



Sandia studies subterranean storage of hydrogen



GASSING UP? — A geosciences engineer works on a gas adsorption system in a fume hood as part of a project to see if depleted petroleum reservoirs can be used for storing carbon-free hydrogen fuel.

Photo by Craig Fritz

Will empty petroleum reservoirs work for storing clean hydrogen?

By **Mollie Rappe**

Imagine a vast volume of porous sandstone reservoir, once full of oil and natural gas, now full of a different, carbon-free fuel — hydrogen.

Sandia scientists are using computer simulations and laboratory experiments to see if depleted oil and natural gas reservoirs can be used for storing this carbon-free fuel. Hydrogen is an important clean fuel: It can be made by splitting water using solar or wind power, it can be used to generate electricity and to power heavy industry, and it could be used to energize fuel-cell-based vehicles. Additionally, hydrogen could be stored for months and used when energy needs outpace the supply delivered by renewable energy sources.

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Sandia pumps \$140 billion into the economy through technology development

Yes, that's billion with a B

By **Kim Vallez Quintana**

To say that the technology and products Sandia researchers have helped imagine, innovate and industrialize have had a massive impact on the country would be an understatement.

Two studies commissioned by Sandia and NNSA show that work at the Labs has had an \$140 billion economic impact since 2000. That is particularly significant considering it spans just two decades, less than a third of Sandia's 75-year existence.

"I am very proud of how Sandia excels in fulfilling its technology transfer mission to deliver economic impact to the U.S.," Business Development senior manager Mary Monson said. "Sandia's contribution of \$140 billion over 20 years makes it a leader among Department of Energy laboratories."

— CONTINUED ON PAGE 5



POSITIVE IMPACT — Deputy Labs Director David Gibson announces the \$140 billion economic impact of Sandia Labs in the past 20 years during a press conference on April 2.

Photo by Craig Fritz

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Security team upgrades travel processes, earns NNSA coin



TRAVELING A NEW PATH — NNSA Sandia Field Office Manager Daryl Hauck, left, presents an NNSA Enhanced Mission Delivery Initiative coin to Bernardo Diaz in recognition of improvements that Bernardo and the International Security & Risk Management program helped make to nuclear security enterprise processes for traveling to foreign nations on behalf of NNSA and other U.S. government agencies.

Photo by Bret Latter

By **Myles Copeland and Karli Massey**

Bernardo Diaz has been part of a few big changes. He and his team from Sandia's International Security and Risk Management were recognized by NNSA on March 12 for improvements that make it faster and easier for Sandians and other nuclear security enterprise contractors to travel to foreign nations on behalf of NNSA and other U.S. government agencies.

"Thousands of travelers will benefit from these improvements, enabling us to more effectively accomplish NNSA's mission with our international partners," said NNSA Sandia Field Office Manager Daryl Hauck, who presented Bernardo an NNSA Enhanced Mission Delivery Initiative coin in appreciation of his effort to help nuclear security enterprise processes move quicker and more efficiently. "He showed persistence in making it happen. He didn't take no for an answer."



A COIN FOR EXCEPTIONAL SERVICE — Stephen Neidigk holds a coin presented by NNSA's Sandia Field Office to the Transportation Safeguards & Surety Program for delivering a mobile high-security vault in just six months. **Photo by Craig Fritz**

NNSA's Enhanced Mission Delivery Initiative aims to improve efficiency, productivity and collaboration across the nuclear security enterprise.

Bernardo worked with NNSA officials to reduce the number of approvals needed for these types of trips.

"I know what a pain it is to cut red tape," he said. "I think my previous experience told me, 'We can change it.'"

Bernardo's "previous experience" includes reestablishing U.S. diplomatic relations with Cuba.


Havana was his first assignment as a diplomat for the U.S. Department of State. Diplomatic relations between the two countries were severed in 1961 and remained so when Bernardo arrived in 2014.

"It was a hardship post," said Bernardo, who moved there with his wife and dog. "The Cuban people are incredible, but the work was hard. The country was stuck in the 1950s. Not much has progressed in terms of infrastructure."

Bucking 70 years of history, Bernardo was part of the team that carried this international effort across the finish line. The Department of State Superior Honor Award hangs in his Sandia office, recognizing his "Outstanding sustained performance and significant contribution in support of diplomatic relations between the United States and Cuba."

Years later, Veronica Robles, a member of his staff who helped lead the project, credited Bernardo with driving the improvement in the travel process.

"Bernardo really took the time," Veronica said. "Our travelers go through a lot. The biggest thing I always go back to is to reduce the human stress of it all. How can we make it a little bit better? How do we get them out the door to do that mission work?"

"This award is satisfaction we're doing what's right to serve the mission," Bernardo said. 

NNSA awards coin for quick delivery

Coin presentations like the one to Bernardo are a new way the NNSA is recognizing Sandians who cut red tape and speed innovation and product delivery.

The second coin in this series went to manager Stephen Neidigk and his team from the Transportation Safeguards and Surety Program, which delivered a mobile high-security vault in just six months.

To meet a national security need on this tight timeline, the team used several forms of advanced manufacturing, including 3D printing, technical embroidery and model based systems engineering, to move from concept to construction without formal drawings.

Stephen's team delivered models and manufacturing specifications that allowed several vendors to construct major components of the vault that were subsequently assembled at Sandia.

"Typically you spend 75% of your design time on the drawings," Stephen said. "When you're budget- and time-constrained, it forces you to figure out solutions within those constraints ... This work required a functional prototype. It was a build-to-think exercise. Let's build it, learn, adjust and do it again."

This drastically different approach, which included Stephen carrying a 1/20-scale model of the vault to meetings to convey the concept and support design discussions, delivered a full scale prototype in about a quarter of the time usually required for this type of project. The solution was a 20-foot shipping container with a 30,000-pound vault inside.

"We didn't recreate the wheel," Stephen said. "Completing the prototype vault was an excellent example of Sandia's ability to deliver at the speed of relevance. We utilized experience and technology developed over the last 40 years to save time and completed an 80% solution in six months as opposed to 100% solution in five years."

"While other recent innovations have focused on process improvements, this project uses the Labs' know-how in system integration, working with partners to meet a national security need," Labs Director James Peery said during the coin presentation on March 18. "This is one of the areas where Sandia excels."



SPEEDY AND SECURE — Members of the Transportation Safeguards & Surety Program were recognized by NNSA for delivering a mobile high-security vault in six months. **Photo courtesy of Stephen Neidigk**

Hydrogen storage

CONTINUED FROM PAGE 1

“Hydrogen would be good for seasonal and long-term storage,” said Sandia chemical engineer Tuan Ho, who is leading the research. “If you think of solar energy, in the summer you can produce a lot of electricity, but you don’t need a lot for heating. The excess can be turned into hydrogen and stored until winter.”

However, hydrogen contains much less “bang” in a set volume than carbon-based fuels such as natural gas or propane and is much more difficult to compress, Tuan said. This means storing huge amounts of hydrogen in metal tanks on the surface is just not feasible, he added.

Hydrogen can be stored underground in salt caverns, but salt deposits are not widespread across the U.S., said Don Conley, the manager for Sandia’s underground hydrogen storage work. Therefore, Tuan’s team is studying if hydrogen stored in depleted oil and gas reservoirs will get stuck in the rock, leak out or get contaminated.

Tuan’s team recently shared their findings in a paper published in the [International Journal of Hydrogen Energy](#).

Leaky rocks or secure storage?

First, Tuan’s team studied if hydrogen would get stuck in the sandstone or shale that forms the body and seal around many oil and gas reservoirs, or if the gas would leak out. Sandstone is composed of sand-sized grains of minerals and rocks that have been compressed over eons; sandstone has a lot of gaps between particles and thus can store water in aquifers or form oil and gas reservoirs. Shale is mud compressed into rock and is made up of much smaller particles of clay-rich minerals. Thus, shale can form a seal around sandstone, trapping oil and natural gas.

“You want the hydrogen to stay where you inject it,” Tuan said. “You don’t want it to migrate away from the storage zone and get lost. That’s just a waste of money, which is a big concern for any storage facility.”

Tuan’s collaborators at the [University of Oklahoma](#) used experiments to study how hydrogen interacts with samples of sandstone and shale. They found that hydrogen does not stay inside sandstone after it is pumped out, but up to 10% of the adsorbed gas got stuck inside the shale sample, Tuan said. These results were confirmed by Tuan’s computer simulations.

Taking a closer look at a specific type of clay that is common in the shale around oil and gas reservoirs, Tuan conducted computer simulations of the molecular interactions between layers of montmorillonite clay, water and hydrogen. He found that hydrogen does not prefer to go into the watery gaps between mineral layers of that kind of clay.

This means that the loss of hydrogen in clay due to getting stuck or moving through it would be tiny, Tuan said. This is quite positive for underground storage of hydrogen. These findings on clay were published last year in the journal [Sustainable Energy and Fuels](#).

Additional absorption experiments are being conducted at [Stevens Institute of Technology](#) and the University of Oklahoma to confirm the molecular simulation results, Tuan said.

Risks of contamination?

Using both experiments and simulation, Tuan’s team found that residual natural gas can be released from the rock into the hydrogen when hydrogen is injected into a depleted natural gas reservoir. This means that when the hydrogen is removed for use, it will contain a small amount of natural gas, Tuan said.

“That’s not terrible because natural gas still has energy, but it contains carbon, so when this hydrogen is burned, it will produce a small amount of carbon dioxide,” Tuan said. “It’s something we need to be aware of.”

Tuan’s team, principally Sandia post-doctoral researcher Aditya Choudhary, is currently studying the effects of hydrogen on a depleted oil reservoir and how left-over oil might contaminate or interact with hydrogen gas using both molecular simulations and experiments.

The findings from Tuan’s research can be used to inform and guide large



CLAY CHEMIST — Tuan Ho, a Sandia chemical engineer, has been studying if depleted oil and natural gas reservoirs can be used for storing hydrogen. **Photo by Craig Fritz**

field-scale tests of underground hydrogen storage, said Don, who also manages Sandia’s portion of DOE Office of Fossil Energy and Carbon Management’s [Subsurface Hydrogen Assessment, Storage, and Technology Acceleration](#) project. The project plans to conduct such a field-scale test in the future to demonstrate the feasibility of depleted oil and natural gas reservoirs for hydrogen storage, he added.

Additional research is needed to understand how microorganisms and other chemicals in depleted petroleum reservoirs might interact with stored hydrogen, Tuan said.

“If we want to create a hydrogen economy, we really need widely distributed means of storing large quantities of hydrogen,” Don said. “Storage in salt is excellent where it exists, but it can’t be the sole option. So, we’re turning to depleted oil and gas reservoirs and aquifers as more geologically distributed means of storing large quantities of hydrogen. It’s all in the name of decarbonizing the energy sector.”

The project is funded by Sandia’s [Laboratory Directed Research and Development](#) program. 

Economic impact

CONTINUED FROM PAGE 1

Impact in dollars and cents

The two studies conducted by TechLink, a federally funded technology transfer center at Montana State University, show: \$140 billion in overall economic impact, \$72.2 billion in new-product sales, \$22.52 billion in new-product sales to the government, \$14.1 billion in tax revenue and about 607,000 jobs created.

The studies examined Sandia's Cooperative Research and Development Agreements and patent license agreements between 2000 and 2023, assessing how they translated into actual products, sales, tax revenue and jobs. This benefits the national economy, improves the nuclear weapons stockpile for the U.S. and international allies, and supports NNSA missions.

"The nuclear security enterprise is a treasure trove of commercializable technologies, and Sandia National Laboratories stands apart in its efforts to bring products to market," said NNSA's Office of Technology and Partnerships acting Director Jahleel Hudson.

Cooperative Research and Development Agreements and patent license agreements

Cooperative Research and Development Agreements and patent license agreements are two ways Sandia helps move its technology to industry.

The cooperative agreements are contractual vehicles that enable federal labs and outside parties to jointly develop new technologies, leaning on each other's expertise and resources.

The patent agreements are legally binding contracts that give licensees, usually to for-profit corporations, the right to make, use and sell federal government-owned inventions.

Sandia has excelled in these agreements. According to fiscal year 2022 DOE Office of Technology Transitions data, Sandia had:

- The highest number of patent disclosures and filings, and copyright assertions.
- The second highest number of active patent licenses.
- The third highest number of Cooperative Research and Development Agreement projects in the DOE.

A boost for local communities

In recent years, Sandia has accelerated efforts to move innovation to industry through the creation of new programs. One such program is the DOE Boost Platform, led by Sandia and external partner FedTech, which partners with 13 other DOE labs. The goal is to bring national labs, startups, academia and entrepreneurs together to find solutions to commu-

with people and entrepreneurs from their community to focus on the challenges they're facing. It's kind of like the whole impetus behind Boost."

Expanding use of clean energy technology

Another successful program is the C-4 Partnering Model. The four C's stand for colocate, collaborate, community and communicate. Sandia is one of seven labs that works with regional partners to develop a local commercialization ecosystem for manufacturing clean energy technologies focused on collaboration and rapid technology development.

Supporting the semiconductor sector

Through Semiconductor Sector S2-EDGE, or Expedite and Develop Game-Changing Exemplar, Sandia collaborates with four other labs that use feedback from industry to inform innovations in semiconductor technologies and next-generation microelectronics before moving them to market.

These programs are just part of the reason Sandia's tech transfer numbers are so successful, Mary said. "We are committed to bringing new programs to our ecosystem that researchers can take advantage of to move labs-developed technologies to the market."



IMPACTING THE COUNTRY — Sandia's Cooperative Research and Development Agreements and patent license agreements have resulted in a \$140 billion economic impact since 2000.

Graphic by Britt Archuleta

nity-based energy challenges, especially in rural areas.

Sandia is already negotiating three licenses under this program, including one with a team representing interest in New Mexico and Alaska.

"They are looking to use Sandia's algae technology in Santa Fe's municipal water system," Mary said. "It highlights the fact that communities want to work



SOUND CHECK — Sandia and The Goodyear Tire & Rubber Co., partners for more than 30 years, have developed a virtual way to test how noisy a tire will be on the road before any physical testing.

Photo courtesy of Goodyear

Where rubber meets the road

This massive economic impact has been fueled by long-lasting partnerships, like

one with The Goodyear Tire & Rubber Co. In the early '90s, the tire company turned to Sandia for its expertise in advanced computational mechanics, simulation and structural dynamics to improve tire performance, reduce product development times and improve manufacturing methods.

Thirty years later, that partnership continues. One of its latest projects is a virtual way to develop a **quieter tire** without the need for physical testing. Over the years, the partnership has also resulted in the development of the **Assurance TripleTred**, a visually distinctive all-weather tire, and the development of **Virtual Flat Track**, which uses computer simulations to test a virtual tire on a virtual test track simulating actual road conditions.

All this technology has roots in Sandia's nuclear deterrence mission.

Powering New Mexico

Sandia is also involved in ongoing work with the Public Service Company of New Mexico, widely known as PNM. In

2020, the two **formalized a Cooperative Research and Development Agreement** to help PNM develop a more resilient, clean electric grid and meet a 2040 carbon emissions-free target.

The partners are developing new analytical approaches, capabilities and technologies to help PNM use distributed and centralized sources of clean energy. Sandia and PNM will explore different types of storage, such as batteries, thermal storage and hydrogen that can provide grid resilience. Together, the partners can work to test solutions in real-world scenarios.

Repurposing technology for the market

Last year, Sandia supported partner Advanced hCMOS systems, an Albuquerque based-startup, to **commercialize the world's fastest burst-mode X-ray camera**, which was created at the Labs. The company is co-founded by former Sandians Liam Claus and Marcos Sanchez, who took advantage of the Entrepreneurial Separation for Technology Transfer program to start their own business.

While the technology was developed to support Sandia's nuclear power and fusion work, there are many other applications, including astrophysics research, laser design and materials science.

For example,



EXCELLING IN TECH TRANSFER — Sandia leads the DOE complex in tech transfer, measured by patent filings, copyright assertions and patent disclosures. It also ranks near the top in active patent licenses and Cooperative Research and Development Agreements projects. **Graphic by Britt Archuleta**

researchers are looking to use it to develop stronger glass screens for cell phones. They need to understand how glass fractures, and this technology will allow them to study fractures at extremely high speeds.

The company is already serving government customers and is working on ramping up production through a DOE Phase I Small Business Innovation Research Grant and a TRGR Technology Readiness Initiative project.

75 years of impact

With 75 years of innovation behind it, Sandia plans to make an even bigger impact in the years ahead.

Commercialization of lab-developed technologies has long been part of Sandia's mission, but it is also a reminder that this national lab is made up of some of the brightest minds in the country. Through these partnerships and programs, this work can make its way into the real world and affect everyday lives, which is something that makes Sandians and NNSA proud.

“Over the last 20 years, Sandia's economic impact has generated billions of dollars, created half a million high-paying jobs, and positioned the United States as a leader in technological innovation,” Hudson said. “NNSA's Technology and Partnerships Office values Sandia's extraordinary achievements and is delighted to have commissioned the study to recognize this success.”

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Digital engineering session offers three takeaways

By **Kenny Vigil**

Nearly 900 employees attended an information session, both online and in person, to learn more about Sandia's digital engineering activities. These efforts support Sandia's goal to lead in modern engineering.

Here are three key takeaways from the information session held on Feb. 14.

Why now?

The current geopolitical landscape and the escalating proliferation of nuclear weapons underscore the urgency of Sandia's national security missions. Digital engineering will help the Labs meet the crucial operational needs of nuclear deterrence, as well as other mission areas that deliver critical systems to the nation.

"Digital engineering is a tool that will help us deal with these threats as we move forward," said Shawn Dirk, a senior manager leading Sandia's digital engineering efforts.

Digital engineering applies to many capabilities that facilitate increased collaboration while reducing the time required to execute programs, by shifting away from traditional and cumbersome paper-based documentation. In addition to increasing efficiency, digital engineering will allow Sandia to develop higher performing and better optimized systems.

A bigger initiative

Sandia's digital engineering journey aligns with a larger effort by NNSA to standardize tools that will enable safe and secure data and information exchange across the eight labs, plants and sites comprising the nuclear security enterprise.

"There's an acknowledgment that no single site can undertake digital engineering alone," Shawn said.

Sandia started developing the goal to


lead in modern engineering early in 2023 and NNSA established the Digital Transformation Senior Steering Group the following summer to spearhead an enterprise effort. Deputy Labs Director Laura McGill co-leads the steering group, which oversees four workgroups, with representation from several Sandia employees.

The right information at the right time

Establishment of a common digital thread, an interconnected flow of data from various sources, is the centerpiece of our digital engineering efforts that will serve as the authoritative source of truth. It facilitates the use of Sandia's extensive capabilities in modeling and simulations to drive earlier design decisions, speeding up the iteration and delivery processes.

The NNSA digital engineering framework will create a data-driven architecture for greater collaboration. The digital engineering transformation is not just about the tools. Data is at the heart of the transformation. Facilitating data flow between design and production agencies is key.

"It's a capability that enables decisions through the analysis of data from multiple sources at multiple sites. It allows users to have that data at their fingertips at the right time," Shawn said.

Sandia has developed a strategy around digital engineering and corporate milestones, deploying model-based definition and model-based system engineering on the W87-1, and even more so on the W93 program as capabilities are matured. 



KNOWLEDGE IS POWER — Sandia senior manager Shawn Dirk leads an information session about digital engineering in the Steve Schiff Auditorium on Feb. 14.

Photo courtesy of Sandia

Modern engineering definitions

As Sandia embarks on its journey to lead in modern engineering, you may encounter the following terms more frequently.

Modern engineering: An interdisciplinary field applying contemporary technology and scientific advancements to design, build and maintain structures, systems and processes. It often involves computer modeling, simulation, and advanced materials, providing solutions to address complex, real-world challenges.

Digital engineering: Paperless data analysis and decision support using authoritative sources of data and models across disciplines to support lifecycle activities from concept through disposal.

Digital thread: A modern engineering approach eliminating paper artifacts and manual transactions, integrating interconnected data, authoritative sources, and enabling mechanisms within a digital enterprise that is accessible by design and production agencies through a common enterprise network.

Model-based systems engineering: A technical approach to systems engineering focusing on creating and exploiting domain models, digital representations of entities, as the primary means of information exchange rather than document-based methods.

Babu Chalamala elected to National Academy of Engineering

Engineering a brighter energy future

By **Michael Ellis Langley**

Since joining Sandia in 2015, Babu Chalamala has diligently worked to improve the safety and reliability of grid storage technologies. In the long run, his efforts support the large-scale integration of grid storage and the modernization of the electricity infrastructure. In the short term, they have earned him election to the **National Academy of Engineering**.

On Feb. 6, the National Academy of Engineering **announced its 2024 class** of 114 new members and 21 international members, including Babu.

“It is humbling,” he said. “Being elected to the National Academies is a major career milestone, and you feel honored and happy to know that your engineering contributions have significant merit.”

Being elected to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to “engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature,” and to “the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education.”

Babu works to further the modernization of the electricity system and find ways to make grid storage technologies viable for large-scale deployment.

“We are rapidly transforming the

electric grid, integrating a range of new technologies, including renewables, along with major grid infrastructure upgrades to support the electrification of transportation and deeper decarbonization of the electric power sector,” he said. “Ensuring that the system is robust, reliable and has adequate operational reserves requires integrating far greater amounts of energy storage than we currently think.”

Babu said deeper decarbonization and transformation of the grid infrastructure are monumental tasks that will take decades, but he believes the global pace of change is approaching a critical turning point.

“Decarbonization of the electricity system is not just a U.S. problem; it is a global issue and is key to addressing and adapting to the challenges posed by climate change,” he said. “Ensuring that the system is robust and reliable and has adequate operational reserves requires far greater amounts of energy storage than we currently think.”

Babu believes his inclusion in the National Academy of Engineering honors all those who tirelessly work to accomplish this lofty goal.

“Sandia has been a leading DOE laboratory in grid storage since the early '90s,” he said. “My election is a reflection of the excellent work our team has done and the significant contributions we have made to support the development and deployment of energy storage technologies.”


Babu and the other new members, including Sandia materials scientist **Tina Nenoff**, will be formally inducted during the National Academy of Engineering’s annual meeting on Sept. 29.

Established in 1964 under the charter of the National Academy of Sciences,



GRID GURU — Babu Chalamala will be formally inducted into the National Academy of Engineering in September. **Photo courtesy of Sandia**

the National Academy of Engineering serves as a parallel organization of exceptional engineers. It shares with the National Academy of Sciences the responsibility for advising the federal government, sponsors engineering programs aimed at meeting national needs, encourages education and research, and acknowledges the superior achievements of engineers.

Present, retired and former Sandians listed as members of the National Academy of Engineering include James Asay, Babu Chalamala, Jackie Chen, Margaret S.Y. Chu, Tom Cook, George Dacey, Paul Fleury, John Galt, Gary Grest, Walter Herrmann, William Jack Howard, Jill Hruby, Charles Jakowatz Jr., Miriam John, Tamara Kolda, Laura McGill, Tina Nenoff, Gordon Osbourn, Julia Phillips, Dana Powers, Eugene Reed, C. Paul Robinson, Alton Romig and Albert Westwood. 

Building a family their own way

The calls that changed everything for two Sandia families

By **Maggie Krajewski**

When Matthew McDonough and his wife signed up to become foster parents, they planned on easing into it by taking in one child at a time. Likewise, when Rebecca Sanchez and her husband started their fostering journey, they were almost exclusively taking teenagers.

But as Rebecca, a Sandia business operations analyst, puts it, as parents, biological or not, you can never really predict what's going to happen.

So, when Rebecca got a call from their caseworker that they needed placement for 2- and 3-year-old siblings, Rebecca and her husband got to toddler-proofing their home and learning how to install car seats.

Matthew, a Sandia electrical engineer, said when his wife got a call from their caseworker asking whether they'd be willing to make an exception to their no-sibling rule to take in 2-month-old twins, his wife looked to him for confirmation while simultaneously telling the caseworker, "Yes."

"Families are built a lot of different ways," Rebecca said.

And these unexpected turns of events were how these two families built theirs.

The Sanchez family

Fostering and adopting had always been on the table for Rebecca and her husband, Ernest.

"We were just dating when the topic first came up," Rebecca said. "It was casual kind of like, 'would you consider it,' and neither one of us were opposed to it but we didn't look into it any further."

And then they got married, and their friends started having kids.

When Ernest brought up adoption again, Rebecca started looking into the



DOWNTIME — Sandian Rebecca Sanchez relaxes with her son Emilio, 11, as he does his homework. The Sanchezes began fostering the siblings, and eventually adopted, Natalia and Emilio when they were 2 and 3 years old.

Photo by **Craig Fritz**

process and discovered the Heart Gallery project, which raises awareness about adoption and works to find homes for older children and sibling groups in protective custody with the New Mexico Children, Youth and Families Department.

The first step to adopt through the Heart Gallery is to become a licensed foster parent through CYFD, so Rebecca and Ernest got to work. After becoming certified, they attended a few events and met a 15-year-old boy they came close to adopting, but it ultimately fell through, and they decided to take a step back.

"The house felt so quiet," Rebecca said. "So, we started to think through, were we doing this because of one specific child, or are we willing to move forward with any child God puts into our home."

Working with their caseworker, they decided to ease back in as foster parents.

"We started doing respite care and emergency placement, mostly for teenagers and

sibling groups because that's where we saw the biggest need," Rebecca said.

In 2016, Rebecca's caseworker called with a new request.

"She said, 'I have siblings, but they're a little younger than you usually take, but we really need a place for them,'" Rebecca said. "They were 2- and 3-years-old, and our house was definitely not toddler proof."

Rebecca and Ernest spent the next day and a half getting electrical outlets covered and safety gates installed, ready to welcome Emilio and Natalia home.



HOMEWORK HELP — Emilio Sanchez, 11, left, discusses his reading homework with his mom, Rebecca, while she and Natalia, 9, center, unpack her backpack.

Photo by **Craig Fritz**



ALL IN THE FAMILY — Natalia Sanchez, 9, gives a little love to her donkey at her family's home in Belen. Rebecca and her husband adopted Natalia and her brother Emilio in 2016.

Photo by Craig Fritz

"Initially, it was just supposed to be for a few days, but then a few days turned into a few weeks, and then a few months, and it became clear this was headed towards adoption," Rebecca said. "Our caseworker asked if we'd be interested in adoption. We said yes."

It took a year and a half to finalize the adoption. In that time, Rebecca said things still felt very much up in the air.

"Will their parents change their mind? Will a relative pop up out of the blue?" Rebecca said. "There was no way to know, but we just reminded ourselves that no matter what happened, each day we had was just another day to love these kids."

This one-day approach is how Rebecca has looked at every foster child that has come through her life.

"During our CYFD training, an instructor who had been in foster care shared her story with us — awful situations in her biological home, abusive relatives and foster families — but then she told us about one foster home she had spent just a couple days in, and it was there that for the first time, she saw what a good family looked like, and that family became her example for what she wanted her own family to look like," Rebecca said.

"As foster parents, we're not in control of these kids' destiny or their future. We have a day to show them that they're loved and cared for. Maybe it goes further, maybe it's the last time we see them, but we have one day where we can make a difference in their story."

The McDonough family

Matthew and his wife, Leslie, had always planned on having a large family. And



BUILDING FAMILY — Electrical engineer Matthew McDonough and his wife Leslie adopted twin daughters from foster care. Matthew helps coordinate the foster and adoption cohort of the Sandia Parents Group.

Photo courtesy of Matthew McDonough

after having their first child, and learning that they were pregnant with their second, things appeared to be on track.

But after their second baby was stillborn, they decided to take a break to heal both emotionally and physically.

"We had talked about adoption sometime in the future before, but after losing our daughter, we decided to start looking into fostering," Matthew said.

Together they started the process to get certified as foster parents, attending trainings, completing background checks, interviews and home visits.

"At the time our son Nathan was 2 years old, so we were good with younger children, but we did not want siblings at that time, because we wanted to ease into fostering," Matthew said. "And then the call came, and suddenly it didn't matter."

"We were sitting around the kitchen table one weekend when our caseworker called and said, 'I know you don't want siblings and it's totally up to you, but we have twins,'" Matthew said.

And just like that, they went from a family of three to a family of five.

"I don't think we could have done it without our church family," Matthew said. "They really wrapped their arms around us and helped with everything from baby stuff and clothes to providing a real sense of community."

Early on, it became clear adoption was on

the table, and that "sometime in the future" was suddenly right in front of them.

Two and a half years after baby Selena and Teresa came home, the adoption was finalized.

In that time, Leslie found out she was pregnant, and the couple welcomed their second son, William, and they continued to foster, something Matthew says allowed them to "serve their community."

"Initially I was nervous about fostering, but luckily God paired me with someone who wasn't," Matthew said. "For those who might be interested in fostering and feel scared, I would want them to know that CYFD really helps guide you through the process. You can ease into it and if you need to, you can stop, or take a break. But for us, it's been incredibly rewarding."

"Awhile back we were caring for a 5-year-old boy. He was pretty delayed developmentally. We had this jungle gym structure in our backyard and the first time he slid down the slide, he got to the bottom and just kind of crumpled up like a wet rug. He had never been on a slide and didn't know you're supposed to stick your feet out to stop yourself," he said. "I can't quite describe the joy we felt after he had been in our home a week and was suddenly able to do something so simple and pure, like slide down a slide, land on his feet and climb back up to do it all over again."

In January, the McDonoughs became a family of seven with the birth of their third



DREAM COME TRUE — Sandia electrical engineer Matthew McDonough’s children, from left, William, Selena, Nathan, Teresa and Sarah, center. Matthew and his wife adopted Selena and Teresa two and a half years after they were placed in their home through foster care.

Photo courtesy of Matthew McDonough daughter, Sarah, making those dreams of a large family a reality.

Fostering and adoption at Sandia

Matthew is the coordinator of the foster and adoption cohort of the Sandia Parents

Group, of which Rebecca is also an adviser. The group provides a community of support for adoptive and foster parents at Sandia.

They have a recurring open forum, led by Matthew and other advisers within the group, and provide information about Sandia specific benefits available to foster and adoptive parents. The group also has a [website](#) where they publish information about additional resources available and upcoming events.

Sandia offers several benefits to foster and adoptive parents including time off for baby bonding which includes up to 12 weeks of leave under the Family and Medical Leave Act, and up to six weeks of time off at 70% pay. Sandians can supplement the remaining 30% with accrued vacation, bought vacation or flex time.

For those looking to adopt, Sandia will reimburse up to \$2,500 per child for adoption-related expenses for children under the

age of 18 through the [Adoption Assistance Program](#).

Additional benefits, including incidental family care, the new Sandia Childcare Fund and [life and family support services](#), are also available to foster and adoptive parents.

“It’s hard to find a place that’s more flexible to work for than Sandia,” Matthew said. “The work environment here really values work-life balance and a big part of that is giving us time to be involved parents and caretakers, whether the children be biological, foster or adoptive.”

Fostering and Adoption Lunch and Learn

The Sandia Parents Group and New Mexico Children, Youth and Families Department invite anyone interested in becoming a [Resource Foster Parent](#) to a virtual lunch and learn April 16 from noon-1 p.m MT. Check Sandia Daily News for a Teams link to the event.

Willis Whitfield: A simple man with a simple solution that changed the world

Creating clean room technology

By **Kim Vallez Quintana**

Willis Whitfield was, by all accounts, a simple and humble man. Raised on a cotton farm in West Texas, he knew how to work hard and solve problems, from fixing tractors and other machinery, to inventing equipment when he couldn’t find something that fit his needs. That ingenuity led Whitfield, a longtime physicist at Sandia, to create advanced clean room technology that is still in use today.

The problem at hand

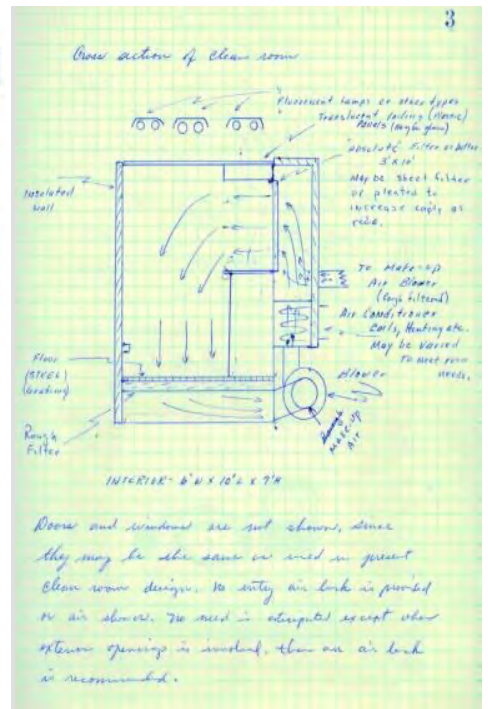
In 1959, there was a common problem affecting the manufacturing of complex parts, including nuclear weapons components. They didn’t work because there were particulates in them. Because Sandia needed the parts for weapons going into the stockpile, and its mission includes pushing

the boundaries of science, engineering and technology, it set out to solve the problem. First, the Labs assembled a team from the advanced manufacturing section, which included Whitfield, to look at the issue.

An idea sketched out on a tablet

The team spent the next few months traveling to various manufacturers to see the problem firsthand, along with the clean rooms they had at the time. Those clean rooms were not so clean. Tests showed one of the best clean rooms of the period averaged more than a million particles per cubic foot of air.

On the way home from one of those trips, Whitfield had an idea. “He was on an



A SIMPLE DESIGN — Willis Whitfield’s sketch of a clean room, created while on an airplane in 1960. **Photo courtesy of Sandia**



CLEAN ROOM PROTOTYPE — Bill Neitzel and Willis Whitfield in the prototype clean room, 1961. **Photo courtesy of Sandia**

airplane, and he whipped out a tablet and basically drew out the whole schematic of how the clean room should work,” said Whitfield’s son Jim, who was 6 years old at the time. “It was just a simple sketch. It just took a few minutes, and it’s the basic principle that is still used today.”

That principle is called laminar-flow, or the constant sweeping of a room with highly filtered air. As Whitfield once said, “It’s letting the air be the janitor.” The process involves pushing particles to the floor, filtering them and circulating them back into the room with a constant but very slow movement of air. Data collected

on Whitfield’s 1961 prototype showed an average of 750 dust particles per cubic foot of air — 1,000 times cleaner than clean rooms in use at the time.

It was so clean that some doubted Whitfield’s data was correct.

“People at meetings questioned the claims. There were people there who had to vouch for Whitfield’s credibility,” Sandia historian Rebecca Ullrich said. “When they realized it was real, the idea took off like wildfire. By the mid-1960s, there were standards in place and a variety of different industries picked up the design. It was Sandia’s earliest tech transfer. It was transformative.”

The Atomic Energy Commission filed a patent application on the laminar airflow clean room in Whitfield’s name. On Nov. 24, 1964, the U.S. issued Patent No. 3,158,457, titled Ultra Clean Room.

Clean rooms based on Whitfield’s concept are still used today in everything from electronics and pharmaceutical manufacturing, to operating and recovery rooms to prevent infection. Early adopters included RCA Corp., General Motors Co., Western Electric Co., Bell Laboratories and Lovelace Medical Centers.



A SIMPLE FARM BOY — Willis Whitfield as a child on his family’s farm in West Texas. **Photo courtesy of Jim Whitfield**

credit to everyone. While the basic idea was his, he always talked about the team that helped design, develop and test the concept,” Rebecca said. The team included Claude Marsh, James McDowell, James Mashburn, William Neitzel, Irving Kodel, Longinos Trujillo and Harold Baxter.

Whitfield’s son says he was so little when his dad invented the clean room that he didn’t quite understand what he had accomplished.

“The only thing I can remember was one day my dad coming home and telling my mother, ‘We got a raise,’” he said. “At the time, this 6-year-old heard the word ‘raisin,’ and I didn’t quite understand why they were getting so happy about a breakfast food.”

Whitfield said as he got older, he got to see firsthand the impact his dad made.

“He could take very complicated things and just take it down to the essentials. Being an old farm boy, he would just invent something that did an effective job. Even as a kid, a young man, he was that way,” Whitfield said.

Jim Whitfield followed in his father’s footsteps, studying physics, mathematics and electrical engineering. He went on to work for Motorola for 25 years, where he saw a clean room in action. “I actually spent quite a bit of time in my dad’s invention. From a personal point of view, I would say to myself ‘I am working in something my dad made.’ Every time I would walk in, I would say, ‘Thanks Dad.’”



SURVIVING THE TEST OF TIME — In a 2008 photo, Willis Whitfield stands outside a clean room at Sandia’s Microsystems Engineering, Sciences and Applications complex. **Photo by Randy Montoya**

A humble man

While Whitfield became known as one of Sandia’s landmark innovators, he always remained humble.

“I do know that one of the things he was always insistent about was mentioning the other people involved. He always gave

Whitfield's other work

Willis Whitfield worked at Sandia for 30 years. While creating the modern-day clean room was undoubtedly his biggest accomplishment, Whitfield also did other important work, such as eradicating sewage by turning it into clean water.


“The process didn’t gain huge traction outside of the Labs, but it is early exploration in energy work and solar, which Sandia still focuses on today. It’s part of

the work Whitfield invented and participated in,” Rebecca said.

Later in his career, Whitfield helped NASA develop techniques to sterilize spacecraft before missions.

Honoring a legend

Whitfield died in 2012 at the age of 92, just after his clean room invention marked its 50th anniversary. Two years later, in 2014, Whitfield was inducted into the National Inventors Hall of Fame,

an honor he shares with people like Eli Whitney, Thomas Edison, Orville and Wilbur Wright, Albert Einstein and more recently, Steve Jobs and John Harvey Kellogg. Whitfield is the only Sandian to this day to be honored with a full-sized bronze statue. It sits outside Sandia’s Microsystems Engineering, Science and Applications complex where clean rooms are used to manufacture precision mechanical assemblies. 

Two Sandians honored with 2024 Women in Tech Awards

Remarkable women who drive innovation and excellence in tech

By **Kim Vallez Quintana**

Two Sandians have been honored with 2024 New Mexico Women in Tech Awards from the New Mexico Technology Council. The award recognizes remarkable women who drive innovation and excellence in their tech field and inspire and empower others to pursue careers in the tech industry.

Mary Monson

If an invention or project created at Sandia has the potential to make it into the real world, you can bet Mary Monson knows all about it. You can also bet that Mary and her team will do all they can to make it happen.

“I’ve never met anyone with her level of passion and drive,” said Technology Partnership Manager Joel Sikora, who has worked with Mary for 19 years. “She constantly challenges herself and others to make a greater impact.”

As senior manager of Technology Partnerships and Business Development, Mary holds the reins for the tech transfer division and is always trying to steer Sandia to the best partnerships.

Her start at Sandia was not a traditional one.

“I moved to Albuquerque and sent my resume to Sandia. There was no specific job posting,” Mary said. “Sandia was looking to engage beyond the NNSA and DOE programs, so they hired a handful of marketing people. I was one of them.”

After legislation passed that enabled national labs to do tech transfer, Mary changed roles. Now more than 25 years later, she helps lead and amplify Sandia’s efforts to move technology out of the Labs. Her team said her work has turned the program into what it is today.

“Under her, I’ve watched us grow from one department of a dozen people doing business development to six departments with more than 130 people doing business development, economic development, business intelligence, licensing and partnership agreements,” Joel said.

Mary’s entire career has been in tech. Her first job was at a company called Unisys, a leader in computing at the time. “That is where I fell in love with tech,”



TECH TRANSFER EXPERT — Mary Monson, senior manager of Technology Partnerships and Business Development, accepts an award from the New Mexico Technology Council on March 13 for her immense impact on tech transfer at Sandia. **Photo by DeAnna Vincent**

Mary said. She continued to work for tech companies including Texas Instruments and Digital Equipment Corp. before coming to Sandia.

Being a woman in the tech industry isn’t always easy. Mary says her career has been fascinating and fun. “I get to work with smart people and am constantly learning. That has always been present in my career.”

She is especially proud of how far Sandia has come since it started its tech transfer efforts. “We started with just Cooperative Research and Development Agreements and licenses but have creatively established new programs along the way like the Entrepreneurial Separation to Transfer Technology program. We’ve established new capabilities like

Business Development, and Business and Competitive Intelligence. We had nothing like that before.”

Mary is one of eight honorees this year for the New Mexico Tech Council Women in Tech Award. The organization highlights her 25 years of management experience and her work getting lab technology to the marketplace.

Mary said she is honored to receive this award. “I appreciate the New Mexico Technology Council’s recognition of the importance of leadership in deploying and commercializing technology. It’s a privilege to be part of such an impressive group of women leaders.”

Those who work with Mary couldn’t say enough positive things about her.

“Mary is a pioneering force, not just in navigating the complex field of federal technology transfer but in forging pathways for others to follow,” Sandia Technology and Economic Development Manager David Kistin said.

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Mara Schindelholz

Mara Schindelholz, principal research and development staff member at Sandia, is also one of this year’s honorees. Mara has 15 years of experience in creating and commercializing new technologies.

Mara came to Sandia with experience developing corrosion sensors and materials aging models for the DOD. Since starting at Sandia, she has, among other things, worked in surveillance of nuclear weapons, led the development of new technologies such as sensors and digital technologies that could be beneficial throughout a nuclear weapon’s lifecycle, and worked to commercialize some of these technologies through the DOE’s Energy I-Corps program and the National Lab Accelerator Pitch Competition.

Mara is currently on an Intergovernmental Personnel Act assignment to the National Science Foundation as a program director for their Small Business Innovation Research/Small Business Technology Transfer program. Her role in the Technology, Innovation, and Partnerships program, was established through the [2022 CHIPS and Science Act](#).

Mara’s love for tech started at an early age. “My mom was a math teacher, and my dad was a biology professor at an all-female college,” Mara said. “They instilled in me a love for math and science and that women were just as capable as men in these fields.”

Mara has been working to prove that point her entire career. She earned her bachelor’s degree in chemistry and her master’s in materials science and engineering. She worked at two small businesses early in her career where she says she recognized the disparity of women in the tech field.

“When I started, I was one of only two female principal investigators in my group of 15 at Sandia,” she said. “I’ve had some incredible female mentors but there is always room for improvement, especially in the area of entrepreneurship and tech transfer.”



WOMEN IN TECH CHAMPION — Mara Schindelholz, principal research and development staff member at Sandia, accepts a Women in Tech Award from the New Mexico Technology Council at their event on March 13.
Photo by DeAnna Vincent

Mara said she’s encouraged by the programs Sandia has started to change that, including the ones spearheaded by fellow honoree Mary Monson.

As part of her role at the National Science Foundation, Mara is working to recruit more female startup founders, recognizing that they receive less than 3% of venture capital funding in the U.S.

Mara says she is honored to be recognized by the New Mexico Technology Council for her efforts and to be on this accomplished list. When asked what the most rewarding part of her job is, Mara said, “I love seeing new technologies created for the betterment of society — be that to enhance national security, increase economic competitiveness, or tackle environmental challenges.”

It’s clear that Mara’s work is far from done. [f](#)

New Mexico Women in Tech Awards

The New Mexico Women in Tech Awards were founded in 2008 by Lisa Atkins, chief operating officer of FatPipe New Mexico and former chair of the New Mexico Technology Council board of directors. Atkins recognized the need for a community dialog about gender equity in the workplace and a call to action to create career pathways for young women entering the tech industry. Over the past 15 years, the New Mexico Women in Tech Awards have recognized more than 100 women, shaping the tech landscape by providing funding to advance education and training.

Sandians build beds for kids in need

By **Michael Shaikh**

A rainy forecast did not stop 25 Sandia volunteers from showing up to build and deliver beds for kids in need. Sleep in Heavenly Peace, a fully volunteer-based nonprofit in Livermore, California, takes their mission, “No kid sleeps on the floor in our town” seriously. They achieve this goal by building, delivering and furnishing beds for children currently sleeping on the floor, a couch or with a parent. Chapter president Daniel Curtis estimates there are around 3,000 Alameda County children who don’t have beds. This local chapter is making a dent in lowering that number every year. In 2023, they delivered 175 beds across the county.

When Community Relations Specialist Michelle Walker-Wade met Curtis and learned about the nonprofit’s mission last year, she knew this community service opportunity was perfect for Sandia.

“From that Saturday in January 2023 until Feb. 17, 2024, when the bed-build day took place, the community involvement team strengthened our relationship with the organization by hosting a kids’ bedding drive, introducing them to our corporate contributions program and connecting with Daniel and his wife at other local community events,” Michelle said.

On bed-build day, 40 volunteers showed up ready to work. The build process required many different stations that seamlessly worked together. From raw wood, volunteers measured and cut lumber into various sizes. They sanded, drilled, pre-assembled and stained the bed components. The headboard was branded with the Sleep in Heavenly Peace logo, leaving its mark on the child’s life. With the help of Sandians, volunteers built a record 21 beds in two hours, one hour ahead of schedule.



SAFE AND SMOOTH — Sandia volunteers sand splinters off bedframes. Photo by Spencer Toy



ALL IN A ROW — Systems engineer Zane Craddock, left, and Hannah Meade line up headboards after staining them. Photo by Spencer Toy



BUILD A BED — Communications intern Michael Shaikh lays slats in a bunk bed. Photo by Spencer Toy

Watching a pile of wood transform into beds for kids was fulfilling. After the bed-build and short pizza celebration, eight Sandians delivered beds to children’s homes, completed the build and furnished them with bedding. The project impacted five children in four homes.

Mechanical engineer Nathan Srinivasan participated in both community service projects.

“This opportunity was local to me, so it was a great and convenient way to get more involved. It was important to me because I realized how much we take for granted, such as proper sleeping accommodations and a comfortable bed you can call your own,” Nathan said. “Seeing the kids look at their new beds was definitely heartwarming.” [📷](#)

Sandia celebrates Earth Month

Learn about Earth Month events and find Teams links by visiting the [Earth Month 2024 webpage](#) or by reading Sandia Daily News. In addition to these events Sandians can submit [Earth Day-related photos and haikus](#) by April 15. Select photos will be used during the Environmental Management System's Environmental Excellence Awards presentation.

APR
5

Bicycle Commuter Group lunch ride

Friday, April 5, noon-1 p.m. MT

Explore the amenities open to Sandia employees on a relaxed Friday bike ride across the Kirtland Air Force Base. If you're new to the base, this is an opportunity to learn about getting around on a bike and to meet fellow bike commuters. Visit the [Earth Month site](#) for more information.

APR
10

Meteorology team discusses changes to weather impacted by the current climate

Wednesday, April 10, noon-12:45 p.m. MT

Sandia's meteorology team will discuss the impact that weather changes have on our Labs' sites, as well as our communities. The presentation will include the opportunity for Q&A on the role of the meteorology team and how they can help with on-site work.

APR
11

Milind Tambe: Machine learning for social impact

Thursday, April 11, 10-11 a.m. MT

Join an in-person and virtual presentation from Milind Tambe, director of the Center for Research on Computation and Society at Harvard University and director of AI for Social Good at Google Research. Tambe will discuss his team's work to advance machine learning and optimization for public health, conservation and public safety. Additionally, Sandia's Energy Equity and Environmental Justice Reading Club will discuss a paper co-authored by Tambe on Monday, April 15, at 3 p.m. MT.

APR
16

George Ducker: The upcoming wildfire season and its potential impacts

Tuesday, April 16, noon-12:45 p.m. MT

Environment, Safety and Health will be joined by New Mexico Forestry Division's Communications Coordinator George Ducker to discuss the upcoming wildfire season outlook and the impact that climate change has had on woodland fuels and fire conditions in New Mexico and California. Discussion will also focus on what our role is to prevent and be prepared for wildfire.

APR
18

Sandia New Mexico Earth Day Celebration

Thursday, April 18, noon-2 p.m. MT

Join Sandians to celebrate Earth Month at a local park. Several internal and external organizations will provide activities, demonstrations and information on how Sandians can promote environmental responsibility. Check Sandia Daily News or the [Earth Month site](#) for location information.

Sandia's Waste Management and Pollution Prevention team will host two 20-minute tours of on-site recycling facilities at 1:30 and 2:00 p.m. MT. Tours are limited to 15 people. Participants must register in advance.

APR
21

Earth Day Festival New Mexico

Sunday, April 21, 10 a.m.-4 p.m. MT

Sandia is sponsoring the Earth Day Festival New Mexico 2024 event on Sunday, April 21 from 10 a.m.-4 p.m. at Balloon Fiesta Park in Albuquerque. This family-friendly event will feature educational exhibits, demonstrations and hands-on activities. Sandia Climate Change Center Director Rob Leland will participate in a panel discussion on New Mexico's sustainable future alongside New Mexico Sen. Martin Heinrich, Rep. Melanie Stansbury, Gov. Michelle Lujan Grisham and executives from PNM and Nusenda Credit Union.

APR
22

Earth Day Celebration with the EMS Environmental Excellence Awards Presentation

Monday, April 22, noon-12:45 p.m. MT

Join Sandia's Environmental Management System team as they present the annual Environmental Excellence Awards. The awards are given to project teams and individuals who exhibit outstanding environmental stewardship with their work at the Labs. The presentation will include information about how and why they were chosen to receive this year's awards.

APR
23

Dan Lambe: The role of trees in climate change

Tuesday, April 23, noon-12:45 p.m. MT

Arbor Day Foundation Chief Executive Dan Lambe will lead a virtual discussion on the important role trees play as our communities deal with climate change. The discussion will be followed by a Q&A.

APR
24**Sandia California Earth Day Celebration***Wednesday, April 24, 10:30 a.m.-1:30 p.m. PT*

Join Sandia and Lawrence Livermore National Laboratory to celebrate Earth Month. In addition to activities and tables by internal and external organizations, there will be food trucks, a scavenger hunt, plant exchange and research posters. Check Sandia Daily News or the Earth Month [site](#) for location information.

**Volunteer events**

In Albuquerque, 15 volunteers are needed at Storehouse New Mexico on Saturday, April 6, 8:30 a.m.–2 p.m. MT. A group of 15 volunteers are needed to help sort clothes at Locker 505 on Saturday, April 13, 10 a.m.–noon MT. Another 35 volunteers are needed to help sort and distribute food at Roadrunner Food Bank on Saturday, April 27, 11 a.m.–1 p.m. MT. Contact Katrina Wagner to sign up.

In California, volunteers are needed on Saturday, April 13 for the Quest Science Center's Tri-Valley Innovations Fair & Climate Summit at the Alameda County Fairgrounds and on Saturday, April 27 for the Tracy Earth Day Expo in downtown Tracy. Volunteers will help with STEM activities and demonstrations of a hydrogen fuel cell vehicle. They will also share climate or earth-related demos or posters. Contact Michelle Walker-Wade for more information.

Excited students attend STEM Day for Girls

Sandia sponsored and co-hosted STEM activities for fourth- and fifth-grade girls during Women's History Month

By **Michelle Walker-Wade**

Photos by **Spencer Toy**

When a group of fourth- and fifth-grade girls arrived at Las Positas College's Science & Technology Center on March 9, they were nervous yet excited about a day of STEM workshops tailored just for them.

The 41 young scholars and their volunteer chaperones entered state-of-the-art college classrooms and science labs and were met by a team of STEM professionals from Sandia and the Tri-Valley branch of the [American Association of University Women](#), who would spend the next five hours inspiring them with STEM Day for Girls activities.

The students — primarily from elementary schools in Livermore, Pleasanton and Dublin, California — had hands-on experiences in every letter of the STEM acronym: science, technology, engineering and math.

In the Aerodynamic Forces workshop, the girls worked in teams to use engineering and math skills to build a contraption that would absorb energy for an egg-drop experiment.

The DNA of Living Things workshop included discussing the science of life and extracting DNA from strawberries. They also made DNA bracelets that represented various animal species.

Finally, in the Cyber CSI workshop, the young scholars applied cryptography techniques — a skill used in cybersecurity — to solve a mock crime scene investigation.



CYBERDETECTIVES ON THE JOB — Carol Kinnard from the American Association of University Women and Project Lead the Way begins the Cyber CSI workshop by having the girls swear to secrecy before they start the investigation.

Nearly half of the girls said they enjoyed the day so much it was hard to pick a favorite workshop. However, the most popular experience was the DNA workshop because, in one participant's words, "DNA is kind of cool because it looks like snot."

Several parents thanked the STEM Day for Girls hosts.

"Thank you for bringing STEM to the younger girls because we need to get them interested sooner," a parent said.

Many of the girls said this was their first STEM event. All participants said they want to do it again next year.

"I think we hit the sweet spot," said the American Association of University Women's Naomi Siu, a retired bioscientist who helps with various research projects. "I do this

because I feel very strongly that one of the best ways for women to achieve financial stability is through careers in STEM.”

As title sponsor and co-host of STEM Day for Girls, Sandia California’s community involvement team planned the event to be held during Women’s History Month. Sandia selected American Association of University Women to co-host the March event because of its mission to advance gender equity for women and girls through research, education and advocacy.

The event was the same day and location as the Sandia-sponsored regional DOE National Science Bowl competition for middle school students. This allowed fourth- and fifth-grade girls to catch a glimpse of older students participating in a science competition.

While organizing the event, Sandia’s community involvement team focused on recruiting multigenerational volunteers from high schools and colleges, plus postdocs, fully vested professionals and retirees.

For scientists of all ages, STEM Day for Girls was a big win. [fb](#)



LAB LEARNING — Attendees extract DNA from strawberries with the help of volunteers from Sandia, the American Association of University Women and students from local high schools.



THE NUCLEAR MATTRESS — After successfully dropping an egg from 1 meter high, students attempt a 6-foot drop onto the device they named the “nuclear mattress.”



STRAWBERRY EXTRACTION — A fifth grader successfully extracts DNA from a strawberry while chemist Bernice Mills cheers her on.



EAGER ENGINEERS — Girls engineer an energy absorber in the Aerodynamic Forces workshop.



READY TO LEARN — The STEM Day for Girls scholars head to their first workshop.



LUNCH BREAK — Sandia's STEM Day for Girls held lunch in a courtyard while Sandia's DOE Science Bowl middle schoolers had lunch at another courtyard nearby.



SCIENCE STUDY — Fourth- and fifth-grade girls sit in a science lab while Sandia biotechnologist Jessica Trinh gives a short lesson on DNA.

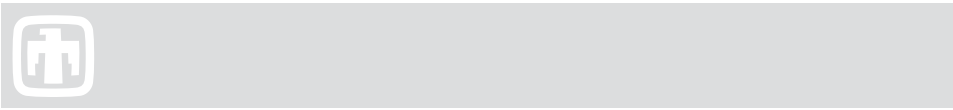


CSI SANDIA — Young cyberdetectives use a cipher to decode a mock crime scene message.



THE FUTURE IS BRIGHT — A group of 41 fourth- and fifth-grade students and 19 volunteers pose during STEM Day for Girls at Las Positas College in Livermore, California.

Mileposts



Gene Anderson 40



David Clements 35



Scott Jones 30



Sylvia Saltzstein 30



Darren Talley 30



Anita Dotson 25



Steve Pope 25



Joe Bishop 20



Carlton Brooks 20



Rose Flores 25



Brian Hart 20



Valerie Jimenez 20



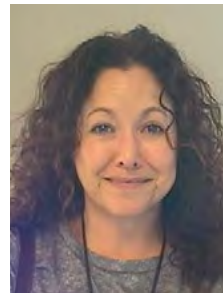
Carla Jordan 20



Heather Kraemer 20



Cally Maloney 20



Brenda McNabb 20



Bernadette Ramirez 20



Brandy Reyes 20



Anita Romero 20



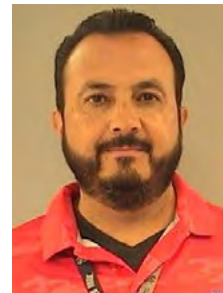
Krista Smith 20



David Turner 20



Esteban Yezpe 20



Will Vigil 20



Kai Deng 15



Isaac Perea 15



Sondra Spence 15

Recent Retirees



Tom Ciccateri 17



B. Liddle 15