AI highlight defects for them.”

Jesse emphasized that inspections will not rely solely on AI.

“Operators will double-check to make sure the AI is highlighting real defects, and if there’s a defect AI misses, the operator will catch it,” he said. “AI augmentation is going to be more effective than manual visual inspection and more effective than

just letting the AI run loose.”

Jesse said this is a big shift, but operators are embracing it to help meet demand.

“They are thrilled to have these technologies coming online, and they’re not going to be replaced. They’re going to be reassigned because we have more work coming into our production floor,” Jesse said.


The processes will be set up so that while the components are scanned, operators can work on other tasks. The AI augmentation for active ceramics demonstrates what the DOE’s **Genesis Mission** is designed to accomplish: tackle the nation’s most complex science and technology challenges using AI. In this case, it helps speed up the nuclear deterrence mission.

Looking ahead

Jesse said the next few months will be busy on the production floor with the upgrades. In addition to tool installation, engineers are working to develop processes for imaging systems and software for the AI-augmented inspections.

During a visit to the lab one afternoon, employees were eagerly collaborating and learning how the new equipment works, including a recently installed acoustic imaging system. Over the next few months, work documentation will be developed and released, and employees will be trained on the updated processes.

“We have a lot of support for this at the management and leadership level. I have a tremendous team helping,” Jesse said. “We’re trying to deploy this workflow on our production floor as an exemplar and then take the same workflow and deploy it to other parts of Sandia and nuclear security enterprise sites. That’s the long-term goal.”

The new imaging systems and AI augmentation tool are scheduled to be up and running by early fall. NNSA’s AI for Nuclear Security initiative, led by the Office of Advanced Simulation and Computing, is funding the project. 



SPEEDIER INSPECTIONS — A technician at Sandia reviews a scanned image of a ceramic billet from her desktop. The Labs is transitioning from using a manual inspection to one that uses artificial intelligence to flag defects. Technicians will still review the results for quality control. **Photo by Craig Fritz**



INSPECTING CERAMICS FOR
ND WITH HELP FROM AI

Innovation and teamwork in the great technical unknown

30 years ago Sandia led the development of a foundational technology



FUTURE FOUNDATION — Development of extreme ultraviolet lithography in 2003.

Photo by Randy Montoya

By Sarah Jewel Johnson

Microchips are a cornerstone of daily life. Nearly every device we rely on includes a tiny microchip and its even smaller circuits.

However, despite our reliance on the technology, few know how a team of Sandians in California and New Mexico and their partners at Lawrence Livermore and Lawrence Berkeley national laboratories contributed to the foundation of microchip development

and, in the process, created a bond spanning decades.

New era, new demands

As technology and tools advanced in the 1990s, pressure grew to create higher performing microchips to accommodate growing needs and capabilities. No one could identify a cost-effective, accurate way to create higher performing chips that required higher chip density and smaller features, which required shorter wavelengths

of light to etch the details. A team of researchers at Sandia believed an emerging technology, called extreme ultraviolet lithography, or EUVL, potentially held the key to shorter wavelengths and higher chip density.

In 1997, Sandia joined forces with Lawrence Livermore and Lawrence Berkeley to create the Virtual National Laboratory, a groundbreaking consortium of national laboratories and industry. Their

research focused on EUVL and relied on key capabilities from each lab.

“It’s an amazing story in so many ways because of the people. It was the highlight of my career,” Sandia retiree Rick Stulen said.

Stulen was, and is, the cornerstone of the EUVL team. He developed one of Sandia’s largest Cooperative Research and Development Agreements to date, in partnership with Lawrence Livermore and Lawrence Berkeley, to form the \$300 million EUVL program, funded by Intel, IBM, AMD, Motorola and others. Eventually, he became the chief operating officer of the EUVL Virtual National Laboratory.

“I am driven by curiosity and a strong desire to be innovating — to always be thinking about new stuff,” Stulen said. “I’m not a solo guy. I think about what’s important for society, contributing to the big picture and working with others to contribute.”

Intersection of industry and imagination

During this time, Sematech was created as a national consortium to lay out the roadmap for tech development needed in semiconductor manufacturing, from lithography to packaging.

“Sematech was so effective,” Stulen said. “Once a year, everyone would get together and evolve the technical roadmap for chip manufacturing. EUVL was one lithography option, but we also discussed X-ray lithography, electron-based lithography and other things — all of which are different ways to make small features. At the end of one of the early Sematech meetings, attendees took a vote on the best option and EUVL came in dead last. But it didn’t deter us.”

Despite being voted as the least viable technological option to solve the manufacturing dilemma, Stulen and his peers persisted.

Within four years, the team developed the world’s first EUVL exposure machine, weighing 10 tons and measuring 10 feet tall. This tool, composed of a main chamber alongside an illuminator, could produce an image using 13.4-nanometer light from a laser plasma source. It was a tremendous leap forward in resolution, enabling much more powerful and energy-efficient chips with smaller transistors that are made today with modern EUVL.

“I am an optimist,” Stulen said. “I knew EUVL was the dark horse, but we created this great lab network, the Virtual National Laboratory. It was unheard of at the time and a successful business structure, mainly due to the support of our leaders. We created a culture of equality — everyone was treated the same — regardless of what lab you worked for or what your title was.”

One way forward

Two years after EUVL technology was downvoted as a dead-end option, it was voted as the most probable solution to the growing semiconductor manufacturing issue.

Sandia was responsible for designing and assembling the prototype extreme ultraviolet lithography exposure tool called the Engineering Test Stand. Sandia also worked to solve technical challenges inherent in such bleeding-edge technology.

Stulen hired Lennie Klebanoff in 1997 to serve as the EUVL environment team lead. Lennie and his team of seven Sandians were tasked with reducing extreme ultraviolet lithography-induced contamination of optic surfaces as well as particle contamination of the mask.

“The contamination control that this technology requires is frightening,” Lennie said. “We needed to limit contamination of the optics to no more than several atomic layers. Also, the mask had to be protected from particle contamination, which would spoil the transfer of the mask image. It was the equivalent of not allowing anything larger than a basketball over an area the size of the continental United States.”

Lennie remembers the first few months on the project as a mix of nerves and tackling the unknown, but the innovation that resulted and working with so many talented people at the laboratories and in industry was life-altering.

“I really enjoyed working with so many people,” Lennie said. “But the environmental problems scared me. I was pretty uptight about it. Fortunately, one day I confessed my fears to Rick. His wonderful encouragement dissolved my fears, completely freed me up, and the answers started coming. It was very gratifying work, and I’m so happy the work was useful and has had such an impact.”

Kurt Berger, who worked on the EUVL team as the source development engineer

and sensor engineer, has a similar nostalgic perspective.

“I liked working for 12-15 hours straight and not realizing where the time went,” Kurt said. “The people were great, and everyone was focused on the same goal: to make the future better.”


Sarah Allendorf, director of Sandia’s Transportation and Industrial Processes programs, remembers the EUVL team as one of the most impactful in Sandia’s history, and one whose impacts are still felt today.

“I love many things about EUVL,” Sarah said. “Technically, it started from people thinking really big. Logistically, it was a huge CRADA, and to get all of the institutions to agree was a monumental task. It’s so much more than just the technology — it was state-of-the-art physics and business and clever work that we still apply to many problems.”

A better future

Since the Virtual National Laboratory pioneered the foundation for modern-day EUVL technology, the impact has been hailed as the savior of Moore’s Law, which is the concept that the number of transistors on a circuit must double every two years to keep up with technological demands. Others say EUVL singlehandedly made artificial intelligence and robotics possible by enabling smaller transistors. While many on the team are proud of that accomplishment, it’s the teamwork and comradery they cherish most.

“I have such warm nostalgic feelings of friendship when I think about my fellow EUVL Sandians, our friends at Lawrence Livermore and Lawrence Berkeley, and our industry partners too,” Lennie said. “It was such difficult work, but Rick created a true family environment, which made it all happen.”

“Nothing was impossible at that time,” Stulen said. “Our purpose was always clear, and we were energized by the need to solve an issue. But what was so motivating is that everyone was involved — like cousins from different countries all sitting at the same dinner table. Together we accomplished our goal to demonstrate the feasibility of this technology, and it’s because everyone had a piece of the puzzle. We just needed to put it together.” 

California campus takes it outside

By **Lea Blevins**

Sandians in Livermore found a perfect day to spend their lunch breaks under a clear, blue sky for the Take It Outside event on April 29.

Organized by California's Preventive Health team, the event featured food trucks, a plant exchange, cornhole games and Employee Health & Wellbeing info tables.

The Sandia California Division Council hosted craft activities for staff to make bookmarks from dried flowers and to paint rocks.

In addition to lunch from local vendors, workforce members could sample quinoa and bulgur salads to encourage wellness.



FLOWER POWER — Manager Karla Reyes, left, makes a dried flower bookmark with members of the Sandia California Division Council.

Photo by Lea Blevins



SALAD WITH 'FRIENDS' — Maria Montes and Gina Madison serve samples of Jennifer Aniston's viral salad recipe.

Photo by Lea Blevins

How Sandians show up off the clock

Giving 295 hours of time, talent during National Volunteer Month



TOMATO HOLES — Mariah, left, and auditor Ashley Ramirez, center, help prepare fields for planting in Corrales, New Mexico, April 18. This volunteer event drew 25 Sandians, their family members and friends. In May, a group of 30 volunteers from Sandia will revisit the fields to plant tomato plants.

Photo by David Lienemann



ONION STACKS — Sandians sort and pack 50-pound bags of onions during a service project at Roadrunner Food Bank. In April, 50 volunteers from Sandia participated in projects at Roadrunner. Community Involvement mobilized 118 people and 295 volunteer hours across various projects during National Volunteer Month.

Photo by David Lienemann



TINY BOTS — From left, Andy Graves; his daughter Rocío Sandoval-Graves, 8; her cousin Matías Sandoval, 3; and Matías's father, Marcos Sandoval, work with small Ozobots robots to execute a line of instructions at Jefferson Middle School Science Night on April 9.

Photo by Craig Fritz



TUNE UP — Clay Campbell with Free Bikes 4 Kidz New Mexico loads a bike into a box truck at the Trek Store on April 4. The organization collected 48 bikes at the event. Sandia volunteers assisted with cleaning and refurbishing them for donation to local partners such as afterschool programs, health clinics, church groups, crisis centers and tribal organizations.

Photo by Craig Fritz

Curiosity, discovery reign at NM Kids Day

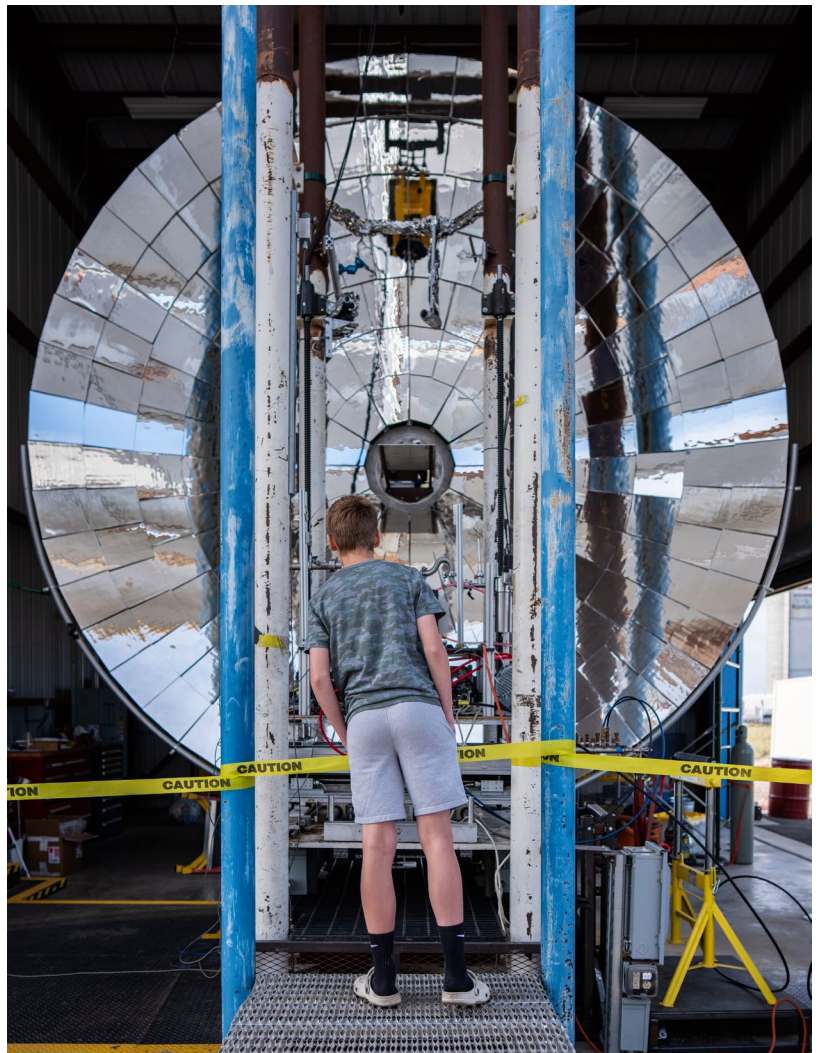


UP, UP, OUT OF THE WAY — Lucia Alvorez, 12, left, and Katy Orona, 13, avoid a wind-blown high-altitude solar balloon inflated by Atmospheric Science team members at Hardin Field during Kids Day. Staff members organized 70 activities across the New Mexico site, from the solar tower to Hardin Field. **Photo by Craig Fritz**



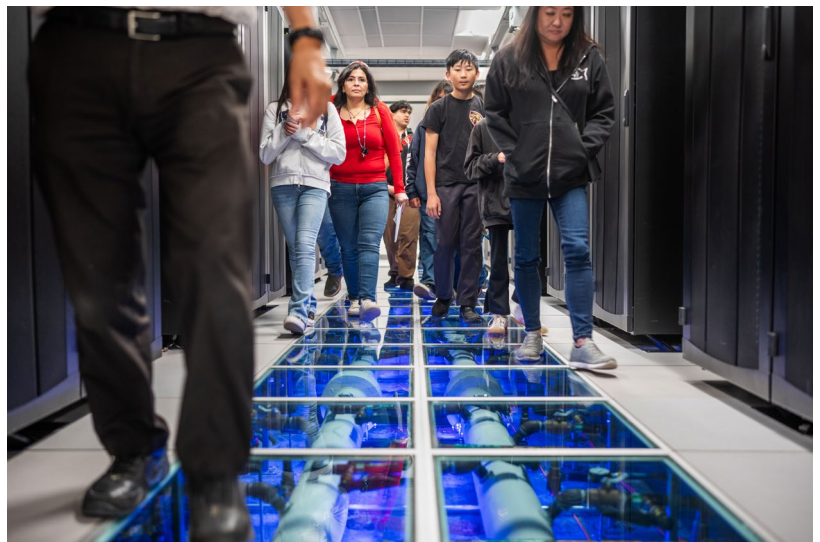
FEEL THE BEAT — Megan Phipps listened to her own heartbeat while chatting with medical services staff on Kids Day.

Photo by Craig Fritz



FUTURE REFLECTED — Jack Grange, 12, takes a closer look at the solar furnace at the National Solar Thermal Test Facility on a Kids Day tour with his dad, Spencer.

Photo by Craig Fritz



COOL COMPUTING — Families tour the Corporate Computing Facility, where the cooling system for supercomputers runs through the floor, during Kids Day on April 29. The event drew 2,409 children for a full day of science demonstrations and behind-the-scenes tours.

Photo by Craig Fritz



Asian American and Pacific Islander Festival

RIBBON DANCE — Members of the Albuquerque Chinese Folk Dance Ensemble perform the fast-paced and intricate ribbon dance at the 2026 Asian American and Pacific Islander Heritage festival, hosted by Sandia and the National Museum of Nuclear Science & History.

Photo by Alicia Bustillos

Mileposts



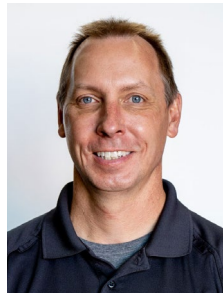
Ashley Pena Amparan 25



Julia Baca 25



Jamie Cash 25



Mike Enghauser 25



Daniel Petersen 25



Dan Clayton 20



Pamy Schorzman 20



Meaghan Carpenter 15



Suzanne Franchini 15



Ken Hernandez 15

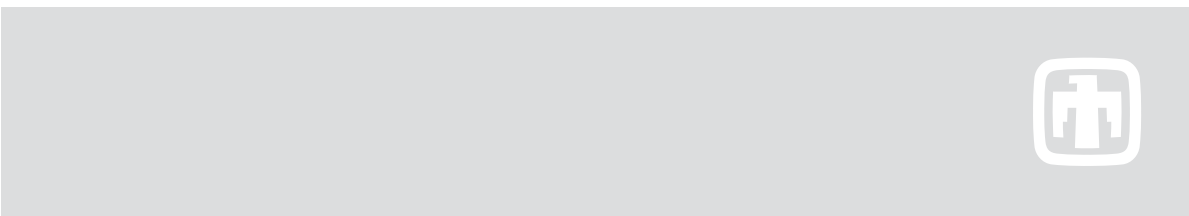


Clinton Justus 15



Whitney Lacy 15

Recent Retirees



Richard Duran 17