



Advanced materials in a snap

Research shows machine learning could lop a year off technology design cycle

By **Troy Rummler**

If everything moved 40,000 times faster, you could eat a fresh tomato three minutes after planting a seed. You could fly from New York to L.A. in half a second. And you'd have waited in line at airport security for that flight for 30 milliseconds.

Thanks to machine learning, designing materials for new, advanced technologies could accelerate that much.

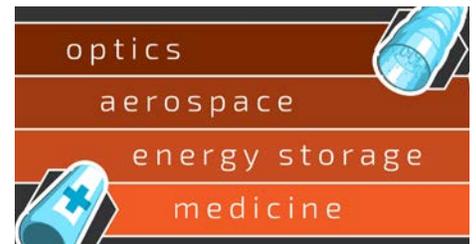
A Sandia research team has successfully used machine learning — computer algorithms that improve themselves by learning patterns in data — to complete cumbersome materials science calculations more than 40,000 times faster than normal.

Their results, published Jan. 4 in *Nature Partner Journals Computational Materials*, could herald a dramatic acceleration in the

creation of new technologies for optics, aerospace, energy storage and potentially medicine while simultaneously saving laboratories money on computing costs.

"We're shortening the design cycle," said David Montes de Oca Zapiain, a computational materials scientist who helped lead the research. "The design of components grossly outpaces the design of the materials you need to build them. We want to change that. Once you design a component, we'd like to be able to design a compatible material for that component without needing to wait for years, as it happens with the current process."

The research, funded by DOE's Basic Energy Sciences, was conducted at the Center for Integrated Nanotechnologies, a DOE user research facility jointly operated by Sandia and Los Alamos national labs.



Machine learning speeds up computationally expensive simulations

The researchers used machine learning to accelerate a computer simulation that predicts how changing a design or fabrication process, such as tweaking the amounts of metals in an alloy, will affect a material. A project might require thousands of simulations, which can take weeks, months or even years to run.

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NEW DEPUTY — Sandia Deputy Labs Director Laura McGill.

Photo courtesy of Sandia National Laboratories

Sandia names new leader of nuclear deterrence program

Deputy labs director part of reorganization for continued excellence

By **Michael J. Baker**

Sandia has named a new deputy labs director to lead its nuclear deterrence programs as part of a reorganization that supports the Labs' continued excellence in assuring the safety, security and reliability of the nation's nuclear arsenal.

Laura McGill, who joined Sandia after more than 30 years in the defense industry,

began her roles as deputy laboratories director and chief technology officer for nuclear deterrence on Jan. 4. She recently retired from Raytheon Missiles and Defense as deputy vice president of engineering.

"I'm honored to join Sandia Labs and the tradition of serving the national security mission," Laura said. "I look forward to leading such a diverse and extensive team of incredibly talented people, learning from them, providing guidance and working together to deliver required capability and performance."

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LAB NEWS Notes

EDITOR'S NOTE: Welcome to the first all-digital *Lab News*. We've stopped printing the paper, but will continue to publish every two weeks. We want you remain in our community of readers, so please send your comments and suggestions for stories or for improving the paper. *Lab News* welcomes guest columnists who wish to tell their own "Sandia story" or offer their observations on life at the Labs or on science and technology in the news. If you have a column (500-800 words) or an idea to submit, contact *Lab News* editor Jim Danneskiold at jjdanne@sandia.gov.

Prestigious IAEA Curie award goes to Sandia intern

Lauren Crabtree accepts inaugural education award

By **Whitney Lacy**

The International Atomic Energy Agency selected Lauren Crabtree for its inaugural Marie Sklodowska-Curie Fellowship Program to recognize her studies in nuclear engineering.

Lauren, a year-round intern in International Safeguards and Engagements, is pursuing her master's and doctorate in nuclear engineering at the University of New Mexico. She expects to earn her master's in the spring.

"It's such a great honor to receive this award and to be recognized at Sandia," she said.

To qualify for the fellowship, Lauren graduated summa cum laude with a bachelor's in nuclear engineering from UNM, and worked as an intern at Los Alamos National Laboratory and Sandia. She has



LAUREN CRABTREE — Winner of the IAEA Marie Sklodowska-Curie Fellowship.

Photo by **Lonnie Anderson**

held numerous leadership positions in UNM's American Nuclear Society Student Chapter and co-founded a student organization called "oSTEM," which seeks to foster orientation equality and professional

development in STEM students.

The IAEA program supports young women studying in nuclear science fields

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Susan Seestrom: advancing science and engineering

Sandia physicist selected fellow of American Association for the Advancement of Science

by **Neal Singer**

Susan Seestrom, associate laboratories director for advanced science and technology and Sandia chief research officer, has been named a fellow of the American Association for the Advancement of Science.

The physicist was cited “for her path-breaking work in nuclear physics, especially using ultracold neutrons, and her leadership, both in her [physics] community and at national laboratories.”

She is only the fourth presently active Sandia scientist to be elected by her peers.

The honor is awarded, according to a letter from the society, because of “scientifically or socially distinguished efforts to advance science or its applications,” and the “expectation that recipients maintain the highest standards of professional ethics and scientific integrity.”

Her most important contributions, Susan believes, have been made in program strategy development and in helping the research teams she works on to function more effectively.

Making things work

Of international interest was her research into ultracold neutrons, important to basic science.

“We were able to create the world’s most intense source of ultracold neutrons using frozen deuterium,” she said. “A number of important experiments followed, concluding for me with a high-precision measurement of the neutron lifetime.” The lifetime research, initiated under Los Alamos National Laboratory’s Laboratory Directed Research and Development program, and later funded by DOE Office of Science and the National Science Foundation, was published in the journal *Science* in 2018.

But she describes her role not in terms of personal brilliance but as helping an important collaboration succeed.

“I brought some order,” Susan said. “I may not be the best in articulating theoretical concepts or developing new detectors, but I can see problems clearly and focus on organizing a team to reach a goal.”



FELLOW PHYSICIST — Sandia nuclear physicist and Associate Labs Director Susan Seestrom has been selected as a fellow of American Association for the Advancement of Science.

Photo by Lonnie Anderson

In the world of experiments, hardly anything works the first time, she said. “You have to have the perseverance to make things work. The biggest thing I did was keep our collaboration focused to use our time wisely in order to obtain a meaningful result. I also was able to perform one of the first of multiple analyses of our comprehensive neutron lifetime data sets.”

Her experience has led her “to often think that there are two kinds of people in physics — very deep or very broad. I think I am the latter, and that ability to be interested in many different things is well-aligned with management positions.”

Her appreciation of the value of strong organizational skills during a productive research career at Los Alamos led her to management when she applied for a deputy group leader job.

“I was lucky to get the job,” she said. “But I applied because I thought I could do

it better than most people I had observed doing these jobs.”

Future plans

Susan said she enjoys opportunities to make an impact on programs. She envisions enhanced agility for the important **Laboratory Directed Research and Development** office that she oversees, which maintains a program designed by Congress and the national labs to create and evaluate new technologies.

“We need to be able to move our research resources quickly, as we did to a problem like the COVID-19 global pandemic,” she said.

On a larger scale, her major program efforts include replacing the aging **Annular Core Research Reactor** radiation test facility and designing the next, more powerful version of Sandia’s **Z pulsed power machine**. Z is already the most powerful producer of X-rays on the planet, with missions that include investigating high-density

radiation frontiers for national defense and for basic science.

The starting point

Susan followed a non-typical path to executive leadership. She grew up the oldest of four children in central Minnesota, where her family ran an electrical contracting business. For financial reasons, she attended the University of Minnesota in Minneapolis. She always felt her family expected her to attend college, even though neither parent achieved a degree.

She loved her introductory physics courses, in which she received straight A's, and appreciated the structure provided in the physics study halls when student groups, led by graduate assistants, would work through the day's physics problems.

She married in her senior year of college and gave birth to her first child while in graduate school. While both events were considered social challenges decades ago, she made it through school. "I wondered myself if I'd be a disappointment," she said. "But, as it turned out, I could handle it."

Induction ceremony

The AAAS will hold a virtual Fellows Forum on Feb. 13, when new fellows will participate in an induction ceremony. They will receive an official certificate and a gold

and blue rosette pin (representing science and engineering, respectively) to commemorate their election.

The AAAS is the world's largest general scientific society and publisher of the journal *Science*, among other technical publications. AAAS was founded in 1848 and includes more than 250 affiliated societies

and academies of science, serving 10 million individuals. The nonprofit AAAS's mission, according to its blurb, is to "advance science and serve society" through initiatives in science policy, international programs, science education, public engagement and more. 



IAEA Curie award

CONTINUED FROM PAGE 2

relevant to the IAEA's mission to "advance the safe, secure and peaceful uses of nuclear science and technology such as nuclear engineering, nuclear physics and chemistry, nuclear medicine, isotopic techniques, radiation biology, nuclear safety, nuclear security and non-proliferation."

The program's long-term objective is to contribute to a new generation of women leaders in nuclear science fields, and to promote their participation in global scientific and technological development and potential contributions to a peaceful, prosperous and sustainable world.

"I am beyond thrilled for Lauren," said her mentor, Adam Williams of the Center for Global Security and Cooperation. "This

is a great opportunity for her, and likely the first of many such distinctions. We are very fortunate to have her at Sandia."

The program was launched by the IAEA in March 2020 and supports up to 100 female graduate students per year, to help close a gender gap in the nuclear field. The fellowship was named after two-time Nobel Prize winner Marie Curie, whose fundamental work in radioactivity helped harness the power of the atom. The IAEA is the world's center for cooperation in the nuclear field, but women generally make up only 30 percent of those in professional or leadership categories.

"I'd like to thank Adam Williams of Sandia and Cassiano de Oliveria of UNM for helping me with this fellowship," Lauren said. "I couldn't have done it without their support and recommendation."

Lauren, a New Mexico native, applied for the fellowship during her second year of graduate school at UNM. "I'm also enrolled in the new nuclear security program within the Nuclear Engineering department," she said.

The nuclear security program is a **partnership** between Sandia and UNM to create a novel approach to teaching nuclear security. Its goal is to create more robust opportunities for current and future nuclear engineering students at UNM.

After earning her doctorate, Lauren said, "I hope to then complete a postdoc position at Sandia or hopefully become full time if all goes well."

The fellowship will cover university tuition fees and living expenses for up to two years. Lauren also has the opportunity, if selected, to pursue a 12-month internship at the IAEA in Vienna related to her field of study. 

A season for giving



ONE FOR EVERYONE — Krissy Galbraith prepares coats in her home for distribution to meet the needs of those hit hardest by California wildfires.

Photo courtesy of Krissy Galbraith

By **Paul Rhien**

At a time when many are struggling with the economic impacts of the COVID-19 pandemic, Sandia has joined multiple community efforts to help less fortunate children enjoy the magic of the holidays. Volunteers from the Labs led efforts again this year to collect donated coats and toys for charitable campaigns at the California site.

California Toys for Tots

Adjusting their annual Toys for Tots campaign, the Emergency Management organization at the California site collected toy donations via Amazon wish-lists and on-site collection boxes.

California Labs employees and contractors donated more than 240 toys to the Marine Toys for Tots Program.

Dennis Baker, manager for Emergency Management, expressed appreciation to everyone who supported the drive.

“Sandia’s successful Toys for Tots campaign highlights the generosity of Sandians who, in spite of the COVID-19 pandemic, gave freely so every child in need can get a toy for Christmas,” Dennis said.

Instead of their traditional block party, campaign volunteers organized a drive-by toy donation event on December 10, so families could drop off donated toys and get their socially distanced photos taken with Santa Claus.

One Warm Coat

Many who have already been struggling to make ends meet also faced record wildfire devastation that spread across six California counties this summer. To help meet the growing need for coats this fall and winter, Sandia employees donated 138 new coats and 20 beanies to assist north bay communities hit hardest through the Sandia Gives campaign in partnership with **One Warm Coat**, a San Francisco-based nonprofit that provides warm coats to those in need. Sandia’s contributions to the coat drive were distributed by Redwood Gospel Mission in Santa Rosa, California, during its **Great Thanksgiving drive-thru** event on Nov. 25.

Krissy Galbraith, a creative designer at the California site, spearheaded the coat drive, pivoting to a virtual campaign, offering alternative ways to donate to One Warm Coat.

“If 2020 has taught us anything, it’s that you never know when you’re going to need help,” Krissy said. “I am so grateful for my colleagues at Sandia for continuing to open their hearts and provide warmth to those in need year after year.”

Holiday Spirit

For safety reasons, the Holiday Spirit campaign also called on the workforce to support their toy drive virtually this year. Through online donations, Sandians donated nearly 200 gifts that went directly to local charities. Donations were made to the Boys and Girls Clubs of Tracy, Marilyn Avenue Food Pantry in Livermore, and Lotus Bloom (Family Resource Center) in Alameda, who distributed the toys to families in need.

“These agencies we work with have many needy children they provide services to. They are very grateful for the gifts, especially this year,” said Karelyn Baker, who organizes the annual drive. “The pandemic has reduced the aid they usually receive from various sources, so they appreciate even more the people who came through for them.”

Learn more about additional opportunities for community giving [throughout the year](#). 



SANDIA GENEROSITY — Rachel Sowell, right, and her daughter Natalie drop off a gift for a child in need at the Marine Toys for Tots drive-by donation event on Dec. 10.



HO, HO, HOLIDAY GIVING — Amelia Weintraub, right, drops off a gift at the Toys for Tots drive-by donation event on Dec. 10 and hits the brakes on her candy apple sleigh for a photo with Santa Claus.

Photos by Kaela Angelo



SOCIALLY DISTANT SANTA — Kevin Manktelow, right, and his family get their photo taken with a socially distanced Santa at the Toys for Tots drive-by donation event on Dec. 10.

Faster algorithms

CONTINUED FROM PAGE 1

The team clocked a single, unaided simulation on a high-performance computing cluster with 128 processing cores (a typical home computer has two to six processing cores) at 12 minutes. With machine learning, the same simulation took 60 milliseconds using only 36 cores — equivalent to 42,000 times faster on equal computers. This means researchers can now learn in under 15 minutes what would normally take a year.

Sandia's new algorithm arrived at an answer that was 5 percent different from the standard simulation's result, a very accurate prediction for the team's purposes. Machine learning trades some accuracy for speed because it makes approximations to shortcut calculations.

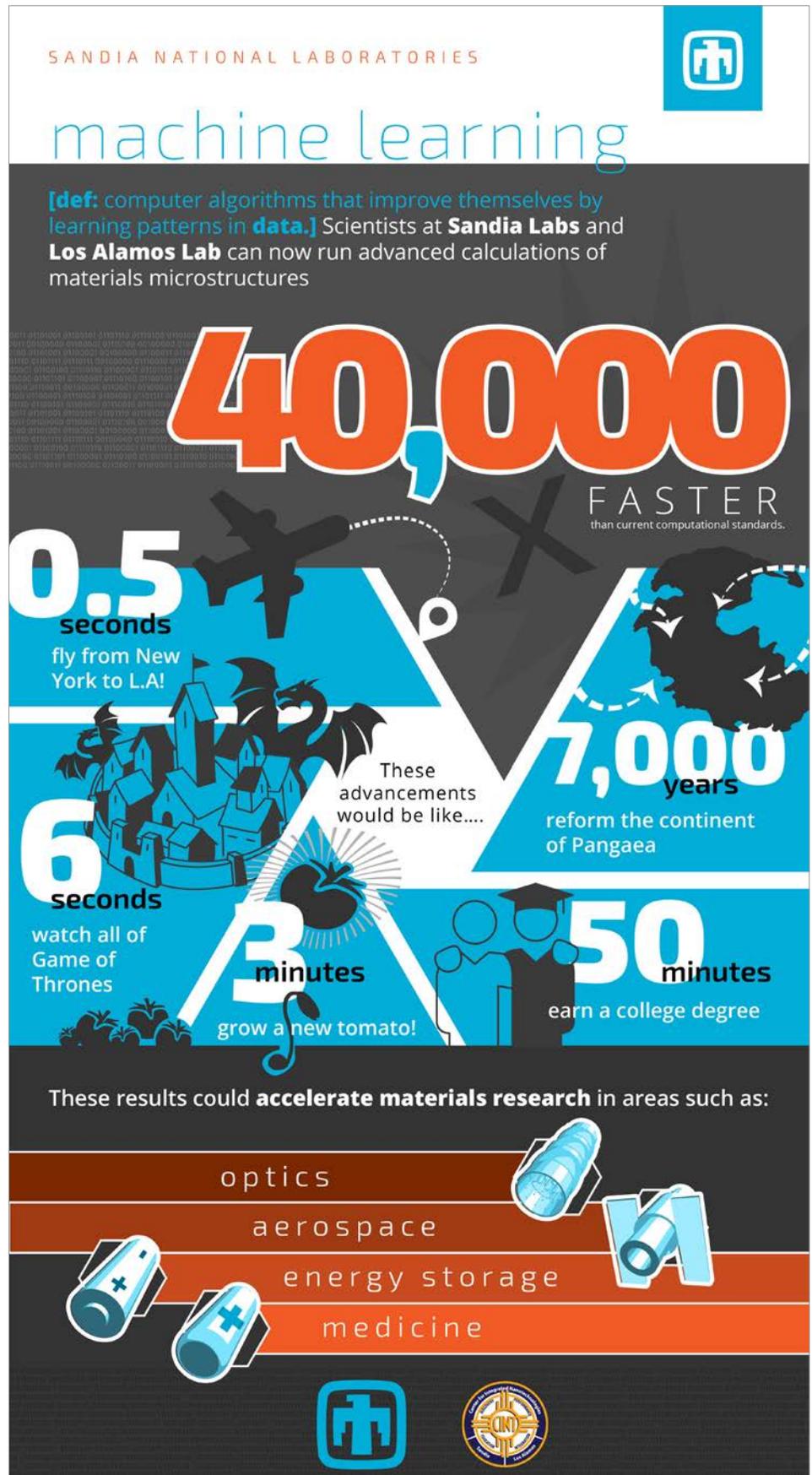
"Our machine-learning framework achieves essentially the same accuracy as the high-fidelity model but at a fraction of the computational cost," said Sandia materials scientist Rémi Dingreville, who also worked on the project.

Broader benefits

Rémi and David are going to use their algorithm first to research ultrathin optical technologies for next-generation monitors and screens. Their research, though, could prove widely useful because the simulation they accelerated describes a common event — the change, or evolution, of a material's microscopic building blocks over time.

Machine learning previously has been used to shortcut simulations that calculate how interactions between atoms and molecules change over time. The published results, however, demonstrate the first use of machine learning to accelerate simulations of materials at relatively large, microscopic scales, which the team expects will be of greater practical value to scientists and engineers.

For instance, scientists can now quickly simulate how minuscule droplets of melted metal will glob together when they cool and solidify, or conversely, how a mixture will separate into layers of its constituent parts when it melts. Many other natural phenomena, including the formation of proteins, follow similar patterns. And while the Sandia team has not tested the machine-learning algorithm on simulations of proteins, they are interested in exploring the possibility in the future. 



SUPER FAST — Sandia has developed a machine-learning algorithm capable of performing simulations for materials scientists nearly 40,000 times faster than normal. **Image by Eric Lundin**



SIGN OF THE HOLIDAY GIVING TIMES — Participants at the local charity Common Bond thank Sandia employees for helping with a donation of \$5,000, as part of the United Way Healthy Living, Healthy Giving campaign. **Photo courtesy of Common Bond**

Big gives

Sandia's employee and corporate giving campaigns shine during pandemic year

By **Stephanie Holinka**

In an extraordinary year that tore many at the Labs away from their extended family and work colleagues, Sandia employees came together to support charities and projects that contribute to resilience within its New Mexico and California communities.

Sandia employees contributed \$4.8 million to the annual Sandia Gives 2020 campaign, which benefits United Way of Central New Mexico, United Way of the

Bay Area and other nonprofits. The campaign achieved a recent record, increasing donations by \$324,000 over 2019.

“Sandia employees and retirees have supported vital needs in our communities for more than 60 years,” said Labs Director James Peery. “The challenges of 2020 brought that generosity to a new level. Throughout the year, Sandians answered every call to donate time, money, goods and services to those facing unforeseen hardships. The impact has been profound. I could not be prouder of our workforce.”

The New Mexico site’s annual Holiday Gift Drive, which went virtual this year, raised more than \$33,000 to ensure that every child in Bernalillo County foster care received a gift during the holidays. Sandia also contributed a corporate donation of \$12,500 to NM Kids Matter to support their Court Appointed Special Advocates program. The program advocates for children who have been abused or neglected and works with children in foster care to ensure their needs are met and their voices are heard.

“Sandia employees are generous with their money and with their time,” says

Community Involvement Manager Amy Tapia. “This year, they stepped up at a time when the need was greatest.”

Sandians in New Mexico and California also contributed to the Marine Toys for Tots Program at both locations. The Albuquerque drive donated about \$9,500, roughly half the total monetary donations from all sources in previous years. The California campaign raised garnered 240 toys.

Unprecedented need

In addition to its regular giving efforts, Sandia and its employees responded to calls for monetary and volunteer help to meet unique needs generated by the COVID-19 pandemic.

Sandia employees in New Mexico were challenged to raise \$15,000 in 15 days to support the drastic increase in food insecurity in the early months of the pandemic. Employees exceeded the challenge amount and donated more than \$75,000. An additional \$25,000 came from National Technology & Engineering Solutions of Sandia, the contractor that manages the Labs. In addition to raising \$100,000 for

the Roadrunner Food Bank, hundreds of employees volunteered to sort food, while following COVID safe practices.

In late April, a grassroots effort initiated by Sandia's workforce sparked a Labs-wide fundraising drive for hard-hit tribal communities in New Mexico, which accounted for disproportionate numbers of COVID-19 cases. The American Indian Outreach Committee (AIOC) and [Community Involvement](#) coordinated The Need is Now fundraising drive, which generated more than \$225,000 from 1,766 donors in just two weeks, plus a \$25,000 match from NTESS. In early May, the AIOC brought supplies and donations to Zuni Pueblo's Emergency Mobile Pantry, which supports elders and pueblo members most in need while under lockdown as the COVID-19 pandemic swept through McKinley County.

Employees also contributed more than \$20,000 to the California site's Together Apart campaign, which supported local efforts to provide critical resources to the Bay Area community during the pandemic. Sandia also contributed \$10,000 for a total

donation of \$30,000 to the United Way of the Bay Area and United Way of San Joaquin. In support of local efforts to provide food security in California, NTESS provided \$15,000 to the Alameda County Community Food Bank. Sandia volunteers and their families joined in and bagged 24 pounds of produce and more than 14,000 pounds of pasta.

Volunteer coordinator Katrina Wagner says that, despite the limited opportunities for in-person volunteering this year due to pandemic restrictions, every volunteer opportunity was fully subscribed quickly by eager volunteers ready to help.

Corporate donations

The generosity of Sandia employees was also supported by NTESS corporate contributions to emergency relief, food security and family stability, in addition to annual support of education and STEM activities. In 2020, NTESS contributed \$1.4 million on behalf of Sandia to local communities, including \$175,000 in the Livermore area.

Early in the Spring, Sandia was the first corporate partner to step up and donate

\$20,000 to the United Way of Central New Mexico's Emergency Response Fund, which supported nonprofits hurt by the pandemic. Funds went toward basic needs, economic development and recovery and family stability.

Sandia provided \$80,000 to United Way in emergency funds to help neighbors meet immediate needs, while continuing to support United Way's Educational Success and Family Stability initiatives.

Sandia also contributed \$120,000 to the United Way of Central New Mexico Corporate Cornerstone Program and Donor Group Sponsorship. Cornerstone Partners support the work of the United Way including Mission: Graduate and Mission: Families, the 2-1-1 helpline, Tax Help New Mexico and the Family Advocacy Center. Sandia also donates to individual community efforts that support domestic violence survivors, foster children, and those facing homelessness and food insecurity. [i](#)

[CLICK HERE](#)

TO LEARN MORE ABOUT SANDIA'S CORPORATE CONTRIBUTIONS SEE SANDIA'S ANNUAL GIVING REPORT.

Retiree Deaths

April 6-Nov. 2, 2020

Charles "Chris" L. Christensen (82)	April 6
Jerry Hunting (89)	June 2
Glen Fowler (79)	June 7
Edwin Beauchamp (90)	June 21
Dennis Adkins (83)	June 22
Edna Lee (93)	June 22
Barbara Holt (84)	June 29
Barry Schrader (79)	June 30
Victor Holmes (75)	July 2
William Lemmon (88)	July 4
Thomas Undieme (76)	July 5
Katherine Weston (95)	July 6
L. Sandra Borgrink (84)	July 7
Geraldine Wimmers (74)	July 7
D. Joy Ash (86)	July 13
Lawton Miller (86)	July 15

William Hobson (64)	July 17
Gary Swagerty (86)	July 17
N. Bourgeois (92)	July 18
Robert Mikkelsen (95)	July 18
Flaviano Saavedra (92)	July 21
Sandy Rhodes (64)	July 23
Sidney Gasser (97)	July 24
Betty Williams (92)	July 24
Jeremy Banks (49)	July 24
Billy Carlen (66)	July 24
Ann Shiver (89)	July 25
Jack Houston (87)	July 26
James Scheibner (90)	July 28
Donald Jelinek (82)	July 29
Melinda Horton (66)	July 31
Aldred Stevens (85)	Aug. 1
Norma Brewster (92)	Aug. 2
Fred Wymer (84)	Aug. 2
Paul Brannan (71)	Aug. 3
Willard Randall (94)	Aug. 8

Donald Putz (80)	Aug. 9
William Kluesner (73)	Aug. 12
Bernard Argo (64)	Aug. 17
James Rife (83)	Aug. 18
Tommy Priddy (87)	Aug. 19
Thomas Lane Pace (95)	Aug. 20
John Nielson (81)	Aug. 23
Frederick Broell (79)	Aug. 24
Lewis McEwen (89)	Aug. 30
Johnnie Nevarez (74)	Sept. 3
Jerry Olguin (93)	Sept. 5
Pedro Armijo (84)	Sept. 6
Paul Cooper (83)	Sept. 7
Paul Bailey (95)	Sept. 11
Robert Hogan (90)	Sept. 16
Robert Beasley (87)	Sept. 19
Dennis Mangan (81)	Sept. 28
Richard Jones (98)	Oct. 5
Clarence Young (85)	Oct. 6
Pilar Llamas (91)	Nov. 2

Deputy labs director

CONTINUED FROM PAGE 1

As one of **two** deputy Labs directors in a position second only to the Labs director, Laura leads programs that were recently reorganized into two divisions to meet the nuclear weapons modernization schedule and assure the reliability of the existing **stockpile**. These programs reinforce Sandia's role as the design agency and system integrator for the nation's nuclear weapons.

Division leadership changes

Steve Girrens continues in his roles of associate Labs director and chief engineer for nuclear weapons as head of the newly formed Stockpile Management, Components and Production division. Previously, Steve led the Nuclear Deterrence division, an organization that continually and successfully grew under his leadership to meet the needs of the nation's weapons programs, prompting the need to expand the nuclear deterrence leadership team.

Rita Gonzales joins the leadership team as the associate Labs director of the new Modernization and Future Systems division. Rita started at Sandia in 1991 and has spent the past 22 years leading technical design and development efforts supporting both nuclear deterrence and strategic partnership programs.

"I'm tremendously excited about the new nuclear deterrence leadership team and what they can accomplish," said Labs Director James Peery. "We are fortunate to have someone of Laura's caliber and wealth of experience join an all-star team with Steve, whose contributions these last few years are nothing short of heroic, and Rita, who has repeatedly demonstrated her leadership ability over two decades.

"Moving forward, our new structure will re-balance the growing workload throughout the nuclear deterrence organizations by addressing roles, responsibilities and activities to ensure Sandia stays on track to meet our nuclear weapons deliverables," James said.

Deputy Labs director brings experience to Sandia

Laura has worked in the defense industry for more than three decades, the last 27 years



CONTINUING AS ALD — Sandia Associate Labs Director Steve Girrens.
Photo courtesy of Sandia National Laboratories

in the development and production of weapons systems. In 2019, she was inducted into the **National Academy of Engineering**.

Before joining Sandia, Laura served as deputy vice president of engineering at Raytheon Missiles & Defense, a Raytheon Technologies business with 30,000 employees, including 15,000 engineers and scientists. Before that she was vice president of engineering for Raytheon Missile Systems, leading an organization of 7,800 engineers and scientists developing and producing weapons for the U.S. military and Department of Defense. She was responsible for systems performance, technical execution, test and flight operations, technology investment, engineering career development and compensation, overhead expenses and capital investment. Prior to vice president, she served as the chief engineer over programs that provided the delivery platform for nuclear payloads.

As Sandia's deputy laboratories director and chief technology officer for nuclear deterrence, Laura leads the labs in establishing modern engineering tools and practices for all nuclear deterrence programs and projects. She is responsible for meeting Sandia's nuclear deterrence deliverables as the design and engineering lab for non-nuclear components of the nation's nuclear



NEW ALD — Sandia Associate Labs Director Rita Gonzales.
Photo courtesy of Sandia National Laboratories

stockpile and technical integrator for the complete weapons systems.

Associate Labs directors deliver continued excellence

As associate labs director and chief engineer for nuclear weapons, **Steve** now heads the newly formed Stockpile Management, Components and Production division.

For three years and seven months, Steve led the Nuclear Deterrence division during a period of rapid growth that saw a weapons program that surpassed \$2.5 billion and a staff of more than 2,200 people. Steve kept Sandia on track as the labs met major nuclear weapon modernization deliverables.

Rita became the associate labs director for the Modernization and Future Systems division on Dec. 4. In the new role, she oversees a team that ensures systems-level execution of **life extension programs and alterations** and has responsibility for inserting new technologies into future systems.

Before her recent promotion, Rita was the director of Advanced Systems and Transformation and led a team in the development of safe, secure, trusted and mission-capable weapon designs and architectures. 

Solar prize winners highlight successful DOE voucher program

By **Kelly Sullivan**

DOE's Solar Energy Technologies Office recently announced round three winners of its American-Made Solar Prize, both Sandia partners through the competition's voucher program.

"This is great news from a Sandia perspective," said Laurie Burnham, Labs photovoltaics researcher. "We supported one of the two grand prize winners in rounds one and two and took the podium in round three." Since the competition began in 2018, Sandia has supported 15 companies, including eight semi-finalists and four of the six winners.

Small businesses with solar prize vouchers have made Sandia a favorite because it offers expertise and technical capabilities to support small companies who wouldn't otherwise have access to high-precision facilities and renowned experts, Laurie said.

"The vouchers can be used at any national lab, and these companies have chosen Sandia, which offers capabilities in a number of fields, such as materials sciences, cybersecurity, forensics, diagnostics, and others," she said.

In fact, a number of Sandia departments and scientists rallied to help make connections and support both round three winning projects:

Wattch — photovoltaic system monitoring device

"Wattch is the Fitbit for PV systems monitoring," Laurie said. "All large-scale PV systems are monitored to some degree, and real-time system performance enables operators to monitor the health of their systems and know if they are performing as expected."

Laurie said, "Wattch is differentiated by its predicative capability, and is meant to be relatively inexpensive, portable and a widely deployed device —much like a Fitbit."

Solar researcher Dan Riley, supporting principal investigator to round three



WATCHING THE SUN — Principal investigator Dan Riley checks the Wattch monitoring enclosure, whose sensors monitor the power output of a photovoltaic system at Sandia's Photovoltaic Systems Evaluation Laboratory.

Photo by William Snyder

winner Wattch, said even though a company's technology or product may focus on the solar sector, the development process is typically multifaceted.

"Sandia's really deep, broad expertise in many different fields allowed Wattch to go forward with its round three submission," Dan said. "For instance, the Wattch product must be securely connected to the internet, so we were able to connect the company with Lon Dawson's energy security group. It's the breadth of scientific inquiry we have at Sandia that allows these companies to put forth compelling proposals."

Funding from the American-Made Solar Prize is allowing Sandia to test the Wattch device in Albuquerque and at the Nevada and Florida Regional Test Centers for Emerging Solar Technologies. Sandia researchers compare the quality of the Wattch device with Sandia's high-fidelity data systems to confirm that Wattch is picking up all of the

necessary data and processing it within an acceptable accuracy range.

Sandia also helps with vulnerability testing to ensure the device can be securely integrated into a photovoltaic system tied to the grid. The Sandia team is helping select appropriate models and designing the analysis software for the project.

Maxout Renewables — Evergrid for backup power

Maxout Renewables Evergrid came into existence in the aftermath of the disastrous California Camp Fire of 2018, when downed transmission lines were blamed for starting one of the most deadly and costly wildfires in California history.

After that fire, during similar environmental conditions, California utility companies implemented a preemptive power outage or Public Safety Power Shutdown as a preventive measure.

The owners of Maxout Renewables wondered how to keep electricity flowing from photovoltaic systems even when the utilities turned the power off, thereby isolating those systems from the grid.

The Evergrid product solves this challenge by acting as a stand-alone appliance that provides affordable, safe backup power when the grid is down.

Sigifredo Gonzalez, a renewable energy researcher, was principal investigator on the Evergrid project, which combines a small battery pack device that provides the signal for the PV inverters to come online and spin up a flywheel.

The Evergrid system enables the PV system to restart and operate autonomously from the utility, Gonzalez said. The inexpensive, flywheel-based unit is more affordable than a battery backup system and can reduce the size of traditional battery backup systems.

“The cybersecurity, Environmental Safety and Health and distributed energy groups all assisted Maxout Evergrid, so the technology can be made to operate when the utility experiences outages caused by environmental conditions or equipment failure,” Gonzalez said.

“The American-Made Solar Prize program is a great method to incite innovation and is beneficial to Sandia because it allows the lab to keep its finger on the pulse of innovation that’s being developed,” he said. “Some technology may never progress, but other

intellectual property will go all the way to commercialization.”

Sandia helps technology grow

Using Sandia’s expertise to assist a small business in the growth of its technology, while at the same time exposing researchers to the latest technological innovations, requires a trusted partnership, said Irene Trujillo, who co-leads the Sandia Solar Prize initiative with Laurie. It’s those special connections across the lab that have attracted so many start-ups to Sandia, a virtual one-stop shop for technical expertise across a multitude of disciplines, Irene said.

Anthony Martino, photovoltaics manager, said, “Sandia owes its Solar Prize success not only to all of our technical capabilities, commitment to innovation and can-do attitude, but also to the hard work of Irene Trujillo and Laurie Burnham, who co-lead the program at Sandia and have done a terrific job recruiting companies and pairing them with the right technical teams.”

Both winning companies say they have been pleased with their experiences working with Sandia.

Alex Nussey, chief economic officer of Wattach, said, “The chance to work with the experts at Sandia was an incredible opportunity for our team. We were able to get quick answers to critical questions, and our ongoing experiments will continue to enable a far better product.”

Eric Cummings, co-owner of Maxout Renewables, said his company also had a positive experience.



EVERGREEN EVERGRID — Maxout Renewables, one of two grand prize winners in Round 3 of the American-Made Solar Prize, was recognized for its Evergrid stand-alone appliance that provides affordable, safe backup power when the grid is down. **Photo courtesy of Maxout Renewables**

“We first spoke with Sigifredo Gonzalez early in the project, long before we had proven the concept. His enthusiasm for the Evergrid idea helped us through the usual hiccups and problems of early-stage development.

“As a startup working outside our core technical competence, Maxout benefitted greatly from the institutional knowledge and long-term experience of Sandia and Sigifredo,” he said.

Other Sandia-supported grand prize winners include SolarFlex, a company that has developed a novel design for high-efficiency, low-cost back-contact solar cells; and Solar Inventions, which has created a sub-cell architecture to reduce resistive losses and manufacturing costs.

More information is available about the [American-Made Solar Prize](#). 

Engineering showcase sparks innovation

Annual UC Davis event helps Sandia connect with students

By **Michael Ellis Langley**

With the help of almost a dozen members of the workforce, Sandia was able to successfully lead the 2020 Sandia Engineering Design Award for undergraduate students who participated in the [Engineering Design Showcase](#) at the University of California, Davis, held virtually due to the pandemic.

Erin Mussoni and Camron Proctor organized Sandia’s participation in the

June event. Teams of up to 10 UC Davis seniors were asked to tackle an engineering problem, leveraging the skills they learned as undergraduates.

Each team presented their design to a panel of judges, including the Sandia volunteers and UC Davis College of Engineering Associate Director of Undergraduate Studies [Ralph Aldredge](#). Teams were judged on their demonstration of the engineering design process, creativity and innovation. The judges

also paid close attention to a project’s connection to national security and consideration for diverse communities.

“UC Davis has great programs for alternative energy studies, bioengineering, mechanical engineering and other disciplines that are relevant to Sandia. We want to get the best and brightest who are doing real engineering work,” Camron said.



UC Davis

“We also asked them to show how their project aligns to national security and Sandia’s mission areas,” Erin said.

Impressive results

The winning team presented **Process intensification in direct synthesis of dimethyl carbonate for carbon dioxide utilization**, asserting that climate change is a growing threat to national security and America’s socioeconomic way of life. They proposed a process to create a direct synthesis of dimethyl carbonate from carbon dioxide and methanol, a method that shows promise in processing high volumes of carbon dioxide as a chemical feedstock.

“They thought about their design project with a greater view,” Erin said. “They also

stood out through their advanced technical writing and their oral presentation. We were impressed because they communicated at a graduate level.”

Camron agreed that the team members did a good job of “distributing responsibility for the work and for demonstrating the process.” But, he added, the Engineering Design Showcase does a lot more than put a spotlight on undergraduates.

“We want the students to be aware of what we are working on and we want to start that relationship with them,” he said. “We also want to enhance our relationship with UC Davis — to show them what kind of jobs their students get. The leadership at the university needs to understand that we

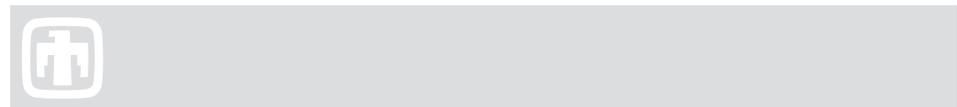
are doing good, important work on behalf of the nation.”

Both Erin and Camron said the challenges posed by the pandemic were managed easily because the innovations made within the past few years encourage more students to participate and advance the event.

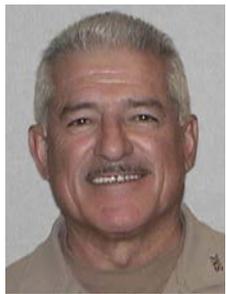
They also thanked the other Sandians — most of them UC Davis alumni — who helped with the organizing and judging.

“I’m grateful for their passion and leadership for this entire endeavor,” Erin said. “Their diversity in technical backgrounds was huge, and they made it so that we had judges from enough disciplines to accurately examine the work of every team, no matter their major. It made everything really easy.” 

Mileposts



Leonard Martinez 35



Tommy Serna 35



Douglas Weiss 35



Kathleen Alam 30



Tom Corbet 30



Donna Mullany 30



Steve Gianoulakis 25



Mario Delgado 20



Jon Eberhart 20



Chris Gibson 20



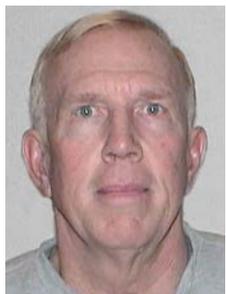
Jackie Griffin 20



Scott Lindblom 20



Matt Montano 20



Lee Post 15



Travis Anderson 15



John Nguyen 15



Anne Rimbort 15



Justin Weaver 15