SANDIA LABNEWS
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Vela's 60th birthday **Page 12**

Preventing collateral damage in cancer treatment

New patch detects and stops misplaced radiation

By **Kim Vallez Quintana**

WORKING TO CHANGE LIVES — Materials scientists Patrick Doty, left, and Isaac Avina teamed up to create the patch displayed between them, which can better prevent damage of healthy tissue in proton radiation cancer treatment. **Photo by Spencer Toy**

Using a simple concept and a patented Sandia sensor that detects radioactive materials, a team at Sandia has developed a patch to stop damage to healthy tissue during proton radiotherapy, one of the best tools to target certain cancerous tumors.

"This is an important need, especially among pediatric patients," said Patrick Doty, one of the creators of the patch. Proton radiation therapy is used to send a high dose of radiation into a specific area of the body to disrupt and destroy

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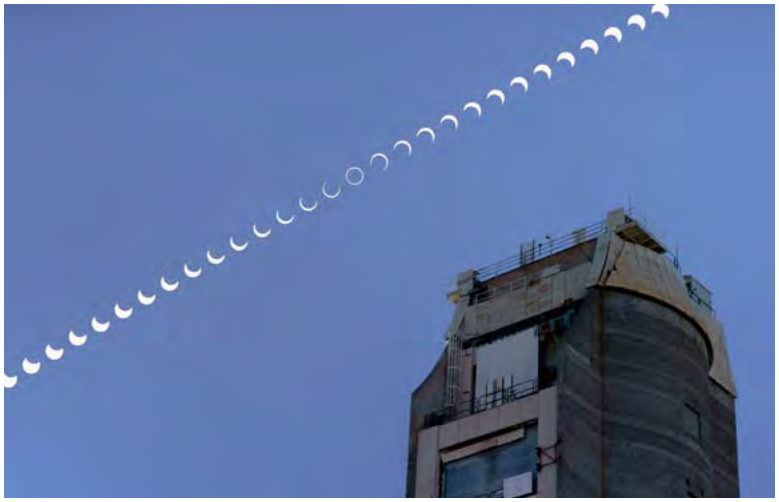
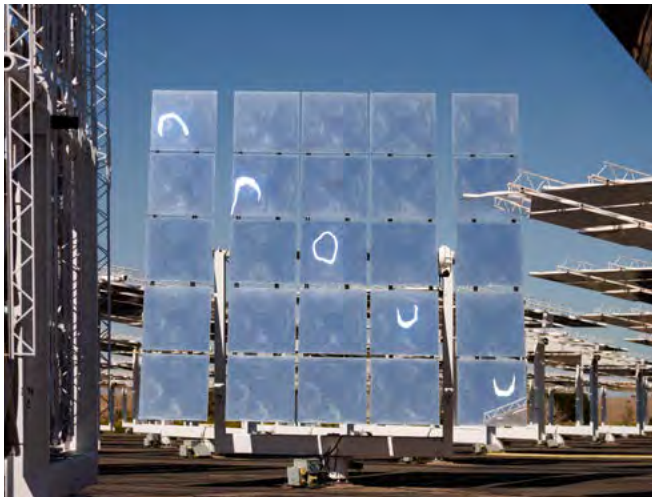
There goes the sun: annular solar eclipse





Phases of the annular solar eclipse are shown as it passes Sandia's National Solar Thermal Test Facility in Albuquerque on Oct. 14. The left photograph includes multiple exposures as the sun and moon traveled left to right, as well as an exposure without the eclipse. The photograph on the right comprises multiple exposures as the sun and moon traveled from bottom right to top left, through each segment of a heliostat, and a final exposure without the sun.

According to NASA, an annular solar eclipse occurs when the moon passes between the sun and Earth, but when it is at or near its farthest point from Earth. Because of this, the moon does not completely cover the sun. As a result, the moon appears as a dark disk atop a larger, bright disk, creating what looks like a ring around the moon. **Photos by Craig Fritz**

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Labs leaders outline simplified strategy to accelerate nuclear deterrence capabilities

PARTNERING TO DELIVER — Sandia's nuclear deterrence leadership announced three new pillars to quickly deliver safe, secure and reliable deterrence capabilities, such as the B61-12, seen here at Nellis Air Force Base prior to a 2022 flight test. Before the test, the nuclear weapons package was removed and replaced with a joint-test assembly package. **Photo by Craig Fritz**

By **Kenny Vigil**

Simplify. Empower. Partner.

These pillars will be the driving force of Sandia's nuclear deterrence portfolio strategy — with the overall goal to deliver more quickly. More than 1,100 employees joined as nuclear deterrence leadership unveiled the strategy during a live Microsoft Teams meeting on Oct. 4.

"We need to deliver nuclear deterrence capabilities faster to ensure we have a flexible and responsive stockpile. We'll make data-informed decisions to make sure we do this without reducing safety, security and reliability," said Laura McGill, deputy labs director for nuclear deterrence and chief technology officer.

Citing the current geopolitical scene, Laura said, "It's a dynamic environment. We must be able to deliver."

The pillars in the new strategy connect to Sandia's two overarching goals, which are to accelerate innovation and lead in

modern engineering. Each pillar also ties to one of Sandia's three key behaviors. The behaviors set expectations for how Sandians interact with one another, stakeholders and customers to meet national security missions.

Simplify for rapid execution

Thinking creatively about how Sandia accomplishes work to deliver more quickly is the basis of the "simplify" pillar. In the short term, nuclear deterrence programs will work with other organizations to identify which nontechnical activities in workflows can be eliminated.

A longer-term goal will look at developing project management standards and applying them across Sandia's nuclear deterrence programs for consistency. The "simplify" pillar connects to Sandia's "purpose-driven" behavior to serve the nation passionately and creatively.

Empower to out-innovate the adversary

Encouraging employees to take risks and push the envelope will empower Sandians to deliver for the nation's most critical deterrence needs. This initiative focuses on preparing for urgent and emerging deterrent needs using research and development. Empowering employees ties to Sandia's "courage" behavior. A major focus of this pillar is to deploy a technical and cultural training program, with an emphasis on employee onboarding.

Partner to deliver

Laura said Sandia has spent a lot of time over the past year enhancing partnerships across the nuclear security enterprise. The goal is to enhance and expand collaboration with partners to streamline operations for delivery. The pillar ties to Sandia's "connected" behavior to leverage diverse perspectives. To help accomplish that, Sandia will have a point person dedicated to enhancing cross-program and and cross-site relationships.

Laura said the new nuclear deterrence strategy is greatly simplified. "We're really changing the posture of our nuclear deterrence portfolio to be more responsive and to leverage our capabilities," she said. Nuclear deterrence leadership played a role in developing the new strategy.

Cancer treatment

CONTINUED FROM PAGE 1

tumor cells, but the radiation also kills nearby healthy cells. The goal is to be as precise as possible when targeting the radiation, but human movement is an issue especially when dealing with children.

"If you breathe, you move. When your heart beats, you move. You can't stop those types of motions. And kids are wiggly. You can't keep them still for long," Patrick said. "Sometimes doctors must resort to general anesthesia and the treatments sometimes go day after day for six weeks. Imagine going to the hospital and having to be put under every day for weeks. That is not good for anyone, but it's especially bad for kids."

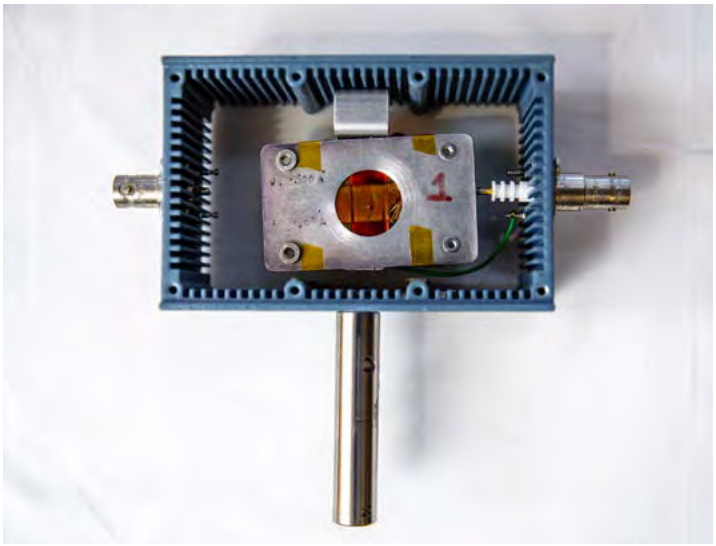
Patrick and fellow materials scientist Isaac Avina came up with a solution: an imaging patch that makes it easier to deliver a precise dose to the right location.

Current systems prompt the radiation to stop when movement is sensed through cameras, but they can't sense how much radiation was misplaced or at what dosage. Isaac and Patrick said this patch, called an Electronic Polymer Dosimeter for Radiotherapy, can do both.

"You can think of this patch as electronic film. The idea is to print an array of sensor elements on the patch and each element or pixel gives location and intensity information. In that way it records an image of the dose delivered," Patrick said.

Although the team began its focus on pediatric cancer treatment, they quickly learned the patch could be vital in treating other cancers.

"Proton radiotherapy is the gold standard for treating certain cancers, but there are problems with targeting it, especially in small areas like in prostate cancer and brain cancer and now we have a solution," Isaac said.

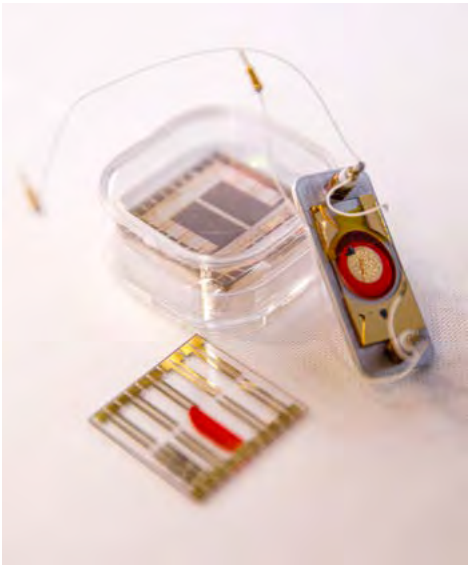


ADAPTING TO DIFFERENT CONDITIONS — A test fixture for mounting free-standing detectors on polymer films in the proton beam.
Photo by Spencer Toy

"There are certain tissues at risk that you don't want to destroy, including those in the brain. You can lose hearing because of collateral damage, or you can hit nerves or other vital tissues, so they use physical restraints," Patrick said. "For brain cancer patients they literally nail a device that fits over your head to a hard bench, so your head is completely still. Imagine how traumatic that is."

Where the idea came from

While the team said the need for this new technology is huge, no one has come up with a realistic and inexpensive solution until now. So how did they do it? Isaac and Patrick said the idea stemmed from their nuclear detection work as part of Sandia's core mission. The main component of this patch is a neutron and



PREVENTING COLLATERAL DAMAGE — The Electronic Polymer Dosimeter for Radiotherapy, created by a team at Sandia.

Photo by Spencer Toy

proton sensor that Sandia patented.

"It had not been used anywhere else. It was invented here and was designed for detecting signatures from nuclear materials," Isaac said. "We wanted to see if we could use it for other applications including cancer therapy, knowing cancer therapy has the same signatures."

Basic principle, basic materials

The team paired the sensor with a polymer and electrodes, attached them to a layered material that looks like a bandage and added adhesive. They say that the polymer, known more commonly as a plastic or resin, is ionized after the proton interacts with it. The electrodes then feed the charge back to an amplifier, detecting the beam intensity and precise location in real time. That stops the radiation if the beam is off target and records the information to determine which tissues the radiation penetrated and at what levels.

Adding artificial intelligence and machine learning tools to the technology may lead to advanced algorithms for treatments. By analyzing the data being gathered by the patch, the sensor can provide more accurate beam profiles that help better differentiate between cancerous and healthy tissue. This can further enhance the efficacy of the treatment and prevent excessive radiation treatments.

A personal mission

For Isaac and Patrick their mission is personal. Isaac's father is battling cancer, so Isaac learned a lot about cancer treatments and the good and the bad that come with them.

"I wanted to find a way to help this whole process and wanted to contribute but didn't know how," Isaac said. "This became especially true while I was researching and talking with the clinics and learned what children have to undergo during these cancer treatments. I realized there was a gaping need in this field of oncology, and I wanted to help." That's when Patrick and Isaac teamed up and started brainstorming.

Patrick has been working on radiation detection for more than 20 years and has long been looking for a new way to use the technology. He realized the need in oncology when he and Isaac were accepted into DOE Energy I-Corp, which helps scientists become entrepreneurs. Oncologists from some of the top cancer centers in the country shared the challenges they face in treatment.

"To be able to talk to doctors, who use this every day in the field and find out what their real needs are, we realized just how important this was," Patrick said.

What's next

The team has been presenting its technology through various programs and networking with entrepreneurs in hopes of commercializing the patch. They also have seen a lot of interest in testing the technology in situations that are closer to real life. They say some of the country's top cancer centers have the capability to do so through systems that mock-up an entire proton radiation therapy procedure.

"I was talking to a doctor from one oncology department, and he asked me if I could send it over immediately. He didn't care about the cost. He didn't realize that we don't have any product on hand to share but the urgency was clear. He wanted it not tomorrow but yesterday," Isaac said.

The team hopes their work can soon change the lives of cancer patients for the better.

"For years we knew that we had a very cool material that did things that nothing else could," Isaac said. "We wanted to help in another area. We realized that is in cancer therapy."

More benefit choices for 2024

Employees encouraged to review, choose benefits before Nov. 6

By **Karyn Scott**

Open Enrollment began Oct. 18 and closes Nov. 6.

"Employees told us in the last Benefits Preference Survey that they value choice in their health insurance benefits and that time off is important to them," said Executive Director and Chief Human Resources Officer Brian Carter.

"We heard their need for flexibility, more support for child care and other resources that make it easier to balance life's financial demands. Over the last several years, Sandia has both improved the benefits we provide and offered employees more options. And this year, we will continue to enhance employees' already great benefits so they continue to meet their needs at all stages of life."

What's new for 2024 Open Enrollment

Sandia will continue to offer two medical plans: the Health Savings Plan and the Total Health PPO Plan. Three dental plans and three vision plans are also offered. Additionally, employees will see the following enhancements to their benefits lineup:

- **Behavioral and mental health covered at 100% after deductible.** For both the Health Savings Plan and the Total Health PPO Plan, in-network behavioral, mental health and substance abuse benefits will be covered at 100% after an employee meets their annual deductible.
- **Vision plan reimbursement increase.** For all three vision plans, out-of-network reimbursement will increase by $10 for eye exams, frames and lenses.
- **Expanded Smart90 Pharmacy Benefits.** For those employees covered by the health plans under Blue Cross Blue Shield of New Mexico or UnitedHealthcare in 2024, the pharmacy benefit with Express Scripts will have an expanded Smart90 Program that allows members to receive a 90-day supply of their maintenance medications at any in-network pharmacy. Employees may contact Express Scripts at 877-817-1440 to verify that their medication qualifies.
- **New autopay feature and vendor for the Health Reimbursement Account and Healthcare Flexible Spending Account.** Beginning Jan. 1, participants in the Total Health PPO Plan with Blue Cross Blue Shield of New Mexico or UnitedHealthcare will have a new vendor, PayFlex, to manage their Health Reimbursement Account and Healthcare Flexible Spending Account. PayFlex will offer an autopay feature that automatically reimburses employees for medical, dental and vision services processed by their insurance plan. Employees who do not wish to use the autopay feature must opt out of this option during Open Enrollment.

PLANNING AHEAD — During Open Enrollment, Sandians can choose medical, dental and vision plan options for 2024. Open Enrollment continues through Nov. 6. **Photo by Craig Fritz**

Retiree Open Enrollment

- Pre-Medicare: Oct. 15-Nov. 10
- Medicare: Oct. 15-Dec. 7
- New for 2024, the Sandia Group Kaiser Senior Medicare Advantage plan is available for all pre-2012 and post-2012 pension-eligible retirees.
- Details about Sandia retiree plans and Via benefits can be found in the 2024 Benefit Choices and Open Enrollment Guides, available at **SandiaRetireeBenefits.com**.

What's new for 2024 outside of Open Enrollment

Beginning in 2024, Sandia will offer employees the following new and enhanced benefits beyond what is being offered through this year's Open Enrollment:

- **New floating holidays.** In addition to Sandia's 11 observed holidays, there will be two new floating holidays (16 hours total) that employees can use during the year to celebrate any holiday or occasion that's important to them, with prior manager approval.
- **Increase to vacation time.** Sandians will see an increase in vacation accruals starting their third, fifth, 10th, 15th and 20th year.
- **$1,500 for child care needs.** The Sandia Childcare Fund is a post-tax program, paid for by Sandia, that employees can use to offset the cost of eligible child care expenses.
- **Expanded eligible expenses for the Lifestyle Spending Account.** Beginning Jan. 1, the list of eligible

expenses for the Lifestyle Spending Account will be slightly more expansive and will include items such as music subscriptions, meditation apps and salon and barber services.

- **Expanded eligibility for Sandia's 401(k) match.** Eligible student loan payments will now count as 401(k) contributions and qualify for Sandia's 401(k) plan matching contribution, up to the established maximum (66 2/3 cents of every dollar up to the first 6% of the employee's eligible compensation). This includes the employee's student debt and cosigned or parent loans.
- Represented employees should refer to their collective bargaining agreement to verify their benefit options.

View more information about the new and enhanced benefits for 2024 that are outside of Open Enrollment.

How to enroll

To enroll, visit HR Self Service and follow the prompts. To make their elections from home or a mobile device, employees need an HSPD-12 or mobile credential.

The elections employees make during Open Enrollment are effective from Jan. 1 through Dec. 31, 2024.

Resources to help employees choose

- 2024 Sandia Benefits Guide: A comprehensive summary of benefit options.
- An interactive Medical Plan Comparison Tool that asks a few questions to help determine which medical plan may be right for an employee.
- Medical, dental and vision plan comparison charts: Charts that detail the coverage available under each plan option.
- Monthly premiums for 2024: A table that shows monthly rates for medical, dental and vision options.
- Understanding Your Sandia Medical Plan Options video: Compares the Health Savings Plan and the Total Health PPO Plan.
- Open Enrollment Benefits website: Additional information about benefit options.

Energy management practices earn Sandia recognition as DOE 50001 Ready site

By **Diana Hackenburg**

Molly Blumhoefer thinks managing energy is just one piece of the puzzle in ensuring Sandia operates efficiently and sustainably. She's part of Sandia's energy management team, which has been busy creating a system to organize, measure, improve and, when needed, troubleshoot energy use across the Labs' California and Albuquerque campuses.

The DOE recently acknowledged the team's efforts by recognizing Sandia as a 50001 Ready site. This designation shows that Sandia is a leader in energy management and performance improvement.

"Going through this process to become recognized by the DOE as 50001 Ready underscores the importance of energy management at Sandia and makes it sustainable long-term," Molly said. "Meeting their requirements emphasizes and supports what we are doing and gives us credibility moving forward as we continue to make our operations more energy efficient."

The team, which also included Danny Alkon, Michael Flores, João Oliveira and Nicole Rinaldi, partnered with Global Strategic Energy to complete the 25 tasks required to achieve 50001 Ready designation, which mimics the structure of the international standard for energy management, ISO 50001. A recent order by DOE recommends that all agency facilities consider implementation of an ISO 50001 or 50001 Ready program to track, analyze and improve energy efficiency.

HIGH PERFORMANCE — Gary Roberts, a plumbing contractor, works on the cooling system in Sandia's high-performance computing building on Oct. 9. **Photo by Craig Fritz**

Setting a baseline

Sandia is no stranger when it comes to tracking energy use, so the team started by assessing what existing tools could meet program requirements. "We already had an energy management system in place," Molly said, "so we just needed to document our efforts and make the system more robust."

That need to enhance current practices also extended to the way Sandia models energy use. Rather than just dividing energy use by area, the team added the capability to normalize consumption based on weather.

"Now, if we see a big spike in energy use across the site, we can assess whether it's due to weather or indicates a bigger problem — like a system malfunctioning. Not having to spend as much time investigating a trend will have a huge impact on how we move forward," Molly said.

Another important baseline required designating a few buildings or systems as significant energy users based on their high energy consumption and opportunities for improvement. The team chose two buildings in Albuquerque and one in California. By identifying these users, the team could

focus their efforts and increase their impact, said Casiano Armenta, acting manager of Sandia's energy and infrastructure data management group.

"For example, we chose the high-performance computing building because it uses a lot of power. But also, we can't just shut off the computers, right?" Casiano said. "So, we need to keep the systems up and running to meet the team's needs but be as efficient as possible."

Each building or system has a crew devoted to keeping an eye out for problems and implementing energy conservation measures. These buildings can then serve as templates for replicating improvements across the broader campuses.

After completing the 50001 Ready program tasks, the team underwent both an internal audit and an audit performed by the contractor to identify any weaknesses. The audits found only one nonconformity, which the team fixed immediately, and a few other areas of concern. Molly said they are brainstorming creative ways to overcome these challenges, such as how to align the ISO 50001 standards with other federal sustainability directives Sandia must achieve.

Energy leadership

In addition to saving energy to reduce costs, energy management supports Sandia's commitment to model the way forward in site sustainability both among the national laboratories and in the community. "We want to be as cutting-edge as possible and be a leader in this dynamic environment," Casiano said.

Sandia is committed to achieving net-zero emissions by or before the U.S. goal of 2050. While most people associate net zero with increasing alternative energy, Casiano thinks about energy conservation. "The starting point is needing to be as efficient as we possibly can with the energy that we're using now."

Molly views this work as one of the ways Sandia can act as a responsible neighbor, especially since our Albuquerque campus is in close proximity to underserved communities. "We need to be a good steward of the land and taxpayer dollars. We need to do our part because our efforts can have a huge impact on the environment."

A COOL SYSTEM — Manuel Torres, left and Tony Tafoya check the liquid cooling system in Sandia's high-performance computing building on Oct. 5. As a result of work done on the facility and others, Sandia has been recognized as DOE 50001 Ready site for energy management practices. **Photo by Craig Fritz**

One additional outcome of going through the 50001 Ready process was meeting with people from across the Labs to discuss future risks and opportunities related to energy management. Climate change, utility rates and an expanding mission all came up in conversations that wouldn't have happened otherwise, Molly said.

"We need to be able to anticipate how climate change might impact our heating and cooling systems. For example, increasing wildfires could drive stricter guidelines for indoor air quality, which would drive up energy demands," Molly said.

Continuing the journey

Now that Sandia has achieved the 50001 Ready recognition from DOE, the team is starting to think about full ISO 50001 certification. "I feel at this point, we could go into another third-party audit and feel confident about our program," Molly said.

In the meantime, the team continues to find ways to improve energy management and lower consumption. Other initiatives, such as Smart Labs and Monitoring-based Commissioning, help ensure buildings perform as expected, leading to greater occupant safety and comfort.

It's not just the energy management professionals who can contribute to these efforts, Casiano said. A feature recently added to the Sandia Maps employee portal allows users to see how much energy a building consumes. That awareness can extend to each time one enters a building.

"Just like you would in your own home — if you have a leaky faucet, if you notice something wasteful, put in a ticket," Casiano said. "We want Sandia staff to be the eyes and ears of what is going on in our buildings. If you have an idea, let us know — because all those little things add up.

Rocks may hold key to storing intermittent renewable energy, expanding its use

By **Kenny Vigil**

Sandia is collaborating with New Mexico-based CSolPower LLC to develop an affordable method of storing energy from renewable sources. The primary goal of the partnership is to transition to zero-carbon solar and wind energy for generating electricity.

"You need to have energy storage and dispatchable power when renewable energy is unavailable or when there's a large spike in demand from the grid," said Luke McLaughlin, a mechanical engineer at Sandia who works on thermal energy storage. "With this project, we're integrating renewable energy sources into an electrically charged thermal energy storage system. Our aim is to develop the technology and take it to a place where you can use wind and photovoltaic energy sources to charge the system."

The system consists of rocks held in a bed that can be heated or cooled with air

to store thermal energy. "We've learned that gravel from landscaping companies can be successfully used for the system without requiring extensive washing or preparation," said Nathan Schroeder, a Sandia mechanical engineer. Nathan said Sandia designed a small 100-kilowatt-hour test rig to test the rock bed's performance at the National Solar Thermal Test Facility. Photovoltaic panels are being installed, and updates have been made to demonstrate the bed's ability to charge using an intermittent energy source.

"One of the advantages of thermal energy storage in rocks is that it can be built anywhere. It can be commodified and doesn't require extensive permitting. We believe it can be implemented more quickly and economically than other approaches," said Walter Gerstle, who co-founded CSolPower in Albuquerque in 2019.

Cost is a crucial factor.

"Reducing the cost of this thermal energy storage system, or energy storage systems in general, increases the potential for deploying these systems in industry and it increases the likelihood of adopting renewable energy," Nathan said.

Heating things up when the sun is down

CSolPower's technology focuses on long-duration energy storage, which means it can provide energy storage ranging from hours to months. During testing, the bed was charged with air at temperatures of 500 degrees Celsius, or greater than 900 degrees Fahrenheit, and the system maintained that temperature for up to 20 hours.

"We successfully charged and discharged the system, and so far, the performance of the system is in line with our predictions and modeling," Nathan said. The technology offers a way to reduce dependence on fossil fuel heat sources. "A natural approach is to store excess electricity generated during the day as heat, and then use it to heat water and homes at night. This is an example of the small-scale use of this storage option," Walter said.

Prototype testing will continue until June 2024. "Our goal is to take this lab-scale project and prepare it for deployment in the marketplace," Nathan said. While CSolPower aspires to make its technology ready for utility-scale storage, the company plans to start with small-scale implementation. If the current phase of testing is successful, several greenhouses in northern New Mexico are lined up to use the rock bed for thermal energy storage. "Instead of curtailing solar energy production, we would store it and use it during cold nights to keep the greenhouses warm enough to grow plants year-round," Walter said.

STORING ENERGY — Walter Gerstle, who co-founded CSolPower LLC, is working with Sandia to develop his company's thermal energy storage system and get it ready for commercial use.

Photo by Craig Fritz

TEST TIME — Sandia mechanical engineers Nathan Schroeder, left, and Luke McLaughlin, right, discuss the design of a thermal energy storage system with CSolPower co-founder Walter Gerstle, center. Sandia is testing CSolPower's thermal energy storage system at the National Solar Thermal Test Facility.

Photo by Craig Fritz

Helping New Mexico businesses

The Technology Readiness Gross Receipts initiative is financing this phase of the project. Sandia's Technology and Economic Development Department helps administer the tax-funded program, which allows eligible New Mexico businesses to work with scientists and engineers from Sandia and Los Alamos national laboratories. The goal is to help New Mexico business owners get their inventions ready for the commercial market. Businesses interested in learning more can contact Genaro Montoya at gmontoy@sandia.gov.

Celebrating Hispanic Heritage Month together

Todos Somos, Somos Uno: We Are All, We Are One

By **Maggie Krajewski, photos by Lonnie Anderson**

It was one of those perfect Albuquerque days where fall is just around the corner and the sun is shining, the sky is blue and the breeze is just enough to cool you down without blowing over the table settings.

A line of freshly waxed classic cars lined Hardin Field while another line formed at the Hangry Jalapeno food truck serving up fresh tacos, Frito pies and burritos. Albuquerque High School's Mariachi San Jose performed on the stage and Sandians and Kirtland Airmen and women mingled, ate and celebrated, together. Todos Somos, Somos Uno: We Are All, We Are One.

The event was organized by the Hispanic Outreach for Leadership and Awareness employee resource group to recognize the start of Hispanic Heritage Month.

ADMIRING FANS — The 1991 Nissan D-21 minitruck was a crowd favorite this year. Vincente Garcia says the car was brand new, but nothing fancy, when he got it in high school. In 2008 his cousin gave Bedrock a makeover and built and installed hydraulics.

TODOS SOMOS — Albuquerque High School's Mariachi San Jose performs at the Hardin Field event celebrating Hispanic Heritage Month.

ALL OUT — Mark Dodd won the Labs Director's Choice award for his 1949 Bentley Mark VI. Mark went all out even dressing the part to match his classic Bentley.

COMMITTEE'S CHOICE — Matthew Martinez won the Hispanic Heritage Month Committee's Choice award for his 1954 Chevrolet Bel-Air.

GETTING STARTED — The Hispanic Outreach for Leadership and Awareness Chair Roberta Rivera kicks off the Sept. 21 event.

AWARD WINNER — Juan Bustos won the car show's People Choice Award for his 1939 Chevrolet Coupe.

Sandians share stories of triumph in 'A Better Life'

By **Maggie Krajewski**

Five Sandians took the stage earlier this month to share their journeys to become the first in their family to earn a college degree.

The event was organized by the Hispanic Outreach for Leadership and Awareness employee resource group to commemorate Hispanic Heritage Month.

Each story was different, but all demonstrated the courage to carve a new path, a connection to someone who believed in them and a mindset driven by their purpose to create a better life.

PROUD MOMENT — Juan Manuel and Rita Serrano take in their son's doctoral certificate after being presented it by Manuel Serrano at Sandia's 2023 Hispanic Heritage Month signature event.

Photo by Craig Fritz

Amanda Vital

Amanda grew up with a little voice in her head reminding her that she can go farther.

"Mija, get your education." The voice is her father's.

Her father, Francisco Javier Vital, came to the United States from Guadalajara, Mexico, in the 1970s. He started his own roofing business in Albuquerque, but as an immigrant living in the U.S., he faced harsh racism and discrimination.

"Here, he was just a poor immigrant, an illegal alien," Amanda said.

But not to Amanda. To her, he was a superhero.

Still, as parents do, he wanted more for his young daughter, and pushed her, his Mija, to get her education.

At 15, Amanda's life took a detour, and she suddenly had a Mija of her own. But Amanda stayed the course, graduated on time, with honors and a toddler.

"I didn't think I deserved to go to college," Amanda explains. "I didn't know anyone that went to college other than my teachers … that was a life that was foreign to me. I didn't think I was smart enough."

Five years after graduating high school and led by her father's voice, Amanda stepped onto the campus of Central New Mexico Community College, walked away with a course schedule, and proved herself wrong.

Amanda graduated from CNM with her associate degree and fell in love with higher education. She took a job at the college helping other first-generation students pursue their education and eventually, encouraged her own mother to get her associate degree.

Amanda started classes at the University of New Mexico but by that time she had three children and was working full-time at CNM. It was just too much, and Amanda dropped out.

"In 2018, I watched as cancer ravaged my father's body and eventually took him from us," Amanda recalls. "Even amongst the cloud of grief I was in, I heard my dad's voice, 'Mija, get your education,' so that summer… I walked back onto the UNM campus."

Amanda left with a success plan and a new course schedule. She graduated in December 2020 with a Bachelor of Science degree in tech and training and another BS in communications.

On graduation day Amanda put on her cap and gown, drove to the cemetery, knelt by her father's gravestone and told him, "Pa, I got my education."

Today, Amanda works as an information management professional with Sandia's Mission Assurance team.

David Castillo

David's sixth grade teacher wrote a note on his report card that read, "I'm sorry to report but David does not take his schoolwork seriously."

She wasn't wrong.

A self-described "impressionable follower," David said he spent high school avoiding as much work as possible and ditching classes. In 1979, he graduated with a 1.86 grade point average.

That summer David moved with his family to Albuquerque where he got a job flipping burgers at Blake's, but after seeing his first paycheck, he realized he might need something more.

"I went to Winrock Mall and wandered into the H. Cook Sporting Goods store and

noticed a 'Help Wanted' sign in the ski department," David said.

He applied, got the job and a new group of coworkers and friends, who made a new impression on him. This time it was to further his education.

David enrolled at UNM where many of his co-workers were full-time students. However, after struggling with the freshman curriculum he reassessed his situation. David applied and was accepted into the Laser Electro-Optics Program at Albuquerque's Technical Vocational Institute. This opportunity helped him get a job at Sandia's Radiation Hardened Integrated Circuit Facility, or RHIC-1. From there, he would go on to earn his associate degree in applied science, nearly doubling his high school GPA, graduating with a 3.67.

At that time there were increasing opportunities in hazardous waste and David's work at RHIC-1 would soon morph into his career.

In 1993, David was hired as a technologist in Sandia's Waste Management Department and in 1998 he was promoted as a distinguished technologist. Today David is a senior member of the technical staff with the Labs Environmental Systems Department.

Amanda Hebert

Amanda and her twin sister were just 16 years old when they left home, two years older than their mom was when the girls were born.

Her parents spent much of her childhood in active addiction, a cycle Amanda was determined to break.

Amanda and her sister attended a work study program during their junior year of high school where they met Elaine.

"Elaine would end up being a stand-in mother for my sister and I, and a big inspiration for me in continuing my education," Amanda said.

The twins would become the first in their family to graduate high school and college.

Amanda joined the Army National Guard during undergrad to help pay for school and after taking a break in 2010 for a tour of duty in Afghanistan, she graduated in 2013 with a Bachelor of Science in environmental health.

THE FIRSTS — Presenters and members of the Hispanic Outreach for Leadership and Awareness group pose for a photo during the 2023 Hispanic Heritage Month signature event, A Better Life, in Steve Schiff Auditorium on Oct. 3. **Photo by Craig Fritz**

She moved to Albuquerque with her daughter after graduation to work at Sandia. In 2019, Amanda would become the first in her family to earn a master's degree. Today, Amanda is an engineering program and project lead with the Labs Safety and Health Engineering I group.

Amanda Hawkins

The Adverse Childhood Experience study measures the level of childhood trauma experienced based on 10 risk factors. Amanda scored a 9/10.

Growing up, Amanda and her five siblings often went without food, basic utilities and at times, a home.

An elementary school teacher told Amanda that based on her background, she would likely never go to college. But her high school principal saw Amanda's potential and helped her get a summer internship with the United States Department of Agriculture's Forest Service.

She was on track to graduate until her junior year until her mother pulled her out of school to help take care of the family. However, a classmate's parents encouraged her to continue with her education.

Amanda listened and would end up being the first in her family to graduate both high school and college.

A college internship at the Labs introduced Amanda to what would soon become her career. Today, she is a quality engineer with the Component Science, Engineering and Production Center.

"Sandia changed my life," Amanda said.

Manuel "Manny" Serrano

Manny's parents, Juan Manuel and Rita, were both forced to drop out of school when they were in elementary school. Growing up in Mexico, the two left school to help support their families.

Years later the two would meet, fall in love, marry and in 1994 on Independence Day, immigrate to the United States.

The couple settled in Hatch, New Mexico, where they worked long hours picking chile and onions.

"Despite my parents not having a formal education, they always encouraged me and pushed the importance of education," Manny said.

Manny would eventually become the first in his family to not only graduate primary school, but high school, college and on the 29th anniversary of his parents coming to the U.S., Manny would the first in his family to earn his doctorate.

Manny is a systems engineer working with the W76-1 Systems Life Extension group.

Happy 60th birthday to Vela, watchman for nuclear detonations

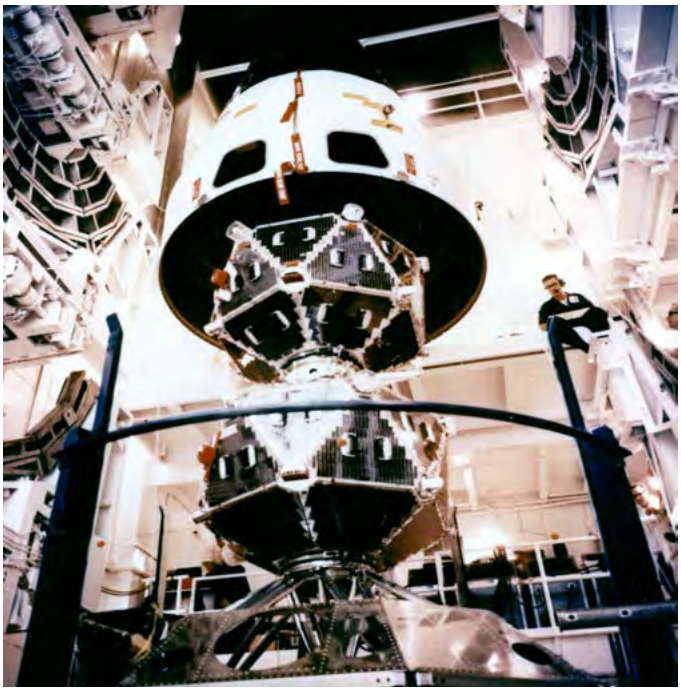
By **Rebecca Ullrich, Labs historian**

Sixty years ago this week, on Oct. 16, 1963, the United States launched a pair of satellites whose primary purpose was to determine the feasibility of using satellites to detect nuclear detonations in outer space. The satellites were part of the Vela program, initiated in 1959 to provide a nuclear detonation detection capability to verify compliance with nuclear treaties. The treaties weren't in place yet in 1959, but negotiations for a nuclear test ban treaty had been underway since the mid-1950s. By 1958, at talks in Geneva, the ability for all sides to verify compliance with any test ban was clearly identified as a major sticking point.

Background

Late in 1958, after the United States, United Kingdom and Soviet Union had entered a nuclear test moratorium based only on their word, there was some concern that testing might continue but be hidden. A group called the Panofsky Panel, assigned by the National Academy of Sciences to look into the possibility of using surveillance satellites to detect nuclear detonations, concluded it was feasible. The Atomic Energy Commission asked each of its weapon laboratories to pursue the issue. In August 1959, Sandia formed its group, the Buzzer Committee.

At the same time, the Department of Defense's new Advanced Research Projects Agency was conducting a similar, but broader study. The agency's program, called Vela, pursued technology to monitor nuclear detonations in space, at ground level and underground. The space-monitoring satellite portion of the project was called Vela Hotel.



COMMENCE COUNTDOWN — The fifth pair of Vela satellites ready for launch on a Titan III C, 1969. **Archival Sandia photo**

Later that year, the Atomic Energy Commission and Department of Defense efforts merged under the Advanced Research Project Agency's Vela Satellite Program. Within that program, the Air Force Space Systems Division oversaw satellite design, manufacture and launch, while the Atomic Energy Commission developed and provided the instrumentation for monitoring and detecting nuclear detonations.

STATE OF THE ART — Sandia-designed, room-filling analog computer used for Vela simulation models. **Archival Sandia photo**

While satellite work was underway, negotiations for a permanent nuclear test ban continued. The test moratorium ended Sept. 1, 1962, when the Soviet Union resumed testing, followed quickly by the United States. But negotiations continued. On Aug. 5, 1963, the Partial (or Limited) Test Ban Treaty was signed in Moscow by the United States, United Kingdom and Soviet Union. The treaty banned nuclear weapon tests in the atmosphere, in outer space and under water. Congress advised ratification on Sept. 24, President Kennedy ratified it on Oct. 7 and it entered into force on Oct. 10, 1963. A week later, the first Vela satellites to monitor nuclear detonations were launched.

First launch

The first Vela pair was lifted into space by an Atlas-Agena space booster that placed it in a slightly elliptical orbit about 60,000 miles above the earth. The pair then separated, and a rocket motor in the center of each satellite moved it into its own circular orbit, positioning the pair 180° from one another on opposite sides of the Earth.

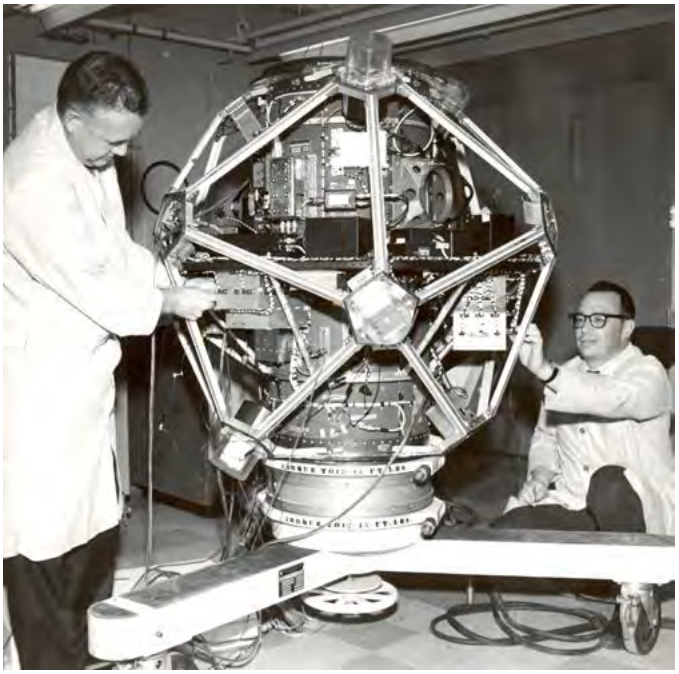
The satellites and their payloads were complex systems — about five feet tall, weighing over 400 pounds and carrying

about 14,000 solar cells and 40,000 electronic components. Each satellite in the pair was an icosahedron, with 19 sides holding solar power panels and the 20th serving as the rocket motor exhaust area.

Los Alamos designed the sensors to detect nuclear detonations; Sandia was responsible for the logic system and the prelaunch test capability. TRW Systems Group, a division of Thompson Ramo Wooldridge Inc., was tapped by the Air Force to produce the satellites themselves and provide the communications and power systems.

Over the course of the Vela program, Los Alamos designed and produced the X-ray, gamma ray and neutron radiation detectors. Each corner of each satellite held a radiation sensor. The data obtained from the Los Alamos sensors fed both the potential detection of a nuclear detonation in space and the understanding of the space background. Gamma ray astronomy was born in Vela research.

The Sandia-designed logic system on each satellite included more than 23,000 components. Bill Goldrick, who worked on satellites from 1959 throughout his career, later noted that the logic system was state-of-the-art at the time, but seemed rudimentary later.



SATELLITE SHAKEDOWN — Bob House and Simon Steely putting the first Vela design through its prelaunch testing, 1963. **Archival Sandia photo**

"These were not even hybrid circuits," he recalled. "They were quarter-watt resistors and capacitors and so on."

Six months after the first Vela launch, Lab News reported on the satellites' success, noting that redundant systems built for backup had never been needed during the more than 20 million transistor hours that were logged. Data transmission to the ground stations was successfully continuous for the first weeks and then successfully switched to a periodic schedule with additional on-demand reporting. Six months into the program, more than two billion bits of information had been transmitted.

Moving forward

The original plan was to do more launches of the original design, but designers envisioned expanded capabilities that were implemented over time. Each subsequent Vela pair launched was more sophisticated than its predecessors.

By the third launch, the Los Alamos sensors were sophisticated enough to finely distinguish background radiation and to support research on sources of charged particles that moved into the Van Allen radiation belts, among other questions.

Sandia was starting to use more sophisticated solid-state devices in field test instrumentation and pursued them for Vela. Labs Vice President Glenn Fowler later noted that, "Their low power consumption and ability to withstand cold temperatures in space made them ideal for Vela."

By the third Vela launch in July 1965, Sandia used Texas Instruments integrated circuits designed for NASA in a few of the logic system components, significantly reducing their size. Subsequent designs turned even more to integrated circuits.

IT WILL FLY! — Bill Goldrick and John Mitchell, stalwart Vela designers, with a Vela model. **Archival Sandia photo**

A turning point was reached with the fourth pair of Vela satellites, launched in April 1967 atop a Titan III C. These were polyhedrons weighing 730 pounds, each with 26 sides, of which 24 held triangular solar cell panels. TRW made significant improvements in attitude control. The first three pairs were spin stabilized, while the fourth used reaction wheel systems.

The Los Alamos-designed instrumentation included eight X-ray sensors and four gamma-ray detectors on a band around the satellite's center. Los Alamos also provided neutron detectors and new

Solder on the level

Sandians T. A. Allen and Bob Sylvester developed a hot air solder leveler to coat and level the solder on the Vela components prior to the first launch. This process turned into a successful tech transfer for Sandia, as hot air solder levelers went on to be used by printed-circuit board manufacturers. A 1989 estimate indicated the Sandia-developed hot air solder leveler had saved industry about $250 million annually.

experiments, including a charged-particle analyzer and a solar-proton telescope for measuring background radiation. The telescope was particularly interesting at the time for detecting increasing solar activity as the sun moved into the active portion of its 11-year cycle.

In addition to the electronic systems, Sandia also provided new electromagnetic pulse detectors and optical detectors based on the bhangmeters used in atmospheric nuclear testing to observe a nuclear burst. Sandia-designed data processing electronics also supported the new detectors. For the first time, the satellites would look earthward and be able to detect nuclear detonations deep in the Earth's atmosphere, as well as shielded detonations and those behind the Moon.

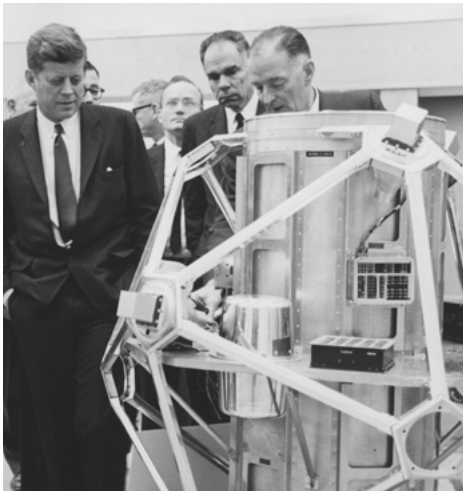
Vela V and V-B satellites were launched in 1969 and 1970, respectively. They were nearly identical and remained Earth oriented. They continued to feed basic research, as well as monitor for nuclear detonations. Los Alamos announced in July 1969 that the Vela V satellites had located a new galactic X-ray source, SCO XR-1.

Vela ends

In March 1971, the Vela program moved from the Advanced Research Project Agency to the U.S. Air Force. The program was considered complete, and the announcement of the change included the observation, "We believe we have now met our technical objectives."

On Sept. 27, 1984, the last of the Vela satellites were turned off. Sandia and Los Alamos both continued to work on nuclear detection monitoring, supporting subsequent satellite payloads, as well as related nonsatellite efforts.

Over the years, the Vela satellites were noted frequently for their reliability, which was commented upon while they were flying and in subsequent years. Sandia took pride in its own 100% quality check of the payloads it developed, as well as the ground checkout equipment designed to test the payloads and satellite operations repeatedly prior to launch. There were no failures.



PRESIDENTIAL INSPECTION — President John F. Kennedy learning about Vela during his December 1962 visit to Sandia. Left to right: Kennedy, Presidential Science Advisor McGeorge Bundy, Atomic Energy Commission Chair Glenn Seaborg and Sandia Labs Director Siegmund "Monk" Schwartz.

Archival Sandia photo

Computer scientist named Asian American Engineer of the Year

Tian Ma provides exceptional service to the Sandia community

By **Kylie Engleman**

Sandia computer scientist Tian Ma was named a 2023 Asian American Engineer of the Year by the Chinese Institute of Engineers/USA at a ceremony last month. Each year, the institute honors exceptional Asian American engineers who demonstrate strong technical skills, leadership abilities and commitment to public service.

"This is a very prestigious award to receive. It is a nationally recognized achievement," Tian said. "Receiving this award is very significant and has been a huge honor."

Tian immigrated to the United States with his parents when he was just 11 years old, causing him to face both language and economic barriers throughout his childhood. Despite the hardships, Tian strove to achieve the strong work ethic that his parents instilled in him from a young age. Such a work ethic was and continues to be the driving force behind his highly celebrated career as an engineer.

Tian has received awards including the DOE's Secretary's Achievement Award in 2015 and the Society of Asian Scientists and Engineers Professional Achievement Award in 2020. Tian was also recognized by the Chinese Institute of Engineers, having been named Most Promising Asian American Engineer in 2016.

This time, Tian is being recognized for his outstanding achievements as a research

A STORIED CAREER — Computer scientist Tian Ma was named Asian American Engineer of the Year at a ceremony in Jersey City, New Jersey, in September. **Photo by Craig Fritz**

and development computer scientist. He is a leading innovator in remote sensing systems, which includes data analysis, processing and exploration. With more than 20 years of experience in the field, he is a nationally recognized expert in detection algorithms and tracking systems. Tian holds several patents for his work relating to advancements in object detection and tracking systems.

"I like to not only develop scientific methods, but bridge the gap between science and engineering," Tian said. "I think that science is how you come up with an idea but turning it into a reality is what engineers do, and what I enjoy doing the most."

Alongside his work at Sandia, Tian holds several professional STEM and volunteer roles. He serves as a technical and scientific reviewer for the Journal of Big Data, Journal of Super Computing, Remote Sensing, and Electronics. He is a technical mentor for the NNSA Minority Serving Institution Partnership Program, a collegiate mentor for the Society of Asian Scientists and Engineers, and a former volunteer for the New Mexico District Attorney's office.

Because of his background navigating language and economic barriers as he pursued his education, Tian was motivated to connect with local students through STEM. He serves as a board member for the New Mexico Future City Competition, a project-based learning initiative for middle school students, and routinely volunteers at local STEM competitions.

Tian started his Sandia journey in 2003 when he was selected for the Labs' One Year on Campus fellowship program as an R&D computer scientist. Though the program, Tian obtained his master's degree in electrical and computer engineering. As a lifelong learner, Tian keeps pace with the essential technology skills that are relevant in the current fast-changing world by completing his Master of Business Administration in management of technology and doctorate in systems engineering under Sandia University Programs.

Tian said his commitment to excellence and his community is the driving force behind his selection as this year's Asian American Engineer of the Year award.

"This award holds a lot of significance to me because it's external," Tian said. "Some of the recipients are Nobel laureates and CEOs. Just being listed next to these people is a huge honor."

Mileposts

Doug Ammerman 35

James Eanes 30

Darrell Armstrong 25

John A Gonzales 25

Paul Kotula 25

Michael Trahan 25

Gabriel Velasquez 25

Andrea Ambrosini 20

Jennifer Miller 20

Dan Pless 20

Karen Smith 20

Jason Morris 15

Kara Peterson 15

Jon Shelton 15

Mike Walker 15

‘Sandia Serves’ — in a big way

Employees give back what was given to them

By **Kim Vallez Quintana**

“When I was a kid, a bicycle changed my life.”

That’s why Levi Allen, a technical grad student and intern at Sandia, decided to volunteer at the Free Bikes for Kidz NM event during Sandia Serves day.

While Levi said he wants to keep the full story behind that bicycle private, its impact was huge. “I just wanted to be a part of something that could do the same for someone else,” Levi said.

He helped clean and load 102 bicycles for kids in need, all donated by Sandians. He was one of 230 volunteers in Albuquerque and 30 in Livermore, California, who contributed their time and talents on Sept. 30.

Among them was one tiny volunteer, 6-year-old Lucas Kuca, whose parents Vanessa and Michal both work at Sandia.

“Lucas saves a portion of his weekly allowance for sharing,” Vanessa said. “We told him about the event, and he was excited to contribute. He almost had enough to purchase a new bike for another kid, but his one condition was that he wanted to buy a bike for a boy.”

Mom and dad pitched in the rest and volunteered their time. Of course, they brought along their son. “We had a hard time pulling him away,” Vanessa said. “He kept asking, ‘Can we clean another bike, please?’”

The family has made it their goal to volunteer regularly. Their lives today are very different from how they lived growing up,” Vanessa said.

“Michal’s parents immigrated to the U.S. when Michal was 3 years old, escaping communist rule in Poland. My parents immigrated from El Salvador, one of the poorest and most violent countries in Central America at the time,” she said. “Michal and I will never truly understand the sacrifices our parents made to provide a better life for us, so ensuring we give back is one way we hope to keep grounded and grateful as a family.”

There were many more personal stories to be heard around the city on Sandia Serves day.

Computer engineer Maria Swartz is new to Sandia. She chose to help prepare meals at the Ronald McDonald House.

“We have some family friends who have stayed at a Ronald McDonald House while their daughter was having heart surgery,” Maria said. “I know that having a place to stay with a hot meal can help take one element of stress away from families in similar situations.”

It turned out to be rewarding in more ways than one. “Being newer to New Mexico, I hadn’t cooked chile before. It was fun to learn how to prepare New Mexican cuisine and meet other Sandians,” Maria said.

FEEDING THE HUNGRY — Laura Shimabukuro, front, and Nalini Menon dishing up hot meals at Loaves & Fishes community dining hall in Martinez, California. **Photo by Michael Shaikh**

GIVING BACK WHAT WAS GIVEN TO HIM — Levi Allen repairs a donated bike that will go to a child in need as part of Sandia Serves Day, a way of helping pay it forward **Photo by Katrina Wagner**

LEARNING YOUNG — Six-year-old Lucas Kuca cleans a bike, along with his dad Michal Kuca as part of the Free Bikes for Kidz NM event. **Photo by Vanessa Kuca**

The 11 community service projects in Albuquerque also included building ramps for New Mexicans who have mobility issues, helping with home improvement projects for low-income homeowners, staffing local food banks for the day, making blankets for non-profits, working in the garden at the Rio Grande Food Project, organizing clothing donations at Locker 505, building a shade structure at the transitional living center Saranam, and cleaning and repairing kennels at Animal Humane NM.

Two long-time co-workers took advantage of the opportunity to volunteer together, preparing food boxes at Roadrunner Food Bank.

"We could have been Lucy Ricardo and Ethel Mertz," joked Chrissy Casias, who laughed and smiled the whole day with her friend of 17 years, Jacque Ramirez. "I had a terrific time with my kind-hearted friend. It does take a village and an extra pair of hands makes a gigantic difference."

In California, volunteers took part in five projects, including working in a community garden, sorting food and clothing donations at a non-profit, staffing a fundraising bocce ball tournament, baking and decorating birthday cakes for foster kids in the community and preparing hot meals at a soup kitchen.

"It was such a rewarding experience, so we already have signed up to serve warm meals for Thanksgiving," said Nalini Menon, who brought her daughter and husband along.

It's a feeling many of the volunteers share.

"I'm incredibly blessed to have the means to give back to my community and thankful for the opportunities to help those who are less fortunate than me," Jacque said.

Vanessa Kuca talked about how much fun her family had.

"This is the first year we've set this goal for our family, and we've had a blast doing it thanks to the Sandia Serves Community," she said. "It's been really great to see Lucas enjoy it. We're proud of him, but more importantly, we hope he is proud of himself."

LEARNING A NEW MEXICO TRADITION — Maria Swartz and Nathaniel Krakauer learn the New Mexico tradition of making red chile from pods while preparing meals for families at the Ronald McDonald House.

Photo by Katrina Wagner

SERVING FROM ABOVE — Jac Pier puts the finishing touches on a pergola at Saranam, a transitional living center, on Sandia Serves Day.

Photo by Jen Clear

LUCY AND ETHEL? — Longtime friends Chrissy Casias and Jacque Ramirez laugh and joke as they work together to package rice at Roadrunner Food Bank. The nonprofit distributes an estimated 60 million pounds of food each year.

Photo by Amy Tapia

A MOUNTAIN OF DONATIONS — Samantha Varela shows her daughter how to fold clothing at Locker 505, a clothing bank for K-12, as Liz Rose tackles the piles of clothes around them.

Photo by Katrina Wagner

SERVING WITH A SMILE — Ram Sena Bojja and Amy Schudder help load frozen meat in the walk-in freezer at Tracy Interfaith Ministries in Tracy, CA.

Photo by Michelle Walker-Wade