



## Sandia spiking tool improves artificially intelligent devices

### Technique should benefit smartphones and self-driving cars

By **Neal Singer**

**W**hetstone, a software tool that sharpens the output of artificial neurons, has enabled neural computer networks to process information up to a hundred times more efficiently than the current industry standard.

The aptly named software, which greatly reduces the amount of circuitry needed to perform autonomous tasks, is expected to increase the penetration of artificial intelligence into markets for mobile phones, self-driving cars and automated interpretation of images.

“Instead of sending out endless energy dribbles of information,” Sandia neuroscientist Brad Aimone said, “artificial neurons trained by Whetstone release energy in spikes, much like human neurons do.”

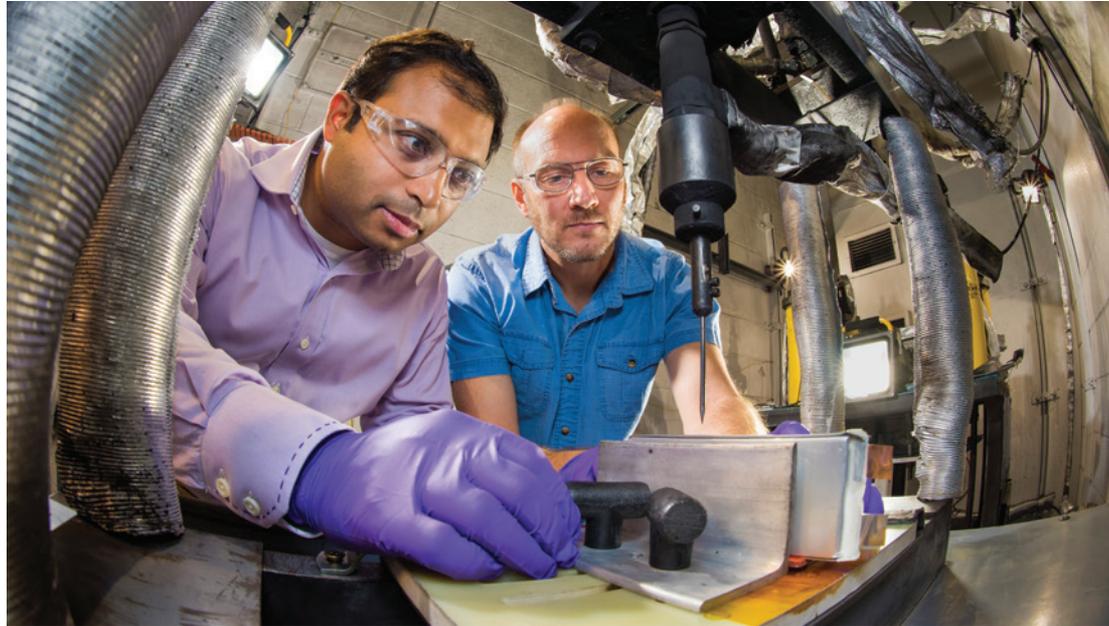
The largest artificial intelligence companies have produced spiking tools for their own products, but none are as fast or efficient as Whetstone, said Sandia mathematician William Severa. “Large companies are aware of this process and have built similar systems, but often theirs work only for their own designs. Whetstone will work on many neural platforms.”

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**NOT YOUR TYPICAL BAND** — Against a backdrop of conventional technologies, Steve Verzi, William Severa, Brad Aimone and Craig Vineyard (left to right) hold different versions of emerging neuromorphic hardware platforms. Their Whetstone approach makes Artificial Intelligence algorithms more efficient so they can be implemented on smaller, less power-hungry hardware. Not pictured is Sandia intern Ryan Dellana.

Photo by Randy Montoya



**PRECISION TESTING** — Mohan Karulkar and Chris Grosso work on battery materials that can be charged in less than 10 minutes.

Photo by Randy Montoya

## Extreme fast-charging batteries

### Sandia, University of Michigan investigating materials to expedite vehicle battery-charging rates

By **Michael Padilla**

A key roadblock to the widespread use of long-range electric vehicles — the longer time needed for a complete recharge compared to a gas station fill-up — may soon be overcome, thanks to DOE support for extreme fast-charging battery research.

Fueled by a \$1.5 million award from DOE’s Vehicle Technology Office, Sandia and the University of Michigan have teamed up to develop engineered battery materials that can be charged in less than 10 minutes.

Fast-charging battery research aims to reduce the time gap between gas and electric vehicles by developing advanced anodes, electrolytes and battery cell designs that can be charged rapidly while

maintaining performance over at least 10 years. Sandia and University of Michigan researchers are overcoming fast-charge challenges at the material level by enhancing a battery’s anode — the storage hub for lithium ions during the charging process — to store lithium ions more quickly, which translates to faster charge rates.

The project is one of several announced to help advance DOE’s research on batteries and electrification by reducing battery pack costs to less than \$100 per kilowatt-hour, increasing range to more than 300 miles and reducing charging time to less than 15 minutes by 2028.

“It’s a great opportunity for Sandia to use our expertise in battery and advanced power

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## Robotics system demilitarizes 700,000 Army submunitions

By **Manette Newbold Fisher**

More than 700,000 Multiple Launch Rocket System submunitions have been demilitarized since the Army started using an automated, nine-robot system conceptualized, built and programmed by Sandia engineers.

“This is by far the most complex, automated robotic demilitarization system that Sandia has built in the last 20 years,” said Bill Prentice, Sandia software lead for the project. “This is exactly the kind of thing to use robotics for — to get humans out of harm’s way. Let the automation of robots do what they do well, and have humans make advanced decisions on safety.”

The automated system, owned by the Army, is located at the Anniston Munitions Center’s

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**CUT, REMOVE, DEFUSE** — This automated system demilitarizes warheads by cutting them into separate sections, removing foam packs filled with grenades and detaching grenade fuses.

Photo by Regina Valenzuela

# A trajectory for fulfillment

By **Jasmine King-Bush**

Black History Month for me was a time to look back at the giants on whose shoulders we now stand. Honoring our history is essential because success isn't just a single plot point on a timeline. Rather, it's a vector that can extend from the past into the future.

I trace the start of my personal trajectory to the year 1863 with the construction of the first African-American church in California's East Bay. My great-grandfather completed much of the woodwork for the historic Oakland church, including building the altar and the tithing box.

## Mapping the past

The First African Methodist Episcopal Church was a first in many ways. For 30 years after its founding, it was the only African-American church in the area, and it was the first school for minority kids in Oakland. Initially, other public schools in the city were reserved for white students.

In addition to serving as a meeting space and launching pad for many social and political clubs over the years, the church became a foundation for the faith that has helped to guide my life. I now live in Lathrop, California and attend The Gathering Place in Tracy, where the pastor preaches values I find uplifting: empathy and acceptance of all people.

The next moment in my story happened in 1965 when my grandfather built a house across the street from Bishop O'Dowd High School, also in Oakland. We were the first black family on the block. Looking to increase diversity in their student body, priests from the prestigious school offered my mother and uncle full scholarships to attend.

They both received excellent educations there, as did I and later, my son. The school places a heavy emphasis on analytical thinking and requires extensive volunteerism as well as a college-level thesis before students can be considered for commencement. I do not doubt

that the foundational concepts of research, community involvement and commitment to greatness have contributed to the successes that I've achieved so far.

## Present-day plot points

Fast forward to 2012 — the year I came to Sandia. I started on a temporary contract as a badging specialist. During the second week of my contract, Sandia retiree Dennis Siebers, who was then a manager in the Combustion Research Facility, nudged me toward a permanent staff position as an office management assistant, asking me, "So, why haven't you applied yet?"

As an OMA, I supported engine combustion research as well as related groups. In 2017, I took on my current role as a financial analyst, supporting systems analysis and engineering, as well as other organizations.

Sandia has been a place of incredible opportunity not only for me, but for my family. My husband Philip Bush also works here in tech support. I encouraged him to join me at Sandia because I knew it would be a place where he could pursue his love for computers and technology, and it has.

Arguably, the most salient data point for this part of the story wasn't my hire date seven years ago, but 20 years ago when my mother was hired at Lawrence Livermore National Laboratory. As a personnel security specialist, she conducted background checks and clearance interviews. Her career in the DOE labs flourished, so I knew mine could too one day. I hope both of us also will inspire my own children.

## Projecting into the future

I am proud of my family's legacy. Multiple generations of my family overcame their fear of the unknown, trying new things in pursuit of opportunities with exponential benefits. Similarly, I am proud of the effort that Sandia is putting into recognizing and honoring diversity at work. These efforts better enable Sandia to fulfill our mission and foster a culture of inclusivity that will benefit the

Labs' current and future employees.

Black history is an important part of our nation's history, one not always taught in schools. That's why I encourage everyone to make some time to participate in Sandia's diversity and inclusion programs.

Through the recent Black History Month events, we learned about how things we use every day — such as stoplights or the gamma-electric cells in our mobile phones — were brought to market by people like Garrett Morgan and Henry Sampson.

It is perhaps easier not to examine uncomfortable, racially charged aspects of past- and present-day America. But so much is lost, on a corporate, cultural and even a scientific level, when we fail to look at realities that have helped shape this world.

A lot of people say they "don't see color," but I disagree with that sentiment. You will miss the full beauty of the rainbow if you don't see color. Everybody should be recognized for the gifts they bring to the whole. For this reason, last year at the California site I organized Sandia's first World Cultural Diversity Day, a fun event celebrating ancestral customs, fashion and cuisines of Sandia staff.

I encourage everyone to take a moment to check out the diversity and inclusion initiatives online, learn about Sandia's plan to encourage diversity through 2020 and beyond, or join one of our campus outreach groups. In these ways, we can ensure that Sandia continues to chart a path toward a brighter, more unified future. 



**THREE GENERATIONS** — Author Jasmine King-Bush (left) with grandmother Vera Harris, whose father helped build the First African Methodist Episcopal Church in Oakland and Jasmine's mother, Fabienne Freeman, a retired DOE personnel security specialist. **Photo by Phillip Bush**

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**KAFB**  
**REVEILLE & RETREAT**  
**REMINDER**

When driving on Kirtland Air Force Base, all civilian and military personnel should come to a complete stop for reveille at 7 a.m. and for retreat at 5 p.m. during the broadcast of "To the Colors" and "The Star-Spangled Banner," respectively. This is expected of everyone driving on base. Exhibit patience and observe this tradition with respect.

"This tradition is how we honor our flag, which stands for freedom, liberty and justice we fight to defend" Col. Eric Froehlich, 377th Air Base Wing commander, said.



**ON YOUR MARKS** — A view of Sandia's algae raceway test bed, where various outdoor environmental conditions can be simulated. Photo courtesy of Sandia National Laboratories

## Hear ye, hear ye: open call for algae

*Sandia invites collaborators in quest for renewable fuels*

by **Jules Bernstein**

To make algae biofuels more competitive with petroleum, growers must increase productivity and keep their ponds from crashing. That's why Sandia and partners are inviting participants to help in the search for the toughest algae strains and most innovative farming techniques.

Though algae sometimes bloom uncontrollably in the wild, it can be difficult to keep them thriving when grown at large scale as a bioenergy crop. Since 2017, Sandia has tested strains of algae for their resistance to disease and grazers, which are organisms that eat algae, as part of the Development of Integrated Screening, Cultivar Optimization and Verification Research project.

Project partners in the first phase of DISCOVER have included Pacific Northwest and Los Alamos national laboratories, as well as the National Renewable Energy Laboratory. Now, joined by Arizona State University's Center for Algae

Technology and Innovation, the project is ready to build on the previous work and bring in strains and technologies from outside the laboratories.

Sandia project lead Todd Lane explained that this a great opportunity for companies that cannot conduct research on their algae technology at the scale that the DISCOVER pipeline can.

Hoping to encourage potential collaborators, Todd said, "If you've got a technology or strain that you think is a winner, we'll help you prove it."

### Promoting algae productivity

Making algae-growing operations more productive is essential to lowering the cost of algae-based biofuels and products. According to Todd, two main factors affect productivity: the growth rate of the algae; and the stability of an algae-cultivation system.

These two factors cannot work independently. Even if the algae grow quickly in the short term, a company will have to sterilize its equipment and start a new crop if a pond crashes, causing delays,

additional costs and diminished annual returns. An estimated 30 percent of production on algae farms is lost each year to pond crashes, during which previously healthy algae die, Todd said.

Sandia has expertise in algae crop-protection strategies and is the DISCOVER lead in evaluating anything that could prevent a pond crash, including any technology that eliminates grazers. The most threatening grazers can eat enough algae to destroy a healthy, 132,000-gallon pond in less than 48 hours, Todd said. Grazers could be any number of parasitic fungi, bacteria and diseases that threaten algae stability.

To date, Sandia has tested 18 algal strains against a diverse panel of grazers, and then further tested the strains with the most prolific growth rates in 1,000-liter ponds under simulated, outdoor-cultivation conditions. As part of this new phase of the DISCOVER project, Arizona State will grow collaborators' submitted strains in its outdoor test beds, while the laboratory consortium will evaluate the productivity of those strains.

Ultimately, the researchers hope to learn the biochemical and physical characteristics of the toughest, most prolific algae strains, so they can identify which strains will be grazer-resistant from their physical properties and reduce the need for the strains to be tested.

### Rare opportunity for companies and inventors

Having the resources of major, experienced research teams available to prove the strength and efficacy of private research is rare. Todd urged those who believe they have developed or discovered the toughest algae strains or most innovative algae farming techniques to apply for the program.

This project is sponsored by DOE's Office of Energy Efficiency and Renewable Energy. Ultimately, data gathered for DISCOVER will be made public, but program organizers can also make arrangements with collaborators to protect intellectual property. [i](#)

Proposals submitted to the call for collaboration will be reviewed on a rolling basis.

Those interested can email [discovr.algae@lanl.gov](mailto:discovr.algae@lanl.gov) for more information or visit the project website.

## Sandia spiking tool improves AI devices

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The open-source code was recently featured in a technical article in Nature Machine Intelligence and has been submitted by Sandia for a patent.

### How to sharpen neurons

Artificial neurons basically are capacitors that absorb and sum electrical charges, then release them in tiny bursts of electricity. Computer chips, termed "neuromorphic systems," assemble neural networks into large groupings that mimic the human brain by sending electrical stimuli to neurons firing in no predictable order. This contrasts with the more lock-step procedure used by desktop computers with their pre-set electronic processes.

Because of their haphazard firing, neuromorphic systems often are slower than conventional computers, but they require far less energy to operate. They also require a different approach to programming because otherwise their artificial neurons fire too often or not often enough, which has been a problem in bringing them online commercially.

Whetstone, which functions as a supplemental computer code tacked on to more conventional software training programs, trains and sharpens artificial neurons by leveraging those that spike only when a sufficient amount of energy — that is, information — has been collected. The training has proved effective in improving standard neural networks and is being benchmarked for the emerging technology of neuromorphic systems.

Catherine Schuman, a neural network researcher at Oak Ridge National Laboratory, said, "Whetstone is an important tool for the neuromorphic community. It provides a standardized way to train traditional neural networks that are amenable for deployment on neuromorphic systems, which had previously been done in an ad hoc manner."

### The strict teacher

The Whetstone process, Brad said, can be visualized as controlling a class of talkative elementary school students who are tasked with identifying an object on a strict teacher's desk. Prior to Whetstone, the students sent a continuous stream of sensor input to their formerly overwhelmed teacher, who had to listen to all of it — every bump and giggle, so to speak — before passing a decision into the neural system. Processing this huge amount of information often requires cloud-based computation, or the addition of more local computing equipment combined with a sharp increase in electrical power. Both options increase the time and cost of commercial artificial intelligence products, lessen their security and privacy and make their adoption less likely.

Under Whetstone, the teacher ignores most of the chatter and only pays attention to a simple "yes" or "no" measurement of each student — when they raise their hands with a solution.

Suppose, for example, the intent is to identify whether a piece of green fruit on the teacher's desk is an apple. Each student is a sensor that may respond to a different quality of what may be an apple: Does it have the correct qualities of smell, taste, texture and so on? And while the student who looks for red may vote "no," the student who

looks for green would vote "yes." When the number of answers, either yay or nay, is electrically high enough to trigger the neuron's capacity to fire, that simple result, instead of endless waffling, enters the overall neural system.

While Whetstone simplifications potentially could increase errors, the overwhelming number of participating neurons — often more than a million — provide information that statistically makes up for the inaccuracies introduced by the data simplification, said William, who is responsible for the mathematics of the program.

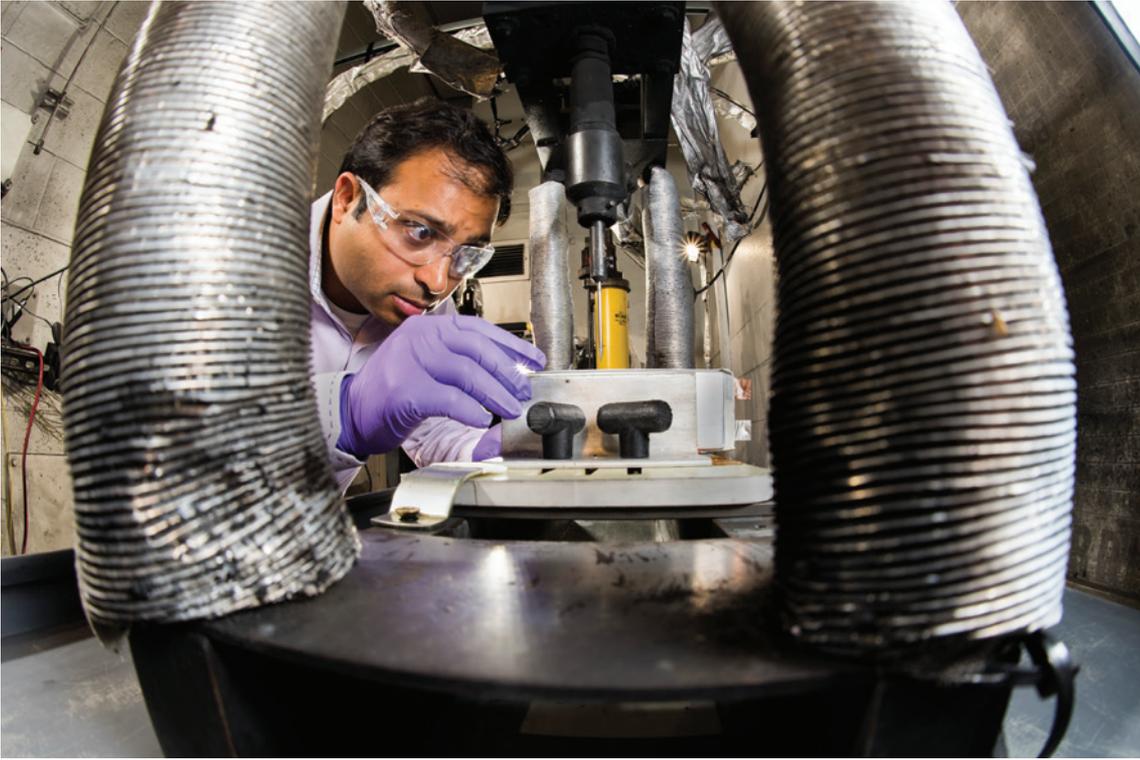
"Combining overly detailed internal information with the huge number of neurons reporting in is a kind of double booking," he said. "It's unnecessary. Our results tell us the classical way — calculating everything without simplifying — is wasteful. That is why we can save energy and do it well."

### Patched programs work best

The software program works best when patched into programs meant to train new artificial-intelligence equipment, so Whetstone doesn't have to overcome learned patterns with already established energy minimums.

The work is a continuation of a Sandia project called Hardware Acceleration of Adaptive Neural Algorithms, which explored neural platforms in work supported by Sandia's Laboratory Directed Research and Development program. DOE's Advanced Simulation and Computing program funds the current work.

In addition to Brad and William, paper authors are Sandia researchers Craig Vineyard, Ryan Dellana and Stephen Verzi. [i](#)



**FINE TUNING** — Mohan Karulkar says the underlying goal of fast-charging research is to focus on the user experience during charging. **Photo by Randy Montoya**

## Fast-charging batteries

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source research to help accelerate vehicle battery-charging rates,” said Chris Orendorff, senior manager of Sandia’s Power Sources Technology Group.

For this project, Sandia will contribute advanced prototype characterization and diagnostic capabilities, while the university will contribute key electrode modification know-how. The university of Michigan Battery Lab, a user facility for scaled-up battery prototype fabrication, will also play a key role in the project.

### Addressing a key roadblock

“The underlying goal of fast-charging research is to address a key roadblock to consumer adoption of electric vehicles — the user experience during charging,” said Mohan Karulkar, the lead Sandia researcher for the project. “We are all accustomed to ten-minute trips to the gas station, but we aren’t there yet with long-range electrical vehicle charging. Fast charging is how you bridge that gap.”

However, Mohan noted that faster charge times come at a cost.

“Increasing charge current lowers the charge time, but it puts additional stresses on the battery,” he said. “This project aims to address this issue by making materials that are better equipped to handle fast charge rates.”

Specifically, researchers are planning novel modifications to existing anode materials to allow faster lithium ion storage, leading to higher charge rates and less stress on the battery.

“We will conduct this research without using exotic new materials. Instead, we will engineer the anode — a cost-effective, measurable and achievable objective,” Mohan said. “If successful, we’ll be one step closer to 10-minute charge times and clearing the way for large-scale electric vehicle adoption.”

Mohan compared battery charging to rainfall in the desert.

“Rain in Albuquerque tends to lead to flooding because so little rain falls throughout the year,” he said. “The faster the rain falls, the worse the flooding because the ground is simply too compact to adsorb the water, even though the soil is incredibly dry and thirsty.”

He said the fast-charging battery project is like building tiny channels into the ground to help

water adsorb faster, while also applying special coatings on the ground to keep water in place and prevent it from running off and pooling.

“In this analogy, the ground is the battery’s anode, and the raindrops are lithium ions,” Mohan said. “The flooding of water is akin to a key failure mechanism during a fast-charge attempt. Lithium piles up on the anode surface instead of being adsorbed into it.”

### Improving battery-charging techniques

Sandia and the University of Michigan are collaborating to improve battery-charging techniques. As university researchers apply various techniques to increase lithium adsorption into the anode, the Sandia team will assess the resulting changes in charging rates, which will lead to further rounds of research.

The science behind improving charge rates faces several challenges. Experimental timeframes become much shorter when the target charging time decreases. To accurately measure electrochemical phenomena during rapid experiments, Sandia will employ high-precision and high-speed analysis tools to understand how batteries are damaged at high rates and how modifications might mitigate those damage mechanisms.

The Sandia team brings a depth of experience in the area of battery charge improvements. Prior to joining Sandia, Mohan spent a decade in the auto industry working to develop electric-vehicle batteries. He is excited to see the advances made by Sandia and the University of Michigan feed back into the commercial sector.

“Once we demonstrate successful techniques for creating fast-charging batteries, further work will be needed to expand the battery improvements to the scale of commercial automotive batteries,” Mohan said.

He said the development of new battery-charging techniques will be coordinated with other Sandia efforts, such as research on heat management and electricity delivery to deliver complete fast-charging solutions.

“Our group isn’t working in a vacuum,” Mohan said. “We will leverage resources from throughout Sandia to make the biggest impact possible.”

*See story on New Battery Test Facility, Page 8*

## Sandia demilitarizes submunitions

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Multiple Launch Rocket System Recycle Facility in Alabama. The system was built for the Army’s demilitarization program that aims to dismantle obsolete ammunition and missiles. The project was funded and managed through the Department of Defense.

The system reduces the stockpile of Multiple Launch Rocket System munitions that have been in storage and enables the Army to recycle rocket materials — capabilities that did not exist. The Army can now recycle the rockets’ aluminum warhead skin, steel grenade bodies and copper.

Speeding up the process of demilitarization also reduces costs. The automated robotic system is designed to demilitarize up to 21 warheads per eight-hour shift.

“We were able to remove people from a potentially very dangerous situation and created something that allowed products to be recycled and reused, which is what the DOD demilitarization program is about,” said project lead Walt Wapman.

Humans still oversee operations, learn to run the advanced robotics system and watch the process on live feeds in a control room. Computer vision, which is a form of artificial intelligence using digital images from cameras, can detect abnormalities during the demilitarization process and alert operators who determine if there is a safety concern.

### Commercial robots

All system robots are commercial, off-the-shelf products that Sandia engineers customized and programmed to do specific tasks.

“There are 644 grenades per warhead, and our job is to take these tightly packed, columnated grenades in the warhead foam packs and demilitarize them,” Bill said.

The system is organized into nine “cells.” The first cell is the weapons disassembly system where warheads are cut into separate foam-pack sections. The foam packs filled with grenades are then delivered to cells two and three where the grenades are removed from the foam packs. From there, individual grenades are delivered to cells four through nine where the fuses are detached. Once the fuses are detached, the munitions have been disarmed.



**COMPLEX CUSTOMIZATION** — Sandia engineers and scientists built and programmed this automated robotic system at Anniston Munitions Center’s Multiple Launch Rocket System Recycling Facility in Alabama to demilitarize Multiple Launch Rocket System submunitions for the Army. **Photo by Regina Valenzuela**

The system can pick up and place foam packs and grenades in precise orientations, and lock and rotate the grenades to examine and remove fuses in a safe way, Bill said.

For more than three years, Bill said he put his heart and soul into development of the robotic system. He and a small team used three computer languages to program the nine robot cells, tested the system and traveled back and forth to Alabama while the robotic work cells were assembled and tested.

“Part of the challenge is when you demilitarize warheads like this, you’re working on munitions that are 10, 20, 30 years old,” Bill said. “You test on inert munitions that are in pristine condition, but when you start cutting apart warheads and looking at live grenades, they might have some environmental effects that cause process abnormalities, such as grenades being stuck together during removal.”

### New system builds on Sandia’s long robotics history

Bill said Sandia has been involved in robotics for more than 20 years and the demilitarization business for at least 18 years. Walt led the demilitarization program at Sandia for most of that time.

“I’d say that what Sandia really brought to the table was an integrated, small team that took a blank sheet of paper and made a nine-robot automated system with 55 cameras, hundreds of sensors and a lot of exceptional designs, enabling us to deliver a reliable system to the Army that’s been safe,” Walt said.

# Space surgeon's prescription for success

By **Jules Berstein**

Photos by **Dino Vournas**

**D**r. Yvonne Cagle, astronaut, surgeon, retired U.S. Air Force colonel and aerospace researcher, has developed a device for space flight that heals muscle damage in record time here on earth.

The technology can transform an ankle from sprained to strong in mere minutes instead of weeks. Cagle attributed her success to the foundation built by black innovators at NASA, saying she is a passionate advocate for diversity in the workplace.

Cagle spoke at Sandia/California as part of Sandia's Black History Month events.

## Traveling in space

Cagle began her talk by describing the feeling of space flight. You never actually see your first launch, she said, you feel it. The vibrations are so strong you have to clench your eyes shut. Once you arrive in zero-gravity, however, she said it feels like skating on glass.

More significant, she said, are the physiological effects of being in space. Scientists have a lot to learn about how bodies behave in space, and Cagle wants to know more about what happens to human health should we attempt to permanently relocate populations off the planet.

It is possible that space travel, whether short or long term, could change living beings radically, even genetically. The possibility prompted Cagle to wonder, "What if the alien we're in search of is ourselves?"

## The fate of floating bodies

The constellation of nasty health symptoms that some astronauts suffer is known as Space Adaptation Syndrome. These negative adaptations to space travel — facial swelling, foggy thinking, a confused sense of balance and direction, nutrient loss, muscle atrophy and bone density loss and demineralization — can continue to cause problems even after astronauts return to Earth.

Keeping muscles healthy is a big focus of Cagle's current research. Muscle injuries heal more slowly when muscles aren't moving against gravity and aren't being exercised. To combat this, she created LIFT, a wearable device that enables rapid healing of strained or sprained soft tissue.

The device takes water produced by inflammation and generates electric currents that restore and rebalance the damaged soft tissue. Cagle showed the audience a photo of a badly bruised and swollen ankle, and then a picture of the ankle after using the device. No trace of bruises or swelling remained.

There was an audible gasp in the room when Cagle revealed the entire healing process had taken a total of 10 minutes.

## Space for all

Cagle noted that hers is only one of many exciting innovations made possible by spaceflight research. However, she said the NASA space program would not have evolved, with aspirations of traveling to Mars, without the efforts of her friend and mentor Katherine Johnson.

Fifty years ago, Johnson's space flight calculations helped the first humans to walk on the moon. Seven years prior, the astronaut John Glenn had insisted that Johnson help verify by hand the equations that would control the trajectory of his historic earth-circling mission.

Johnson's work as a "human computer," as well as the work of two other female African-American NASA pioneers, was celebrated in the film *Hidden Figures*, nominated for three Academy Awards in 2016.

But Cagle lamented that today there are still too many hidden figures whose work is neither acknowledged nor encouraged. She said she is a champion for diversity and inclusion because corporate cultures that invest in diverse voices breed



Dr. Yvonne Cagle, astronaut, surgeon, retired U.S. Air Force colonel and aerospace researcher, told a packed auditorium at Sandia/California how it feels to leave the Earth. Her visit was part of Sandia's Black History Month events and resulted from a partnership between the Vision 2020 Division 8000 Diversity and Inclusion team and the African American Outreach Committee (AAOC) and sister organizations at Lawrence Livermore National Laboratory. The idea for inviting her originated with Camron Proctor (at right in bottom left photo). Cathy Branda (at right in middle right photo), senior manager for applied biosciences and engineering, provided a tour of her Sandia laboratory. Tony Onadele, AAOC chair, and Trish Taylor (left to right in bottom right photo) collect an autograph from Cagle.

deeper understanding of and compassion for all people, encouraging success.

"There is space for all," Cagle said, "And with diversity and inclusion, the possibilities are endless."

## A community grassroots effort

Cagle's trip to Sandia started with Camron Proctor, a systems engineer in thermal fluid science.

"Over a year ago, Camron came to me with a very compelling case for bringing Dr. Yvonne Cagle to speak at Sandia regarding her work and the topic of diversity and inclusion in the workforce," said Kayla Norris, team lead for the diversity and inclusion speakers series and Sandia/California's community relations officer. "After researching her accomplishments and watching some of her TedX talks, I was completely

on board, as was Sandia's African American Outreach Committee."

For six months, Kayla tried to contact Cagle without success. When Cagle gave a talk at Harvard University, Kayla worked through the university to issue the invitation and confirm that Cagle could speak at Sandia.

Working with Jenessa Dozhier and Tony Baylis, who lead diversity and inclusion efforts at Lawrence Livermore National Laboratory, the African-American Body of Laboratory Employees at the neighboring lab enthusiastically agreed to help bring Cagle to Sandia.

After her talk, Cagle had lunch with many members of the two outreach groups and met with Cathy Branda, senior manager for applied biosciences and engineering, Camron, Kayla, and Jasmine King-Bush, co-chair of the Division Diversity Council. 

# Mileposts



New Mexico photos by Michelle Fleming  
California photos by Randy Wong



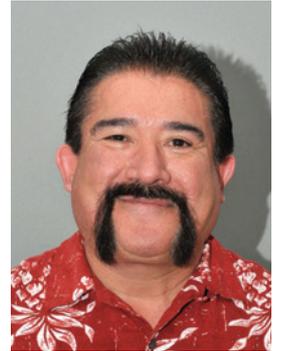
Mike Arms 35



Jaime Gomez 35



Steve Crowder 30



Raymond Griego 30



Rob Jarecki 25



Scott Jones 25



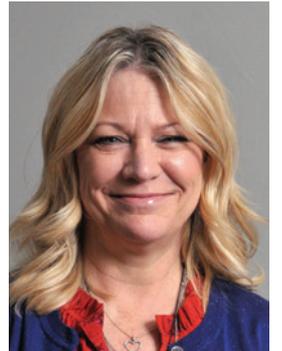
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Jeannie Bekaye 20



Michael Cassady 20



Julie Lujan 20



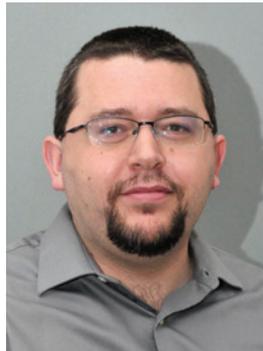
Ken Morris 20



Jane Zingelman 20



Barbara Baker 15



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Melissa Garner 15



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Brandy Reyes 15



Susan Shelton 15



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Benjamin White 15

# Recent Retirees



New Mexico photos by Michelle Fleming  
California photos by Randy Wong



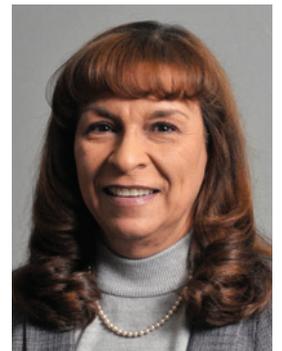
Ken Miller 41



Dana Striker 33



Jan Williams 33



Felicia Durán 23



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March 4 – March 29

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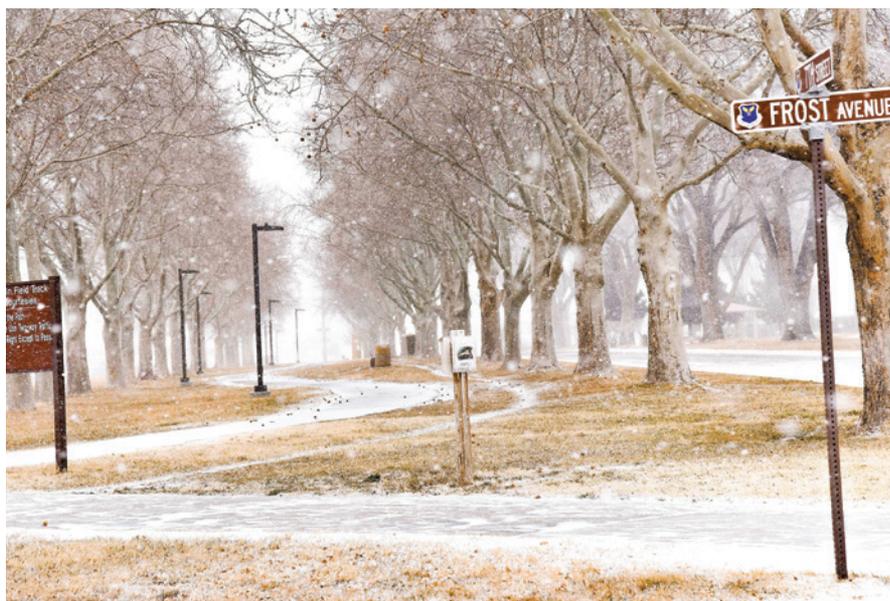
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# When winter weather hits

Photos by **Randy Montoya**

When winter weather strikes, do you know where to go for information about Sandia work delays or closures?

Should overnight weather conditions make the Labs' parking lots unsafe until they are cleared, Sandia's Emergency Operations Center (EOC) will distribute a workforce message about the delay, including a specific time to report to work, and other relevant details, including how to charge time for the delay.

Under snowy conditions, messages will be sent no later than 5 a.m. the day of the delay, and will include a stipulated start time depending on the severity of the storm.

Messages will be delivered in a variety of ways, beginning with Sandia email, allowing employees to monitor the information sources most convenient to them. These sources include:

- Sandia email
- Sandia Bulletin Board (Dial 845-6789 and follow the menu choices; 925-294-3333 for California-specific events.)
- Radio Sandia, 1640 AM
- Alert banners on Sandia's external homepage, [sandia.gov](http://sandia.gov), and internal Sandia Techweb
- News coverage through local television and radio stations
- Sandia Facebook, [facebook.com/SandiaLabs](https://facebook.com/SandiaLabs), and
- Sandia Twitter, [twitter.com/SandiaLabs](https://twitter.com/SandiaLabs)

During inclement weather, employees should follow arrangements made with their manager for weather delays, including any telecommuting work. Information regarding road conditions can be found at [nmroads.com](http://nmroads.com) in New Mexico, or [511.org](http://511.org) in California.

## SANDIA CLASSIFIED ADS

### MISCELLANEOUS

TONY LITTLE GAZELLE, new condition, w/manual & exercise video, great cardio, \$55 OBO. Baca, 505-710-8454.

WOMEN'S SILVER COAT, mouton, vintage, Faux Borgana, \$80 OBO; various handmade denim purses & skirt. Williams, 299-3108.

CORNER SHELVES, 2, oak, 6-ft., \$100 ea.; Spanish-style pine armoire, \$200. Cisar, 899-9116.

COFFEE TABLE, mid-century Lane Acclaim, 3 end tables, photos available, \$800 OBO. Guerra, 505-252-0024, [julia.guerra@comcast.net](mailto:julia.guerra@comcast.net).

SOFA, charcoal chenille, \$350; purple velvet chair & ottoman, \$275; both <2 yrs. old. Martinez, 505-274-2787.

GARAGE SALE, Sat., March 2, hand tools, power tools, table saws, power saws, beer cabinet, better than a flea market, 729 Monroe NE. Barnaby, [bbarnaby@juno.com](mailto:bbarnaby@juno.com).

SECTIONAL COUCH, w/3 recliners, dark brown leather, w/cup holders, \$1,500. Buck, 353-2667.

UTILITY TRAILER, small Scout, w/spare tires/wheels, East Mountains, \$250. Willmas, [djwillmas@gmail.com](mailto:djwillmas@gmail.com).

ELLIPTICAL, Sole E95, w/floor mat, excellent condition, \$650. Baker, 505-239-9455.

BOB SEGER TICKETS, 2, sec. A, row 5, seats 5&6, March 5, Tingley Coliseum, \$229.50. Gonzales, 505-238-0662.

POWER RECLINER, La-Z-boy, bluish grey tweed, \$1,600 new, asking \$1,000; full-size sleeper sofa, w/matching wing chair, \$150; coffee table, \$50; text for photos, will negotiate. Morrison, 505-850-0401.

LANDMARK MUSICAL "PIPPIN" TICKETS, March 16-31, UNM Rodey Theatre, [www.landmark-musicals.org](http://www.landmark-musicals.org). Skrien, 505-228-3181.

AT&T MICROCELL, model DPH-154, w/power cable & yellow ethernet cable, \$150. Phillips, [jasonjphilips@gmail.com](mailto:jasonjphilips@gmail.com).

GUITAR AMP, Roland 80XL, 80-W, 12-in. speaker, DSP effects, excellent condition, \$350. Stubblefield, 263-3468.

ELLIPTICAL, Spirit Fitness, 7 programs, wheels, excellent condition, \$50 OBO. Hess, 505-379-3715.

### TRANSPORTATION

'02 BUICK CENTURY, 4-dr. sedan, silver, 97K miles, very good condition, w/all service records, \$2,800 OBO. Massey, 505-917-8124.

'10 HONDA ODYSSEY MINIVAN, newer tires, 115K miles, runs well, clean title, \$7,000 OBO. Amador, 259-8919.

'12 VOLKSWAGEN BEETLE, 2.5L, 5-cyl., leather/heated seats, 88K miles, lifestyle change, \$6,400. Conron, 415-310-5571.

'13 FORD EXPLORER SPORT, 4WD, V6 twin turbo, 365-hp, maroon, 55K miles, showroom condition, \$22,900. Baca, 505-322-8999.

'09 TOYOTA HIGHLANDER HYBRID LIMITED, white, w/load bars, sunroof, tow pkg., 87K miles, good condition, \$13,500 OBO. Bennett, 505-291-1912.

'15 VOLVO XC70 T5 PREMIER, 2.0L turbo, FWD, crystal white, beige leather interior, <30K miles, \$24,500. Jarek, 331-8307, call or text.

'08 CHEVY TRAILBLAZER LT, 4x4, V8, fully loaded, white, leather interior, sunroof, 82K miles, excellent condition, \$8,500 OBO. Fricks, 505-410-4413.

### RECREATION

'11 BMW F650GS, 800 cc, Lava Orange, antilock brakes, only 600 miles, \$5,500. Fondren, 463-5572.

### REAL ESTATE

4-BDR. HOME, 2,824-sq. ft., up-to-date, beautiful views, 51-Foothills South, 3309 Embudito Dr. NE, \$404,000. Ebbens, 505-604-4380, [maggiiebbens@sellersbuyersnm.com](mailto:maggiiebbens@sellersbuyersnm.com).

### WANTED

SMALL PICKUP, good running condition. Lucero, 505-440-9893.

HOMEBREWING SUPPLIES, especially bottles, kegs, boiling pots, carboys, tools, instruments, etc. Menicucci, 505-235-8501.

### AD SUBMISSION GUIDELINES

**AD SUBMISSION DEADLINE:** Friday noon before the week of publication unless changed by holiday.

**Questions to Michelle Fleming at 505-844-4902.**

**Submit by one of the following methods:**

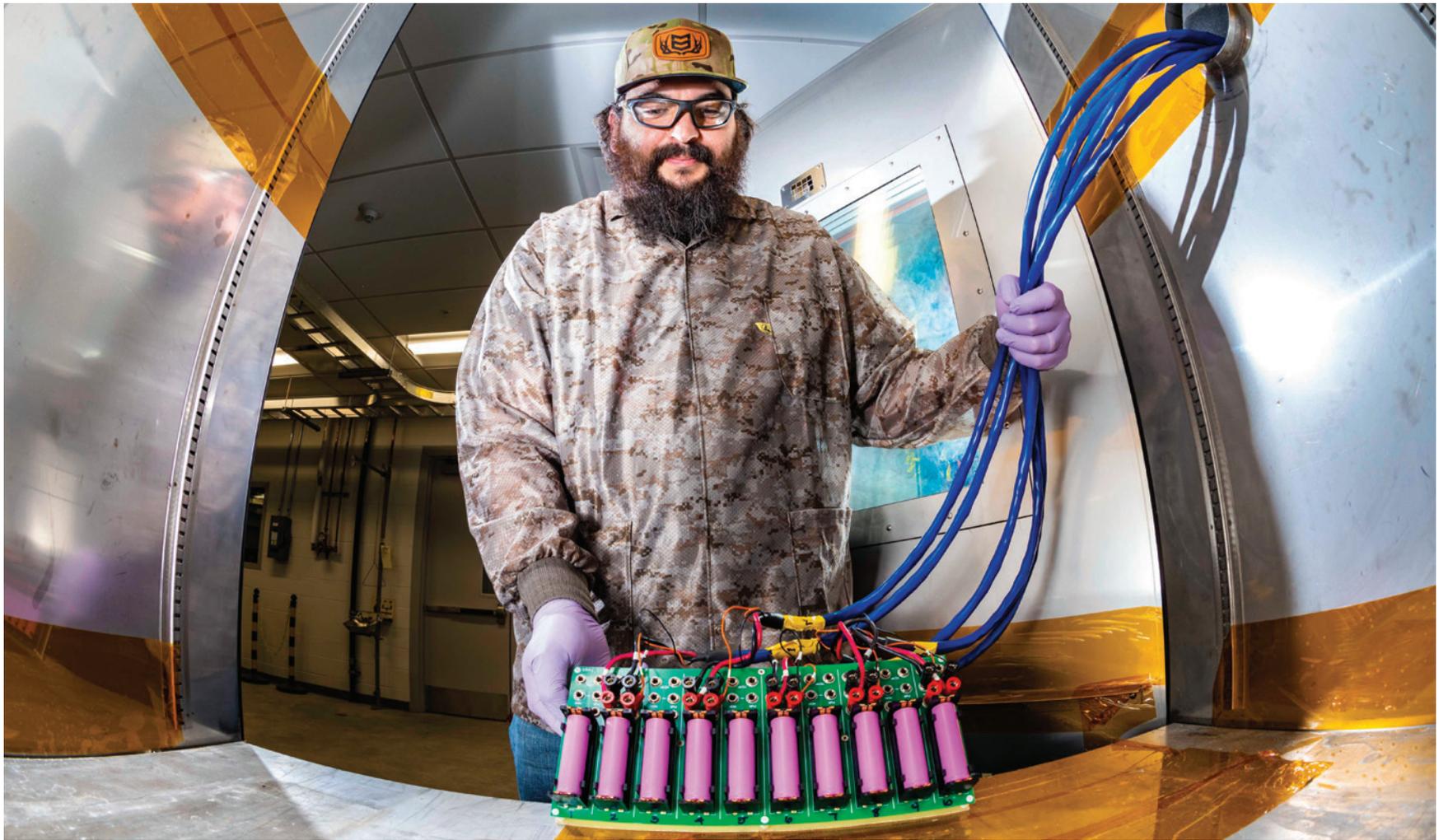
- **EMAIL:** Michelle Fleming ([classads@sandia.gov](mailto:classads@sandia.gov))
- **FAX:** 505-844-0645
- **MAIL:** MS1468 (Dept. 3651)
- **INTERNAL WEB:** Click on the News Tab at the top of the Techweb homepage. At the bottom of the NewsCenter page, click the "Submit a Classified Ad" button and complete the form.

*Due to space constraints, ads will be printed on a first-come, first-served basis.*

### AD RULES

1. Limit 18 words, including last name and home phone (web or email address counts as two or three words, depending on length).
2. Include organization and full name with ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. The same ad may not run more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce and retired Sandians only.
10. Housing listed for sale is available without regard to race, creed, color or national origin.
11. Work wanted ads are limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in poor taste.

# Power to spare: New Battery Test Facility boosts work of power sources team, with big benefits for customers



**EVE OF DESTRUCTION** — Tommy Aldaz sets up a variety of measurement instruments in preparation for a destructive battery experiment on a test array at the new Battery Test Facility completed last year. **Photo by Randy Montoya**

By **Jennifer Sawayda**

When Sandia tests the performance of high-capacity energy storage devices, the power sources group frequently would hit obstacles that reduced efficiencies and stretched out schedules.

Those obstacles have now been removed with the construction of a 7,500 square-foot Battery Test Facility that enables the team to assemble and test batteries more efficiently for customers to validate whether they perform up to expectations.

The new building was specifically designed to handle the tests. The team now can do higher-capacity battery testing for nuclear deterrence, security, grid storage and vehicle transportation.

## In the Works

Sandia has three other major construction projects that are in the final planning stages.

### Emergency Operations Center

The design of a new Emergency Operations Center in New Mexico should start in fiscal year 2020. The facility will be dedicated for all Sandia's Emergency Management organizations.

### California Data Center

Construction begins this summer on the CA Data Center Replacement Facility, a 9,000-square-foot structure with enhanced reliability and efficiency to replace the aging data center. The NNSA recapitalization program supports the construction project, which should take about a year.

### TA-IV/Z Support Building

The multi-program TA-IV/Z Support Building will house such support functions as office, meeting, training and light lab rooms for the Z machine and other south TA-IV R&D facilities. Completion and occupancy should take about 18 months.

"The Battery Test Facility allows us to take on more work, especially in the national security space," said Chris Orendorff, senior manager. "In terms of different capabilities, it will allow for performance testing of a variety of battery systems of different chemistries in relevant sizes for our customers."

The facility represents the first stage in consolidating all of Sandia's battery-testing activities. It provides more of the environmental and risk controls needed to conduct performance testing successfully.

"High precision testing was difficult because it was hard to control the temperature adequately in the old building," said Daena Richter, who led operations for the construction project.

Previously, testing complications sometimes led to facility failures that interfered with work others did in the building, so some higher-risk experiments had to be conducted at remote sites.

"It took a lot of logistics, time and planning to use these other facilities as the former building couldn't handle these higher-risk activities," Daena said.

Designers built engineered controls into the Battery Test Facility to avoid such risks. Features include concrete masonry infrastructure, gas sensor equipment, work stations outside the labs so technicians can conduct tests remotely and two specially designed hazardous materials storage units, as well as local exhaust ventilation that detects negative pressure and reduces hazardous gases.

The facility was the culmination of a seven-year collaboration among Energetic Components, Infrastructure Services and Facilities and Emergency Management.

In 2012, Facilities Planning conducted a recapitalization study, which recognized that Sandia's long-term strategy for battery testing required a complete facility replacement. The recommended phased solution began with removing the highest-hazard battery testing from the previous building to reduce risk and create space for subsequent renovations. That led to the recommendation to build a stand-alone building customized for higher-fidelity battery testing.

"It was clear that the first step had to be moving the highest-hazard testing activities out of the former building into a building appropriately designed

for the hazards," Malia Orell said, facilities strategic planner for Nuclear Deterrence. "There was extensive collaboration between facilities planning and the power sources team to ensure this investment would mitigate mission risk in the near term as well as fit into their long-term strategy."

Sandia planners deemed the proposed investment a high priority, and NNSA provided \$8.5 million in funding. The facilities projects team and architectural and engineering partners worked with the power sources team led by Summer Ferreira to design and construct the building to meet government requirements for new construction while ensuring the facility met the group's unique needs.

"The trick was to balance the LEED environmental considerations that are government requirements for new buildings with the energy dense power and HVAC requirements needed for the work," Daena said. "Facilities Engineering was a key part of this equation." The facility is anticipated to receive LEED Gold certification.

Another major factor in the planning was placement. To create synergy with nearby buildings used by the Energetic Components Center and deal appropriately with potential hazards within, designers decided to build within walking distance of the Explosive Component Facility.

According to Daena, the agility built into the Battery Test Facility aids cross-pollination of mission work. "It's a capabilities lab, not a single program-specific lab. That's where its agile nature proves beneficial."

Construction was completed in October 2018. An open house on Feb. 14 drew a crowd of about 40 to tour Sandia's newest facility. 



**COME ON IN** — Associate Labs Director for Infrastructure and Operations John Clymo welcomes folks to the new Battery Test Facility. **Photo by Norm Johnson**