



S A N D I A

## LABNEWS

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New  
emergency  
center  
Page 4

COINFLIPS	2
Diversity award	7
Retiree deaths	9
Open Enrollment	10



**RETRIEVABLE ROCKET** — Sandia launched a suborbital rocket from NASA's launch range at Wallops Flight Facility in Virginia.

Photo by Lee Wingfield, NASA Wallops Flight Facility

## Major upgrade to HOT Shot rocket program culminates in successful launch

By **Troy Rummler**

A major upgrade to the NNSA's HOT Shot sounding rocket program culminated in a **successful launch** on Sept. 11 at the NASA Wallops Flight Facility in Virginia.

HOT Shot, short for High Operational Tempo Shot, collects scientific data that benefits aerospace research and informs future weapon designs for the U.S. nuclear enterprise. The upgrade added new hardware necessary to recover the vehicle as well as new, onboard memory chips, which “massively improves the amount of data that we’re able to collect,” said Sandia HOT Shot lead Kelsey Forsberg.

Previous rockets were not retrieved, limiting the amount of information gathered. Researchers could only access data that was sent from the rocket wirelessly during flight. Sandia estimates that retrieving the rocket with its onboard memory will allow the Labs to collect about 40 times more data, dramatically accelerating the program’s scientific mission.

— CONTINUED ON PAGE 11

## Sandia creates global archive of historical renewable energy documents

*Six decades of concentrating solar power know-how aids today's researchers, engineers*

By **Mollie Rappe**

Sandia began studying the power of the sun to produce utility-scale energy in the 1960s. Sandia's **National Solar Thermal Test Facility** was **commissioned in 1978**, spurred by the oil crisis of 1973.

Many of the documents detailing the design, construction and research conducted at the world's first multimewatt concentrating solar tower spent decades sitting in boxes or on shelves in basements and backrooms. Until now.

— CONTINUED ON PAGE 8



**A BIG PLAN** — Ken Armijo, left, a Sandia mechanical engineer, and Alice Parsons, a technical librarian, study a historical blueprint for a portion of Sandia's Solar Tower. The document, among tens of thousands of others, is now accessible online to researchers and other interested parties worldwide.

Photo by Randy Montoya

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**TABLE of CONTENTS**

- 1** | Major upgrade to HOT Shot rocket program *continued on page 11*
- 1** | Historical renewable energy documents *continued on page 8*
- 2** | The secret to your brain's elusive computing power
- 4** | Equipped for emergencies
- 6** | Sandia supports nonprofits that promote financial planning
- 7** | National 2021 Diversity Team Award goes to Sandia
- 9** | Retiree deaths
- 10** | New healthcare plan option during Open Enrollment
- 11** | Mileposts and Recent retirees
- 12** | LAMP facility is latest building project for California campus
- 13** | District Attorney presents update on metro crime
- 14** | Kouri awarded DOE Early Career Research Program grant
- 15** | Popular YouTube show features Sandia energy science

**LABNEWS Notes**

Lab News may contain photos shot prior to current COVID-19 policies. Individuals in photos followed all social distancing and masking guidelines that were in place when photos were taken.

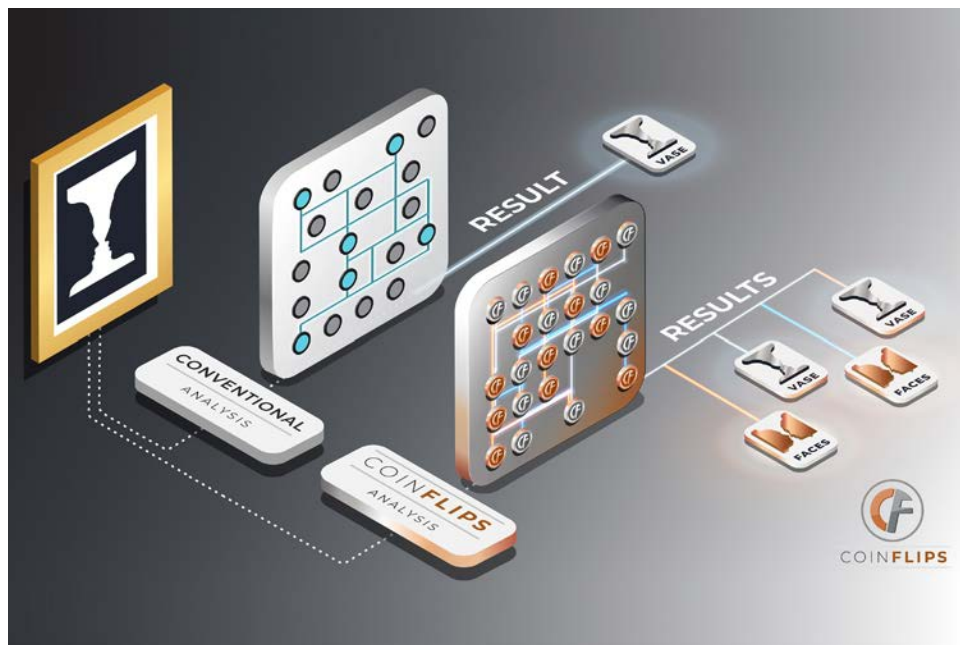
# What if the secret to your brain's elusive computing power is its randomness?

Scientists awarded \$6 million to plan brain-inspired computer that runs on probability

By **Troy Rummler**

If you've ever asked a car mechanic how long a part will last until it breaks, odds are they shrugged their shoulders. They know how long parts last on average, and they can see when one is close to breaking. But knowing how many miles are left is extremely difficult, even using a supercomputer, because the exact moment a belt snaps or a battery dies is to some extent random.

Scientists at Sandia are creating a concept for a new kind of computer for solving complex probability problems like this. They propose that a "probabilistic computer" could not only create smarter maintenance schedules but also help scientists analyze subatomic shrapnel inside particle colliders, simulate nuclear physics experiments and process images faster and more accurately than is possible with conventional computers.



**HEADS OR TAILS?** — Conventional computers can look at the optical illusion on the left and normally only see a vase or two faces. Sandia is laying the groundwork for a computer that, like our brains, can glance many times and see both.

Image by Laura Hatfield

As part of a new microelectronics codesign research program, the DOE's Office of Science **recently awarded** the project \$6 million over the next three years to develop the idea. Sandia will be working with Oak Ridge National Laboratory, New York University, the University of Texas at Austin and Temple University in Philadelphia.

A codesign microelectronics project involves multidisciplinary collaboration that takes into account the interdependencies among materials, physics, architectures and software. Researchers also will look at ways to incorporate machine learning methods.

The concept for a probabilistic computer runs opposite to how computers are normally built and programmed, Sandia scientist Brad Aimone said. Instead of making one that is perfectly predictable, Sandia wants one with built-in randomness that computes information differently every time.

"To a large degree and at a great energy cost, we engineer computers to eliminate randomness. What we want to do in this project is to leverage randomness. Instead of fighting it, we want to use it," said Brad, who leads the project he and his team call COINFLIPS (short for CO-designed Improved Neural Foundations Leveraging Inherent Physics Stochasticity).

"What if, when I'm communicating with you, I flip a coin?" Brad said. "If heads, you act on my message; if tails, you ignore it. We want to discover how you can use randomness like this to solve problems where probability is important."

### **Concept modeled after unpredictable connections between brain cells**

Aimone is an expert in technology that mimics the brain, including machine learning. He got his idea for a probabilistic computer from how brain cells talk to each other.

Inside your brain there are billions of

cells called neurons that pass information across trillions of cell-to-cell connections called synapses. Whenever one neuron has a message, it sends a signal to lots of other neurons at the same time. But, only a random fraction on the receiving side carry on the message to more cells. Neuroscientists don't agree why, but Brad thinks it could be a reason why brains do some tasks better than computers, such as learning and adapting, or why they use less energy.

To imitate this brain behavior, scientists need to figure out how to generate trillions of random numbers at a time. That much randomness is too complex and takes too much power for computers, said Sandia's Shashank Misra, who leads the COINFLIPS hardware team.

"We will need to get creative with new approaches, including new materials, atomic-scale control and machine learning-driven designs to generate the sheer volume of randomness needed and to make it useful for computation," Shashank said.

COINFLIPS will also identify tasks that benefit from randomness.

Probabilistic computers are part of a larger effort at Sandia to explore what computers in the future might look like. Researchers around the world have recognized that the rate at which computers are improving is slowing down, Brad said. To break past the apparent limits of computers, scientists are looking at new, original ways of designing them.

Conrad James, the Sandia manager of the COINFLIPS team said, "Several of us at Sandia have been exploring brain-inspired computing and new design approaches for years. Encouraging more communication between mathematicians, algorithm developers and device physicists led to the formation of this team and research proposal."

### **Sandia adds to other efforts to rethink computers**

COINFLIPS was one of only 10 proposals selected nationwide to receive funding

to design new, energy-efficient microelectronics. Separately, Sandia is lending its expertise in nanotechnology and computer modeling to another selected project led by Lawrence Berkeley National Laboratory.

These researchers will be redesigning nanosized sensors used in communications, imaging, remote sensing and surveillance technologies to be more compact, efficient and integrated into a computer processor.


"The photon absorption, the transduction to an electrical event and the measurement will all be part of one quantum system," said Sandia physicist François Léonard, who is a member of the collaboration.

They will also attempt to enhance these sensors with advanced materials, such as carbon nanotubes, hollow carbon straws that are 100,000 times thinner than a strand of hair.

A third Sandia team consisting of researchers Alec Talin and Matt Marinella will be supporting another selected project that Oak Ridge National Laboratory is leading. Their research could help improve the energy efficiency of processing of information from sensors in autonomous vehicles, handheld devices and satellites.

Most of the time and energy that a computer chip needs are spent shuttling information between where it is stored and where it is processed, Alec said. But it might be possible to slash the power computers use by combining these two elements using brain-inspired devices developed at Sandia.

"The key idea is that in the brain, the memory and the logic (processing) are collocated in the same basic element, the neuron," Alec said.

Fast, energy-efficient systems could potentially process complex tasks, such as recognizing images and translating languages in real time, on portable devices like smartphones without needing the computing power of the cloud, Alec said. 



# Equipped for emergencies

*Sandia Labs breaks ground on state-of-the-art Emergency Operations Center*



**NEW DIGS** — Rendering of Sandia's new Emergency Operations Center, expected to be fully operational by spring 2023.

Graphic courtesy of Sandia Emergency Management

By **Luke Frank**

**S**hovels symbolically speared the ground Sept. 22 at the site of Sandia's new \$42.5 million Emergency Operations Center.

The 25,000-square-foot complex located on Kirtland Air Force Base is expected to be operational by spring 2023. The center will house NNSA and Sandia emergency management staff offices, the 24/7 Emergency Management Communications Center, dedicated incident management and coordination space and multipurpose training rooms, among other functions. Summit Construction of Albuquerque was awarded the construction project.

"The new Emergency Operations Center at Sandia is a testament to NNSA's commitment to modern and sustainable infrastructure across the nuclear security enterprise," said Dr. Daryl Hauck, manager of NNSA's



**THE SCOOP** — Dignitaries from Sandia, NNSA and Summit Construction move the first shovels of earth commencing the construction of Sandia's new Emergency Operations Center. Actual construction began at the site that afternoon. From left are David Stuhan, director of Sandia Environment, Safety and Health; Johnathon Huff, associate Labs director, National Security Programs; Patrick Thomas, president of Summit Construction Inc.; Amanda Tapia-Pittman, federal project director, NNSA Acquisition and Project Management; Dr. Daryl Hauck, manager of the NNSA Sandia Field Office; Dori Ellis, deputy Labs director and chief operations officer; and Harold Yeldell, associate Labs director of Infrastructure Operations.

Photo by Bret Latter



Sandia Field Office. “This state-of-the-art facility will allow Sandia to conduct its emergency preparedness and response capabilities in a secure and effective manner that is protective of their incredible workforce and our neighbors in the local community, and better aligned with the magnitude of the important work being done at the Labs.”

## Emergency Operations Center functions

Sandia’s Emergency Operations Center, activated during an emergency or crisis, is staffed around the clock by the Labs’ emergency management specialists. The new facility will include functional and efficient space, tools and capabilities for emergency response professionals to identify, collect, analyze and share incident information with emergency response organizations like Kirtland Fire Emergency Services, Sandia Medical Clinic or the University of New Mexico Hospital.

“The safety and well-being of our employees and surrounding communities have always been a top priority for Sandia Labs and the NNSA,” said David Stuhan, director of Environment, Safety and Health. “This cutting-edge facility integrates emergency communications, operations, planning, logistics and even emergency training and policy leadership in close proximity and improves our ability to share preparedness and response information instantly with Kirtland Air Force Base, the NNSA, the DOE, New Mexico Department of Homeland Security and Emergency Management, local government and tribal authorities or the public.”

Sandia’s emergency management organization will be located in the new Emergency Operations Center and oversee the building’s day-to-day operations. The Labs’ Emergency Management Communications Center will be staffed 24/7 and support emergency and nonemergency calls. The new facility will provide space for three dedicated 911 call stations, two dedicated nonemergency call stations and one dedicated Sandia duty officer station.

The new building will have redundant mechanical and electrical systems, a backup generator, showers, a kitchen with a pantry and dining area and temporary sleeping areas for resilience to operate independently for at least 70 hours.

## Distinguished groundbreaking guests

*Joining Sandia and NNSA leadership were four New Mexico Congressional dignitaries who offered their take on Sandia’s new Emergency Operations Center.*



**Jason Jarvis**, field representative, Office of Sen. Martin Heinrich, delivered comments from the senator.

“The new EOC will serve an essential role in maintaining the safety of Sandia’s workers and protecting the security of Sandia’s operations from all potential hazards. Once its construction is completed, a modern and fully equipped building will finally replace an outdated facility that is currently housed in the basement of a structure that was built in 1949.”



**Sofia Sanchez**, district director, Office of Rep. Melanie Stansbury

“Representative Stansbury visited the facility on base here last month. As someone who was a researcher herself and doing projects, she knows the importance of safety for our Sandians. And we are looking forward to coming back for the grand opening.”



**Barbara Romero**, northern district advisor, Office of Rep. Yvette Herrell delivered comments from the congresswoman.

“New Mexico stood at the first horizon of the nuclear age. Our great state still pushes boundaries in science, technology and our knowledge of the cosmos. Sandia National Labs continues this great tradition ensuring that America is energized, secure and ready for the future. I applaud Sandia National Labs for their investment in our community and for their dedication to the safety of our citizens.”



**Xochitl Campos Biggs**, district director, Office of Rep. Teresa Leger Fernandez

“I have had the pleasure of working with many emergency managers as a social worker in various capacities. I know that you are always preparing for an emergency that the rest of us are not thinking of. I know that some of your colleagues might even tease you when you go on trainings to make sure that you’re so prepared. Our office is very proud to support the work that you do keeping the workers here and our nation safe.”

## Improvements with new Emergency Operations Center

The new center will provide numerous improvements to support Sandia's emergency management organization and program, including response capabilities. Examples include:

- Larger and more flexible space.
- More area for a full emergency operations structure that aligns with the National Incident Management System.
- Accommodations for up to 102 center


staff (62 in the main area and 40 in an overflow area), compared to the 18-staff capacity of the current center.

- A series of video walls and monitors that gives responders a common look at operations throughout the center.
- Advanced training areas with modern technology.

## NNSA's construction pilot project

Sandia's new Emergency Operations Center is supported by NNSA's Enhanced

Minor Construction and Commercial Practices initiative and is the fourth of four original EMC2 initiative projects to start construction.

EMC2 presents an opportunity to acquire less complex non-nuclear facilities that follow commercial best practices within NNSA requirements. This approach streamlines acquisition and execution processes, which accelerate delivery and increase buying power for commercial-like construction. 

# Sandia Gives kicks off, supports nonprofits that promote financial planning and more

By **Tatiana Del Cid**

**O**ct. 4 marked the beginning of the **2021 Sandia Gives campaign**, which runs through Oct. 22. Each fall, Sandia partners with United Way to promote access to basic needs and success for their local communities. Sandians are invited to donate to United Way and designate their contributions for specific nonprofits and causes that are meaningful to them.

## A history of generosity

Last year, Sandians demonstrated overwhelming generosity during the annual campaign. The Labs' staff supported their local communities by raising a record \$4.845 million at the height of the COVID-19 pandemic. These donations impacted the lives of thousands of individuals and families in California, Carlsbad, Albuquerque and beyond.

After contributing \$208,907 through Sandia Gives in 2019, the Sandia/California workforce increased giving in 2020 by almost \$60,000, raising \$268,377 to support **United Way Bay Area** and other nonprofits and causes that serve local neighbors.

## Spotlight on SparkPoint

**SparkPoint**, a nonprofit dedicated to fighting poverty, benefitted from Sandian donations to United Way Bay Area. Located in community colleges and shelters, SparkPoint centers provide free services to low-income families to help them meet basic needs, increase income,

build credit, expand savings and reduce debt. Financial coaches work individually with community members to set goals, brainstorm strategies and set realistic action plans.

Shayenne, a Bay Area resident, has participated in the SparkPoint program. After she successfully completed a rehabilitation program, Shayenne was excited to find a new career by returning to school. However, she faced financial challenges in both meeting her nutritional needs and saving enough money to move from a transitional house to a permanent home.

Shayenne's community college directed her to its on-campus SparkPoint center. This center gave her access to a SparkPoint food pantry and a financial coach. The coach helped connect Shayenne to additional resources and develop a financial plan.

Today, Shayenne is thriving. She lives happily in her own apartment and is excited about what the future holds as she pursues a nursing degree.

Thanks to the generous support of Sandia employees, SparkPoint now operates more than 20 centers in community colleges and shelters. Students connected to SparkPoint centers have been found to be 11-38% more likely to stay enrolled in school and to continue enrollment the following semester.

The SparkPoint program is one of many services offered by United Way and its partner nonprofits to support community members in meeting their nutritional, housing and safety needs.



**MEET SHAYENNE** — Shayenne is now financially independent and on her way toward a nursing degree, thanks to the support of SparkPoint centers, which receive funding from Sandia Gives donations.


Photo courtesy of United Way Bay Area

## Sandia's long-standing partnership with United Way

United Way and its partner nonprofits rely on donations to serve local neighbors facing challenges from COVID-19, wildfires, financial hardship and more.

Flannery Mays, a corporate engagement officer at United Way Bay Area, has expressed gratitude for the ongoing support from Sandia. "No matter how large the problems of the world may be, there is no contribution too small; we all make a difference when we work together," she said.

Donating funds through Sandia Gives is an opportunity for Sandians to continue to show up for local communities. Together, Sandians can do great things.

Visit the **Sandia Gives website** to learn more about the campaign and how to support local nonprofits and community members in need through generous contributions. 



# National 2021 Diversity Team Award goes to Sandia

By **Luke Frank**

**S**andia recently was recognized for its contributions to its organization and communities as a 2021 Diversity Team Award winner by Profiles in Diversity Journal. Fifteen companies and 16 diversity teams are being celebrated this summer for their teamwork to advance the cause of diversity and inclusion.

The award recognizes talented team members who work together to support and advance diversity, inclusion and equity within their respective organizations. The award also celebrates the inclusivity that diverse individuals, working together as members of a team, represent.

“Sandia Labs’ eight-member diversity team works tirelessly to make inclusion and diversity an essential part of who we are,” said Esther Hernandez, chief diversity officer at the Labs. “They always exceed expectations with innovative initiatives while collaborating with key leaders and groups across the Labs to build an inclusive and diverse culture that attracts, retains and develops a thriving workforce. I couldn’t be prouder of our team.”

Sandia’s diversity team elevates inclusion and diversity with continual support of executive champions and division ambassadors, who help to advance the Labs’ inclusion and diversity efforts. The team further buttresses Sandia’s program by collaborating with employee resource groups that provide social and professional events and opportunities. The Labs’ inclusion and diversity team also develops and maintains diversity reference resources and hosts seminars, forums, dialogues, videos, training and more.

“We’re pleased and proud to congratulate this year’s Diversity Team Award winners,” said James Rector, publisher of Profiles in Diversity Journal. “By recognizing the contributions these teams make to their organizations and communities, we celebrate the




**ADVANCING DIVERSITY** — Sandia was recently honored by Profiles in Diversity Journal for “its teamwork to advance the cause of diversity and inclusion.”

**Photo by Randy Montoya**

inclusivity that diverse individuals working together as members of a team represent.

“Research shows that diverse teams are more innovative and produce superior results,” Rector added. “And, we believe that recognizing the achievements of these teams is an important next step in the growth and evolution of diversity, inclusion and equity in the workplace.”

Profiles in Diversity Journal has recognized thousands of people from around the world who are making a difference by advancing the cause of diversity and inclusion. With the introduction of its Diversity Team Award in 2020, it also recognizes the importance of diverse contributions by those who have joined to support and advance inclusivity. 

# WE

DO GREAT THINGS

# TOGETHER



» **OCTOBER 4 - 22** «

Sandians gave \$4.8 million in 2020 to help others.

Every dollar matters.  
Please contribute.

**give.sandia.gov**





## Solar library

CONTINUED FROM PAGE 1

Sandia's solar researchers and librarians have spent the past few years collecting, digitizing and cataloging a host of reports, memos, blueprints, photos and more on concentrating solar power, a kind of renewable energy produced by using large mirrors to reflect and concentrate sunlight onto a receiver on a tower to generate electricity. These historical research documents are now in a [publicly accessible digital archive](#) for other concentrating solar power researchers, historians, corporations and average citizens to view. Valuable metadata updates, including the addition of abstracts for each report, were completed by technical librarian Steve Jordan.

"We believe being able to share this information will make the technology in general more accessible and the path to commercialization faster," said Ken Armijo, a concentrating solar power researcher at Sandia and the project leader. "A lot of 'what if' questions can be answered if you look at what was documented back in the day. By having this information available, we're saving the U.S. taxpayers money because new researchers and companies won't need to reinvent the wheel."

In addition to the tens of thousands of Sandia reports, hand-drawn diagrams, videos and massive floppy disks, the team worked with collaborators in [Australia](#), [South Africa](#), [Germany](#), the [U.S. DOE](#) and others to include their one-of-a-kind concentrating solar power documents from the same time period, Ken said. The team hopes to expand the archive to include historical concentrating solar power documents from partners in other countries as well.

### 'On the shoulders of giants'

Successful research projects are shared widely within the research community in the form of peer-reviewed papers, presentations and reports so that other researchers can learn from the results. However, the results of unsuccessful projects are often shared quietly from one person to another, Ken said. This knowledge can be lost when a researcher retires and can lead to new researchers repeating the mistakes of the past out of ignorance.

"As we were looking through these paper-based documents, we found that there were 20,000 to 50,000 documents that had never been digitized, and if one day there was a big flood or a fire, all of that information would be gone," Ken said. "Over the years Sandia has been involved in a lot of significant, impactful, even seminal research in concentrating solar power. The idea was to digitize and organize all of this invaluable material into an archive available to everyone so that researchers could learn what had been done — what were the successes and failures of the early research so that we don't risk making those same mistakes again."

Some of these seminal projects include [Solar One](#), a 1981 Sandia-led project with Rocketdyne, now Aerojet Rocketdyne, to deliver 10 megawatts of electricity to Barstow, California. The concentrating solar power tower operated from 1982 to 1986. In 1995, Sandia and Rocketdyne upgraded the tower to [Solar Two](#), using a new high-temperature molten-salt receiver capable of storing heat to convert into electricity after the sun went down. Solar Two operated from 1996 to 1999. Earlier this year, Sandia received a \$25 million award from DOE to build a [third-generation, particle-based](#) concentrating solar power plant with even more storage capacity. Documents from the archive could inform this third-generation plant.

In addition to these significant renewable energy research projects, Sandia's solar

tower has been used in research for NASA, defense testing and assisted with solar energy commercialization.

### From 'Down Under' to the worldwide web

Of course, Sandia is not the only research institution that has been studying concentrating solar power for decades. In fact, the [Australian National University's](#) concentrating solar power project in [White Cliffs, Australia](#) predates Solar One.

The focus of the ANU researchers from the 1970s onward was on solar dish technology for concentrating sunlight, said [Joe Coventry](#), a concentrating solar power engineer with ANU and the [Australian Solar Thermal Research Institute](#).

White Cliffs is a tiny, remote town about 12 hours northeast of Sydney that was completely off the electrical grid when the concentrating solar power project started, Coventry added. The White Cliffs concentrating solar power plant operated autonomously from 1983 to 1994, when the town was connected to the national grid. After the White Cliffs project, ANU researchers focused on much larger solar dish prototypes and ammonia-based energy storage systems for several decades. Several of ANU's early projects were collaborations with Sandia.

Coventry will mail about a half-dozen boxes of physical documents from these early projects to Ken and his team to digitize and add to the archive.



**FIRST LIGHT** — In 1978, Sandia began concentrating solar power research at the newly constructed National Solar Thermal Test Facility. Historical photos, like this one, are part of the global archive of concentrating solar power documents. **Photo from the Lab News archives**



“We have a set of beautifully hand-drawn diagrams of some of the early dish designs and the designs for the world’s first demonstration solar plant station in White Cliffs,” Coventry said. “For some of these pioneering designs, there’s only one copy of the drawing in the world. To have the opportunity for those to be digitized and available for people to look at online, is quite exceptional.”

He also included strategy and vision documents — the most interesting finds, in his opinion — project proposals and other reports across the ocean to be digitized.

“The world is moving to decarbonize, and concentrating solar power has a really important role in providing low-cost energy storage and to decarbonize energy-intensive industrial processes,” Coventry said. “Seeing how it all started out is really quite interesting, and Australia had its part, but it’s really hard to track the history on innovation if the documents aren’t accessible online.”

In addition to access from the primary digital archive, the digitized concentrating solar power documents can also be accessed by DOE’s [Office of Scientific and Technical Information](#) library, or OSTI, and Sandia’s SAND report library, Ken said.

Between the stacks in the library

All of this would not have been possible without the work of a team of technical librarians.

Shannon O’Grady, one of these technical librarians, constructed the user interface

and the database for the concentrating solar power archive. Annette Chavez, another member of the library team uploaded all the digitized documents onto Sandia’s servers.

Technical librarian Alice Parsons has been working on the external documents from DOE and international partners to make sure that the documents’ metadata is compatible with the archive and Sandia’s library catalog. Sandra Pacheco, the library’s authority on Sandia reports, did the same thing with the metadata for Sandia documents and made sure that they were accessible through the DOE library.

“Making these mostly forgotten documents accessible to colleagues and collaborators globally is really exciting,” said Alice. “There are so many golden nuggets of information in these old documents that could prove invaluable to current researchers. Hopefully the archive will encourage collaboration and reduce the likelihood of research being inadvertently repeated.”

One of these golden nuggets, in Ken’s opinion, were documents on molten sodium research from 1981.


“My research is in molten sodium and heat transfer liquids, so it was very exciting to find sodium concentrating solar research done the year I was born,” Ken said. “And I’m designing the same kind of thing right now. It was like looking into someone’s mind from 40 years ago. I was able to read those documents and use the information they learned back then right

away to make progress on my research.” These documents can provide a lot of value to the research and commercialization communities. Alice said that she would be thrilled if the archive helps concentrating solar power become a commercial success faster than it would have otherwise.

“This is a really unique project and will serve as a blueprint for other technical archive-like projects,” Alice said. “Think about those irreplaceable, historical, technical documents that define your project, documents that might benefit future researchers if they were discoverable and accessible. If you have any, give the library a call. We would be happy to look at your collection and discuss the possibility of a project-specific archive or other means of maintaining your documents.”

Next, Ken will work to digitize one-of-a-kind video reels of concentrating solar power research. He also hopes to expand the archive to include one-of-a-kind historical documents for other areas of renewable energy research.

“I feel that there’s not one silver bullet in renewable energy,” Ken said. “Concentrating solar power is just one technology of many, such as wind, photovoltaic, geothermal, hydropower. I’m hoping that as this archive takes off, we’re able to add more and more information, not just reports but videos, engineering drawings and more.”

This archive project is funded by the DOE [Solar Energy Technologies Office](#) and was started by Chuck Andracka, a retired Sandia engineer. 

Retiree Deaths			
April 1-July 28, 2021			
Robert Martin (age 80)	April 1	Arthur Henniges (74)	April 20
Paul Jesse (89)	April 3	D. Eva Chavez (91)	April 22
Henry Hanser (85)	April 3	Richard Wayne (82)	April 22
Albert Harrison (88)	April 4	John Linebarger (89)	April 27
Bonita Braasch (80)	April 7	John Weydert (97)	April 30
Eugenio Rios (98)	April 8	Dale Allan Young (92)	May 2
Sam Jajola (78)	April 12	Donald Wilcoxon (77)	May 3
Robert Wemple (80)	April 12	Silviano Chacon (94)	May 5
Christian Hartwigsen (79)	April 14	Frederick Sexton (70)	May 7
Jimmy Shorty (84)	April 17	Patricia Breiling (88)	May 8
Robert Lange (67)	April 18	Franz Lauffer (76)	May 9
Joe Ray Duran (96)	April 18	Roberto Gutierrez (83)	May 14
Ann Riley (80)	April 19	Higinia Gore (92)	May 14
		Robert Silva (85)	May 15
		Ralph Fox (95)	May 18
		James Rea (80)	May 18
		Thomas Schara (68)	May 22
		Joseph Magruder (89)	May 27
		Samuel Giron (75)	May 27
		Arthur Payne (73)	May 27
		Tonimarie Dudley (71)	May 29
		Christine Erwin (62)	June 1
		Kenneth Reil (73)	June 12
		Samuel Bensonhaver (70)	June 16
		William Brooks (92)	June 17
		Robert Dawirs (94)	June 18
		Alfred Watts (77)	June 19
		Bruce Higgins (89)	June 20
		Lonnie Trujillo (61)	June 20
		Jack Bartberger (74)	June 28
		Norman Breazeal (87)	July 1
		Gerald Cessac (79)	July
		Leslie Shope (93)	July 7
		Richard Damerow (84)	July 7
		Carolyn Groves (75)	July 10
		Robert Leslie (97)	July 10
		James Provo (85)	July 12
		Florindo Salas (79)	July 20
		Kenneth Tschritter (82)	July 25
		Archie Farnsworth (80)	July 28

# Sandia to offer new healthcare plan option during Open Enrollment

By **Shelley Kleinschmidt**

**W**hen Sandians review their benefit offerings during Open Enrollment next month, they will see big changes for 2022, including a new healthcare plan choice.

This year, all Sandians need to confirm their benefit choices during Open Enrollment, which runs Oct. 25 to Nov. 12. Because of the new option for healthcare, all staff should make a deliberate choice in what programs they want for next year.

Most of the changes are in response to employee input gathered during the August 2020 benefits preference survey, said Mary Romero Hart, senior manager for benefits.

“Employees will see several positive changes to Sandia’s already robust set of benefits options,” Mary said. “More than ever, this year we’re encouraging everyone to actively examine their benefits options now and throughout Open Enrollment, and to select what’s best for themselves and their families.”

In the survey, employees asked for more healthcare plan choices, so the Labs is offering a new medical plan option.

The Health Savings Plan premiums will cost about 25% less for most employees. Employees who choose the Health Savings Plan will contribute to the health savings account, and Sandia will contribute as well. The account is earmarked for healthcare expenses — both current and future, even after retirement. Sandians can contribute tax-free to the account, and for every dollar saved in the HSA, Sandia will match two-thirds of a dollar, up to a maximum amount. The plan offers other ways to earn additional contributions from Sandia. More information about the new plan is available at [hr.sandia.gov](https://hr.sandia.gov).

“The Health Savings Plan is about paying less for healthcare coverage and saving more for the future,” Mary said. “It offers three things Sandians told us

they wanted from a medical plan: more choice, smaller paycheck deductions and a new way to save for future healthcare expenses.”

The new Health Savings Plan has some of the same features as the traditional Sandia Total Health, now renamed the Total Health PPO Plan. These include coverage for the same healthcare services: doctor and hospital visits, prescriptions, and no-cost preventive care; choice of the same tiered Blue Cross and Blue Shield of New Mexico and UnitedHealthcare plans, with the same tiered networks of doctors and providers; and the same coinsurance rates for medical services.

The new plan is different in that it includes full-cost charges for non-preventive medical and prescription drugs and some personal healthcare services at the on-site Employee Health Services clinics, up to deductible limits of \$1,400 for employee coverage and \$2,800 for employee plus dependent coverage, for in-network services. Once new plan enrollees reach those deductibles, the plan begins to share costs.

The annual out-of-pocket limit combines medical and prescription costs and will also be lower than the Total Health out-of-pocket limits combined.


Details will be offered in the annual Open Enrollment

## Open Enrollment for retirees is coming soon.

Retirees, watch for more information in the Oct. 22 Lab News and in the mail.

*PreMedicare Open Enrollment:*  
Oct. 15 - Nov. 12, 2021

*Medicare Open Enrollment:*  
Oct. 15 - Dec. 7, 2021

newsletter in the Oct. 22 edition of Lab News. Also available will be an interactive decision support tool, virtual information sessions and detailed on-demand information. Employees will receive two benefit mailers sent to their homes and informational emails from Human Resources and Corestream, Sandia’s partner in delivering the Sandia Extras discounts program. 

MISSION  
FORWARD

This is  
why I got  
vaccinated.



They're safe. They keep you safe. They keep others safe.

[coronavirus.sandia.gov](https://coronavirus.sandia.gov)



## Mileposts



Larry Shapnek

40



Robert Abbott

20



Ricardo Urioste

20



Whitney Faust

15

## Recent Retirees



Linda Gonzales

42



Cynthia Blain

31



Kathleen Alam

30



Komandoor Achyuthan

16

## HOT Shot

CONTINUED FROM PAGE 1

Sandia had been anticipating the HOT Shot upgrade since the inception of the program in 2017 and began implementing it in October 2020, Kelsey said. Sandia manages HOT Shot and conducts each launch for the NNSA.

“Vehicle recovery is something that we wanted to do for a long time,” Kelsey said. “NASA has an outstanding capability, so we partnered with them for this launch.”

Recovery will now be an option for future launches, dependent on the needs of experiments and launch site capabilities, Kelsey said.

The latest launch marks HOT Shot’s fourth mission. It has conducted dozens of non-nuclear scientific experiments that evaluate prototypes and help develop high-fidelity computer models and mechanical flight simulators.

The sounding rocket is a two-stage Terrier-Improved Malemute booster stack. It stands about 35 feet tall and is 18 inches wide at the base, Kelsey said.

### Retrievability enables greater scientific sophistication

Sandia aerospace engineer Katya Casper is taking advantage of the upgrade. Thanks to the increased memory capacity, her team was able to equip the rocket with 144 sensors to detect temperature, air pressure, vibration and mechanical stress. The information she gathers helps her study in minute detail how air flows over fast-moving vehicles so she can improve the accuracy of Sandia computer models used to make preflight predictions.

She said she expects to get back several gigabytes of data from her sensors, some of which take 2.5 million measurements per second.

“Recovering onboard data is key to this experiment,” Katya said. “If we were limited to only telemetered (wirelessly transmitted) data, we would have to limit the number of sensors and the data rates we could acquire.” The result would be a fraction of the data Sandia needs to build a complete model.



**HOT SHOT** — The launch is HOT Shot’s fourth mission, but the rocket has evolved to collect scientific data that benefits aerospace research.

Photo by Lee Wingfield,  
NASA Wallops Flight Facility

Retrieving hardware also lets researchers diagnose issues that onboard recording devices might miss. In conjunction with Sandia, Kansas City National Security Campus is using HOT Shot to refine manufacturing technologies for defense programs.

Researchers printed electrical circuits onto objects inside the rocket in lieu of cables using additive manufacturing. Data taken during flight will show if the printed circuit traces and associated connectors survived the flight and provided continuous power and communication signals. But recovering the rocket allows the team to conduct postflight electrical testing and visual inspection that could be critical to identifying undetected damage.

“The additional level of assessment is invaluable in diagnosing anomalies discovered during flight and understanding failure modes,” said Kevin Clark, a Kansas City site systems engineer. [i](#)

**CLICK HERE**

TO WATCH THE VIDEO OF THE LAUNCH.

# Modern LAMP facility is latest building project for California campus



**TURNING SHOVELS** — From left, Sandia Field Office Officer Thomas McCall, Director Marcey Hoover, Director Pam McKeever, Associate Labs Director Andy McIlroy, Overaa Construction project managers Scott Thompson and Carl Overaa, and Sandia Field Officer Phillip Duarte helped break ground on the new Limited Area Multi-Program building on Aug. 11.

Photo by Dino Vournas

By **Trina West**

**O**n a warm summer morning in a vacant lot on Sandia's California campus, Labs leadership joined Facilities staff, Protocol personnel and commercial contractors to attend the groundbreaking ceremony for the California site's latest construction project: the Limited Area Multi-Program Security Office Facility Building.

At the Aug. 11 event, Associate Labs Director Andy McIlroy talked about how important the project is for the California site.

"We have a huge surge of work at Sandia/California for our national security mission," he said. "The increased limited-area office space that will be available once LAMP is built will touch all programs."

The Limited Area Multi-Program project is part of a multiyear integrated effort to study California site space and manage site population. Construction of the

26,800-square-foot office space has started and is scheduled to be completed in early 2023.

The north portion of the lot is transforming into a two-story office building with four separate suites and flexible, collaborative office layouts to accommodate up to 110 people. The building emphasizes modern security features, including vault-type rooms and videoconference capabilities. Occupancy of the building is expected to take place in March 2023.

"This project is part of a larger plan to modernize infrastructure," said Pam McKeever, director of California site



**CALIFORNIA CAMPUS GROWTH** — An artist's rendering shows the concept for the Limited Area Multi-Program building, due to open in spring 2023.

operations.

An investment in modern space for the site's future, the new office building will provide limited-area space to accommodate growth in broad-based classified work at Sandia/California. 



# District Attorney presents update on metro crime

## *Speaker series addresses vital local issues*

By **Stephanie Holinka**

**E**xecutive director and chief information officer John Zepper hosted the third visit of Bernalillo County District Attorney Raúl Torrez, who returned after a two-year hiatus. Torrez updated a mostly virtual Sandia audience of over 1,200 staff on the improvements and ongoing challenges facing law enforcement and prosecutors in the Albuquerque metro area. The presentation is part of the ongoing **Community Engagement Speaker Series**.

Torrez opened by noting how photos of him displayed in the auditorium tracked the progression of gray in his hair, which he attributed to his years as district attorney in the Albuquerque area. In his presentation, Torrez discussed his efforts to incorporate data analytics techniques and practices in law enforcement investigations to better anticipate violent crime before it occurs.

Torrez said his approach focuses on repeat offenders who largely drive crime in the metro area.

“There’s a tiny percentage of very violent, very dangerous individuals who commit an overwhelming share of crime.” Torrez said traditional law enforcement methods are less effective on this population, and his use of analytics and tactics like the use of social media tracking is intended to address this population.

Torrez showed examples of social media posts from people charged with violent crimes who use social media to buy and sell illegal items and post about their activities online. He said they are able to do this because law enforcement uses old-school methods to fight crime.

“They are using technology in ways that most law enforcement hasn’t caught up with yet,” Torrez said.



**CRIME UPDATE** — Bernalillo County District Attorney Raúl Torrez visited Sandia to present an update on crime rates and law enforcement strategies on July 20. His presentation is part of the ongoing **Community Engagement Speaker Series**.  
**Photo by Lonnie Anderson**

In his update of crime statistics since 2019, Torrez noted increases in property crime rates in Albuquerque and nationally. Despite this, the auto theft rate has decreased. Torrez said Albuquerque has dropped from number one to number two in the nation in auto thefts, reflecting a significant reduction, but the rate is still high.

Due to time constraints, Torrez was not able to share all the information he planned, so he recorded a supplemental presentation for Sandia staff. In his

second presentation, he discussed the efforts of Sandia volunteers, the use of social media and genealogical data in reducing crime rates. He also answered questions that he received during the initial presentation.

Staff can watch the **July 20 presentation** and **supplemental video** online. Employees interested in **volunteering** in the crime data analysis and victims advocate programs can contact Roberta Rivera at [rjriver@sandia.gov](mailto:rjriver@sandia.gov).

# Drew Kouri awarded DOE Early Career Research Program grant

*Controlling uncertainty when optimizing supercomputer simulations*

By **Neal Singer**

**W**orking to solve a problem, supercomputing researchers may encounter incomplete data or flawed programs. For both issues, Sandia researcher Drew Kouri has attracted interest from the broad computing community for his ability to mitigate uncertainty in both supercomputer programs and data, optimizing each to reach the best solutions.

His research was awarded a best-paper designation for 2019 in the journal **Optimization Letters** and now has earned him a DOE Early Career Research Program grant, titled “Adaptive and Fault-Tolerant Algorithms for Data-Driven Optimization, Design, and Learning.”

The DOE grant, for Advanced Scientific Computing Research, provides about \$500,000 per year for five years and is expected to cover Drew’s salary and research expenses, including the salaries of postdoctoral assistants.

“Maintaining our nation’s brain trust of world-class scientists and researchers is one of DOE’s top priorities, and that means we need to give them the resources they need to succeed early on in their careers,” Secretary of Energy Jennifer M. Granholm said. The grant is one of 83 distributed this year by the 12-year-old program.

Drew’s optimization algorithms solve complex problems in technical fields that may involve uncertain responses from sub-components. Among those of interest to him are interactions between ice sheets and sea ice in climate models, and between fuel pellets and protective cladding in light-water nuclear reactors. Other applications for Drew’s optimization algorithms are radio frequency cavity designs for particle accelerators, energy network resource allocation, parameter estimation in seismology and the training of machine-learning models.

His methods involve novel online modeling approaches that he expects to ensure rapid convergence to an optimal solution.



**EARLY EXPLORER** — Sandia researcher Drew Kouri has been awarded a DOE Early Career Research Program Grant.

Photo by Kim Jackson

Already the joint author of more than 20 papers on the theme of developing algorithms for risk minimization, Drew earned his doctorate in 2012 from Rice University in Houston, Texas, in computational and applied mathematics. (His dissertation title, which seems a signpost for Drew’s later work, is “An Approach for the Adaptive Solution of Optimization Problems Governed by Partial Differential Equations with Uncertain Coefficients.”)

He served as the J. H. Wilkinson Fellow at **Argonne National Laboratory** before coming to Sandia in 2013, where he became a lead developer of the Rapid Optimization Library, an optimization software package.

## Resilient algorithms to optimize extreme-scale simulations

Among the challenges that draw Drew’s interest are uncertainties about how next-generation computing platforms will perform, as well as uncertainties associated with the operating and environmental conditions for the system being modelled.

“I am developing optimization algorithms to produce solutions that are resilient to faults and errors induced by three factors: next-generation supercomputing

He overcomes the performance degradation common to conventional algorithms as problem sizes increase by using the technique of randomized sketching, which uses randomized projections to reduce the dimensionality of the data.

## Promising background

hardware, physical data insufficiencies and uncertainties in the model,” he said. “While it may not always be possible to ‘reduce uncertainty,’ still, one must make a decision that accounts for the uncertainty.”

His algorithms, which handle uncertainties by mathematically quantifying their effects, are a way for supercomputer programmers to work around mistakes caused by error-prone hardware or software “without throwing an entire day’s work away,” he suggests.

Since uncertainties may grow as researchers at the national laboratories and other supercomputing locations upgrade their computers from petascale (a million billion operations per second) to exascale (a billion billion operations per second), Drew notes that the increased speed and data flow of the incoming machines may magnify omissions and other errors.


“My work,” he said, “aims to help engineers formulate and efficiently solve optimization problems that account for these uncertainties.”

## AI and machine learning relationships

He sees a relation between his work, artificial intelligence and machine learning, all of which use optimization techniques to reach their solutions.

“Machine learning and AI problems are typically posed as optimization problems,” he said, “and the algorithms that I develop could be applied to solve them.” The difference lies in how the problems are modelled.

“Machine learning and artificial intelligence models are often not motivated by physics. For the problems that I consider, the models typically come from physical laws,” he said.

According to the Early Career grant description of Drew’s intent, his “work will permit inexpensive approximations during early iterations (and)... employ randomized compression of individual components to lessen the memory burden and to safeguard against hardware faults and failures.” 



# Popular YouTube show features Sandia energy science

By **Paul Rhien**

**W**ith nearly 150 million views on her popular YouTube channel since 2011, Dianna Cowern has been bringing science to life through experiments, demonstrations and other compelling discoveries. This summer, Cowern, known to many as “Physics Girl,” took her show on the road, taking an 1,800-mile road trip with her production crew in a hydrogen fuel cell car as part of a series she was creating on what it will take to create a renewable, zero-emission future.

In her [video on energy storage](#), the MIT physics grad turned STEM educator talked to scientists, researchers and engineers working to develop innovative ways of addressing the intermittency of wind and solar energy.

Cowern turned to Sandia scientists Chris San Marchi and Anna Snider Lord to help her break down the current and emerging science of producing hydrogen by renewable methods.


“Hydrogen really is a very flexible energy storage media and conveyance media,” Chris said. “So it can be really a central theme in our future energy portfolio.”

In the [final video in the renewable energy series](#), Cowern visited with Cliff Ho to help unpack how concentrating solar power works and the future impacts of the technology.

“It doesn’t convert sunlight directly to electricity like photovoltaics does,” Cliff explained. “It uses lots of mirrors to generate heat by concentrating the sunlight, focusing it on materials to heat it up.”

Sandia’s renewable energy research programs support the resilience and security of our nation’s energy systems through fundamental and applied R&D and physical and computational research.

Learn more about the Labs’

[Concentrating Solar Power program](#) and other [renewable energy research](#) at Sandia. 



**PHYSICS GIRL** — YouTube creator Dianna Cowern turned to Sandia researchers to help her break down current and emerging energy science in a recent video series on her popular “Physics Girl” YouTube channel.

Photo courtesy of Dianna Cowern



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This is  
why I got  
vaccinated.

They're safe. They keep you safe. They keep others safe. [coronavirus.sandia.gov](https://coronavirus.sandia.gov)