SANDIA LAB NEWS
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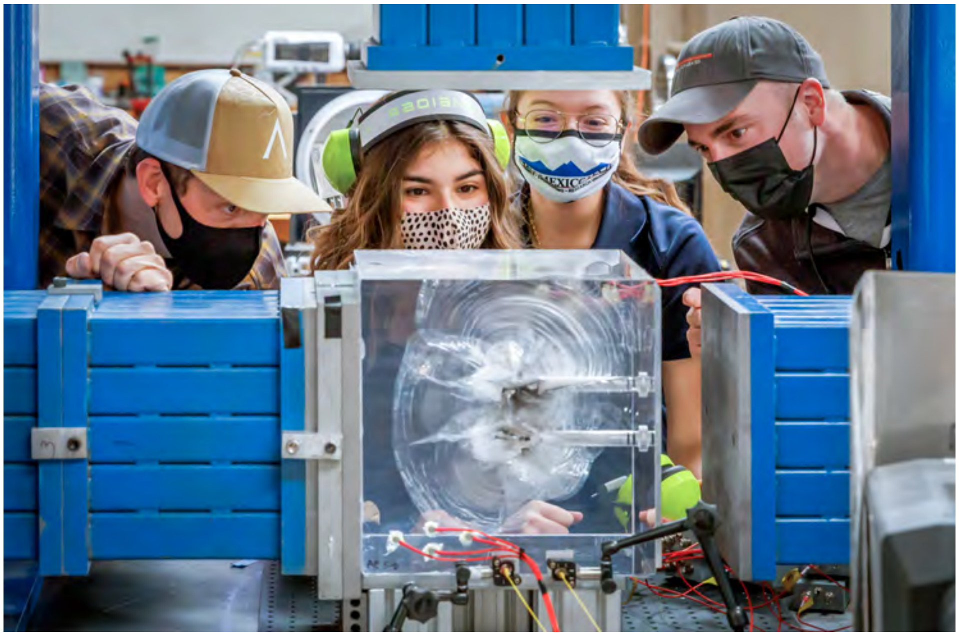
Exploring explosives for expanding geothermal energy



LITTLE BANG — From left, Joseph Pope, a Sandia technologist, Sivanna Torres, a New Mexico Institute of Mining and Technology doctoral student, Veronica Espinoza, a New Mexico Tech student, and Eric Robey, a Sandia mechanical engineer, examine a plexiglass cube fractured by a small-scale explosion. This study could inform the creation of new geothermal energy systems. **Photo by Bret Latter**

Sandia researchers test explosives and propellants to create geothermal power sites

By **Mollie Rappe**

Why are scientists setting off small-scale explosions inside 1-foot cubes of plexiglass? They're watching how fractures form and grow in a rocklike substance to see if explosives or propellants, similar to jet fuel, can connect geothermal wells in a predicable manner.

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Mark your calendar

Sandia All-Hands meeting with Labs Director James Peery, 2 p.m. MDT Thursday, June 23.

New Mexico Nuclear Deterrence team visits Tonopah Test Range

Laura McGill talks to staff and enjoys a tour of the site

By **Whitney Lacy**

Deputy Labs Director for Nuclear Deterrence Laura McGill, along with others from the Nuclear Deterrence executive office, visited Tonopah Test Range in late May. The site has a rich history of supporting broad national security missions and most recently has been the primary flight-testing range for weapon development and qualification as well as compatibility certification of the B61-12 Life Extension Program on five

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TONOPAH TELESCOPE — Deputy Labs Director Laura McGill, left, gets firsthand operator experience with Jim Rini in a TTR ME-16 telescope. The telescope is used to provide high speed documentary video. **Photo by David Coleman**

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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.

From postdoc to associate labs director

There are no limits if you're willing to 'step outside your comfort zone'

By **Julie Hall**

CAREER SUCCESS — Associate Labs Director Andy McIlroy began his career at Sandia as a postdoctoral researcher in 1991. Since then, he has worked in combustion chemistry, development of the Livermore Valley Open Campus, weapons system engineering and more. **Photo by Dino Vuornas**

After graduating from the University of Colorado with a doctorate in chemical physics, Andy McIlroy joined Sandia in 1991 as a postdoctoral researcher in chemical kinetics and laser diagnostics.

After working as a postdoc for approximately two years at the Combustion Research Facility, he left to join The Aerospace Corp. in Los Angeles due to Sandia's now-defunct policy of not hiring its own postdocs.

He spent four years in Aerospace's propulsion group before returning to Sandia in 1997 as a technical staff member in the CRF's Combustion Chemistry and Diagnostics department. He was drawn to the opportunity to return to the work he wanted to do in combustion chemistry research. His wife, Julie Fruetel, whom he met while an undergraduate at Harvey Mudd College in Claremont, California, and who was working in Los Angeles, also joined Sandia to work on the microfluidics grand challenge.

The Labs also gave Andy a chance to regularly ride with fellow Sandian and Lawrence Livermore cyclists during the lunch hour.

"I do value work-life balance. That's one of the things that attracted me to Sandia in the first place," he said. Andy's preferred place to be is "outside somewhere, first and foremost, and if at all possible, on a bike.

"I also liked the collegial atmosphere at Sandia/California and the CRF in particular, and I wanted to be a part of that," he said.

Looking back, Andy said he isn't sure he knew who the Sandia/California vice president was at the time. Now, he holds that role.

As Integrated Security Solutions Associate Labs Director, Andy provides leadership and management direction for Sandia/California — with about 1,900 staff members — including California weapons systems and component engineering. He also is responsible for Sandia's energy and homeland security portfolio, which includes about 500 people in New Mexico.

"When you're new to Sandia, I don't think you realize all the opportunities you have to take your career in different directions at Sandia. And it's not like you have to have a long-term plan. Sometimes an opportunity presents itself, and you take it not knowing what the eventual outcome will be," he said.

From management to a unique challenge

Andy returned to Sandia as a staff scientist and was part of a team that discovered a new combustion intermediate, the first discovered in over 30 years. The work ended up on the cover of Science.

"That was the highlight of my technical career," he said.

About that time, he was selected for a management position in reacting flows. A management position in combustion chemistry and diagnostics followed. He then became senior manager for chemical sciences, which he acknowledges was a "big step" early in his career.

As he was trying to get his feet under him in that position, he was thrown another challenge. He was asked to take a key role putting together a proposal for repurposing the California site, which NNSA officials were considering for closure. His experience in that diverse group and the proposal itself led to his next position as senior manager for Livermore Valley Open Campus development. In that role, he developed the physical and operational infrastructure for the campus, an initiative of Sandia and Lawrence Livermore national laboratories for an easily accessed campus along their boundaries to foster collaborations and partnerships between experts from within and outside the labs. The campus opened in 2011 and was expanded in 2021.

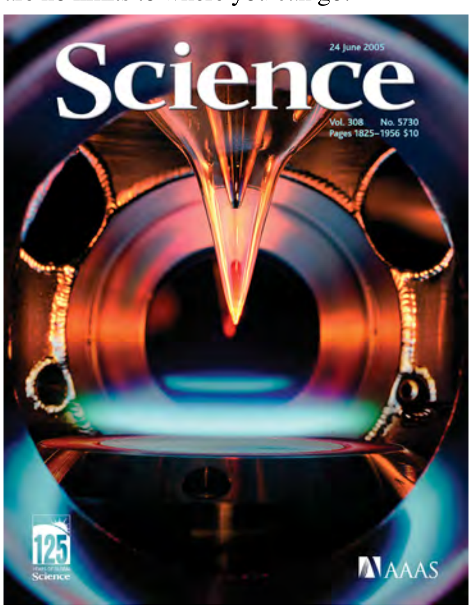
Leadership positions in diverse areas, different sites

In 2014, Andy became senior manager for science-enabled engineering within the California Weapons Systems Engineering Center and led verification and validation for Sandia's Advanced Simulation and Computing Program. In 2015, he became deputy chief technology officer and director of research strategy and partnerships. This position involved commuting to Sandia/New Mexico for three to four weeks every month, which he did for two years before becoming director of the Energy and Homeland Security Program Management Center.

When Dori Ellis became deputy labs director in June 2019, Andy became acting leader for the California site. In September 2019, he was officially selected for the associate labs director position.

"As a young researcher, I never would've guessed I'd be where I am today," Andy said. "I've been fortunate to have had many opportunities at Sandia over nearly 28 years where I learned about different facets of Sandia's work and developed new skills.

"If you're willing to step outside your comfort zone, and even step outside your discipline, and take on new challenges, there are no limits to where you can go."



COVER STORY — In 2005, Associate Labs Director Andy McIlroy was part of a team that discovered a new combustion intermediate, the first discovered in over 30 years. This work was featured on the cover of Science.

Expanding geothermal energy

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Geothermal energy has a lot of promise as a renewable energy source that is not dependent on the sun shining or the wind blowing, but it has some challenges to wide adoption.

One challenge is that there are only a few places in the U.S. that naturally have the right combinations of hot rock close to the Earth's surface with available underground water. Another challenge is the initial start-up cost of drilling and connecting geothermal wells. Eric Robey, a Sandia mechanical engineer, is leading a team to explore if explosives can reduce those two challenges.

"Our goal was to come up with a new way of creating a geothermal fracture network that you have a clear idea where it is going to go — it's steerable and manageable — and you are utilizing fewer resources and being more environmentally friendly," Eric said. "This is where explosives and propellants come in. The idea is that they'll allow us to get away from pumping a lot of fluid down the wells. We're collaborating with Lawrence Livermore National Laboratory to model the explosions and improve the predictability of forming fracture networks."

Starting with 1-foot cubes of plexiglass, which mimic many of the properties of rock, the team watched the explosion shockwave ripple through the cube and listened with specialized microphones to the formation of tiny fractures. The team is using the information on the location of the fractures and the timing of fracture formation to refine existing computer models of underground explosions.

Challenges of cracking hot rock

Because natural formations with the right combination of hot rock and underground water aren't located throughout the U.S., the DOE's Geothermal Technologies Office supports the research, development and testing of enhanced geothermal systems. An enhanced geothermal system takes a location with hot rock and turns it into a location suitable for producing geothermal power by drilling deep wells and carefully fracturing the hot rock so that water can reach the hot rock and carry that heat up to the surface to produce power.

Enhanced geothermal systems have the potential to power 100 million homes, according to the Geothermal Technologies Office.

"They're finding out it's a difficult problem to get fractures to go where they want them," Eric said. "The goal of our project is to see if we can steer the formation of fractures a bit more."

Watching the shockwave

Using plexiglass cubes with small amounts of explosives or propellants ignited in the center, the research team can watch small-scale explosions ripple outward with ultra-high-speed cameras while monitoring the formation of tiny fractures using other sensors. Surprisingly, the mechanical properties of plexiglass are quite similar to granite at about 750 degrees Fahrenheit, said Oleg Vorobiev, a computer model expert at LLNL. To further mimic the properties of hot, hard rock deep underground, the team, including Sandia technologist Joe Pope, applied dozens of tons of pressure to the plexiglass cubes to stress the material and see how the stresses impact fracture formation, Eric said.

SETTING IT UP — Eric Robey, left, a Sandia mechanical engineer, and Joseph Pope, a Sandia technologist, prepare a plexiglass cube for a small-scale explosion. The information from this study could be used to create new geothermal energy systems in locations where it is currently not feasible.

Photo by Bret Latter

Working with Michael Hargather's group, which uses advanced imaging techniques to study explosions and energetic materials, at the New Mexico Institute of Mining and Technology in Socorro, the team watched the explosive shockwave ripple through the plexiglass using schlieren imaging, a technique that uses ultra-high-speed cameras and mirrors to "see" the differences in density.

These differences can be caused by the compression of a shockwave or even differences in temperature like shimmering air over a hot highway, said Sivana Torres, a doctoral student who conducted the experiments at New Mexico Tech's Energetic Materials Research and Testing Center. For these experiments, the team recorded the explosions at 1 million frames per second.

"This project has been a really cool experience: Being able to be my own test engineer and being able to visualize the shockwave propagating through plexiglass," Torres said. "One of my biggest concerns going into 1-foot cubes was that they would be too thick for our imaging system. I do small-scale tests in plexiglass. It was a pleasant surprise that we were able to see the shockwave propagation."

The team also used a technique called photon Doppler velocimetry, which measures the speed of the shockwave as it reaches the outside of the cube by detecting tiny changes to the frequency of a laser. The team hoped that they would be able to see the weaker waves caused by fracture formation, but they were only able to see the initial shockwave, Eric said.

'Listening to a whisper in a hurricane'

After recovering from his initial disappointment, Eric borrowed some specialized microphones called acoustic emission sensors. With an array of microphones on the surface of the cube, the team was able to hear the weaker waves caused by fracture formation and triangulate where they were coming from within the cube.

"This is kind of like listening to a whisper in a hurricane," Eric said, as the shockwave is much stronger than the fracture waves. "This was a bit of a breakthrough because A, it has never been done before and B, it was very uncertain that we'd be able to hear that whisper in a hurricane, but we could."

The acoustic emissions data not only allowed the team to correlate what they could hear from outside the cube to what they saw within the cube, essential for transitioning from doing experiments in plexiglass to doing experiments in granite, but they could also accurately track when the fractures occurred, which is important for the computer modeling efforts, Eric said.

"We're in the process of learning how to 'fly blind' while we can still see," Eric said. "The instruments we're deploying in the clear plastic are the same instruments we'll deploy when we move to opaque rock."

The team conducted similar experiments in cubes formed from different pieces of plexiglass joined together to mimic faults in rock, to see how explosive-formed fractures react to rock faults. They learned that the explosive-formed fractures tend not to cross preexisting faultlines, but the amount of stress the plexiglass is under and orientation of the rock fault are important, Eric said. These results will also be used to improve the computer models.

Computer modeling to scale-up solutions

LLNL has trusted computer models of underground explosions based on decades of experiments, starting with underground nuclear testing in the 1960s, Vorobiev said. However, the experiments these models were based on were mostly conducted in cold rock rather than the hot rock needed for geothermal energy production.

"Eventually, the goal is to understand how to create fracture networks in hot, compressed granite at significant depths," Vorobiev said. "This is very challenging, computationally, because events occur at different timescales. Shockwave propagation is very fast compared to microfracture formation caused by the explosive gases."

The experiments conducted by Eric and Torres are great because they not only provide the information about the final cracks, but they recorded the series of events that produced them, Vorobiev said. His task is to analyze the data from Eric's experiments to refine LLNL's existing models. These models can scale up the results from lab experiments to be able to predict what might happen in actual geothermal field sites, he said.

One of the significant findings from the experiments is that the fractures can start anywhere around the explosive or propellant and grow outward, but due to explosive gases, these random fractures will eventually grow toward the areas with less stress such as along existing fractures, Vorobiev said. The random initiation is good, he said, since it is a way to connect preexisting parallel fractures into a network, which is needed for geothermal energy production.

Now, the team is conducting experiments with explosives or propellants in 1-foot cubes of granite, with the eventual goal of moving to 3-foot cubes of granite. If these lab-scale experiments prove promising, the team hopes to test this in the field at the DOE's Frontier Observatory for Research in Geothermal Energy, Eric said. There are still several hurdles to overcome, but if everything goes smoothly it could take as little as three to five years to reach field-scale testing and from there, commercial implementation.

This research was funded by DOE's Geothermal Technologies Office.

SHOCKING SCHLIEREN — A schlieren image of an experiment 80 microseconds after detonation. The image shows the leading edges, fingernail-like protrusions from the center, and emanating bands, lighter ripples. Sandia scientists hope this kind of data on fracture formation in plexiglass can be used to make geothermal energy more assessable. **Image courtesy of Eric Robey**

Tonopah Test Range

CONTINUED FROM PAGE 1

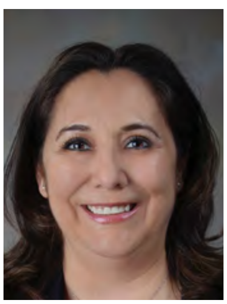
military aircraft platforms and with more in the works. Located about four hours north of Las Vegas, Nevada, the Tonopah Test Range provides research and development test support for DOE weapons programs and has the facilities, large land area and security necessary to conduct a variety of test operations. During her stay, Laura took a four-hour tour of the site that included visits to radar and telemetry outposts, as well as to the Test Operations Center tower where she experienced a simulated test-flight checkout.

"The work you conduct here is a critical step in the development and delivery of the nuclear deterrent. Your flight tests demonstrate that the weapon and the aircraft work as an integrated system to successfully execute the mission," Laura told a town hall audience. "Thank you for all you do. It's beautiful here."

SCENIC VIEWS — Tonopah Test Range at night in May overlooking the target on Antelope lake. The trailer in the foreground holds the ME-16 telescope. **Photo by David Coleman**

Mileposts

Clark Dohrmann 35



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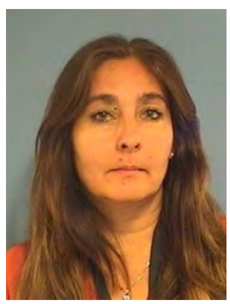

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Science at Sandia: Motivated by curiosity, vital to national security and well-being

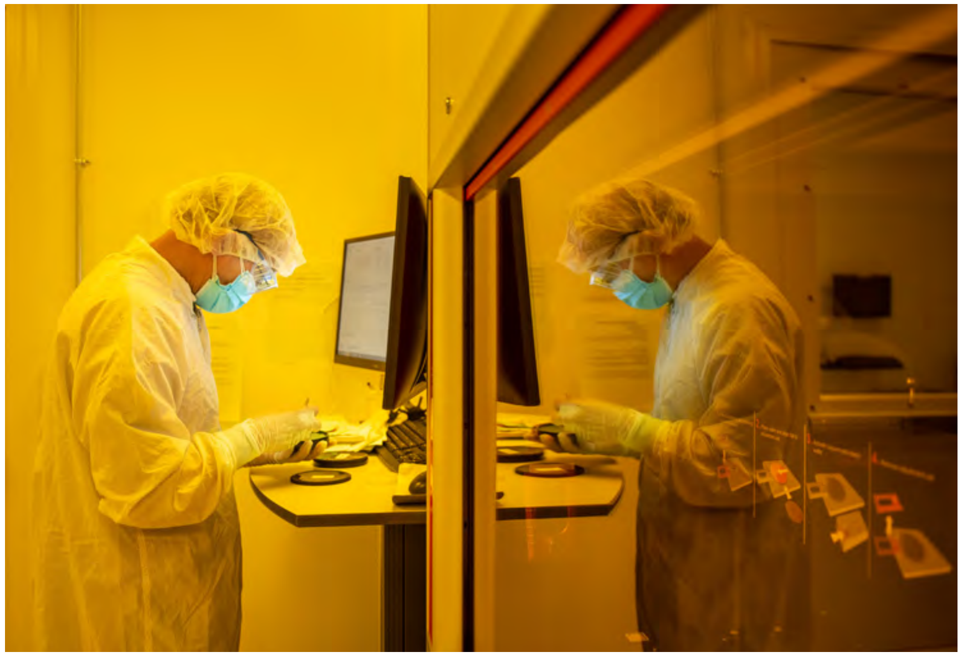
By **Andi Penner**

Born of curiosity-motivated discovery and driven by an urgent wartime need, the August 1945 atomic bomb explosions in Hiroshima and Nagasaki graphically illustrated the role of foundational science in the U.S. effort to bring World War II to an end. The world was both awed and horrified by the power and energy unleashed through nuclear physics. A new scientific era had begun.

In 1949, the Sandia Corp., which began as a Los Alamos Scientific Laboratory division, was responsible for the non-nuclear pieces of the nation's nuclear weapons. By 1957, many at Sandia had realized that those non-nuclear pieces were fundamentally tied to a wide range of materials and natural phenomena best understood in the context of scientific principles.

At the forefront of this realization was a young manager and physicist Richard Claassen, who in March 1957 gave a presentation to Sandia's AT&T/Bell Labs managers on plans for an organization dedicated to "fundamental research." This "group of qualified scientific personnel," Claassen said, would engage Sandia in several distinct but related disciplines, each overlapping with Sandia's weapons work, specifically "solid-state physics, radiation effects, combustion processes, physical electronics, hydro-magnetics, high-temperature physics, theoretical mechanics and geophysics." Claassen documented his remarks in a memo to Sandia leaders in May 1957.

In recognition of the 65th anniversary of Claassen's remarks and memo, the Labs is launching a "Sandia Loves Science" campaign to honor the legacy of his words and Sandia's rich history in advanced science, technology and engineering through articles, activities and events. The vision outlined by Claassen helped propel Sandia into an era of discovery that continues today.



TINY PATTERNS — Computer scientist Anh Luong works in a clean room at Sandia's Center for Integrated Nanotechnologies to add patterns to a laser sample. Work performed at CINT is one example of science and technology research that happens daily at Sandia.

Photo by Craig Fritz

The Claassen effect

The Labs' leaders took note of Claassen's contention that "in a mature organization, the research effort should be expended in advance of the development programs." Claassen's original presentation and the subsequent memo "are now viewed as the origin story for Sandia's research," said Susan Seestrom, Sandia's associate labs director of advanced science and technology and chief research officer.

"It's the reason Sandia now has strong research organizations exploring the fundamentals of science and engineering, making an impact not only on national security, but also on the international scientific community and global interest in the science of the possible," Susan said.

Sandia's interest in radiation effects was one of the earliest examples of such fundamental research. The Labs pursued a deeper understanding of radiation effects on electronic devices, which were beginning to be semiconductor-based rather than relying on vacuum tubes. Research in ion-solid interactions helped establish the fundamental materials physics of ion implantation, a process for altering the surface of materials to change its properties. The work was embodied in a then-widely used computer program called Transport of Ions in Matter. To this day, the publication about TRIM is one of Sandia's most often cited and influential articles. In 1990, Sandia researcher Tom Picraux received the prestigious DOE Office of Science E.O. Lawrence award "for developments in ion-channeling and related ion-beam techniques for materials characterization, leading to new microscopic understanding of materials."

Another early and ongoing example of Sandia's impact is fundamental research in combustion science. In the 1970s, researchers recognized the advanced computational and laser diagnostic tools that the Labs pioneered for weapons development could be employed to probe the complexity of combustion. Sandia's Combustion

Research Facility became a leading force in understanding the coupled chemistry and turbulent mixing that underlies combustion processes. Direct and detailed measurement of combustion, including in operating engines, was coupled with fundamental discovery in chemical reactivity and turbulent transport. CRF accomplishments were recognized, for example, with the elections of engineers Jim Miller and Jackie Chen to the National Academy of Engineering.

Far-reaching Sandia-developed tools like the Chemical Kinetics, or CHEMKIN, program for calculating combustion chemistry helped bring these discoveries to designers of cleaner and more efficient devices.

The Labs' fundamental research in compound semiconductors laid the foundation for strained-layer devices, for which Sandia physicist Gordon Osbourn received the 1985 E.O. Lawrence award, which noted his work "for stimulating the new field of strained-layer super lattices by making the first theoretical calculations predicting their unique electrical and optical properties."

"Claassen's objectives for a fundamental research organization still guide us today even though the nature of national and global security work has changed. As engineers, we can do a better job of collaborating with scientists earlier in the process—in research, advice, and design before there is ever a surprise problem."

—Sandia Labs Director James Peery

Sandia has since pioneered many such devices with significant impact not only on weapons design but also important other applications. Innovations in solid-state lighting are increasing the energy efficiency of general illumination worldwide, and innovations in ultra-wide-bandgap semiconductors will influence future power electronics for grid modernization.

Sandia also has extended its fundamental research into the area of quantum information science. With roots in the early 2000s, researchers embarked on a Laboratory Directed Research and Development Grand Challenge, Quantum Information Science and Technology. Still in its early years, quantum research has a wide range of national security applications, not to mention the promise of revolutionizing computation.

"Sandia has been strategic in adding new areas like high-performance computing, computational science, quantum information science and climate science," said Labs Director James Peery, commenting on Claassen's words. "We have looked at what's on the horizon and made investments through LDRD and other vehicles to bring in the scientists and engineers. We've had a true impact, not only in the scientific community, but also in the national security community."

Discovering the future

The fundamental research Sandia engages in will continue to impact national security and society.

"It's easy to get distracted by the urgent nature of our deliveries in nuclear deterrence and national security work and lose sight of the deep scientific understanding and the deep thinking that comes from having a vigorous fundamental science program," said Associate Labs Director Andy McIlroy. "That is what allows us to address problems that others in the scientific and engineering community think are impossible to solve."

Claassen raised challenges associated with foundational research that remain today. Claassen said the best research and development work happens inside a corporate culture and organizational structure that encourages and supports discovery research and the scientists who desire to pursue it. Claassen proposed a research organization because he saw fertile ground for growing fundamental science and scientists at Sandia.

DERIVING DATA — Postdoctoral appointee Kimberly Bassett looks at electrodeposited films to build a machine learning data set at Sandia's Center for Integrated Nanotechnologies. **Photo by Craig Fritz**

"Claassen's ideas bear repeating and still apply even if we extend them from the weapons work of the late 1950s to the many other national security areas we work on today," said Deputy Chief Research Officer Basil Hassan.

"Claassen recognized then, and it is still true now, that success comes from the close connections between those engaged in early-stage discovery research and engineering solutions. We tend to see research to development to application as a linear process, but Sandia has demonstrated success in many areas, including impacts to the national hypersonics and energy programs, by ensuring this process is circular. By learning how to translate that discovery to engineering applications, we then learn how to better drive discovery research by those areas inspired by our broad national security mission," Basil said.

Sandia's people, research foundations, capabilities and programs not only serve national security but also contribute to the nation's technoscientific health. The Labs' seven research foundations — bioscience, computing and information science, earth science, engineering science, materials science, nanodevices and microsystems, and radiation, electrical and high energy density science — align with mission needs.

"Claassen's objectives for a fundamental research organization still guide us today even though the nature of national and global security work has changed," James said. "As engineers, we can do a better job of collaborating with scientists earlier in the process — in research, advice and design before there is ever a surprise problem."

The next generation

James sees research opportunities as a great recruiting tool.

"We do great science here, and we often don't know where that science is going to (take us)," he said. "You may be working on research in one area of national security and discover that what you're working on is applicable, say, to climate security. Or vice versa. Multiuse research is one of the really fun parts of the science that we do here. You never really know at the beginning where it might lead."

For example, James said, "In the mid-1990s, one individual started an LDRD project on optimization techniques. For probably five years, we didn't know exactly where it was headed. Then came this huge push for modeling and simulation, not only optimization but also uncertainty quantification, sensitivity analysis. And now, it's probably one of LDRD's biggest successes. There are countless examples like that at the Labs."

Recognizing that the Labs' work is expanding into new areas that may have seemed like science fiction to Claassen, such as artificial intelligence, quantum computing and the rise of biology as a predictive science, James encourages the workforce to "be curious when new hires talk about new scientific tools or new approaches to doing engineering, which they bring into our laboratory environments. And we need to extend that interest to all levels of management who are involved in addressing the challenges."

"This is an exciting time for fundamental research, curiosity and discovery at Sandia," Susan said. Discovery research often leads to unexpected breakthroughs and can nurture and sustain an inquisitive and creative workforce, one of whom could write the next Claassen Memo.

"As experimentalists, we are involved in rapid cycles of learning," she said. The Advanced Science and Technology division, Sandia's primary research organization, "exists to solve the foundational science, technology and engineering questions of today and tomorrow."

GOLDEN WAFER — Senior technologist Michael De La Garza removes a silicon wafer coated with gold that will be used for calibrating a thermal metal evaporator that he built at Sandia's Center for Integrated Nanotechnologies.
Still from video by Kimberly Bassett

Recent Patents

January-March 2022

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).

- **Michael P. Frank:** Ballistic reversible superconducting memory element. Patent #11289156
- **Gabriella Dalton and Edward Steven Jimenez:** Calibration method for a spectral computerized tomography system. Patent #11263792
- **Nicholas Myllenbeck, Anthe George and Ryan Wesley Davis:** Compounds that induce octane overboosting. Patent #11225622
- **Steven James Spencer, Timothy James Blada, Stephen Buerger, David W. Raymond and Jiann-Cherng Su:** Control systems and methods to enable autonomous drilling. Patent #11280173
- **William Mark Severa, James Bradley Aimone, Richard B. Lehoucq and Ojas D. Parekh:** Devices and methods for increasing the speed and efficiency at which a computer is capable of modeling a plurality of random walkers using a particle method. Patent #11281964
- **Timothy Walsh, Jerry W. Rouse and Daniel Bowman:** Directional infrasound sensing. Patent #11287506
- **Robert Kaplar and Jack David Flicker:** Gallium nitride electromagnetic pulse arrestor. Patent #11227844
- **Ronald S. Goeke:** Method for eliminating runout of braze filler metal during active brazing. Patent #11241752
- **George T. Wang and Keshab Raj Sapkota:** Method for fabricating embedded nanostructures with arbitrary shape. Patent #11222950
- **Erik David Spoerke, Stephen Percival and Leo J.Small:** Molten inorganic electrolytes for low temperature sodium batteries. Patent #11258096
- **Bryan James Kaehr:** Optically configurable charge-transfer materials and methods thereof. Patent #11222249
- **Matt Eichenfield, Christopher Michael Long and Daniel Beom Soo Soh:** Photonic integrated circuits for generating high-brightness squeezed light. Patent #11226502
- **Brennan Walder and Eric Glenn Sorte:** Probe for operando in situ electrochemical nuclear magnetic resonance spectroscopy. Patent #11215686
- **David W. Peters, Richard Karl Harrison and Jeffrey B. Martin:** Radiation detector using a graphene amplifier layer. Patent #11287536
- **Vitalie Stavila:** Solid state synthesis of metal borohydrides. Patent #11267702

Sandia observes Juneteenth as federal holiday

This year, the Labs will add Juneteenth to its calendar as a federal holiday. Juneteenth commemorates the emancipation of enslaved African American people and was recognized as a federal holiday in 2021, the first new federal holiday since Martin Luther King Jr. Day in 1983.

Juneteenth is “a time for people of all backgrounds to come together to fellowship with, educate ourselves about and uplift the African American community,” former Deputy Labs Director Dori Ellis wrote in a letter to staff about the holiday in 2020. “I encourage you to take some time to self-reflect and create a personal path forward to instill positive and permanent changes in your immediate environment. Get to know your colleagues. Make sure all your teammates are encouraged to bring their whole selves to work.”

Typical ways that Juneteenth might be celebrated include family gatherings, cookouts, city celebrations, parades, pageants, educational and cultural demonstrations and acknowledgment of the achievements of African Americans and contributions to their communities.

This new, permanent Labs holiday replaces the Energy Conservation Day, usually observed on the Friday after Thanksgiving for many staff members. Represented employees should follow provisions in their collective bargaining agreements.

Virtual tools bring cybersecurity experts together to tackle tough problems

By **Michael Ellis Langley**

An annual workshop designed to bring the best minds in cybersecurity from Sandia and the federal government together to tackle pernicious security issues found a way to bring more people to the table despite a virtual environment.

Sandia cybersecurity researcher Jon Crussell runs West Coast Winter Cohort, which is organized by the Labs and in its fourth year.

"The purpose of the West Coast Winter Cohort is to bring together some of our partners in the federal government to foster working relationships and problem solving," Jon said.

Every year, the cohort presents the participants with a current cybersecurity issue to tackle. The people are broken into teams to work on various parts of the issue, all to create relationships between agencies and cyber professionals with different skillsets.

HACKER ATTACKERS — The West Coast Winter Cohort, photographed in 2020 prior to the COVID-19 pandemic, brings together cybersecurity experts from all over the nation every year to tackle security issues and create collaborative relationships between agencies.

Photo by Michael Ellis Langley

"The challenge this year was malware obfuscations, which are basically impediments that are added to programs by cyber adversaries in order to make analysis harder," Jon said. "They are explicitly put there by adversaries to make the process of reverse engineering the program harder. It's very challenging to remove, so we were looking at techniques to automatically mitigate some of those impediments and remove them to help speed up malware analysis."

Cybersecurity researcher Sophie Quynn builds tools to analyze malware at Sandia and, during the cohort, was the static analysis team lead.

"When it comes to malware analysis, there are two main types of analysis techniques: static and dynamic," Sophie said. "Dynamic analysis is when you activate the malware in a sandbox environment and collect data on what it does. Static tools analyze the malware without running it, examining the code itself for malicious activity."

Virtual success

Jon and Sophie said the event was a success.

"We had some nice feedback from one of the new entities where they are interested in some of the tools that are being built and looking for opportunities to collaborate some more," Jon said. "Also, the problem space is quite large, and so I think we've identified some paths to continue working on in order to provide even more advanced cybersecurity capabilities."

Sophie said the workshop will benefit her work at Sandia. "You get an insight into the little things that matter to our partners that you don't think about from a user experience perspective when you're just focused on the research. You get a sense of the kind of problems they're facing and what's helpful to them. One thing I learned was how important it is to build tools that seamlessly integrate into their systems."

Staying together, apart

The event, held between Jan. 31 and Feb. 24, was virtual for the second year in a row, so Jon and his team made some enhancements for people working remotely on the same project at the same time.

"We had participants scattered across all U.S. time zones," he said, "So we had this concept of core hours where people were expected to be online and available and to use those as the major time of the day to collaborate."

Sophie said that it was important that no one was isolated.

"We had a buddy system, something that Jon implemented," she said. "Every team member had a buddy that they needed to check in with every day. The idea was that no one was ever going a full day without having a one-on-one conversation with somebody about how they were doing."

They also encouraged people to turn on video and set up social hours after the core hours so the 31 participants could chat socially.

"I think we were able to replicate that collaborative research environment," Sophie said. "I did feel like I got to know my fellow teammates very well although we did not meet in person."

Sandians celebrate Pride Month

Photos by **Craig Fritz**

FLYING HIGH— In honor of Pride Month, the Pride flag flies over Sandia for the first time on June 6 in front of Building 800.

PRIDE FLAG FIRST — ProForce's Charles Hedrick, left, and Tommy Serna, center, begin raising the Pride flag for the first time at Sandia as Associate Labs Director Susan Seestrom, the executive champion of the Sandia Pride Alliance Network, and others watch the ceremony.

PRIDEFUL APPLAUSE — Sandia staff members applaud as the Pride flag is raised in front of Building 800 in honor of Pride Month.

PASS THE FLAG — Mary Guth, a board member of the Sandia Pride Alliance Network, passes a Pride flag along a chain of staff members before it is raised.

COLORFUL CREW — Associate Labs Director Brian Carter, other directors and staff members joined the Sandia Pride Alliance Network float during the parade.

PRIDEFEST — Los Alamos National Laboratory health physics coordinator Tom Shereck, left with flag, walks with Sandians during the Albuquerque PrideFest parade.

FLOAT ON — Electrical surety intern Britanny Hernandez waves a flag while aboard the Sandia float as it moved along Central Avenue during the parade.