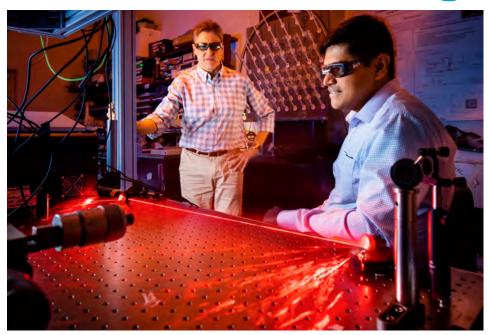


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Ultrafast beam-steering breakthrough



MASTERS OF LIGHT — As a red beam of light is reflected in an arch, scientists Igal Brener, left, and Prasad Iyer demonstrate optical hardware used for beam steering experiments at Sandia's Center for Integrated Nanotechnologies.

Photo by Craig Fritz

Tamed light offers new possibilities

By Neal Singer

n a breakthrough in the fields of nanophotonics and ultrafast optics, a Sandia research team has demonstrated the ability to dynamically steer light pulses from conventional, so-called incoherent, light sources.

This ability to control light using a semiconductor device could allow low-power, relatively inexpensive sources like LEDs or flashlight bulbs to replace more powerful laser beams in technologies such as holograms, remote sensing, self-driving cars and high-speed communication.

"What we've done is show that steering a beam of incoherent light can

- CONTINUED ON PAGE 4

Cloud-resolving climate model meets world's fastest supercomputer

Simulations show a year's climate in a research day

By Neal Singer

ocused on improving the accuracy of climate predictions, a
Sandia-led computational team recently achieved a major
milestone with a cloud-resolving model they ran on Frontier,
the world's first exascale supercomputer.

"We have created the first global cloud-resolving model to simulate a world's year of climate in a day," said Sandia researcher Mark Taylor, chief computational scientist of the Energy Exascale Earth System Model, or E3SM, an eight-lab project supported by the DOE's Office of Science for the development of advanced climate models. "We're ushering in a new era of accuracy."

The E3SM model simulates critical aspects of Earth's

— CONTINUED ON PAGE 5



THE NEW FRONTIER — The world's fastest supercomputer, Frontier at Oak Ridge National Laboratory, has reached 1.1 exaflops, breaking the exascale speed barrier — a threshold of a quintillion calculations per second — and ranking number one on the Top500 list of the world's most powerful supercomputers. Photo by Calos Jones, Oak Ridge National Laboratory



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™ LAB**NEWS** 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.

EDITOR'S NOTE: Please send your comments and suggestions for stories or for improving the paper. If you have a column (500-800 words) or an idea to submit, contact Lab News editor Katherine Beherec at kgbeher@sandia.gov.

Climate change future may be found in factories

By Michael Ellis Langley

he Generation 3 Particle Pilot Plant at the National Solar Thermal Test Facility, which broke ground Feb. 16, is one of the most recent examples of Sandia working with industrial partners to clean up our climate. For years, Sandia has helped American industry become more efficient in converting raw materials to final products; this includes improving technologies, fuels and processes to extract the maximum energy possible and decrease unwanted byproducts.

"The emphasis on climate change is coming together with the need to address aging infrastructure across the country and an important way to advance both is to look at major energy users," said Sarah Allendorf, director of Sandia's Chemistry, Combustion and Materials Science Center. Sarah was director champion of the fiscal year 2022 Industrial Decarbonization strategic initiative that was sponsored by Sandia's Energy and Homeland Security Portfolio.

In January, Sandia and its partners received funding from the Accelerating Carbon Capture and Storage Technologies initiative in the U.K. to develop 3D-printed low-carbon cement technologies — another part of the Labs' efforts to tackle industrial decarbonization with the help of contributors from around the globe.

"Together, industrial and manufacturing activities produce almost a third of the nation's greenhouse gas emissions," said Abraham Ellis, who oversees Sandia's Industrial Decarbonization program. "Many of those industrial processes are energy intensive and difficult to decarbonize. The strategic initiative identified key capabilities that can help address these challenging problems."

Cement is one product of industrial processes that account for a lot of carbon in the atmosphere — an estimated 8% of

global emissions. The strategic initiative team laid out four ways to approach large-scale industrial decarbonization: develop carbon-free feedstocks and chemical processes to reduce carbon dioxide emissions during processing; research alternative energy sources that don't rely on oil or coal to supply heat and power; develop new ways to capture and sequester carbon with natural systems or in products; and recycle and recover products to use again, cutting down on production needs.

"Our strategic initiative looked at the 'industry of today' part and how we can help change their processes," Sarah said. "I'm also curious about the 'industry of tomorrow.' How can we work with these industries to completely reimagine their processes? Could one of those approaches be deployed for immediate impact while in parallel one designs, from a completely clean sheet, a carbon-neutral steel company? For example, how would you build a steel plant if you intended to use hydrogen as a major energy carrier?"

In September, the DOE announced an effort called the Industrial Heat Shot, aimed at "dramatically reducing the cost, energy use and carbon emissions associated with the heat used to make everything from food to cement and steel." The Biden administration hopes to achieve 85% lower greenhouse gas emissions from the industrial sector by 2035. Following this announcement, the DOE released its own Industrial Decarbonization Roadmap, which aligns with Sandia's proposed outline. Sarah said that industrial decarbonization is a national priority that Sandia is well-positioned to address.

"Certainly, the role of hydrogen as an energy carrier was explored in this strategic initiative by the same people who think about hydrogen on a daily basis. We have an active program on everything from hydrogen production to materials used for safe storage. How might these play a deeper role in industry?" she said. "Another area of interest is sustainable aviation fuels. We have a deep



WORKING OVERTIME — Heavy industry, like auto manufacturing, can benefit from the industrial decarbonization work being done at Sandia right now through reduced energy costs and climate change friendly innovations.

Photo courtesy of Getty Images

history in biomanufacturing and bioproducts and using biological processes in concert with other industrial activities to lower the temperature of chemical reactions. Biology works at room temperature. You don't need much energy to be at room temperature, so how can we make that work on an industrial scale?"

Abraham said taking decarbonization from research to solution will take quite a lot of work.

"Decarbonizing high-temperature industrial processes is especially challenging, and Sandia is investigating the applicability of alternatives such as concentrating solar thermal energy. For example, researchers at Sandia's National Solar Thermal Test Facility have already conducted experiments to produce hydrogen, synthetic fuel and ammonia using concentrating solar thermal energy."

"We're going to continue exploring and pick some targeted demonstrations to move towards," Sarah said. "Part of Sandia's climate security strategy is harnessing concentrated solar power as a heat source for concrete or chemicals production. We're moving these applications forward and I think the strategic initiative has been very helpful in getting

a great baseline of understanding the state of the art, where the gaps are and who are the players. Working with our industry partners helps us really focus on what are the big gaps that keep them from deploying more advanced technologies or where the risk is too high. Then we can partner to address gaps or lower risks so they can make necessary changes."

Sarah said there are even more questions that have not yet been asked — questions that will not only benefit the nation and the world but could give companies another reliable income stream to support their industrial decarbonization efforts.

"Think about how to get more value out of a manufacturing process," she said. "Maybe there's a waste stream, produced along the way, that you can convert to valuable products for a different business. So, it's actually a net win in terms of energy use. Let's imagine you have a process that generates a whole lot of carbon dioxide. Can you capture that carbon and somehow convert it into a product that is of value? That would make it a win-win-win."

Beam-steering breakthrough

CONTINUED FROM PAGE 1

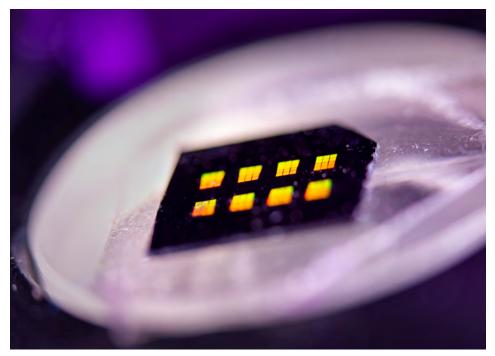
be done," said Prasad Iyer, Sandia scientist and lead author of the research, which was reported in the March issue of Nature Photonics. The work was funded by the DOE Office of Science.

Incoherent light is emitted by many common sources, such as an old-fashioned incandescent lightbulb or an LED bulb. This light is called incoherent since the photons are emitted with different wavelengths and in a random fashion. A beam of light from a laser, however, does not spread and diffuse because the photons have the same frequency and phase and is thus called coherent light.

In the team's research, they manipulated incoherent light by using artificially structured materials called metasurfaces, made from tiny building blocks of semiconductors called meta-atoms that can be designed to reflect light very efficiently. Although metasurfaces had previously shown promise for creating devices that could steer light rays to arbitrary angles, they also presented a challenge because they had only been designed for coherent light sources. Ideally, one would want a semiconductor device that can emit light like an LED, steer the light emission to a set angle by applying a control voltage and shift the steering angle at the fastest speed possible.

The researchers started with a semiconductor metasurface that had embedded tiny light sources called quantum dots. By using a control optical pulse, they were able to change, or reconfigure, the way the surface





SHINING EXAMPLE — A metasurface sample is used for the beam steering with each reflective patch containing thousands of meta-atoms designed to dynamically steer incoherent light.

Photo by Craig Fritz

reflected light and steer the light waves emitted from the quantum dots in different directions over a 70-degree range for less than a trillionth of a second, marking a significant success. Similar to laser-based steering, the steered beam restrained the tendency of incoherent light to spread over a wider viewing angle and instead produced bright light at a distance.

Taming light

A feat previously considered impossible, the team's proof-of-principle work paves the way for developments in the fields of nanophotonics and ultrafast optics. The ability to dynamically control incoherent light sources and manipulate their properties offers a wide range of applications.

One low-power use would be to brighten military helmet screen displays that overlay maps or blueprints on the wearer's normal field of vision. "In applications where space is valuable," Prasad said, "steering light emission with low-size-and-weight metasurface-LED displays could be made possible in the future with this technology. We can use the light emitted in a better way rather than just turning them off and on."

The technique could also provide a new kind of small display that can project holographic images onto eyeballs using low-power LEDs, a capability of particular interest for augmented and virtual reality devices. Other uses could be in a self-driving car where light detection and ranging sensors are used to detect objects in the path of the car.

In terms of expressions of interest, the team has had several inquiries from commercial sources, said Sandia researcher Igal Brener, a paper author and lead scientist on the project. "A commercial product could be five to 10 years out, especially if we want to have all the functionality on-chip," Igal said. "You wouldn't use a control optical pulse to impart the changes in the metasurface needed to steer the light, but rather you would do this control electrically. We have ideas and plans, but it's still early. Imagine an LED lightbulb that can emit light to follow you. Then you wouldn't waste all that illumination where there's nobody. This is one of the many applications that we dreamed about with DOE years ago for energy efficiency for office lighting, for example."

Similarly, tamed light may one day offer benefits in scenarios where focused illumination is only needed in a specific area, such as surgery or in autonomous vehicles.

For incoherent light, the future is looking bright.

World's fastest supercomputer

climate system that might impact conditions in the U.S. in the coming decades, including extreme temperatures, droughts, floods and a rise in sea level.

Clouds play a critical role in Earth's climate system, impacting weather patterns and precipitation. "Traditional Earth system models struggle to represent clouds accurately," Mark said. "This is because they cannot simulate the small overturning circulation in the atmosphere responsible for cloud formation and instead rely on complex approximations of these processes."

The E3SM group developed an improved cloud-resolving atmosphere model named SCREAM, for Simple Cloud Resolving E3SM Atmosphere Model.

"This next-generation program has the

potential to substantially reduce major systematic errors in precipitation found in current models," Mark said, "because of its more realistic and explicit treatment of convective storms and the atmospheric motions responsible for cloud formation."

These motions and their interactions determine many of the characteristics of regional precipitation, he said.

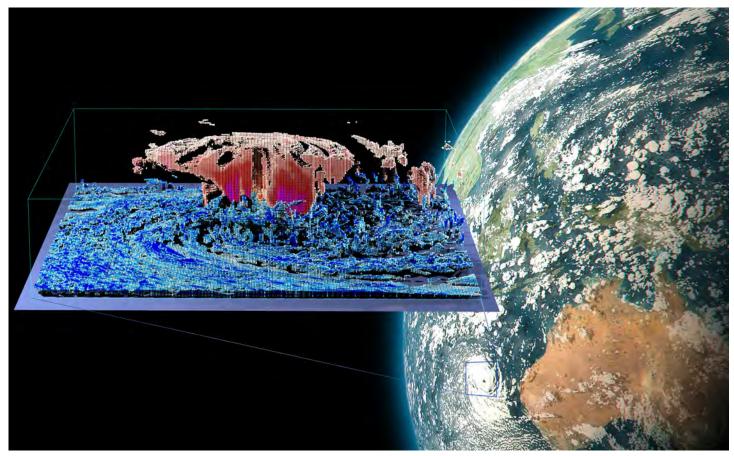
But the new model by itself was not enough. Running a simulation that resolves clouds globally over many decades requires tremendous computing resources to run in a reasonable amount of time. An exascale computer, executing more than a quintillion calculations per second — that's the numeral 1 followed by 18 zeros — was just what was needed.

Frontier, built under DOE auspices at Oak Ridge National Laboratory, fills that bill, with more than 9,000 compute nodes. An E3SM team at Sandia worked

to ensure SCREAM would run well on Frontier, other graphics processing unit-based systems and more conventional central processing unit-based supercomputers.

Frontier is expected to become a production-ready machine later this year but is not yet open for general access. However, through the DOE's Exascale Computing Project, the E3SM developers had a 10-day window to test the performance of the new SCREAMv1 model running at a global 3.25-kilometer resolution. They obtained record-setting performance, with the atmosphere component running at greater than a simulated year per day.

SCREAM's graphics processing unit performance, coupled with the exascale machine, for the first time will enable multiyear climate simulations with a more accurate treatment of clouds, leading to more accurate predictions of future weather and climate.



CLOUD PREDICTIONS — A snapshot from a cloud-resolving Simple Cloud Resolving E3SM Atmosphere Model simulation shows a tropical cyclone off the west coast of Australia. The global view displays clouds where the condensed water content is greater than 0.1 grams of water per kilogram of air. The inset shows a 3D cross section with ice mass in red and liquid cloud structure in blue.

Image by Brad Carvey

Energy researcher named IEEE Fellow

By David Sokoloff

Stan Atcitty, a senior scientist at Sandia, has been named Fellow of the Institute of Electrical and Electronics Engineers. After a rigorous evaluation process, less than 0.1% of voting members are selected as fellow annually.

Stan, a member of the Navajo Tribe, leads the power electronics subprogram as part of the DOE Office of Electricity's Energy Storage Program within the Nuclear Fuel Cycle and Grid Modernization department. He also leads the DOE Office of Electricity's Tribal Energy Storage Program and NNSA's Minority Serving Institute Partnership Program working with tribal colleges and universities.

His research is focused on power electronics necessary for integrating energy storage and distributed generation with the electric utility grid. Six of his projects have won R&D 100 awards and one Gold

Green Energy award from Research & Development magazine. Additionally, Stan has authored over 70 publications and holds four patents, with another three pending.

"I'm thankful and honored to be recognized by the IEEE community. What this does is allows us to further enhance power electronics research and development for energy storage systems in the nation and throughout the world," Stan said. "It also allows me to take some of my national and international influence to increase tribal energy sovereignty, enabling tribes to become more self-determinate nations."

In 2012, President Barack Obama presented Stan with the Presidential Early Career Award for Scientist and Engineers, the highest honor bestowed by the federal government to outstanding scientists and engineers who show exceptional leadership at the frontiers of scientific knowledge during the 21st century.

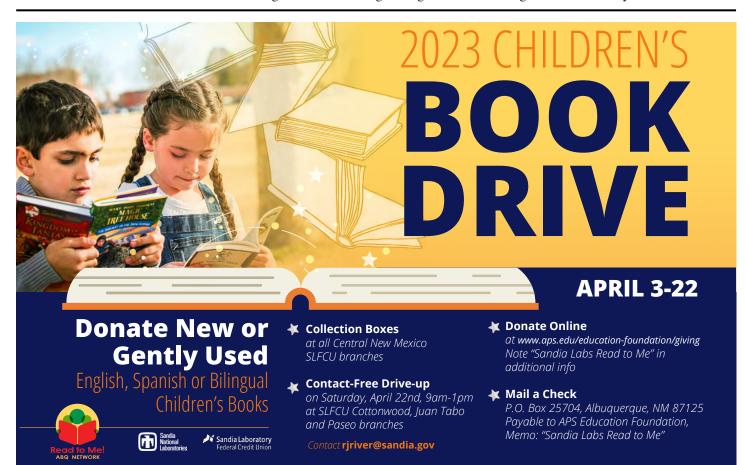
Stan received his bachelor's and master's degrees in electrical engineering from



ENERGY LEADER — Senior scientist Stan Atcitty has been recognized by the Institute of Electrical and Electronics Engineers for his contributions to energy storage and generation.

Photo by Lonnie Anderson

New Mexico State University in 1993 and 1995, respectively. In 2006, he was the first American Indian male to receive a doctorate in electrical and computer engineering from Virginia Tech University.



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Tips to optimize online security

By Ariana Stern

ost people have heard stories about, or even been a target of, email phishing, internet scams or malware attacks. When it comes to protecting online information and devices, users may not be aware of steps for optimizing their online presence for greater privacy and security.

Recently, staff from Sandia's Information Engineering division joined Sandia's Chief Information Officer and Executive Director John Zepper to share best practices with the Coronado Thunderbirds retiree community on how to safeguard electronic devices. The Coronado Thunderbirds is a social club for retirees from federal agencies and their contractors. Over 70 retirees tuned in to the educational talk to learn how to protect their computers and mobile devices, and ultimately themselves, from scams and malware.

The Coronado Thunderbirds were pleased to lead the collaborative meeting with Sandia and the Kirtland Air Force Base Force Support Squadron. Coronado Thunderbirds President John Anthes and Club Newsletter Editor Diana Frederick provided information on the benefits of the club and how to become a member. Air Force Maj. Joseph McIntosh, 377th Force Support Squadron commander, represented Kirtland Air Force Base and discussed some of the benefits available to club members.

"As scams and malware become increasingly sophisticated it's vital that we all become proficient in managing our cybersecurity," John Zepper said. "This event was a great opportunity to partner with our retiree community and help educate them on how scams appear and operate so that they can better recognize the red flags. The end goal is to keep our community safe by providing tips to bolster their own online security."

Boost online security by following these tips.



HOW TO SPOT A PHISH — Sandia cybersecurity software engineer Tyler Morris explains how various indicators can help users identify a phishing email during his presentation to the Coronado Thunderbird retirees. **Photo by Lonnie Anderson**

Security key and tokens

Consider using a security key, a form of second or multifactor authentication. When logging in with your normal credentials, the user will be prompted to provide their security key.

Passwords

Set a device password and use biometrics, like facial recognition or a fingerprint.

Use Apple Password Manager or a tool like Microsoft Authenticator.

Apps and permissions

Review permanent and temporary permissions.

Avoid downloading apps from third-party app stores.

Uninstall unused apps.

Chargers and cables

Use personal chargers only. Don't use public cables.

Use original equipment and manufacturer's cables.

Use wireless chargers, like MagSafe chargers.

Public Wi-Fi

Avoid using public Wi-Fi. If possible, use a hot spot from a phone or tablet instead.

Become a member

Visit the Coronado Thunderbirds membership page for sign-up information. Club members have continued entry to Kirtland Air Force Base and access to most Morale, Welfare and Recreation facilities and activities, such as the Mountain View Club, Tijeras Arroyo Golf Course, Kirtland bowling lanes and fitness centers.

Mobile security apps

Install a mobile security app that can protect against malicious links and tell users about important operating system updates. Examples include programs like Microsoft Defender, Lookout Mobile Security and Norton360.

Antivirus and malware protection on your computer

Install antivirus and malware products to protect home networks and systems.

Set up a recurring reminder to check for and apply software and firmware updates once a month, particularly for critical devices such as an internet router. Some internet service providers handle this for customers.

Wi-Fi security

Rename the default Wi-Fi network. Choose non-personally identifiable network names.

Phishing

Be alert if an email provides a strict deadline with threating repercussions.

Look out for poor spelling and grammar usage.

Check for inconsistent email addresses or links and attachments.

Don't click or open suspicious links or documents.

Call or speak with the sender of the email via a trusted phone number to verify the legitimacy of the email. Never reply.

Never forward the suspicious email to others unless it's a spam phishing

If you believe you've fallen victim to a phishing attack, change associated account passwords and notify applicable companies.



Sandia celebrates **Earth Month**

Learn about Earth Month events and find Teams links by visiting the Earth Day 2023 page on the Climate Security website, the Earth Month page on the Environment, Safety & Health Confluence website or by reading Sandia Daily News.

In addition to the events below, the

Natural Burial Presentation

Wednesday, April 12, noon-1 p.m.

Learn how natural burial options are minimally impactful to the environment.



12

Nature Therapy Presentation

Monday, April 17, noon-1 p.m. MT

Nature therapy, also referred to as ecotherapy, is the process of being in nature to boost mental and physical health. Join this information session to learn how to reduce stress, improve mood and boost your immune system.



Nate Hagens on 18 Sustainability

Tuesday, April 18, 11 a.m.-noon MT

Join us to hear from Nate Hagens, an expert on sustainability. Hagens will present virtually to share his insights on how we can make a positive impact on the environment.



Jeremy Hoffman: The **Geography of Climate** Inequity

Wednesday, April 19, noon-1 p.m. MT

Join us for a virtual and in-person presentation from Jeremy Hoffman, chief scientist at the Science Museum of Virginia and geography professor at Virginia Commonwealth University.

Labs is offering many community involvement opportunities during April. Join co-workers cleaning up a trailhead, volunteering at a food bank and more to make a difference in the local community. Contact Katrina Wagner or Michelle Walker-Wade for more information.

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Environmental Management System Excellence Awards Winners

Thursday, April 20, noon-1 p.m. MT

Learn about how Sandians help reduce ecological impacts in the spirit of resource conservation and environmental protection.

24

Climate Series speaker **Erin Sikorsky**

Monday, April 24, 10:30-11:30 a.m. MT

Erin Sikorsky is director of the Center for Climate and Security, and the International Military Council on Climate and Security. Previously, she served as the deputy director of the Center for Climate and Security. Prior to working with the center, Erin served as deputy director of the Strategic Futures Group on the National Intelligence Council, where she co-authored the quadrennial Global Trends report and led the U.S. intelligence community's environmental and climate security analysis. She is the founding chair of the Climate Security Advisory Council, a congressionally mandated group designed to facilitate coordination between the intelligence community and U.S. government scientific agencies.

Regional science bowl winners announced

Sandia volunteers in NM and CA organize four successful events

By Kim Vallez Quintana

undreds of high school and middle school students from New Mexico and California put their knowledge to the test in regional science bowl competitions sponsored by Sandia and Los Alamos national laboratories. The winners advance to the DOE National Science Bowl in Washington, D.C.

The science bowl is like Jeopardy and challenges students with a strong interest and academic ability in math and science. Teams answer questions from various science disciplines, including biology, chemistry, earth and space science, physics and math.

High school winners in New Mexico

- 1st place Los Alamos High School Team 1
- 2nd place La Cueva High School Team 1, Albuquerque
- 3rd place La Cueva High School Team 3, Albuquerque

High school winners in California

- 1st place Mission San Jose High School, Fremont
- 2nd place Dougherty High School, San Ramon
- 3rd place Foothill High School, Pleasanton

Middle school winners in New Mexico

- 1st place Los Alamos Middle School Team 2
- 2nd place Los Alamos Middle School Team 1
- 3rd place Eisenhower Middle School, Albuquerque

Middle school winners in California

- 1st place William Hopkins Junior High Team 1, Fremont
- 2nd place William Hopkins Junior High Team 2, Fremont
- 3rd place Pleasanton Middle School

The winning Los Alamos High School team consisted of three seniors, one junior and one sophomore. "It was a lot of fun. I met some new people and learned some new things," said team member Minhtet Htoon, who plans to pursue a doctorate in engineering.

"I was so happy it was in person again. It was great to see all the different teams with so many bright young people and enthusiastic coaches. Everyone was so kind to one another, and it was wonderful to chat with some new people," said physics teacher Ali Renner, who led the winning team.

Sandia employees coming together

Sandia's Community Involvement and STEM Outreach teams, along with volunteers from different departments across the Labs, organized the four events in Albuquerque and Livermore between January 28 and March 11. The New Mexico and California events drew a total of 265 participants. Volunteers and



THRILL OF VICTORY — La Cueva Team 3 member Aditya Koushik scored enough points to win a round in the New Mexico High School Regional Science Bowl. His team placed third in the competition.

Photo by Craig Fritz

employees were essential in making the events possible.

"I love Science Bowl. I've helped with it about 15 times since 2002," Sandia engineer Barbara Lewis said. "Volunteers have it easy compared to the students. We just read the questions. They have to answer them. I'm always amazed at how quickly they can come up with the answers, including to math questions, in just five seconds."

In New Mexico, 36 volunteers served as judges, scorekeepers, timekeepers and organizers behind the scenes, while 65 volunteers assisted in the California events.

Bigger stakes ahead

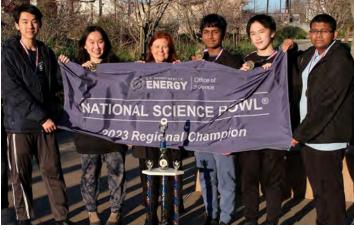
The winners of the regional science bowls will compete in the DOE National Science Bowl from April 27 to May 1. At the national event, the top two middle and high school teams will receive \$5,000 for their schools' science departments, and schools that place in the top 16 will win \$1,000 for their science departments. The teams must outperform 64 other high school teams and 50 other middle school teams to emerge victorious.

Origins of the National Science Bowl

The DOE created the National Science Bowl in 1991 to encourage students to excel in mathematics and science and pursue careers in these fields. More than 320,000 students have participated in the competition during its 31-year history, making it one of the nation's largest science competitions. More than 9,000 students are expected to compete this year.



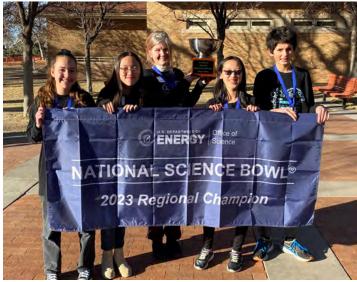
CALIFORNIA MIDDLE SCHOOL WINNERS — The William Hopkins Junior High School Team 1 included, from left, Theenash Sengupta, Rutvik Arora, Aniket Mangalampalli, Roshan Annamalai and Anish Agarwal.



CALIFORNIA HIGH SCHOOL WINNERS — The Mission San Jose High School team included, from left, Samuel Zhou, Annie Xu, coach Dorota Sawicka, Sahas Goli, Jerry Yuan and Gokulanath Mahesh Kumar.

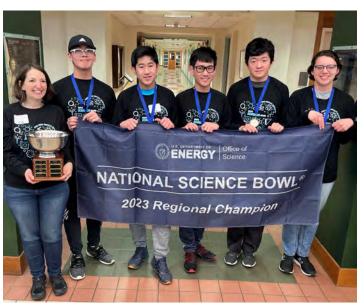
Photo by Ray Ng





NEW MEXICO MIDDLE SCHOOL WINNERS — The Los Alamos Middle School Team 2 included, from left, Rafa Rocha, Lydia Davis, Amy Bartlett-Gaunt, Julia Zou and Drew Bacrania.

Photo courtesy of Amy Bartlett-Gaunt



NEW MEXICO HIGH SCHOOL WINNERS — The Los Alamos High School Team 1 included, from left, coach Ali Renner, Isaac Gao, Linnhtet Htoon, Minhtet Htoon, Charles Cai and Mary Couture. Photo by Debra Menke

Recent Patents

Note: Patents listed here include the names of active Sandians only; former Sandians and non-Sandia inventors are not included.

Following the listing for each patent is a patent number, searchable at the U.S. Patent and Trademark Office website (uspto.gov).

October-December 2022

- Richard Karl Harrison and Kenneth Miguel Armijo: Modular low cost trackerless spectral sensor. Patent #11460344
- Hung Loui: Multi-channel high-speed converter clock synchronization with autonomous coherent deterministic latency. Patent #11469765
- Robert Meagher and Yooli Kim Light: Endpoint detection of amplified nucleic acids. Patent #11473141
- Michael James Gherini, Ryan K. Gehmlich, Dorian K. Balch and Michael Christopher Maguire: Passive tube closure valve. Patent #11473689
- Erik J. Skogen, Charles Alford and Junoh Choi: Photovoltaic array for a power-by-light system. Patent #11476376
- Nicholas Myllenbeck and Patrick L. Feng: High luminescence plastic scintillators. Patent #11479717
- David W. Peters: Tunable infrared pixels via monolithically integrated dynamic metasurfaces. Patent #11482560
- Erica Ann Douglas, Giovanni Esteves, Michael David Henry and Morgann Berg: Metal stack templates for suppressing secondary grains in ScA1N. Patent #11482660
- James Eujin Park, Stephen Percival and Stanley Shihyao Chou: Electrocatalyst comprising a crumpled transition metal dichalcogenide support loaded with monodispersed metal nanoparticles. Patent #11484867
- Nicholas Myllenbeck and Ryan Wesley Davis: Alkyl dialkoxyalkanoates as bioderived, high cetane diesel fuels. Patent #11492565
- Sapan Agarwal: Analog vector-matrix multiplication by capacitive elements with resistive state storage. Patent #11494464



PRIZE WINNING FINISH — Los Alamos High School Team 1 member Linnhtet Htoon, left, and teammate Charles Cai ponder a bonus question during the championship round of the New Mexico High School Regional Science Bowl. Their team won first place in the competition.

Photo by Craig Fritz



A LOVE OF STEM — Sandia employees volunteer at the high school regional science bowl at Albuquerque Academy. Photo by Debra Menke

- Timothy Walsh, Christopher Hammetter, Joseph E. Bishop, Nekoda van de Werken and Harlan James Brown-Shaklee: Computationally optimized and manufactured acoustic metamaterials. Patent #11498282
- William Mark Severa, John Darby Smith and Suma George Cardwell: Spiking retina microscope. Patent #11501432
- Joseph S. Schoeniger and Ryan
 Wesley Davis: Engineering rubisco for food safety. Patent #11518989
- John Sandusky: Broad-area laser awareness sensor. Patent #11519997

- Lee Joshua Rashkin and Jason Christopher Neely: Excitation control of dual-wound machines for coupling mitigation. Patent #11527942
- Connor Brashar: Jitter tracking anti-spoofing algorithm. Patent #11531117
- David G.Wilson and Steven F. Glover: Wave energy converter buoy with variable geometry. Patent #11536243
- David A. Wiegandt, Dominic A. Perea, Dahlon D. Chu, Kevin Robbins and John L. Russell: Ultra-high reliability wireless communication systems and methods. Patent #11540198

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Sandia Fellow Elizabeth Roll: Labswide strategic planning

By Neal Singer

reating conditions in which people of good will can meet, integrate their ideas and emerge with a positive result can be a difficult enterprise but Sandia Fellow Elizabeth Roll seems to have it mastered.

Elizabeth, the Labs' senior strategist and executive coach, is one of two fellows to emerge from the administrative rather than technical areas of the Labs. Graduating from Bryn Mawr College in Pennsylvania in 1996 with a major in economics and a minor in mathematics, she earned a master's degree from the University of Michigan in 2002, where she studied corporate strategy and finance and graduated with distinction.

"I'm a social scientist at heart," she said.
"Math wasn't satisfying to me in itself;
economics drew me in because people's
choices and behaviors are part of the
equation."

She came to Sandia to help executives make decisions that affect other leaders or organizations. But the problems she saw seemed beyond simple economics. "Why is a group getting stuck?" she asked herself. "What values may be in conflict? What are the patterns that people bring that interfere?" Continuing concern over how and why people make business and life decisions led her in 2011 to the Gestalt Institute of Cleveland, where she took courses in human and organizational development, and she was invited to become a faculty member.

Among other achievements, she helped guide growth of the National Security Leadership Development Program, the premier program for developing Sandia leaders. Over 290 Sandia leaders have participated in the program, which has been described as the premier leadership development program in the entire DOE complex. The program shapes the Labs'



FELLOW SPOTLIGHT — Senior strategist Elizabeth Roll was recently named a Sandia Fellow. Her work includes influencing executive decision-making and mentoring staff to develop the skills she has cultivated throughout her career.

Photo by Lonnie Anderson



Sandia Fellows program adds six

Labs Director James Peery recently announced six new Sandia Fellows. For the first time in Labs history, the fellows program has expanded beyond research and development positions to include all professions that are required to meet Sandia's mission.

"This is a rare and highly selective honor that recognizes pioneers with the highest accomplishments among their peers," James wrote in his announcement. "A promotion to this level allows each fellow to focus on advancing the frontiers of their fields and enhancing Sandia's reputation."

Cynthia Phillips, Tina Nenoff, Ted Kim, Elizabeth Roll, Amber Romero and Lonnie Love joined the Sandia Fellows this year. Lab News will profile each fellow. leaders and impacts the culture and brand of the Labs.

Elizabeth facilitated executive and director-level engagements between Sandia and Kansas City National Security Campus, contributing to collaborative growth between the two sites. By understanding the strategic goals of this joint leadership team, she helped the leaders at Sandia and the Kansas City National Security Campus integrate digital-realization teams with advanced manufacturing teams, implement structural and environmental controls for a nuclear stockpile system, and create crosssite improvements in technical areas and among various disciplines, ensuring unity of effort.

"People call me when they feel the need for change, or even just navigating a specific problem," she said. "Sometimes that manifests in working with teams and organizations and sometimes that means a one-on-one coaching engagement to support a leader's growth."

Interacting with a past Labs leadership team, she rapidly implemented a new process to complete a director's unusual request for a 20-year vision for the Labs.

Engaging a wide range of leaders experiencing a variety of circumstances, she translates concepts, models and frameworks into practical actions. Taking on projects daunting in complexity and sometimes lacking in definition has only increased her repute.

At the other end of the scale from fostering ideas of Sandia's upper echelons, she founded a career-mentoring group that teaches 25 Sandia staff mentees to use tools and techniques she has used. She also coached them to build confidence and find footing in new roles.

Her commitment to her own learning and self-reflection has enabled continued growth in her role of bringing ideas to the deal-making table and seeing them prosper.

Just so will Sandians continue to learn how a fellow with business and organizational-development expertise

Mileposts





Cecelia Williams



David Heckart



Alvin Leung



Chrisma Jackson



Ken Plummer



Michael Rimbert



Jill Suo-Anttila



Donna Baldonado



Eduardo Padilla



Jennifer Tapia



Inez Duran



Bo Song

Recent Retirees



David Gardner



Michael 'Ski' Strosinski 30





Lisa Theisen



Mark Murton

Sandia and AWE's strategic intent relationship

By Jennifer Awe

andia and the United Kingdom's
Atomic Weapons Establishment
have a rich history of collaboration, dating back to the Manhattan
Project. In March, Sandia nuclear deterrence leadership hosted AWE partners
for a week of strategic intent meetings

at the Labs. Through the strategic intent partnership, Sandia works with AWE to identify and develop mutually beneficial opportunities for collaboration between the two organizations.

These semiannual meetings help strengthen vital relationships, increase understanding of core capabilities at both organizations and continue to build upon a collective strategic vision. As part of this year's summit, strategic-intent teams held a poster session to share progress and next steps in 11 key areas of nuclear deterrence, such as system engineering and integration, materials and engineering transformation. The poster session was attended by AWE and Sandia executive sponsors and included other guests from the Sandia community.



PARTNERSHIP — Representatives from Sandia and the U.K.'s Atomic Weapons Establishment attended the March strategic intent meetings at the Labs.

Photo by Lonnie Anderson





SHARING KNOWLEDGE — Executives from Sandia like Deputy Labs Director Laura McGill, left, and Associate Labs Director for Nuclear Deterrence Rita Gonzales participated in the weeklong strategic intent meeting.

Photos by Lonnie Anderson